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WASM 2015 editorial



Dear Colleagues and Friends,

On behalf of the World Association of Sleep Medicine (WASM) and the Korean Society of Sleep Medicine (KSSM), we are delighted to welcome you to our joint congress: the 6th World Congress on Sleep Medicine, from March 21 to 25, 2015 at Seoul Korea. The congress provides an international discussion forum of sleep professionals from the entire world. It focuses particularly on the interdisciplinary character of our field. Sleep clinicians, technologists, trainees, educators and scientists from around the world will meet here to advance knowledge on sleep science; sleep in public health; sleep health; and the sleep-wake disorders, diagnosis, and treatments. We seek to maximize learning both from formal presentations by leading experts in their fields and from informal discussion groups emphasizing opportunities for your participation. The social events and the Asian culture of Korea support productive professional and personal interactions. The global

character and reach of WASM in collaboration with the knowledge of the local Korean Society of Sleep Medicine bring the best of sleep medicine to Korea. Your involvement in this congress will be greatly valued. You may learn and also share knowledge and skills that will advance sleep health around the world. We hope that you'll enjoy the science, learning, collegiality, and social events at our world sleep conference in this historic city with great food, culture, art, and music.

Welcome to Seoul!

Best regards,

Allan O'Bryan *

*World Association of Sleep Medicine, 3270 19th St NW, Suite 110,
Rochester, MN 55901, USA*

**Tel.: +1 507 206 1235; fax: +1 877 659 0760.*

E-mail address: obryan@wasmonline.org

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Abstracts for the 6th World Congress on Sleep Medicine, 23 March to 25 March 2015

Altered sleep architecture in autosomal dominant spinocerebellar ataxias: A polysomnographic based study

S. Donilparthi¹, R. Yadav¹, A. Sasidharan², P. Pal¹, S. Jain³, B. Kutty²

¹ Department of Neurology, NIMHANS, Bangalore, India

² Department of Neurophysiology, NIMHANS, Bangalore, India

³ Molecular Genetics Laboratory, NIMHANS, Bangalore, India

Introduction: Spinocerebellar ataxias (SCAs), are tri nucleotide repeat length progressive neurodegenerative disorders in which the cerebellum slowly degenerates, often accompanied by degenerative changes in the brainstem. Sleep disturbances have been reported in few studies.

Materials and methods: Objective: To identify and to characterize the sleep disturbances in patients with genetically positive spinocerebellar ataxias (SCA 1, 2, 3). Methods: Patients with progressive ataxia were identified and assessed clinically. All the patients were interviewed with sleep questionnaire. Disease severity was measured with International Ataxia Rating Scale (ICARS) scale. Sleep quality was assessed with Pittsburgh Sleep Quality Index (PSQI), Mayo Sleep Questionnaire (MSQ), Epworth Sleepiness Scale (ESS). Genetically confirmed cases (20 patients) underwent overnight polysomnography (PSG) using 40 channel Galileo Mizar-40 Polysomnography system (EB Neuro, Italy). The sleep scoring was carried out according to AASM-2012 using POLYMAN v1.15 (Marco Roessen and Bob Kemp) and sleep variables were analysed across sleep cycles using custom scripts written in MATLAB 2012b (Mathworks, USA).

Results: Patients of SCA1, 2, 3 (n = 20; 11 males) were recruited. SCA1 = 8; SCA2 = 7; SCA3 = 5; Mean age = 35.49 ± 7.75; Mean ICARS = 35.15 ± 18.75; Mean PSQI = 3.8 ± 3.6, Mean ESS = 2.1 ± 1.7. All patients (8/8) of SCA1 reported no sleep disturbances; 3/7 patients of SCA 2 reported delayed sleep onset; 3/5 patients of SCA3 reported delayed sleep onset and intermittent awakening. And none of them gave a history suggestive of REM sleep behaviour disorder (RBD), rest less leg syndrome (RLS), excessive day time somnolence (EDS). Polysomnographic analysis showed significant alteration of sleep architecture predominantly affecting REM sleep states. Average Sleep Efficiency = 75.6 ± 17.6; N1% = 17.6 ± 12; N2% = 52 ± 14.6; N3% = 24.5 ± 12.5; REM% = 5.6 ± 6.8. Absent REM sleep states in 70% of SCA2 patients, 60% of SCA3 patients, present in all patients in SCA1 but with significant reduction. There is negative correlation between disease severity (ICARS) and REM percentage (p = 0.028).

Conclusion: In SCAs as the degeneration progresses brain stem structures are involved apart from the cerebellum. The more severe affection of REM sleep States in SCA2 patients and SCA3 supports early affection of brain stem structures. This needs further exploration by neuroimaging and pathology studies.

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Diagnosing REM sleep behaviour disorder in patients with Parkinson's disease: The role of screening questionnaires and of measures of REM sleep without atonia

M. Figorilli¹, R. Ferri², B. Pereira³, P. Beudin⁴, F. Marrosu⁵, M. Puligheddu⁵, F. Durif⁶, M. Fantini⁶

¹ Sleep Disorder Center, Department of Public Health & Clinical and Molecular Medicine, University of Cagliari, Italy

² Department of Neurology I.C., Oasi Institute for Research on Mental Retardation and Brain Aging (IRCCS), Italy

³ Biostatistics Unit (DRCI) Clermont-Ferrand, France

⁴ Neurology Department, Chu Clermont-Ferrand, France

⁵ Sleep Disorder Center, Department of Public Health & Clinical and Molecular Medicine, Italy

⁶ EA 7980, UFR Medicine, University of Clermont, Clermont-Ferrand, France

Introduction: To assess the sensitivity and specificity of both the REM sleep behaviour disorder (RBD) single-question screen (RBD1Q) [1] and the RBD-Screening Questionnaire (RBDSQ) [2], as well as of measures of REM sleep without atonia (RSWA) assessed with three different methods, in patients with Parkinson's disease (PD).

Materials and methods: Sixty non-demented PD patients (M = 37; mean age: 64 ± 8 years) consecutively evaluated at a movement disorder center, filled out both RBD1Q and RBD-SQ, before undergoing a full-night video-polysomnographic recording. RSWA was evaluated using the Montreal method [3] (% tonic 30-s epochs and % 2-s mini-epochs containing phasic chin EMG activity), the SINBAR [4] (% 30-s epochs containing any chin or bilateral Flexor Superficialis Digitorum (FSD) EMG activity) and the automatic Atonia Index [3]. The comparison of these three methods was possible in 32 patients.

Results: RBD was diagnosed in 36 patients following the ICSD-3 criteria, including the presence of ≥27% of 30-s epochs containing any chin or FSD EMG activity. Sensitivity of the RBD-1Q and of the RBD-SQ was 55.9% (ROC = 0.79) and 52.9% (ROC = 0.78), while specificity was 90.9% for RBD-1Q and 81.8% for RBDSQ. The simultaneous use of both questionnaires increases the sensitivity (67.6%, ROC = 0.84) without modifying the specificity (76.2%). Taking ICSD-3 RSWA criteria as a reference, the tonic parameters of two visual methods, namely the Montreal % tonic chin 30-s epochs and the SINBAR % 30-s epochs containing any chin/FSD activity, showed 100% sensitivity, 76.9% specificity and ROC = 0.93. Atonia Index performed slightly lower, with sensitivity = 94.7%, specificity = 69.2% and ROC = 0.84. The phasic parameters performed significantly worse.

The inclusion of FSD does not increase the performance obtained with the chin alone.

Conclusion: Screening questionnaires showed good specificity but low sensitivity; conversely, visual and automatic evaluation of RSWA showed high sensitivity and good specificity for RBD in PD patients. PD patients might underestimate their RBD during sleep and/or they might show relatively frequent RSWA without fulfilling the diagnostic criteria for RBD.

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Antidepressants increase REM sleep muscle tone in patients with and without REM sleep behavior disorder

S. McCarter¹, E. St. Louis², D. Sandness¹, K. Arndt³, M. Erickson³, G. Tabatabai¹, B. Boeve⁴, M. Silber⁴

¹ Mayo Clinic Center for Sleep Medicine, USA

² Department of Neurology and Medicine, Mayo Clinic Center for Sleep Medicine, USA

³ Cornell College, USA

⁴ Department of Neurology, Mayo Clinic Center for Sleep Medicine, USA

Introduction: REM sleep behavior disorder (RBD) is associated with antidepressant treatment, especially in younger patients; but quantitative REM sleep without atonia (RSWA) analyses of psychiatric RBD patients remain limited. We analyzed RSWA in adults receiving antidepressants, with and without RBD.

Materials and methods: We comparatively analyzed manual phasic, tonic and “any” % muscle activity in the submental (SM) and anterior tibialis (AT) muscles as well as automated RSWA in the SM between RBD and control groups. Participants included traditional RBD without antidepressant treatment (n = 30, 15 Parkinson disease [PD-RBD] and 15 idiopathic); psychiatric RBD receiving antidepressants (n = 30); and adults without RBD, including antidepressant-treated psychiatric (n = 30), untreated psychiatric (n = 15), and OSA (n = 60) controls. RSWA metrics were compared between groups, and regression was used to explore associations with clinical variables.

Results: RSWA was highest in traditional and psychiatric RBD patients, intermediate in treated psychiatric controls, and lowest in untreated psychiatric and OSA controls (p < 0.01). RSWA distribution and type also differed between antidepressant-treated patients having higher values in AT, and PD-RBD with higher SM and tonic RSWA. Psychiatric RBD and iRBD patients had similar RSWA. Psychiatric disease severity and antidepressant dosage were not associated with RSWA. Patients with psychiatric RBD had significantly younger age at onset than traditional RBD patients (p < 0.01).

Conclusion: Antidepressant treatment was associated with elevated RSWA even without RBD, suggesting that antidepressants, not depression, promote RSWA. PD-RBD patients had increased SM and tonic muscle activity, while psychiatric RBD and iRBD patients had similar RSWA, suggesting different RSWA mechanisms in these subgroups, or similar underlying neurodegenerative processes with temporal evolution.

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Motor and non-motor features of Parkinson’s disease in idiopathic REM sleep behaviour disorder

M. Rolinski¹, M. Lawton², S. Evetts¹, F. Baig¹, C. Ruffmann¹, C. Mackay¹, T. Quinnell³, Z. Zaiwalla⁴, Y. Ben-shlomo², M. Hu¹

¹ University of Oxford, UK

² University of Bristol, UK

³ Papworth Hospital NHS Trust, UK

⁴ Oxford University Hospitals NHS Trust, UK

Introduction: In some, REM sleep behavior disorder (RBD) is thought to represent the prodromal stage of Parkinson’s disease (PD). To assess this, we endeavored to elucidate the motor and non-motor characteristic of RBD, in comparison with healthy controls and patients with early drug-naïve PD, accounting for potential genetic confounders.

Materials and methods: Patients with idiopathic RBD were recruited from the sleep disorders clinic at the John Radcliffe Hospital, Oxford and the Papworth Hospital, Cambridge. The diagnosis of RBD was made on the basis of polysomnographic evidence according to standard International Classification of Sleep Disorders-II criteria by a consultant specialising in sleep disorders. Patients were excluded if their RBD was judged by their clinical team to be secondary to medication use, or was associated with other neurological conditions, including Parkinson’s disease and narcolepsy. Healthy controls and drug-naïve patients with PD were selected from the Oxford Parkinson’s Disease Centre (OPDC) patient cohort and were matched to the RBD group for age and gender.

All participants were screened for mutations in the glucocerebrosidase (GBA) and the leucine-rich repeat kinase 2 (LRRK2) genes, and a positive family history. Motor characteristics were assessed using the Unified Parkinson’s Disease Rating Scale-III, Purdue pegboard and Flamingo balance test. Nonmotor assessment included screening for cognitive impairment, hyposmia, autonomic features, anxiety and depression.

Results: Fifty-seven patients with idiopathic RBD (mean symptom duration 6.5 ± 3.3 years) were evaluated, along with 74 age- and sex-matched healthy controls and 74 patients with drug-naïve PD (mean disease duration 0.7 ± 0.7 years). Two participants tested positive for one of the alleles of interest, one with RBD (GBA N370S) and one with PD (LRRK2 G2019S), and were, therefore, excluded from further analyses. Patients with RBD were less likely to successfully perform the Flamingo test (p = 0.005) and had a significantly higher total UPDRS part III score than healthy controls (p = 0.02). They had higher bradykinesia (p < 0.001), rigidity (p < 0.01) and tremor (p < 0.05) but not postural instability/gait disorder scores, when compared with healthy controls. Patients with RBD were more likely to have evidence of cognitive impairment (OR 1.58, 95% CI 1.10–2.27), almost three times more likely to have hyposmia (OR 2.86, 95% CI 1.92–4.26) and almost two times more likely to have constipation (OR 1.83, 95% CI 1.27–2.64), as compared with healthy controls. The RBD group was also significantly more likely to suffer from depression (OR 2.21, 95% CI 1.28–3.82) and anxiety (OR 3.13, 95% CI 1.44–6.77). There were no statistically significant differences between the PD and RBD groups in any of the non-motor domains.

Conclusion: RBD is associated with motor and non-motor impairment seen in early PD. This may represent prodromal stages of

sporadic PD rather than common genetic pathways. Further studies are needed to assess whether baseline findings can predict life-long risk of conversion from RBD to PD or related neurodegenerative disorder.

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First evidence for neurodegeneration in REM sleep without atonia

A. Stefani, D. Gabelia, T. Mitterling, P. Mahlknecht, H. Stockner, W. Poewe, B. Högl, B. Frauscher
Department of Neurology, Medical University of Innsbruck, Innsbruck, Austria

Introduction: Idiopathic REM sleep behavior disorder (RBD) is a harbinger of neurodegenerative diseases. It is tempting to speculate that isolated REM sleep without atonia (RWA) might be an even earlier preclinical biomarker of neurodegeneration. We performed a long-term follow-up investigation including neurodegenerative biomarkers and polysomnography in subjects with isolated RWA.

Materials and methods: Participants were recruited from 50 subjects with isolated RWA who were diagnosed at the sleep laboratory of the Department of Neurology at Innsbruck Medical University between 2003 and 2005. Eligible subjects underwent clinical examination, follow-up polysomnography, and assessment of neurodegenerative biomarkers (cognition, finger speed, color vision, olfaction, orthostatic hypotension, substantia nigra hyperechogenicity).

Results: After a mean interval of 8.6 ± 0.9 years, 1/14 participating subjects (7.3%) converted into full-blown RBD. Ten subjects (71.4%) in the RWA group were positive for at least one biomarker compared with four subjects (28.6%) in the control group ($p = 0.057$). For the individual measures, substantia nigra hyperechogenicity and cognitive impairment showed the highest differences between RWA subjects and controls (28.6% vs. 7.1%). EMG activity increased from baseline to follow-up polysomnography with highest increases in the combined EMG activity measure of “any” mentalis and both anterior tibialis muscles (baseline vs follow-up: $32.5 \pm 9.4\%$ vs. $52.2 \pm 16.6\%$, $p = 0.005$).

Conclusion: This study provides first evidence that RWA may present a very early neurodegenerative biomarker. This, however, is of importance to define at risk cohorts for Parkinson disease or related disorders. Future replication in larger studies with longer observational periods is warranted.

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Mortality and its correlated clinical and polysomnographic characteristics in REM sleep behavior disorder

J. Zhang, J. Zhou, S. Lam, Y. Wing
The Chinese University of Hong Kong, Hong Kong

Introduction: Despite its significantly higher risk of developing neurodegenerative diseases, the mortality in RBD and its risk factors has not been known. We aimed to determine the mortality rate of

RBD and its clinical and polysomnographic risk factors by a large prospective cohort in Hong Kong.

Materials and methods: A total of 243 patients (74.9% males, mean age = 65.1 ± 12.2 years old) with typical RBD were recruited from our sleep assessment unit. The diagnosis of RBD was confirmed by at least one night video-polysomnogram. Neurodegenerative diseases at baseline were assessed by clinical neurologists. Death status was reviewed in the Clinical Management System (CMS), an integrated computerized clinical workstation that is being used in all public hospitals in Hong Kong. The mean follow-up period was 88 months (7.3 years) with a standard deviation of 59.9 months (range 7–182 months). Among 243 patients recruited into this study, 44 (18.1%) were found deceased by November 2014.

Results: In univariate cox regression analyses, mortality was associated with age at baseline (hazard ratio (HR) 95% CI = 1.09 (1.05–1.13), $p < 0.001$), wake after sleep onset (HR (95% CI) = 1.04 (1.00–1.07), $p = 0.050$), stage N2 percentage (HR (95% CI) = 1.02 (1.00–1.03), $p = 0.024$), stage N3 percentage (HR (95% CI) = 0.89 (0.81–0.97), $p = 0.012$), and PLMI (HR (95% CI) = 1.03 (1.02–1.03), $p < 0.001$). In multivariate cox regression analyses, mortality was associated with age at baseline (hazard ratio (HR) 95% CI = 1.09 (1.05–1.13), $p < 0.001$), stage N3 percentage (HR (95% CI) = 0.90 (0.81–0.99), $p = 0.034$), and PLMI (HR (95% CI) = 1.03 (1.02–1.03), $p < 0.001$). Sex, obesity, comorbid neurodegenerative diseases, and other polysomnographic characteristics (including apnea and hypnea index and sleep efficiency) were not associated with mortality in patients with typical RBD. After excluding 70 patients with neurodegenerative disease at baseline, mortality was found to be associated with age at baseline (hazard ratio (HR) 95% CI = 1.13 (1.07–1.20), $p < 0.001$) and PLMI (HR (95% CI) = 1.02 (1.01–1.03), $p < 0.001$).

Conclusion: This is the first study exploring the mortality of RBD and its correlated factors. Older age, poor sleep quality and comorbid PLMS are the strongest predictors of mortality in RBD. The finding that comorbid neurodegenerative diseases were not associated with increased mortality was unexpected.

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Apnea induced REM sleep disruption impairs human spatial navigational memory

A. Varga¹, A. Kishi², J. Mantua¹, J. Lim¹, V. Koushyk¹, D. Leibert¹, R. Osorio¹, D. Rapoport¹, I. Ayappa¹

¹ NYU School of Medicine, USA

² The University of Tokyo, Japan

Introduction: Both hippocampal electrophysiology and behavioral performance evidence support a role for sleep in spatial navigational memory, but the role of particular sleep stages is less clear. While rodent models suggest REM sleep's importance in spatial navigational memory, a similar role for REM sleep has never been examined in humans.

Materials and methods: Given the increased severity of obstructive sleep apnea (OSA) in REM associated with REM skeletal muscle atonia, we hypothesized disrupting human REM sleep via sleep-stage specific OSA would impair proper consolidation of spatial memories. We recruited subjects with severe OSA who are well treated and adherent with continuous positive airway pressure (CPAP). Restricting CPAP withdrawal to REM through real-time monitoring of the polysomnogram (PSG) provides a novel way of

addressing the role of REM sleep in spatial navigational memory with a physiologically relevant stimulus. Individual subjects spent two different nights in the lab, during which subjects performed timed trials before and after sleep on one of two unique but equally difficult computer-generated 3D spatial mazes. One night's sleep was normally consolidated with use of therapeutic CPAP throughout, while on the other night, CPAP was reduced only in REM sleep allowing REM OSA to recur.

Results: REM disruption via this method caused reduction of REM sleep and significantly fragmented any remaining REM sleep without affecting total sleep time, sleep efficiency, or slow wave sleep. We observed improvements in maze completion time, distance traveled, and distance spent backtracking after a night of normal sleep that were significantly attenuated after a night of REM disruption without changes in psychomotor vigilance. Furthermore, the degree of improvement in maze completion time significantly positively correlated with the mean REM run duration across both sleep conditions.

Conclusion: In conclusion, we demonstrate a novel role for REM sleep in human memory formation and highlight a significant cognitive consequence of OSA.

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Genetic variation in the insulin receptor substrate-1 gene in Asian Indians with obstructive sleep apnea and non alcoholic fatty liver disease

S. Bhatt¹, R. Guleria¹, N. Vikram², V. Nandhan³, Y. Yadav¹, A. Gupta⁴

¹ Department of Pulmonary Medicine and Sleep Disorders, All India Institute of Medical Sciences, New Delhi, India

² Department of Medicine, All India Institute of Medical Sciences, New Delhi, India

³ All India Institute of Medical Sciences, New Delhi, India

⁴ Department of Radiology, All India Institute of Medical Sciences, New Delhi, India

Introduction: Insulin receptor substrate 1 (IRS-1) gene (Gly-972-Arg) has been associated with type 2 diabetes, insulin resistance and obesity, whereas genetic studies of OSA and NAFLD in Asian Indians are not investigated. The aim of the present study was to investigate the association of IRS-1 gene polymorphism in OSA and NAFLD.

Materials and methods: One hundred eighty subjects 74 OSA with NAFLD (group 1), 35 OSA without NAFLD (group 2), 42 without OSA and with NAFLD (group 3) and 29 without OSA and without NAFLD (group 4) were evaluated. Degree of NAFLD was based on abdomen liver ultrasound and of OSA on overnight polysomnography. Clinical, anthropometric (circumferences and skin folds), body composition and biochemical (fasting blood glucose, lipid profile and liver function test) levels was measured in all subjects. Fasting serum insulin levels and value of homeostasis model assessment of insulin resistance (HOMA-IR) was determined. Polymerase chain reaction and restriction fragment length polymorphism of IRS-1 gene was performed. The associations of this polymorphism with clinical, anthropometric and biochemical profiles were investigated.

Results: Blood pressure [systolic ($p = 0.001$) and diastolic ($p = 0.0003$), anthropometric parameters [waist circumference ($p = 0.001$), hip circumference ($p = 0.003$), subscapular ($p = 0.003$), lateral thoracic ($p = 0.002$) and suprailliac ($p = 0.002$)], body composition [% body fat ($p = 0.003$) and body fat (kg) ($p = 0.01$) and biochemical parameters [fasting blood glucose ($p = 0.05$), serum triglyceride ($p = 0.001$), total cholesterol ($p = 0.002$), high density lipoprotein-cholesterol ($p = 0.05$) and alanine aminotransferase ($p = 0.01$)] were significantly higher in OSA and NAFLD group as compared with other groups. Higher frequency of G/Arg and Arg/Arg genotypes of Gly972Arg polymorphism was obtained in group 1 as compared with other groups ($p = 0.04$); as a consequence frequency of the minor allele Arg was significantly higher in group 1 ($p = 0.003$). In OSA and NAFLD subjects, total cholesterol ($p = 0.002$), alkaline phosphatase ($p = 0.04$), hip circumference ($p = 0.02$), fasting insulin ($p = 0.003$) and HOMA-IR ($p = 0.02$) were significantly increased in Arg/Arg than Gly/Gly and Gly/Arg genotypes. Prevalence of hyperinsulinemia was higher with Arg/Arg than Gly/Gly and Gly/Arg genotypes. Using a multivariate logistic regression model after adjusting for age, sex, body mass index and fasting insulin, subjects with Arg/Arg genotype showed higher risk of OSA and NAFLD (OR, 1.32, 95% CI: 1.43–2.73, $p = 0.05$).

Conclusion: The polymorphism of the IRS-1 (Gly972Arg) gene is associated with occurrence of OSA and NAFLD in Asian Indian subjects. Asian Indian subjects carrying the allele Gly972Arg polymorphism of IRS-1 is predisposed to develop OSA and NAFLD.

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Detection of sleep apnea events in children using the “phone oximeter”

A. Garde¹, P. Dehkordi¹, D. Wensley², J. Ansermino³, G. Dumont¹

¹ Department of Electrical and Computer Engineering, The University of British Columbia, Canada

² Division of Critical Care, British Columbia Children's Hospital, Canada

³ Department of Anesthesiology, Pharmacology and Therapeutics, The University of British Columbia, Canada

Introduction: Obstructive sleep apnea (OSA) can cause physical and psychological complications in children. Polysomnography (PSG), confined to sleep laboratories, is resource intensive. We aim to combine blood oxygen saturation (SpO₂) and heart rate variability (HRV) to identify OSA using the phone oximeter, a device integrating a pulse oximeter with a phone.

Materials and methods: After Research Ethics Board approval and written informed consent/assent, overnight pulse oximetry data were collected using the phone oximeter, alongside standard PSG from 160 children assessed in the sleep laboratory at BC Children's hospital. The phone oximeter provides blood oxygen saturation (SpO₂) and a signal reflecting changes in blood volume (PPG). A sleep technician visually scored all OSA events from PSG. To identify OSA events that occurred in the absence of SpO₂ desaturation, we combined the characterization of SpO₂ and HRV (estimated from PPG, based on pulse to pulse [PP] analysis) in the time-frequency domain, using a 1-min sliding window (no overlap). Each 1-min window was labeled as OSA or non-OSA. The statistically significant parameters ($p < 0.0001$), extracted from SpO₂ and HRV analysis, were used

to automatically identify OSA events via a linear classifier using internal and external 10-fold cross validation.

Results: We analyzed 27,434 minutes (3599 minutes had OSA events). HRV analysis: OSA events showed higher sympathetic activity reflected by significantly higher normalized power at low frequencies (0.44 vs. 0.26), lower normalized power at high frequencies (0.51 vs. 0.70), lower mean of PP intervals (0.72 vs. 0.79), higher standard deviation of PP intervals (0.093 vs. 0.055) and higher root mean square of the difference of successive PP intervals (0.09 vs. 0.06). SpO2 characterization: Among other distinguishing parameters, OSA events had significantly greater SpO2 variability seen in higher standard deviation of SpO2 (1.33 vs. 0.56) and greater number of desaturations $\geq 4\%$ from baseline (0.34 vs. 0.04) relative to Non-OSA. Spectral analysis of SpO2 showed higher normalized power at low frequencies in OSA events due to SpO2 modulation (0.81 vs. 0.45). The 10 most discriminating features were related to SpO2 modulation due to sleep apnea and HRV changes due to intermittent hypoxia. These features provided an accuracy of 81%, sensitivity of 80% and specificity of 81% identifying OSA events with a linear classifier.

Conclusion: Combining SpO2 and HRV analysis enhances the detection of OSA events and has potential as an enhanced OSA screening tool. At-home screening will facilitate more natural sleep patterns with fewer disturbances, and reduce the burden to both families and the health system by screening patients prior to full PSG.

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Symptoms of insomnia in patients with obstructive sleep apnea: Prevalence, correlates and association with suicidality

S. Li¹, J. Lam², J. Zhang², J. Chan², M. Yu², Y. Wing²

¹ University College London, UK

² The Chinese University of Hong Kong, Hong Kong

Introduction: Insomnia and obstructive sleep apnea represent two of the most prevalent and debilitating sleep disorders, which are often associated with adverse health-related consequences. The present study aimed to investigate the prevalence and correlates of insomnia symptoms and their associations with the risk of suicidal ideations in the patients with objectively diagnosed OSA.

Materials and methods: Consecutive patients referred to the sleep assessment unit of a university-affiliated hospital completed a battery of intake questionnaire that assessed sleep-related variables and mood symptoms. Relevant clinical information and polysomnographic (PSG) data were collected and analysed.

Results: The final study sample consisted of 516 patients with PSG-confirmed OSA. About 35% of the subjects reported frequently experiencing at least one type of insomnia. The prevalence of sleep onset insomnia, sleep maintenance insomnia and insomnia with early awakening was 21%, 20% and 15%, respectively. Different subtypes of insomnia were variably associated with female gender, older age, apnea-hypopnea index, and comorbid medical and neuropsychiatric disorders, as well as other sleep disorders. Subjects with insomnia complaints had poorer subjective and objective sleep quality and presented with a higher level of anxiety ($p < 0.001$) and depressive symptoms ($p < 0.001$). Insomnia symptoms were significantly associated with the presence of suicidal ideation after controlling for potential confounding factors (odds ratio = 2.00; 95% CI 1.16–3.45).

Conclusion: Insomnia symptoms are commonly reported in OSA patients and are associated with a constellation of demographic and clinical factors with important prognostic and therapeutic implications. Integrated management of insomnia complaints is indicated and future studies are warranted to explore the efficacy of optimal strategies to treat comorbid insomnia and OSA.

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Prevalence and predictors of sleep related accidents in Egyptian commercial drivers with sleep disordered breathing

N. Morsy, A. Yonis, S. Abdelhafeez, A. El-gilany, M. Elshafey
Faculty of Medicine, Mansoura University, Egypt

Introduction: Egypt is ranked the third country in the world with highest mortality rates due to road traffic accidents. Sleepiness is one of the major reasons for fatal crashes. Untreated sleep disordered breathing is common in commercial drivers and associated with two- to sevenfold increased risk of motor vehicle crashes.

Materials and methods: This study is a cross-sectional descriptive study followed by a nested case-control study. The aim is to estimate the prevalence and the predictors of sleep related road traffic accidents in commercial drivers attending Mansoura Sleep Disordered Breathing Unit (EGYPT). This study includes 90 commercial drivers. The following data were collected: History of sleep related accidents of these drivers was taken. The behavioral history of driving including: mean daily driving hours; mean daily sleep duration, shift work, tea/coffee while driving was taken. The clinical examination was done using: Epworth sleepiness scale (ESS), functional outcome of sleep questionnaire (FOSQ), Berlin questionnaire, STOP Bang questionnaire, OSAS score and wake erect pulse oximetry (SPO2). The polysomnographic results were reviewed using: apnea-hypopnea index (AHI), basal and lowest oxygen saturation, oxygen desaturation index, sleep efficiency %, slow wave sleep %, REM %, and arousal index. Final diagnosis: obstructive sleep apnea syndrome (OSAS) or obesity hypoventilation syndrome (OHS). Then variables analyzed by SPSS version 16. Bivariate analysis was done followed by multivariate logistic regression to detect independent variables of accidents.

Results: The prevalence of accidents was 46.7%. The bivariate analysis revealed that accidents was significantly associated with: OHS diagnosis, decrease in the following clinical parameters: mean daily sleep hours, FOSQ; and increase the following clinical parameters: OSAS score, Berlin questionnaire SPO2 shift work, ESS). Also it is significantly associated with all polysomnographic parameters with increase of AHI, desaturation oxygen index, arousal index, and decrease of basal oxygen saturation, lowest oxygen saturation, sleep efficiency %, slow wave sleep %, REM %. The multivariate logistic regression analysis revealed that the independent predictors of accidents were: REM% (OR = 0.35, the most protective predictor), slow wave sleep % (OR = 0.44), mean daily sleep hours (OR = 0.47), sleep efficiency % (OR = 0.69) with model percent correctly predicted 91.1%.

Conclusion: The following parameters: mean daily sleep hours, sleep efficiency %, slow wave sleep %, REM % could be of predictive importance in detection of sleep related accidents among commercial drivers with SDB.

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Craniofacial photography for prediction of obstructive sleep apnoea in a Hong Kong sleep clinic population

K. Sutherland¹, R. Lee¹, T. Chan², S. Ng², D. Hui², P. Cistulli¹

¹ Department of Respiratory & Sleep Medicine, Royal North Shore Hospital and University of Sydney, Australia

² Department of Respiratory Medicine, Department of Medicine & Therapeutics, The Chinese University of Hong Kong, Hong Kong

Introduction: Craniofacial morphology is a risk factor for obstructive sleep apnoea (OSA). Facial phenotyping by photography has been shown to be useful in identifying OSA in a Caucasian sleep clinic population. However ethnic differences in risk factors may result in a different facial profile in a Chinese population.

Materials and methods: Calibrated frontal and profile facial photos were taken of patients undergoing sleep studies in a Hong Kong Sleep Centre. Facial measurements including linear distances, angles, areas and volumes were computed from surface landmarks identified on the digital images. Facial measurements were compared between those with and without OSA (apnoea–hypopnea index [AHI] < 10 h⁻¹) and prediction models using logistic regression were developed to assess the utility of facial measurements for identifying OSA. Facial phenotype was compared with body mass index (BMI) as a predictor of the presence of OSA.

Results: Two hundred patients were included in the study, 54 control and 146 OSA patients. The OSA group contained more males (77% vs. 61%) and were more obese (BMI 28.9 ± 4.8 kg m² vs. 25.7 ± 3.4 kg m², p < 0.001) than the non-OSA controls. The OSA group had larger face width (15.0 ± 0.8 vs. 14.5 ± 0.7 cm, p < 0.001) and mandibular volume but a more repositioned maxilla and mandible (smaller maxillary and mandibular depth angles). The best logistic regression model contained three facial measurements: cervicomentale angle, face width–depth angle and mandibular length, with a receiver operating characteristic (ROC) area under the curve (AUC) of 0.80 (0.74–0.87 95% CI, p < 0.001). Facial measurements performed better than BMI (AUC 0.736, 0.661–0.811 95% CI, p < 0.001) in classifying patients. Addition of BMI to the facial photo prediction model did not enhance prediction.

Conclusion: Facial photographic metrics differ between those with and without OSA. In a Hong Kong sleep clinic, facial photography performed similarly in identifying OSA patients compared with previous Caucasian samples. OSA risk may be similarly reflected in facial phenotype despite any differences in underlying skeletal and obesity risk factors.

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Role of salpingopharyngeal fold in lateral pharyngeal wall collapse causing obstructive sleep apnea

V. Agrawal

Specialty Hospital, India

Introduction: Salpingopharyngeal fold (SPF), which is a vertical fold of mucous membrane, that stretches from the lower part of the torus tubaris to the soft palate, contains the salpingopharyngeus muscle. Hypertrophy of the salpingopharyngeal fold is found to be an important contributor in the lateral pharynx causing collapse and obstruction.

Materials and methods: The aim of the study is to recognize and evaluate the role of salpingopharyngeal fold in lateral pharyngeal wall collapse causing obstructive sleep apnea (OSA), and the effect of coblation treatment for the same. Sleep nasal endoscopy with

propofol sedation using flexible distal chip videonasopharyngoscope from Karl Storz, Germany, was performed in 40 subjects with moderate to severe obstructive sleep apnea (OSA) confirmed as predominant upper obstruction on overnight study with Apneagraph by MRA Medical, London. Lateral pharyngeal wall was evaluated for hypertrophic salpingopharyngeal folds causing obstruction during the apnea spell. Fourteen out of 40 subjects (35%) were found to have hypertrophic salpingopharyngeal folds resulting in lateral pharyngeal wall collapse. Out of these eight patients were treated with coblation wand Ultra SP from Arthrocare, USA for 10 seconds in the lower part of the salpingopharyngeal folds along with palatal surgery UPPP (Group A), and in remaining six patients (Group B), palatal surgery UPPP was performed. Apneagraph was repeated after 6 months.

Results: The success rate for Group A was 90%, whereas, for Group B it was 70%. The success rate was defined as more than 50% reduction in apnea–hypopnea Index (AHI)/an AHI of less than 20, measured at the end of 6 months. Thirty-five percent of patient showed lateral pharyngeal wall collapse due to hypertrophied salpingopharyngeal folds (SPF). It was found that patients with similar BMI, but with salpingopharyngeal fold hypertrophy were having higher AHI as compared with the patients without SPF hypertrophy. The results of UPPP surgery improved significantly when salpingopharyngeal fold (SPF) coblation was combined with it.

Conclusion: Salpingopharyngeal fold (SPF) is an important contributor in lateral pharyngeal wall collapse causing obstructive sleep apnea (OSA). This should be actively looked for and treated to increase the outcome of palatal surgery. Further study and data are required to understand this entity better.

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Elimination of central sleep apnea by cardiac valve replacement: A continuous follow-up study in patients with rheumatic valvular heart disease

N. Ding¹, X. Zhang¹, H. Wang¹, S. Zhang²

¹ Department of Respiratory Medicine, The First Affiliated Hospital of Nanjing Medical University, China

² Department of Cardiothoracic Surgery, The First Affiliated Hospital of Nanjing Medical University, China

Introduction: Recent studies have suggested that cardiac surgery may affect sleep-disordered breathing (SDB) in chronic heart failure patients. However, the dynamic changes in sleep apnea and heart function after cardiac surgery and the mechanisms responsible for these changes remain unknown.

Materials and methods: Patients with rheumatic valvular heart disease (RVHD) and SDB were enrolled and followed-up at 3, 6 and 12 months after cardiac valve replacement (CVR). Baseline and follow-up clinical data consisting of NYHA classification, 6-minute walk distance (6-MWD), medications, echocardiography, electrocardiography, chest X-ray, arterial blood gas, lung-to-finger circulation time (LFCT) and sleep data were collected and evaluated.

Results: Twenty-four central sleep apnea (CSA) patients and 15 obstructive sleep apnea (OSA) patients completed three follow-up assessments. Comparison of the baseline parameters between OSA patients and CSA patients showed that CSA patients had a comparatively worse baseline cardiac function assessed by NYHA class, shorter 6-MWD, larger left atrial diameter, longer LFCT and enhanced chemosensitivity (higher pH and lower PaCO₂). A continuous significant elevation in 6-MWD and left ventricular ejection

fraction and decrease in NYHA class, plasma BNP, and left atrial diameter were found in both CSA and OSA patients. When comparing CSA and OSA patients, the CSA index was remarkably reduced at month 3 post CVR and was sustained throughout the trial, whereas there were no significant decreases in OSA index and hypopnea index. pH values and LFCT were remarkably decreased and PaCO₂ were remarkably increased in patients with CSA at the end of the third months following CVR. These changes were sustained until the end of the trial.

Conclusion: CSA patients had a worse baseline cardiac function, enhanced chemosensitivity and disordered hemodynamic as compared with OSA patients. CSA were eliminated after CVR; however, there were no changes in OSA. The elimination of CSA is associated with the combined efficacies of improvement of cardiac function, normalized chemosensitivity, and stabilized hemodynamic.

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Is an intermediate chronotype a protective factor to obstructive sleep apnea?

F. Morgadinho Coelho, C. Hirotsu, L. Bittencourt, S. Tufik, M. Levy Andersen
Universidade Federal de São Paulo, Brazil

Introduction: Chronotype and obstructive sleep apnea (OSA) appear to have a similar lifelong evolution. In elderly, there is a concomitant trend to morningness and an increase in OSA severity. Thus, we investigated the effect of circadian preferences on the severity of OSA in a representative sample of São Paulo city.

Materials and methods: We performed a cross-sectional analysis using the São Paulo Epidemiologic Sleep Study (EPISONO). All participants underwent a full-night polysomnography and completed the morningness–eveningness, Epworth Sleepiness Scale, and UNIFESP Sleep questionnaires. Chronotypes were classified as morning-type, evening-type, and intermediate.

Results: Morning-type individuals represented 52.1% of the sample, followed by intermediate (39.5%) and evening-type (8.4%) individuals. Morning-type individuals were, on average, approximately 10 years older than the other two groups. Body mass index (BMI) was significantly higher in morning-type individuals compared with intermediate chronotype. The mean scores determined from the Epworth Scale were similar among the groups and were within the normal somnolence range (<10). Sleep debt was lower in the morning-type compared with the intermediate chronotype and exhibited a significant effect of age. After stratifying the sample by BMI (>26.8 kg/m²) and age (>42 years), we observed increased apnea–hypopnea index values in morning- and evening-type individuals.

Conclusion: We demonstrated, for the first time, an age- and BMI-related effect of morning- and evening-types in obstructive sleep apnea severity, suggesting that the intermediate chronotype might play a role as a protective factor in older and overweight patients.

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Non-ST-elevation myocardial infarction (NSTEMI) patients with moderate to severe sleep apnea (SA) have worse long term prognosis than those with ST-elevation myocardial infarction (STEMI)

O. Ludka^{1,2,3}, R. Stepanova^{2,3}, T. Kara^{2,4,5}, J. Spinar^{1,2,3}

¹ Department of Internal Medicine and Cardiology, University Hospital Brno, Brno, Czech Republic

² International Clinical Research Center, St. Anne's University Hospital, Brno, Czech Republic

³ Faculty of Medicine, Masaryk University, Brno, Czech Republic

⁴ Division of Cardiovascular Diseases, Department of Internal Medicine, Mayo Clinic and Foundation, Rochester, MN, USA

⁵ Department of Cardiovascular Disease, St. Anne's University Hospital, Brno, Czech Republic

Introduction: SA is associated with intermittent hypoxemia leading probably to ischemic preconditioning in the myocardium. This effect of SA may play role in the development of NSTEMI rather than STEMI during acute ischemia. Outstanding issue remains: At what point do the risks associated with SA outweigh the benefits of ischemic preconditioning?

Materials and methods: We therefore prospectively investigated the prevalence and prognosis of these two types of myocardial infarction (MI) in different SA categories among acute MI patients. We prospectively studied 782 consecutive patients admitted to the hospital with the diagnosis of acute MI (both NSTEMI and STEMI). All subjects underwent sleep evaluations using a portable diagnostic device after at least 48 hours post-admission, provided they were in stable condition. Patients were followed for mean follow-up of 19 months.

Results: Almost all patients (98%) underwent urgent coronary angiography and 91% of patients underwent primary percutaneous coronary intervention (PCI). SA was present in 65.7% of patients after acute MI. Increasing severity of SA was associated with increasing incidence of NSTEMI and conversely with decreasing incidence of STEMI ($p < 0.001$). Relative frequency of NSTEMI was in the moderate to severe SA group, 40.6%, while STEMI, 29.9%. There was a higher total mortality of NSTEMI than STEMI patients in the group of moderate to severe SA ($p = 0.004$).

Conclusion: There was an increasing incidence of NSTEMI associated with increasing severity of SA. It may suggest a cardioprotective role of SA during acute MI through ischemic preconditioning, but NSTEMI patients with moderate to severe SA had worse long term prognosis than those with STEMI.

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Validation of a new therapeutic device for treatment of central and mixed sleep apnea with anticyclic servoventilation (ACSV)

W. Randerath¹, G. Nilius², J. Ficker³, A. Benz⁴, M. Bögel⁵, C. Schröter⁶, K. Pietruska⁶, M. Schwaibold⁶, H. Fox⁷, O. Oldenburg⁷

¹ Institute for Pneumology, University Witten Herdecke, Germany

² Helios Klinik Hagen Ambrock, Germany

³ Klinikum Nuernberg, Paracelsus Medical University Nuernberg, Germany

⁴ Thoraxklinik Heidelberg, Germany

⁵ Institute für Assistenzsysteme und Qualifizierung e.V., SRH University Heidelberg, Germany

⁶ MCC GmbH & Co. Kg, Karlsruhe, Germany

⁷ Herz- und Diabeteszentrum NRW, Klinik für Kardiologie, Bad Oeynhausen, Germany

Introduction: Treatment with anticyclic servoventilation is a therapeutic option for patients with central sleep apnea, mixed sleep apnea and/or Cheyne–Stokes respiration. Treatment in this patient group remains challenging due to the complexity of the respiratory disturbance. In this clinical trial the therapeutic efficacy of a new AcSV device was validated.

Materials and methods: Twenty-nine patients (26 males, age 69 ± 11 years, BMI 29 ± 3 kg/m²) with central and mixed sleep apnea (apnea/hypopnea index (AHI) > 15.0 /h TST) underwent treatment with the novel AcSV device (prismaCR, WEINMANN) under overnight polysomnography in sleep laboratory settings.

Results: In comparison with diagnostic findings (AHI 47.4 ± 21.2 /h TST, central apnea index (cAI) 18.7 ± 15.2 /h TST, obstructive apnea index (oAI) 8.3 ± 10.6 /h TST), respiratory events were significantly reduced during treatment with the prismaCR device (AHI 6.8 ± 5.3 /h TST, cAI 0.2 ± 0.5 /h TST, oAI 0.1 ± 0.4 /h TST).

Conclusion: Results of the clinical trial show an efficient reduction of central as well as obstructive respiratory events during the AcSV treatment night. The prismaCR device thus achieves excellent therapeutic results in the treatment of respiratory events as measured by apnea/hypopnea index.

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Effect of a biomimetic oral appliance in adults with obstructive sleep apnea

G. Singh¹, T. Griffin², R. Chandrashekhar³

¹ Biomodeling Solutions, Inc., USA

² Emerald Coast Dental Sleep Medicine, Inc., USA

³ St. Mary Medical Center, USA

Introduction: While some healthcare professionals prescribe CPAP, others prefer mandibular advancement devices for mild to moderate OSA, but both therapies represent life-long use. We investigated the use of biomimetic oral appliance therapy (DNA appliance® system) to test the hypothesis that the airway can be enhanced so life-long therapy might become avoidable.

Materials and methods: In this preliminary study, we included 11 consecutive adults aged >21 years that had been diagnosed with mild to moderate OSA, following an overnight sleep study that had been interpreted by a Board certified sleep physician. Each subject was treated using biomimetic oral appliance therapy (BOAT) by a dentist with advanced training in dental sleep medicine. BOAT differs from conventional mandibular appliance therapy as it aims to correct the nasal airway through midfacial redevelopment in conjunction with mandibular repositioning, which aims to correct the oropharyngeal airway in suitable cases of mild to moderate OSA in adults.

Thus, at each monthly follow-up visit, examination for progress and adjustments of the devices were performed to optimize their efficacy. The mean apnea–hypopnea index (AHI) of the study sample was calculated prior to and after BOAT with no appliance in the mouth when both sleep studies were done. The findings were subjected to statistical analysis, using paired t-tests.

Results: There were 10 females and one male that were included in this preliminary study. The mean age of the sample was 59 years ± 7.4 . Prior to treatment the mean AHI of the study subjects was 13.3 ± 6.9 with no appliance in the mouth when the sleep studies were done. The mean treatment time was 8.3 months ± 5.3 for the sample. During this time, the AHI decreased to a mean value of 4.2 ± 3.3 ($p < 0.01$) after BOAT with nothing in the mouth when the post-treatment sleep studies were done, which represents a mean fall in the mean AHI by 68.4% for the study sample. Thus, this preliminary study appears to support the notion that the upper airway can be improved in adults, to the extent that an appliance may not potentially be necessary after successfully reducing the AHI to within normal limits. If so, life-long appliance therapy might become avoidable.

Conclusion: BOAT may be a useful method of managing mild to moderate cases of OSA in adults, and may represent an alternative to CPAP. However, long-term follow up using a larger sample size is needed to reach more definitive conclusions. Improvements in upper airway morphology after BOAT need to be assessed.

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CBT for insomnia in veterans with PTSD

P. Gehrman

University of Pennsylvania, USA

Introduction: Disturbed sleep is a core feature of Posttraumatic Stress Disorder (PTSD) that usually does not improve with trauma-focused treatment. Cognitive behavioral therapy for insomnia (CBT-I) has demonstrated efficacy in patients with PTSD. The effectiveness of CBT-I in veterans delivered as part of routine clinical care is poorly understood.

Materials and methods: Military veterans with PTSD participated in a six-session group CBT-I program. Each group consisted of four to eight veterans and was delivered using video telehealth equipment. As such, the provider was in a different location from the patients. CBT-I was delivered in a manualized fashion and included standard components including stimulus control and sleep restriction. Participants completed the Insomnia Severity Index (ISI) at the first and last session and also kept sleep diaries throughout treatment. The PTSD Checklist-Civilian version (PCL-C) was administered at the first and last session in a subset of patients as a measure of PTSD severity. Changes in each measure were examined with paired samples t-tests.

Results: Pre- and post-treatment data were available on 126 veterans. The sample was 92.1% male with a mean (SD) age of 57.2 (13.4). On the ISI, the mean (SD) score decreased from 20.0 (4.8) at week 1 to 14.8 (6.1) at week 6. Sleep diary data were available for 76 veterans. There were significant improvements in sleep from week 1 to week 6 of treatment in: sleep latency (46.1 vs. 28.9 minutes), wakefulness after sleep onset (41.6 vs. 27.2 minutes), early morning awakenings (28.4 vs. 15.6 minutes), and sleep efficiency (74% vs. 83%). The change in total sleep time was not statistically significant (5.4 vs. 5.6 hours). PCL-C scores decreased from 63.4 (17.4) to 54.1 (18.3). Changes were not confined to the sleep items of the PCL-C.

Conclusion: These results suggest that CBT-I in veterans with PTSD leads not just to improvements in sleep, but to some improvement in symptoms of PTSD as well. The magnitude of these changes was more modest than clinical trials because of the lack of exclusion criteria and the absence of follow-up data.

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High frequency heart rate variability as predictor of treatment response to cognitive-behavioral therapy for insomnia

J. Gouin, T. Dang Vu

Concordia University, Canada

Introduction: Although cognitive-behavioral therapy for insomnia (CBTI) is the recommended treatment for chronic insomnia, approximately 40% of insomniacs will show residual or recurrent symptoms. To date, there are few reliable predictors of response to CBTI. High-frequency heart rate variability (HRV) has been proposed as a potential index of vulnerability to insomnia.

Materials and methods: Individuals with primary insomnia lasting for at least 6 months were recruited into the study. Pre-treatment sleep evaluation included an overnight polysomnography (PSG), 1 week of actigraphy, 1 week of sleep diary, as well as the completion of the Insomnia Severity Index (ISI) and the Pittsburgh Sleep Quality Index (PSQI). At pre-treatment, patients also had their HRV recorded during a resting baseline period and in response to a worry induction task. Subsequently, patients participated in a 6-week group CBTI conducted by a clinical psychologist. At post-treatment, patients completed a second sleep evaluation including polysomnography, actigraphy, sleep diary, and the ISI and PSQI.

Results: Participants exhibited a significant reduction in ISI ($p < 0.001$), PSQI ($p < 0.001$), PSG-derived sleep efficiency ($p < 0.001$), sleep diary-derived sleep efficiency, but not on the actigraphy-derived sleep efficiency ($p = 0.18$). Correlations between baseline HRV and the change scores in each sleep parameter were calculated to evaluate whether HRV predicted treatment response to CBTI. Correlations showed that HRV during rest at pre-treatment predicted prospective increases of actigraphy-derived sleep efficiency ($R = 0.77$), PSG-derived sleep efficiency ($R = 0.57$), PSG-derived total sleep time ($R = 0.76$), and a reduction in the PSQI ($R = 0.52$) after CBTI.

Conclusion: High frequency HRV during waking restfulness predicted treatment response to a group-based CBTI among patients with primary insomnia. If these results are replicated, HRV might be used as a potential tool to identify patients who are less likely to respond to CBTI and who may need a more complex treatment regimen.

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The exploratory power of sleep effort, dysfunctional beliefs, and arousal for insomnia severity and PSG determined sleep

E. Hertenstein, C. Nissen, D. Riemann, B. Feige, C. Baglioni, K. Spiegelhalder

University Medical Center Freiburg, Germany

Introduction: Differences between subjective sleep perception and sleep determined by polysomnography (PSG) are prevalent, particularly in patients with primary insomnia, indicating that the two measures are partially independent.

Materials and methods: To identify individualized treatment strategies, it is important to understand the potentially different mechanisms influencing subjective and PSG determined sleep. The aim of this study was to investigate to which extent three major components of insomnia models, i.e. sleep effort, dysfunctional beliefs and attitudes about sleep, and pre-sleep arousal, are associated with subjective insomnia severity and PSG-determined sleep. A sample of 47 patients with primary insomnia according to DSM-IV criteria and 52 good sleeper controls underwent two nights of PSG and filled in the Glasgow Sleep Effort Scale, the Dysfunctional Beliefs and Attitudes about Sleep Scale, the Pre-Sleep Arousal Scale and the Insomnia Severity Index. Regression analyses were conducted to investigate the impact of the three predictors on subjective insomnia severity and PSG-determined total sleep time. All analyses were adjusted for age, gender, depressive symptoms, and group status.

Results: Subjective insomnia severity was positively associated with sleep effort. PSG determined total sleep time was negatively associated with somatic pre-sleep arousal and dysfunctional beliefs and attitudes about sleep. Suggesting that subjective insomnia severity and PSG determined total sleep time are associated with different cognitive and somatic variables, our results might contribute to the formulation of new hypotheses for future research. The reduction of sleep effort appears to be a particularly important therapeutic target.

Conclusion: Based on the results of this study, we suggest that future treatment studies investigate the efficacy of treatments designed to reduce sleep effort, such as mindfulness based treatment or acceptance and commitment therapy.

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Do health maintenance behaviors differ across insomnia patients as a function of objective sleep duration?

D. Jarrin¹, M. Lamy¹, H. Ivers¹, A. Harvey², C. Morin¹

¹ Université Laval, Canada

² University of California, Berkeley, USA

Introduction: Insomnia with objective short sleep duration has been associated with health consequences. This may be attributable to health maintenance behaviors (medication use); however, such information is scant. The aim of this study was to explore whether proxies of health maintenance behaviors differ as a function of objective sleep duration.

Materials and methods: Participants were 188 individuals (Mage = 47.4 years, SD = 12.6; 37.8% male) who met diagnostic criteria for insomnia (Mduration = 14.5 years, SD = 12.8). Objective sleep duration was based on total sleep time averaged across two consecutive nights of polysomnographic evaluation. The sample was divided into two groups based on sleep duration shorter ($n = 37$) or longer ($n = 149$) than 6 hours. Participants completed a battery of questionnaires on their socio-demographics, sleep severity symptoms, as well as physical and mental health. They also reported past and current medical conditions and a physical examination was conducted to assess anthropometrics. Proxies of health maintenance behaviors included self-reports of physician visits in the past year, hospitalization history, as well as past and current use of prescribed medication, over-the-counter medication, and the use of natural products.

Results: A majority of the sample was White (81.1%), married (53.7%), and had an average of 16 years of education ($SD = 3.2$). Overall, 60.4% reported a past or current medical condition, 87.4% reported visiting a health professional in the past year ($Mage = 4.1$, $SD = 6.2$; range 0–52), 66.1% reported a history of hospitalization ($Mage = 1.5$, $SD = 1.6$; range 0–7), and 37.8%, 18.6%, and 4.3% reported the use of prescription, over-the-counter medication, and natural product use, respectively. After controlling for age, sex, body mass index, medication use, and comorbidity, no significant differences were found for past or current medical conditions or history of hospitalizations as a function of objective sleep duration. However, compared with individuals with insomnia with long sleep duration, individuals with insomnia with short sleep duration had an odds ratio of 1.20 (95% CI 1.20, 9.14) of visiting a health professional in the past year. Additionally, insomnia with short sleep duration was associated with an odds ratio of 1.06 (95% CI 1.15, 7.22) of past or current use of prescription medication as compared with their counterparts, all while controlling for multiple covariates. No significant differences were observed for over-the-counter medication or natural product use between groups.

Conclusion: Results suggest that insomnia with objective short sleep duration is associated with more physician visits and medication use compared with insomnia with long sleep duration. Knowledge of such health maintenance behaviors is important to identify at-risk individuals, as this may help develop more targeted prevention and intervention strategies for insomnia.

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Insomnia with physiological hyperarousal is associated with hypertension

Y. Li^{1,2}, A. Vgontzas², J. Fernandez-Mendoza², E. Bixler², Y. Sun¹, J. Zhou¹, R. Ren¹, X. Tang¹

¹ West China Hospital, Sichuan University, China

² Pennsylvania State University College of Medicine, USA

Introduction: Insomnia with objective short sleep duration is associated with a higher risk of hypertension and it has been speculated that the underlying mechanism is physiological hyperarousal. In this study, we tested whether insomnia with physiological hyperarousal measured by Multiple Sleep Latency Test (MSLT), is associated with increased risk of hypertension.

Materials and methods: During the January 2010 to July 2014 recruitment period, 844 consecutive insomniacs and 117 normal sleepers were studied in the sleep laboratory. We excluded insomniacs and normal sleepers who had (1) a current major psychiatric condition; (2) current and past use of hypnotics, anxiolytics, antidepressants, and any other psychotropic medication; (3) evidence of sleep-disordered breathing disorder, (4) evidence of sleep-related movement disorder and (5) evidence of a hypersomnia disorder. After an overnight polysomnography followed by a standard MSLT study, 219 insomniacs and 96 normal sleepers met selection criteria for the present study. Chronic insomnia was defined based on standard diagnostic criteria with symptoms lasting ≥ 6 months. We used the median mean MSLT value (i.e., >14 min) and the 75th percentile of mean MSLT value (i.e., >17 min) to define hyperarousal. Hypertension was defined based either on blood pressure measures or on diagnosis/treatment by a physician. Logistic regression was used to assess the independent association of insomnia with hypertension compared with normal sleep and to

examine the association of insomnia with hypertension based on different levels of hyperarousal measured by MSLT values.

Results: After controlling for age, sex, BMI, AHI, diabetes, smoking, alcohol and caffeine use, insomnia was associated with a nearly significant increased odds for hypertension compared with normal sleepers (OR = 2.17, 95% CI = 0.98–4.84). Insomnia combined with MSLT > 14 min increased the odds of hypertension by 300% (OR = 3.27, 95% CI = 1.20–8.96) whereas insomnia combined with MSLT > 17 min increased even further the odds of hypertension by 400% (OR = 4.33, 95% CI = 1.48–12.68) compared with normal sleepers with MSLT ≤ 14 min. In contrast, in insomniacs with MSLT ≤ 14 min, the odds of hypertension were not significantly increased compared with normal sleepers with MSLT ≤ 14 min (OR = 1.17, 95% CI = 0.40–3.43). The odds of hypertension of normal sleepers with MSLT > 14 min were not significantly increased compared with normal sleepers with MSLT ≤ 14 min (OR = 0.87, 95% CI = 0.19–3.90). Even after excluding the participants who were using antihypertensive medication, the linear relationship between blood pressure and MSLT values was still significant (systolic BP, p -linear = 0.04, diastolic BP, p -linear = 0.003).

Conclusion: Insomnia associated with physiological hyperarousal is associated with a significant risk of hypertension. Long MSLT values may be a reliable index of the physiological hyperarousal and biological severity of chronic insomnia.

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Data from the Internet: New methods for automated insomnia interventions

H. Lord¹, F. Thorndike¹, C. Morin², L. Gonder-Frederick¹, M. Quigg¹, K. Ingersol¹, L. Ritterband¹

¹ University of Virginia, USA

² Laval University, Canada

Introduction: The utilization of Internet interventions for insomnia is quickly increasing for individuals with insomnia. This new approach results in Big Data issues requiring new methods of data management and analysis in order to process and summarize data. We propose a methodology for managing large and automated influxes of sleep-related data.

Materials and methods: Three hundred three participants provided data as part of a national RCT to evaluate the effectiveness of SHUTi, an Internet intervention for insomnia based on cognitive behavioral therapy for insomnia (CBT-I). Subjects were randomly assigned to SHUTi or a Patient Education website. All provided daily sleep diaries as well as other data, including demographics, psychological measures, quality of life, and website usage. The collection of data was completely automated and resulted in larger quantities of data than in previous studies of CBT-I. Before data could be analyzed, multiple processes of data integration and transformation were necessary, including joining data, creating structured fields, and checking for data accuracy, consistency, corruption, and completeness on a large scale. Nineteen thousand seven hundred sixty-seven diary entries were examined for impossible, extreme and inconsistent values. Algorithms were created for selecting diary entries to represent sleep outcomes at four time points. Diaries were then aggregated for final data quality checks and for analysis.

Results: Automated data collection resulted in data quality challenges while also enabling considerable improvements. Challenges

included establishing processes to identify potential programming and subject reporting errors. Unlike with traditional data collection, error identification required a systematic, non-qualitative approach. A method for discerning between errors and outliers was also necessary. However, these challenges were met through developing a pattern detection approach within single and multiple fields. In addition, because of the sheer quantity of errors and outliers, they could be analyzed to identify trends to both promote data quality and to answer new, substantive questions of the data. For example, benefits included the possibility of categorizing types of users through patterns of responses, and the identification of learning curves for diary entry through patterns of errors. Other improvements to data quality and analysis included reduced missing data, improved data integrity, and substantial increases in data capture.

Conclusion: The development of new methodologies for addressing insomnia-specific issues in the automated, large scale collection of data is needed in the age of Big Data trials. We propose methods for addressing data quality and management issues, and discuss possible new directions in the examination of insomnia data.

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SMR neurofeedback for improving sleep and memory – Two studies in primary insomnia

M. Schabus¹, H. Griessenberger², D. Koerner³, M. Gnjezda², D. Heib³, K. Hoedlmoser¹

¹ Centre for Cognitive Neuroscience Salzburg (CCNS), University of Salzburg, Austria

² Laboratory for Sleep, Cognition and Consciousness Research, Austria

³ Laboratory for Sleep, Cognition and Consciousness Research, Germany

Introduction: A non-pharmacological intervention, namely instrumental conditioning of 12–15 Hz oscillations (ISC), for improving sleep quality and memory is tested. This frequency range is known to be abundant during (i) quiet but alert wakefulness (sensorimotor-rhythm, SMR) as well as in (ii) light NREM sleep-spindles. ISC is known to influence sleep quality.

Materials and methods: In two studies we here intend to clarify the nature of these effects and apply neurofeedback (NFT) to (sub-)clinical insomnia patients. In the first study 24 young subjects with sub-clinical symptoms of primary insomnia were tested. A counterbalanced within-subjects design (19 lab visits over the course of 3–6 weeks) was adopted. Each patient participated in an ISC-NFT as well as a sham-NFT training block. Polysomnographic sleep recordings were scheduled before and after training blocks.

In a similar manner we then also conducted a counter-balanced double-blind follow-up study with 30 primary insomnia patients and 30 (sex and age matched) controls.

Results: Data of the first study confirm a significant increase of 12–15 Hz activity over the course of the 10 SMR training sessions which was also positively related to overnight memory consolidation changes. Number of awakenings were reduced and slow-wave sleep was increased following ISC but not sham. Last but not least N3 sleep spindles were found to be enhanced after SMR training.

Preliminary results of study 2 indicate that patients suffering from more severe insomnia do not benefit in sleep or memory over the 12 ISC sessions. However, all groups (healthy controls, sleep state

mispercept, and insomnia patients) do enhance SMR-power (and fast spindles) exclusively in the SMR (but not placebo) condition. Subjectively the sleep complaint decreased over both conditions.

With respect to susceptibility to interference it becomes evident that interference affects the declarative (but not procedural) memory domain. Forgetting from initial evening learning to a delayed recall after a week (as well as after interference) is also found more pronounced in insomnia patients than healthy controls. Last but not least, analyses of the sleep EEG and sleep spindles reveal a trait-like relationship between fast spindle activity (SpA) and the initial learning levels in the declarative memory.

Conclusion: Current results indicate that besides healthy individuals also young people suffering from (sub-clinical) primary insomnia can experience subjective as well as objective benefits from ISC-NFT. The results of a comprehensive double-blind study, however, suggest that full-blown insomnia patients are not benefiting from ISC-NFT across 12 sessions.

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Negative functional connectivity between substantia nigra and hippocampus in REM sleep behavior disorder

T. Ellmore¹, R. Castriotta², J. Suescun², M. Schiess²

¹ The City College of the City University of New York, USA

² The University of Texas Medical School at Houston, USA

Introduction: The substantia nigra (SN) is associated with motor function, but stimulation elicits theta oscillations in hippocampus (Hallworth and Bland, 2004) suggesting connectivity between these structures links sensorimotor and memory function (Ambrogi Lorenzini et al., 1999). Here we investigated functional connectivity between SN and hippocampus as a potential marker of neurodegeneration.

Materials and methods: We measured functional connectivity between SN and hippocampus in 20 patients with REM sleep behavior disorder (RBD) and 15 controls using the resting state fMRI method (Biswal et al., 1995). All subjects underwent MR imaging at 3 T, including high resolution T1- and T2-weighted structural MRI, resting state fMRI, and diffusion tensor imaging (DTI). Co-aligned average T2 and direction encoded DTI color maps (Ellmore et al., 2014) in standard space were used to optimize seed placement in left SN (MNI $x = -11$, $y = -18$, $z = -7$) and right SN ($x = 11$, $y = -18$, $z = -7$). Each subject's 150-second eyes-open resting state fMRI run was aligned, spatially normalized, and detrended. Separate datasets were created with and without global signal regression. Rotational and translational motion parameters were regressed out of the timeseries, and group connectivity maps were constructed using AFNI's GroupInCorr and visualized with InstaCorr.

Results: Analysis of between-group connectivity difference maps revealed that controls relative to subjects with RBD have significantly greater ($p < 0.05$, 64 voxel extent threshold) resting state connectivity between left SN and both the left (525 voxels centered at $x = -30$, $y = -12$, $z = -16$) and right (289 voxels centered at $x = 28$, $y = -20$, $z = -17$) hippocampus. No differences in connectivity were found between the right SN and either left or right hippocampus. Examination of within-group connectivity maps revealed that the connectivity difference between controls and RBD is driven by strong negative correlations between SN and bilateral hippocampus (Z score < -3.09 , $p < 0.001$), which does not exist in controls who instead have weakly positive correlations. The same

pattern was found in analyses conducted on data with and without global signal regression.

Conclusion: Negative functional connectivity between SN and hippocampus builds on observations of reduced nigrostriatal connectivity in RBD (Ellmore et al., 2013). More study is needed to understand how abnormal negative correlations between SN and hippocampus relates to early neurodegeneration, cognitive dysfunction, and the eventual development of Parkinson's disease.

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REM sleep behavior and motor findings in Parkinson's disease: A cross sectional analysis

A. Mahajan, L. Rosenthal, C. Gamaldo, R. Salas, G. Pontone, A. Mccoy, C. Umeh, Z. Mari
Johns Hopkins University, USA

Introduction: Parkinson's disease (PD) represents a public health challenge that will grow in our aging population. Understanding the connection between PD and prodromal conditions, like REM Sleep Behavioral Disorder (RBD) is critical to identifying prevention strategies. We aim to examine the relationship between RBD and motor severity in early PD.

Materials and methods: The Parkinson's Progression Markers Initiative (PPMI) study includes PD patients whose symptoms do not require medications for motor symptoms at the time of enrollment and up to 6 months thereafter (per enrolling investigator's judgment). Each of the PPMI cohort's PD patients underwent nuclear imaging to confirm striatal dopamine deficit. An abnormal scan (either DaTscan or AV-133) was an inclusion criterion for the patient group. The demographics of all study participants were collected at the screening visit.

For our analysis, a total of 418 imaging-confirmed PD patients with data on RBD questionnaire scores, GDS scores, Movement Disorders Society – United Parkinson's Disease Rating Scale (MDS-UPDRS) and demographic variables were included.

For the purpose of clinical significance and applicability, we devised four categories for the severity of motor findings:

| Category | MDS UPDRS III score range |
|------------|---------------------------|
| Very mild: | 0–5 |
| Mild: | 6–24 |
| Moderate: | 25–60 |
| Severe: | >60 |

A score of 5 on the RBD Screening Questionnaire was defined as predictive of RBD. Ordered logistic regression analysis was carried out to assess the association between RBD Screening Questionnaire score and MDS UPDRS-3 (motor) score categories.

The correlation of a higher MDS-UPDRS III category with RBD-symptomatology was described as “worse motor findings” with RBD symptomatology.

Results: In our analysis of 418 PD patients, 113 (27%) were classified as patients with “likely-RBD” (RBD Screening Questionnaire score > 5), while 305 (72.9%) were classified as unlikely-RBD (RBD Screening Questionnaire score < 5).

Two individuals (0.5%) were classified with very mild motor findings such as minimal to no bradykinesia, rigidity, postural instability, freezing of gait, resting tremors etc., 290 (69.4%) with mild severity of motor findings and 126 (30.1%) patients with moderate severity

of motor findings. There were no participants who were classified with severe motor findings.

In univariate logistic regression analysis, the odds of having worse motor findings were 1.66 times in participants with likely-RBD as compared with those unlikely to have RBD ($p = 0.028$, 95% CI = 1.057, 2.62). Even when age, gender and GDS scores were taken into account, the association between RBD and MDS-UPDRS 3 score categories was significant (OR = 1.69, 95% CI: 1.07, 2.69, $p = 0.025$).

Among patients unlikely to have RBD, 27.2% have moderate motor findings and 72.1% have mild motor findings. In patients with likely RBD, this percentage goes up to 38% for moderate motor findings, with 61.9% for those with mild motor findings ($p = 0.025$).

Conclusion: We report that an RBD screening questionnaire score of greater than 5, indicative of RBD symptoms, is an independent predictor of worse motor findings in untreated PD patients. RBD could be a valuable target for further studies aimed at interventions to improve motor functioning in PD patients.

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Are REM sleep behavioral events dream enactments?

M. Muntean^{1,2}, C. Trenkwalder¹, A. Walters⁴, B. Mollenhauer^{1,3}, F. Sixel-Döring^{1,5}

¹ Paracelsus-Elena Hospital Kassel, Germany

² Department of Neurosciences, University of Medicine and Pharmacy, Cluj-Napoca, Romania

³ Department of Neurosurgery, University Medical Center, Goettingen, Germany

⁴ Department of Neurology, Vanderbilt University, Nashville, USA

⁵ Department of Neurology, University of Marburg, Germany

Introduction: To establish if motor behaviors and/or vocalizations during REM sleep that do not fulfill diagnostic criteria for REM sleep behavior disorder (RBD) because of a lack of sufficient amount of REM sleep without atonia (RWA) and were therefore defined as REM sleep behavioral events (RBE), represent to dream enactments.

Materials and methods: Thirteen subjects (10 patients with Parkinson disease (PD) and 3 healthy controls) originally identified with RBE were reinvestigated 2 years later with two nights of video-supported polysomnography (vPSG). The first night was used for sleep parameter analysis. In the second night, subjects were awakened and questioned for dream recall and dream content when purposeful motor behaviors and/or vocalizations became evident during REM sleep. RWA was analyzed and the cut-off set at 18.2% as specific for RBD.

Results: At the time of this investigation 9/13 subjects were now identified with RBD based upon clinical and EMG criteria. They all recalled vivid dreams and seven of them could describe dream content in detail. Four out of 13 subjects with RBE showed RWA values below cut-off for RBD. Three of these four recalled having non-threatening dreams and two of these three could describe these dreams in detail.

Conclusion: RBE with RWA below definition criteria for RBD correlate to dreaming. There is evidence that RBE are a precursor to RBD. The majority of patients with RBE in this study converted to RBD within 2 years.

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Widespread functional, but not structural, changes in patients with idiopathic REM sleep behaviour disorder

M. Rolinski¹, L. Griffanti¹, K. Szewczyk-Krolikowski¹, R. Menke¹, T. Quinnell², Z. Zaiwalla³, C. Mackay¹, M. Hu¹

¹ University of Oxford, UK

² Papworth Hospital Nhs Trust, UK

³ Oxford University Hospitals NHS Trust, UK

Introduction: Resting-state functional MRI (rs-fMRI) has been shown by our group as a promising tool for the diagnosis of early Parkinson's disease (PD). As REM sleep behavior disorder (RBD) is strongly associated with alpha-synucleinopathy, we aimed to investigate potential resting-state connectivity and structural changes in this promising prodromal group.

Materials and methods: Twenty-six patients with polysomnography-proven idiopathic RBD and 22 age and sex-matched healthy controls were recruited from the Oxford Parkinson's Disease Centre (OPDC) patient cohort.

All subjects underwent a structural MRI protocol, including T1-weighted and diffusion imaging. Blood-oxygen level dependent (BOLD) sequences were acquired during resting conditions, with the subject awake and their eyes open.

Resting-state analysis was performed using probabilistic independent component analysis (ICA) as implemented in the Multivariate Exploratory Linear Optimized Decomposition into Independent Component FSL tool (MELODIC). A previously developed template of resting-state networks typical for healthy elderly participants was used. Based on a priori hypotheses, three networks of interest (the basal ganglia network (BGN), the sensorimotor network (SMN) and the default mode network (DMN)), and one control network (the primary visual network (PVN)) were chosen for further analyses. The dual regression approach was then used to identify individual temporal dynamics and the associated spatial maps. Statistical comparisons between RBD and healthy controls were performed using permutation-based non-parametric inference. Results were corrected for age, sex and voxelwise gray matter volume, and defined as significant at $p < 0.05$ after FWE correction.

Results: One of the RBD patients had significant cortical atrophy on their T1-weighted structural scan, and was excluded from further analyses. Patients with RBD performed marginally worse on the UPDRS part III (0.7 (1.1) vs. 3.0 (3.4), $p = 0.005$) and had lower cognitive scores (MMSE 29.3 (1.0) vs. 27.4 (1.7), $p < 0.001$). The two groups performed comparably on the Purdue Pegboard Test ($p = 0.5$). At the time of the MRI investigation, none of the subjects fulfilled the UK Parkinson's Disease Society Brain bank criteria for the diagnosis of idiopathic Parkinson's disease and there was no clinical suspicion of any other neurological condition.

There were no significant volumetric differences between patients with RBD and healthy controls. Voxel-based morphometry analysis did not yield any significant gray matter differences between the two groups. Similarly, no significant differences of fractional anisotropy were found using white matter tract analysis.

Rs-fMRI revealed decreased coactivation within the BGN (involving the caudate, putamen, globus pallidus and the dorsolateral prefrontal cortex) and the SMN (precentral gyrus) of patients with RBD. No increased coactivation within these networks was seen in the RBD group, and no between-group differences were seen in the DMN and PVN.

Conclusion: Rs-fMRI demonstrates significantly reduced coactivation within the BGN and SMN of patients with RBD. These results are similar to those found in early PD and are likely to represent pre-clinical basal ganglia dysfunction. This approach shows great promise as a potential biomarker for prodromal alpha-synucleinopathy.

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Quantitative analyses of REM sleep without atonia in patients with voltage gated potassium channel antibody syndrome

E. St. Louis, E. Lieske, S. Mccarter, B. Boeve, A. Mckee, M. Silber, D. Sandness

Mayo Clinic, USA

Introduction: REM sleep muscle tone is increased in most adults with REM sleep behavior disorder (RBD), but the degree of REM sleep without atonia (RSWA) in patients with Voltage Gated Potassium Channel (VGKC) Antibody Syndrome remains unclear. We analyzed RSWA in patients with VGKC positivity, with and without RBD.

Materials and methods: Patients included VGKC patients ($n = 18$) both with ($n = 7$) and without RBD ($n = 11$) and similarly aged controls ($n = 18$) and RBD patients without VGKC ($n = 18$) with an average age of 55.0 years. We comparatively analyzed manual and automated RSWA between VGKC patients with and without RBD, healthy controls, and RBD controls without VGKC. Percentages of phasic, tonic, and "any" muscle activities were compared in the submental (SM) and anterior tibialis (AT) muscles. Statistical analyses involving group comparisons and regression were then performed.

Results: RSWA levels were intermediately elevated in VGKC patients when compared with OSA and RBD controls. VGKC patients had higher RSWA levels in the AT muscle ($p < 0.05$), and comparable RSWA in the SM muscle when compared with controls. RAI was significantly lower in VGKC patients than OSA controls (indicating higher levels of RSWA: 0.85 vs. 0.94, $p < 0.05$), but lower than in RBD cases. SM and AT phasic burst durations were similar between VGKC patients and OSA controls, both groups having lower durations than in RBD controls ($p < 0.05$).

Conclusion: VGKC patients have intermediate levels of RSWA, between those of idiopathic RBD patients and controls, driven especially by higher AT phasic muscle activity. These differences in RSWA characteristics may aid in the differential diagnosis of RBD patients.

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TCM psychological pathomechanism of RBD

C. Wang¹, P. Shen², W. Wang¹, G. Li¹

¹ Psychology and Sleep Department of Guang'anmen Hospital of China Academy of Chinese Medical Sciences, China

² Shanghai University of Traditional Chinese Medicine, China

Introduction: Rapid eye movement (REM) behaviour disorder (RBD) is a sleep disorder with which patients suffer unpleasant dreams with vocal sounds and sudden physical movements with limbs, acting the dream out vividly. On the TCM basis, pathomechanism and treatment of RBD would be discussed from the perspectives of hun (ethereal soul) and po (corporeal soul).

Materials and methods: According to literature on TCM, hun, defined as one kind of soul accompanying independent conscious activities, plays a role of memorizing conscious activities, while po can be referred as corresponding conscious structure of human's perception and locomotor system. Psychologically, normal sleep experiences the complete rest of independent consciousness, in the meanwhile, po, controlling perception and locomotor system, remains completely still; as cache consciousness, hun can rearrange dream with cache information.

Results: From the perspective of TCM, the pathomechanism of RBD lies in the unstable hun and po, in other words, in the absence of independent consciousness, perception and locomotor system are activated by cache consciousness, which leads to the body having heteronomous behaviours during sleep. The TCM psychological principles of treating sleep behaviour disorder are easing hun and stabilizing po, that is, lowering activity of cache consciousness and enhancing relaxation of perception and locomotor system in sleep. In detail, patients were encouraged to experience in a more relaxed sleep via thought induction psychotherapy (TIP); under low resistance circumstance patients would re-cognize the detailed stimuli in daily life, which gave patients an implication that they should keep a distance from their experience of dream in sleep.

Conclusion: Basic theories of TCM have unique understanding and interpretation on psychological pathomechanism of RBD. Further study is needed to gain more clinical enlightenment.

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Association between sleep deprivation and hypertension in the adult population of makati city

C. Ecuadra, A. Atlas, P. Lee, L. Brito, E. Casupanan, T. Co, M. Sanchez, A. Tatco, P. Tiamson
University of Santo Tomas, Philippines

Introduction: Hypertension causes the highest amount of deaths in the Philippines, but it has not yet been established if sleep deprivation among Filipinos contributes to hypertension. Thus, this study aims to identify the association of sleep deprivation with hypertension among Filipino adults.

Materials and methods: The study was approved by the College of Rehabilitation Sciences – Ethical Review Committee Board. It utilized an analytical cross-sectional study design that involved residents aged 32–59 years old from three barangays in Makati City, Philippines.

Data gathering was subdivided into two phases: (a) development of hypertension risk factors questionnaire and inter-rater reliability testing of BP assessment among the researchers; and (b) questionnaire administration and BP assessment. All qualified participants were required to answer the questionnaire administered by the researchers for profiling, and assessment of their sleeping habits and hypertension risk factors. Subjects who had reported medical diagnosis of hypertension or showed any proof of intake of anti hypertensive medications were classified as hypertensive. While participants who were not able to report or show any proof of diagnosis were included in the 1 week BP assessment protocol based on the Philippine Hypertension Society's Guidelines. Subjects who reported of <7 hours of sleep per day in a week were classified as sleep deprived.

Data encoding, processing, and analysis were done using MS Excel, STATA and OpenEpi. Descriptive statistics was used to describe the demographic characteristics of the subjects. Univariable and multivariable logistic regression were used to determine the significant risk factors of hypertension.

Results: Pilot testing of questionnaire revealed a Cronbach alpha of 0.67, while inter-rater test among researchers revealed good inter-rater reliability.

For phase 2, a total of 190 residents participated in the study. Among them, 58% were found to be hypertensive while 61% were found to be sleep deprived. Crude analysis revealed that sleep deprivation, age, sex, time of work, frequent consumption of salty food, past medical history of stroke and cardiac problems and family history of stroke were associated with hypertension. But multivariable analysis revealed that only age and sleep deprivation were significant in the final model. Analysis also revealed that a person who sleeps for <7 hours a night has 2.31 times more risk to be hypertensive when adjusted for age (p value <0.05). Furthermore, a decrease of 1 hour of sleep was found to increase the risk of hypertension by 1.43 times when adjusted for age (p value <0.05). Sleep deprivation was also found to be associated with hypertension among males together with age, salty food consumption, occupation, cardiac problem, and frequent alcohol consumption (p value <0.05). But analysis of among females revealed that sleep deprivation was not associated with hypertension (p value >0.05).

Conclusion: Sleep duration of less than 7 hours was found to increase the development of hypertension by 2.31 times more among those who are sleep deprived compared with those who are not. Aside from sleep deprivation, increased age was also found to be significantly correlated with hypertension.

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Nicotine addiction and sleep deprivation: Impact on pain sensitivity through immune modulation in rats

C. Hirotsu, S. Tufik, M. Andersen
Universidade Federal de Sao Paulo, Brazil

Introduction: Nicotine dependence is related to poor sleep and reduction of pain sensitivity. However, pain and sleep have a bidirectional relationship as chronic pain is associated with sleep disorders, and sleep deprivation (SD) leads to hyperalgesia. Thus, we evaluated the effects of SD added to nicotine addiction or withdrawal in pain.

Materials and methods: Sixty adult rats were distributed into six groups: Vehicle-Control, Vehicle-SD, Nicotine-Control, Nicotine-SD, Withdrawal-Control and Withdrawal-SD. Nicotine addiction was established by chronic administration of nicotine twice a day for 7 days, while withdrawal was induced by administration of mecamylamine twice in a single day. The SD was performed through the multiple platform method for 72 h. After SD or Control condition, the pain threshold was evaluated through the hot plate test. Then, all animals were euthanized for blood collection and measurement of cytokines and corticosterone.

Results: The results showed that SD induced hyperalgesia in all groups independent of treatment, while nicotine treatment led to decrease of pain sensitivity. However, although the Nicotine-SD

group had significant reduction of pain threshold compared with Nicotine-Control group, they no longer differed from Vehicle-SD and Withdrawal-SD groups, due to SD effect. Regarding the immune system, nicotine withdrawal led to increase of IL-6 and TNF α levels independent from sleep condition. Also, TNF α was only significantly increased in the Withdrawal-SD group compared with Nicotine-SD and Vehicle-SD groups. No significant changes were observed on corticosterone levels. A negative correlation between the anti-inflammatory IL-4 cytokine and pain sensitivity was found. Regression model showed that both SD, weight loss and IL-1 α were predictors of pain sensitivity.

Conclusion: The hyperalgesia induced by sleep deprivation seems to be stronger than the analgesia induced by nicotine dependence. Although the drug withdrawal did not potentiate the hyperalgesia induced by SD, it contributed to increased systemic inflammation, showing a possible role for IL-4 and IL-1 α in pain sensitivity.

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Sleep duration, sleep quality, and arterial stiffness

C. Kim¹, Y. Chang², S. Hong³, S. Ryu²

¹ Workplace Wellness Design Institute, Kangbuk Samsung Hospital, Sungkyunkwan University, School of Medicine, Seoul, South Korea

² Center for Cohort Studies, Total Healthcare Center, Kangbuk Samsung Hospital, Sungkyunkwan University, School of Medicine, Seoul, South Korea

³ Department of Otorhinolaryngology – Head and Neck Surgery, Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, South Korea

Introduction: Less is known about the effects of sleep duration and sleep quality on arterial stiffness. We examined the association between sleep duration and quality and brachial-ankle pulse wave velocity (baPWV) in a large sample of young and middle-aged asymptomatic Korean adults.

Materials and methods: Cross-sectional study of 22,337 participants with no history of cardiovascular disease, diabetes, hypertension, or sleep apnea who underwent baPWV measurement as part of a health screening exam. Sleep duration and quality were assessed using the Pittsburgh Sleep Quality Index.

Results: The sleep duration of <5, 8 and \geq 9 h compared with 7 h were associated with higher baPWV ($\beta = 6.47$, $\beta = 14.48$, and $\beta = 24.06$, p for quadratic trend = 0.004, respectively), indicating a J-shaped association. This association remained significant after adjustment for body mass index, fasting glucose, total cholesterol, and systolic blood pressure. Participants with poor sleep quality had 5.92 (95% confidence interval: 0.73–11.11) cm/s difference in mean baPWV compared with those with good sleep quality.

Conclusion: In this large study of apparently healthy men and women, sleep duration had a J shaped association with arterial stiffness measured by baPWV and poor sleep quality was associated with increased baPWV. Our results suggest that arterial stiffness may be prevented by adequate amount and quality of sleep.

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Automated slow wave sleep disruption in middle-aged adults

S. Ooms¹, J. Zempel², D. Holtzman², Y. Ju²

¹ Radboud University Medical Center, The Netherlands

² Washington University School of Medicine, USA

Introduction: Slow wave sleep (SWS), the deepest portion of non-REM sleep, plays an important role in neurophysiologic restoration and other functions of sleep. We developed an automated protocol to selectively disrupt SWS while maintaining normal sleep architecture, as a tool to investigate the specific contributions of SWS to sleep-related physiologic phenomena.

Materials and methods: Four healthy volunteers (45–65 years, 50% men) with normal sleep underwent polysomnography with standard (frontal, central, and occipital) EEG leads. During live recording, a custom Matlab™ program calculated spectral power for the delta (0.5–4 Hz) and alpha (8–12 Hz) bands from the right frontal lead, using Fast Fourier Transform (FFT) for every 10 second mini-epoch. Based on cutoffs for delta and alpha spectral power previously determined from a larger group of middle-aged adults, the program determined whether the mini-epoch represented non-artifactual SWS. If so, the program delivered increasing volumes of random frequency tones to the participant through earphones, until delta spectral power decreased, indicating an arousal. Each participant had one night with this SWS disruption protocol, and one night of sham disruption (wearing earphones but without tones being delivered), in random order. Polysomnograms were scored by a registered technologist using standard criteria. Spectral power analyses were performed using Welch's method on data from the frontal leads. Comparisons between sham and SWS disruption nights were made within participants using paired t-tests.

Results: Delta spectral power was lower with the SWS disruption protocol compared with the sham condition (199 ± 101 uV²*s compared with 109 ± 83 uV²*s, $p = 0.05$). None of the other spectral bands were significantly changed. A mean 2976 (± 172) (range 2784–3199) tones were delivered over the course of the SWS disruption night. Total sleep time, N3 time, REM sleep time, and sleep efficiency were not significantly changed (total sleep time: 403 ± 57 versus 380 ± 94 minutes, $p = 0.725$; REM sleep time $49 (\pm 26)$ versus $74 (\pm 52)$, $p = 0.54$; sleep efficiency: $79 \pm 12\%$ versus $76 \pm 17\%$, $p = 0.77$). As expected in this middle-aged population, there was scant N3 sleep, 26 (± 49) minutes during sham, 3 (± 5) minutes with SWS disruption, $p = 0.37$. Compared with gold-standard visual scoring, the automated protocol had a 98 (± 2)% sensitivity and 86 (± 11)% specificity for detecting non-REM sleep with delta-power above the set threshold.

Conclusion: This novel automated SWS disruption protocol accurately and effectively reduces SWS in a middle-aged population, without significantly affecting total sleep time or other aspects of sleep architecture. This protocol can be used to investigate the effect of SWS disruption in future studies.

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Mutual relations between sleep deprivation, sleep stealers and risk behaviours in adolescents: A cross cultural comparison

T. Paiva¹, T. Gaspar², M. Gaspar Matos³

¹ Cenc Sleep Medicine Center, Portugal

² Lusiana University of Lisbon, Portugal

³ Human Kinetics School, University of Lisbon, Portugal

Introduction: There are marked cultural differences in sleep habits and activities in adolescents. Therefore we intend to analyse the diverse mutual influences of sleep duration and sleep deprivation upon the sleep stealers and adolescent risk behaviors in a national survey and to compare the obtained data with similar studies worldwide.

Materials and methods: Design and settings of the National Survey: The national survey is a component of the Health Behaviour in School-Aged Children (HBSC) study; it is based on a school-based self-completed questionnaire; 3476 students from 139 randomly chosen Portuguese schools, 53.8% were girls; 45.9% attended the eighth grade and 54.1% the 10th grade; the mean age was 14.9 years.

Measurements: (1) Gender and age; (2) sociodemographics, self-reported BMI; (3) sleep duration during the week and weekends, sleep deprivation; (4) screen time (computer use; TV viewing and mobile phone use); (5) sexual behaviour; (6) violent behaviours: fights, use of weapons; (7) use of tobacco, alcohol and drugs.

Pearson chi-square tests and logistic regression were used.

Results: The obtained data were as follows: Excessive use of mobile phone, of computer use during weekdays, and Internet facilities; substance use; violence and sexual relations had significantly higher prevalence in sleep deprived adolescents. By logistic regression only school grade, PC weekdays, tobacco, drugs and weapons were SD predictors, while SD predicted PC weekdays, tobacco, drugs. Comparison with data from other countries and regions shows in several items quite high prevalence among Portuguese adolescents.

Conclusion: Sleep stealer use and risk behaviors are increased by sleep deprivation; their correlations are complex and, in spite of similar association patterns, their prevalence varies markedly across countries. The national data are discussed within the economical crisis framework.

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Beneficial effect of morning light after one night of sleep deprivation

A. Viola, J. Hubbard, H. Comtet, E. Ruppert, P. Bourgin
Sleep Disorders Centre, France

Introduction: Exposure to artificial light improves subjective well-being, mood, cognitive performance and suppresses melatonin secretion; relative to light administration and exposure time.

Materials and methods: This photic influence might be especially useful to counterbalance the impact of prolonged wakefulness on sleepiness and performance. Here, we seek to evaluate the effect of early morning light on performance, mood, alertness, and melatonin, after one night of total sleep deprivation.

Twenty-four healthy young underwent a balanced cross-over design. The participants followed their habitual life rhythms prior to their admittance to the research laboratory to undergo one night sleep deprivation. During the sleep deprivation, cognitive performance was assessed every 2 hours.

The bright light exposure lasted for 30 minutes starting at 5 AM. The three following lighting conditions were applied by Luminette® (Lucimed, Belgium), Philips Energy-Light and control condition with dim light exposure.

Results: We observed a significant ($p < 0.05$) light-enhanced performance by the number of right answers on the PVSAT and the reaction time to the PVT, and decreased sleepiness characterized by the KSS. Preliminary salivary melatonin levels (four participants, on-going analyses) after light exposure were reduced but are not significant as compared with dim light ($p = 0.09$).

Conclusion: These results are of relevance not only for ergonomics and societal reasons, but medical investigations as well. The demonstration that light administration through light-emitting glasses is as efficient as conventional bright light therapy boxes may have direct societal and medical applications, most notably for shift workers.

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Extensive lateral wall enhancement in OSA surgery

A. Elsobky
Mansoura University, Egypt

Introduction: Lateral wall pharyngeal collapse is still an unsolved problem in OSA surgery. I propose the combination of relocation pharyngoplasty with expansion sphincter pharyngoplasty.

Materials and methods: The expansion patients with isolated lateral wall collapse during DISE were divided into three groups: group 1 managed by relocation pharyngoplasty, group 2 by expansion, and group 3 by combination of both techniques.

Results: Mean AHI improvement was best in third group.

Conclusion: Extensive lateral wall enhancement is a promising technique in managing lateral wall collapse.

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Maxillomandibular advancement – The name tells half the story

G. Cho¹, L. Huon¹, S. Liu²

¹Stanford School of Medicine, USA

²Division of Sleep Surgery, Department of Otolaryngology, Stanford School of Medicine, USA

Introduction: MMA remains the most effective surgical intervention for OSA, regardless of disease severity, body habitus, or presence of dentofacial deformity. Powell, Riley, and Li have clearly described the mechanism of its efficacy. Inherent in their discussion but frequently missed by non-sleep surgeons is the importance of MMA with counterclockwise rotation.

Materials and methods: Fifteen patients who underwent MMA at Stanford were included in this retrospective study. Pre and post-operative demographic (age, gender, BMI) and polysomnography data were obtained.

Predictors of surgical success via MMA with counterclockwise rotation were measured using pre and post-operative CT scans. We selected changes in intra-maxillomandibular volume (IMMV), occlusal plane, upper airway length, hyoid position, and posterior airway space as representative measures of counterclockwise movement. IMMV was the volume inside the skeletal complex, bounded by the level of hard palate, inferior border of mandible, and posterior pharyngeal wall. Hyoid position was measured by an angle from the Pogonion to hyoid to the posterior airway.

AHI, ODI, and lowest oxygen saturation were the main outcome variables.

Drug-induced sleep endoscopy was also performed perioperatively with dexmedetomidine and rated by blinded reviewers using the VOTE classification.

A computational fluid dynamics model was applied to compare perioperative changes in theoretical airway pressure and flow velocity during inspiration and expiration.

Wilcoxon and McNemar tests were used for statistical analysis.

Results: The change in AHI ranged from a mean of 61.6 ± 19.8 to 6.2 ± 9.1 ($p = 0.018$), in ODI from a mean of 21.7 ± 22.7 to 0.18 ± 0.3 ($p = 0.028$), and in lowest saturation from a mean of $79.8\% \pm 6.6\%$ to $88.8\% \pm 5.7\%$ ($p = 0.043$).

Change in occlusal plane ranged from 5° clockwise to 6.8° counterclockwise, with the majority of movements in the counterclockwise direction. Elevation of the hyoid bone as reflected by changes in the Pogonion-hyoid-airway angle ranged from a preoperative mean of $152.6 \pm 15.1^\circ$ to $167.5 \pm 8.8^\circ$ ($p = 0.028$). Intra-maxillomandibular volume change increased from a mean of $168.5 \pm 35.6 \text{ mm}^3$ to $204.56 \pm 34.2 \text{ mm}^3$ ($p = 0.036$).

Perioperative VOTE classification ranged consistently from complete or partial (1 or 2) lateral pharyngeal wall collapse at the oropharynx to no collapse (0). Computational Fluid Dynamics model showed marked decrease in obstructed airway segments in negative pressure and flow velocity.

Decreased occlusal plane and elevated hyoid position correlated positively with post-operative improvements in AHI, ODI, and lowest oxygen saturation.

Conclusion: MMA with counterclockwise rotation (CCR) is associated with significant clinical benefit. Surgeons performing MMA should bear in mind that rotation takes precedence over length of mandibular advancement alone, as rotation guarantees adequate mandibular advancement. MMA with CCR maximizes skeletal volume and pharyngeal wall tension – the cornerstones of surgical success.

Acknowledgements: Senior author (SYCL) of this ongoing study would like to thank Dr. Christian Guilleminault for highlighting the importance of studying counterclockwise rotation during one of the many valuable hallway conversations at the Stanford Sleep Medicine Clinic.

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Radiographic and histopathologic findings of the tongue base in patients with obstructive sleep apnea after transoral robotic surgery: A preliminary study

S. Hong, J. Wee, W. Lee, C. Rhee, C. Lee, J. Kim

Department of Otorhinolaryngology – Head and Neck Surgery, Seoul National University Bundang Hospital, Seoul National University College of Medicine, South Korea

Introduction: Tongue base is a frequent anatomical obstructing point in obstructive sleep apnea. However little is known about the histopathologic features and its correlation with radiographic findings. The aim of this study was to investigate the histopathologic findings of the tongue base in patients with OSA after transoral robotic surgery.

Materials and methods: Thirteen patients who underwent transoral robotic surgery were involved in this study. All the study patients were preoperatively diagnosed with OSA and showed tongue base level obstruction after upper airway evaluation. The histopathologic findings of the excised specimens were evaluated and matched with the computed tomography (CT) images. Correlation of the OSA severity (polysomnographic parameters: AHI, lowest O₂ saturation) with the microscopic findings of tongue base were analyzed.

Results: Most of the tongue base specimen had a four layer structure under light microscope, which were epithelial layer, lymphoid follicle layer, glandular layer and muscular layer. The depth of the layers which were measured under a microscopy were highly correlated to the matched layer depth in CT images (follicular layer; $p \leq 0.001$, glandular; $p = 0.073$). However there was no association between the OSA severities with the microscopic findings.

Conclusion: The base of the tongue was composed of four layers which were epithelial, lymphoid follicle, glandular and muscular layer. It is possible to assume the depth of these layers by estimating the CT images. However the severity of OSA was not correlated to these histopathologic findings.

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Airway space and the hyoid position after mandibular set-back orthognathic surgery

S. Kim, S. Choi, J. Kim

Ewha Womans University, South Korea

Introduction: This study was performed to investigate airway changes and the position of the hyoid bone after orthognathic surgery, and to assess possible risk factors.

Materials and methods: In this retrospective study, 50 patients who underwent posterior displacement of the mandible by the bilateral sagittal split ramus osteotomy technique were included. Changes of the position of the hyoid bone and the airway space were analyzed over various follow-up periods, using cephalometric radiography taken preoperatively, immediately after surgery, 8 weeks after surgery, 6 months after surgery, and 1 year after surgery. To identify risk factors, multiple regression analysis of age, gender, body mass index (BMI), posterior mandibular movement, and the presence of genioplasty was performed.

Results: Inferior and posterior movement of the hyoid bone was observed postoperatively, but subsequent observations showed regression toward the anterosuperior aspect. The airway space also significantly decreased after surgery ($p < 0.05$), and increased slightly up until 6 months after surgery. The airway space significantly decreased ($\beta = 0.47$, $p < 0.01$) as the amount of mandibular setback increased. However, age, sex, BMI, and presence of genioplasty were not associated with airway reduction.

Conclusion: The amount of mandibular set back was significantly associated with postoperative reduction of airway space. Careful monitoring is needed to maintain adequate airway regarding obstructive sleep apnea.

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Dynamic changes in gene expression during sleep in OSA

D. Lim, B. Keenan, X. Guo, M. Chan, I. Alonso Vazquez, D. Brady,

G. Maislin, A. Pack

University of Pennsylvania, USA

Introduction: During sleep patients with sleep apnea have repetitive arousals with surges in sympathetic activity as well as cyclical intermittent hypoxia. We hypothesize that these events during sleep will lead to dynamic changes in gene expression across the night in peripheral circulating cells.

Materials and methods: Newly diagnosed OSA patients and controls underwent a polysomnogram and four measures of severity of OSA were obtained for each hour: oxygen desaturation $>4\%$ index; apnea-hypopnea index; percent sleep time with SaO₂ $< 90\%$; and minimum oxygen saturation level. Blood was collected every 2 hours from 6 PM to noon the following day. RNA was extracted from circulating cells. The relative expression level of 18 genes was assessed using PCR at each time point. Expression levels were normalized to

the geometric mean of housekeeping genes, and transcriptional change was calculated as the change in the normalized CT level from the average CT over the first three measures (i.e., 6, 8 and 10 PM) prior to sleep (denoted $\Delta\Delta\text{CT}$). Linear mixed models were used to assess the relationship between the four OSA severity measures during a given 1-hour time period (beginning at 10–11 PM) and $-\Delta\Delta\text{CT}$ for expression of each gene measured up to 12 hours later. A total of 216 comparisons (12 temporal associations for 18 genes) were assessed for each OSA severity measure. We utilized a strict Bonferroni correction of $p < 2.315 \times 10^{-4}$ (i.e., 0.05/216) for statistical significance; results with a $p < 0.0028$ (0.05 corrected for 18 genes) were considered suggestive and a $p < 0.05$ nominally significant.

Results: Nineteen subjects: $n = 5$ controls (ODI4 < 5 events/hour), 5 mild OSA (ODI4 5–15), 3 mild-moderate OSA (ODI4 15–20), 3 moderate OSA (ODI4 20–40) and 3 severe OSA (ODI4 > 40). Patients had a mean (SD) age of 45.1 (10.1) years, a BMI of 33.0 (6.1) kg/m², 63.2% were male and 68.4% were African American. Patients had an AHI of 30.0 (22.4) and ODI4 of 17.7 (17.2) events/hour, hypoxia time of 3.3% (5.5) and SaO₂ nadir of 84.1% (8.0). Across all temporal associations between gene transcriptional changes and the four OSA severity measures ($n = 864$ total), we observed 91 (10.5%) nominally significant associations (higher than expected by chance at our $\alpha = 0.05$): 13 for AHI, 18 for ODI4, 40 for hypoxia time, and 20 for SaO₂ nadir. ICAM1 (adhesion molecule) ($n = 13$), SLC2A1 (glucose transporter 1) ($n = 11$) and NRF2 (nuclear respiratory factor 2) ($n = 10$) showed the largest number of associations, with each gene showing significant or borderline significant increased transcription associated with more hypoxia time across the night, particularly from 5 to 11 hours following hypoxia. In contrast, CYBB (a key subunit of NADPH oxidase) showed decreased transcription in response to higher severity in each of our OSA severity measures, specifically after 5–6 or 8–9 hours. This would be protective.

Conclusion: We observed temporal associations between expression of a number of genes and temporal OSA severity within our sample of 19 patients. The majority of associations was with hypoxia and was delayed. This strategy is identifying novel responses during sleep in patients with OSA.

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Changes of tongue base obstruction degree after palatal surgery including tonsillectomy in obstructive sleep apnea

J. Ahn, D. Han, D. Kim, C. Rhee, C. Lee, T. Won

Department of Otorhinolaryngology – Head and Neck Surgery, Seoul National University College of Medicine, Seoul, South Korea

Introduction: Obstruction at the tongue base in OSA patients is caused by numerous factors which include static volume of tongue and sleep related loss of tone in the genioglossus muscle. The aims of this study were to evaluate changes in the degree of tongue base obstruction after palatal surgery.

Materials and methods: From January 2009 through June 2014, retrospective analysis was performed in patients who underwent palatal surgery (including tonsillectomy) without tongue base surgery, who had performed pre- and post-operative dynamic airway evaluation during sleep (DAES) by sleep video fluoroscopy (SVF) or drug induced sleep endoscopy (DISE). Palatine tonsil size and palatal position of tongue were evaluated. The pre- and post-operative lateral pharyngeal wall obstruction was evaluated. The degree of tongue base obstruction was evaluated by pre- and post-operative SVF and DISE in the level of upper and lower tongue base.

Results: Among 58 patients, 27 patients underwent SVF and 31 DISE. None showed improvement in the degree of tongue base obstruction after surgery. Aggravation in the degree of obstruction in upper or lower tongue base was observed in 47% of patients. Age below 50 years, large-sized tonsil and complete obstruction of lateral pharyngeal wall during sleep were related with postoperative aggravation of upper tongue base obstruction.

Conclusion: Almost half of patients who underwent palatal surgery with tonsillectomy showed aggravation of tongue base obstruction. The treatment plan and counselling for palatal surgery should include aggravation of tongue base obstruction.

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Cortical excitability and sleep in restless legs syndrome

A. Kalloo¹, R. Salas², C. Earley², R. Allen²

¹ Johns Hopkins Bloomberg School of Public Health, USA

² Johns Hopkins School of Medicine, USA

Introduction: Corticomotor excitability in relation to sleep in RLS patients was evaluated. Increased cortical excitability using paired pulse transcranial magnetic stimulation (TMS) shown for the hand in RLS patients has not been evaluated for the leg.

Materials and methods: Thirty-two RLS adults and 28 matched Controls underwent morning TMS following overnight polysomnography. We tested paired-pulse TMS linked to GABA-A and GABA-B activity: short and long interval intracortical inhibition (SICI, LICI) respectively, and intracortical facilitation (ICF) representing glutamatergic activity, tempered by GABA of both the abductor pollicis brevis and the anterior tibialis muscles.

Results: RLS compared with controls showed less ICF for hand ($p < 0.02$) but not leg ($p = 0.20$), and less LICI for leg ($p < 0.02$) but not for hand ($p = 0.21$). RLS females showed less SICI ($p < 0.05$) and more ICF ($p < 0.01$) for hand measures. RLS females also showed less LICI ($p < 0.02$) for leg. Increased arousals during sleep correlated significantly with SICI ($r = -0.57$, $p < 0.01$) and non-significantly with LICI ($r = -0.32$, $p < 0.1$) for leg. Increased ICF for leg correlated significantly with Stage 3 NREM sleep ($r = -0.44$, $p < 0.05$) and non-significantly for Stage 2 NREM sleep ($r = 0.35$, $p < 0.1$). Decreased Stage 2 NREM sleep correlated significantly with SICI ($r = 0.32$, $p < 0.05$) for hand.

Conclusion: These data evaluating paired pulse morning TMS for the hand and leg revealed complex differences in cortical excitability for RLS both compared with controls and in relation to sleep. The significance in GABA-B associated measures suggests a need for consideration of GABA-B agents in RLS treatment.

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The prevalence of restless legs syndrome and association with neurodevelopmental disorder in Korean children

J. Kim¹, M. Lim², E. Kim³, S. Yoo³, M. Ha⁴, K. Paik⁵

¹ Department of Neurology, Dankook University College of Medicine, Dankook University Hospital, Cheonan, South Korea

² Department of Psychology, Dankook University, South Korea

³ The Environmental Health Center, Dankook University Hospital, South Korea

⁴ Department of Preventive Medicine, Dankook University College of Medicine, South Korea

⁵ Department of Psychiatry, Dankook University College of Medicine, Dankook University Hospital, South Korea

Introduction: The aim of this study is to investigate the prevalence of RLS in young Korean children and the association with attention-deficit hyperactivity trait and autism spectrum trait in general population.

Materials and methods: The children attending elementary schools in the neighborhood of Cheonan city were enrolled. Parents and children were asked to fill out the questionnaire including RLS symptoms, family history of RLS, autism spectrum disorder (ASD) and attention-deficit hyperactivity disorder scale (ADHD). To diagnose RLS in children, the first-degree family history of RLS and self-expression of his or her own leg symptoms were also asked as well as four essential criteria of RLS according to international RLS study group diagnostic criteria.

Results: Eleven thousand nine hundred thirty children (9.07 ± 1.78 years, male 5864) were surveyed and 0.6% of them were suspected to have definite RLS. All of them reported “yes” to all four RLS diagnostic criteria and also described symptoms in their own words. Definite RLS were more frequent in children with ADHD trait (1.59% vs. 0.57%, $p = 0.001$) and in children with ASD trait (1.43% vs. 0.57%, $p = 0.016$) than normal children. Children with RLS showed significantly higher ADHD total scale (11.53 ± 8.01 vs. 7.75 ± 6.83 , $p < 0.001$), hyperactivity scale (4.77 ± 4.41 vs. 2.99 ± 3.29 , $p < 0.001$), inattention scale (6.77 ± 4.36 vs. 4.81 ± 4.05 , $p < 0.001$) than normal children. No difference between boy and girl was shown.

Conclusion: Korean children have 0.6% of RLS prevalence. Children with neurodevelopmental trait such as ASD or ADHD showed higher RLS prevalence, which could aggravate neurodevelopmental symptoms with poor sleep.

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Clinical features and cosequences of RLS among the patients with CKD and hemodialysis

S. Koike

Toyohashi Mates Sleep Disorders Center, Japan

Introduction: Restless legs syndrome (RLS) is known to be very common in end-stage renal disease (ESRD) patients and has been reported as occurring in 15–47% of cases. This report describes the state of sleep disorders in Japanese dialysis patients and changes over time in RLS onset rates.

Materials and methods: (1) The state of sleep disorders from 2001 through 2006 was surveyed in 227 patients of the Toyohashi Mates Clinic Dialysis Center (males: 141, females: 86, mean age: 63.9 ± 11.1 years). Subject sleep complaints were evaluated using the Epworth Sleepiness Scale (ESS) and Pittsburgh Sleep Quality Index (PSQI). Polysomnography (PSG) was performed to investigate sleep disordered breathing (SDB) as measured by the sleep-related breathing disorder scale (SRBD) and periodic limb movements during sleep (PLMS). RLS was diagnosed with interviews using the International Classification of Sleep Disorders version II (ICSD II) diagnostic criteria. (2) The effect of advances in dialysis therapy on the RLS complication rate was comparatively investigated using the results of an RLS survey conducted via interviews in 2004 and the results of interviews conducted in 2013 with the same method.

Results: (1) According to PSQI results, 121 patients (58.5%) had a sleep disorder and 21 patients (9.6%) experienced excessive sleepiness throughout the day. PSG results indicated SRBD (AHI ≥ 15) in 59.6% of patients, PLMs (PLMI ≥ 15) in 54.1% of patients and RLS in 52 patients (22.9%). PSG findings revealed that mean PLM index (PLMI) was 75.6 ± 48.8 and mean PLM arousal index (PLMAI) was

26.2 ± 23.9 in 121 patients. PLMS not accompanied by RLS was also noted in 87 patients (38.3%). In these patients, mean PLM index (PLMI) was 75.7 ± 51.0 and mean PLM arousal index (PLMAI) was 25.6 ± 24.1 . Patients on hemodialysis frequently have PLMS regardless of RLS status.

The interview RLS survey indicated that in 2004, 45 of 219 patients (20.5%) had exhibited RLS but enhancements of dialyzers and advances in dialysis therapy had led to significant improvement in the RLS complication rate, which was 9.2% (47 of 513 patients) in 2014.

Conclusion: In addition to RLS, PLMs and apnea are also significantly involved in sleep disorders in dialysis-patients, and overlapping of these conditions is sometimes observed. Although RLS is one cause of sleep disorders in dialysis patients, the incidence of RLS in such patients has greatly decreased with advances in dialysis therapy.

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Effects of the modulation of sensory or motor cortical excitability by rTMS in restless legs syndrome

G. Lanza¹, B. Lanuzza¹, D. Aricò¹, R. Bella², F. Cosentino¹, G. Pennisi³, R. Ferri¹

¹ Department of Neurology IC – Oasi Institute for Research on Mental Retardation and Brain Aging (IRCCS), Troina (Enna), Italy

² Department of G.F. Ingrassia, University of Catania, Italy

³ Department of G.F. Ingrassia, Catania, Italy

Introduction: An electrocortical “disinhibition” to transcranial magnetic stimulation (TMS) was reported in restless legs syndrome (RLS), resulting in a hyperexcitability state; the aim of this study was to explore the role of inhibitory low-frequency repetitive TMS (rTMS) over the primary motor and sensory cortices in de novo patients with idiopathic RLS.

Materials and methods: Twenty right-handed participants (10 RLS patients and 10 age-matched controls) were enrolled and EEG was performed to rule out predisposition to seizure. Measures of corticospinal excitability, including resting motor threshold (rMT), motor evoked potentials (MEPs) and cortical silent period (CSP), were assessed by means of single-pulse TMS using a figure-of-eight coil and recording from the right first dorsal interosseus (FDI) muscle. Patients were randomly assigned to a stimulation sequence including, in differing order, real (motor and sensory) and sham stimulations. By using a stimulus intensity of 110% of the rMT, a session of low-frequency rTMS over the primary motor (M1) and primary somatosensory (S1) cortices were performed in two different days, at the same time (late afternoon) and experimental conditions. In each session, 20 rTMS trains were delivered, with 50 stimuli at 1 Hz for each train and an intertrain interval of 30 s (1000 stimuli in total). Clinical, and TMS parameters (rMT, MEPs, CSP) were assessed before and after every stimulation procedure. The statistical analysis was focused on the pre- vs. post-treatment finding comparison by means of tests for paired datasets.

Results: Preliminary data analysis confirmed the pattern of cortical excitability to TMS previously described in patients with idiopathic RLS (normal rMT and MEPs latency, shorter CSP duration, smaller MEPs amplitude). In addition, we found a beneficial, and possibly long-lasting, effect of the inhibitory real rTMS significantly higher than that of sham stimulation (simulated), as subjectively reported using an ad hoc visual analog scales to practically detect changes in patients sleep quality before and after each stimulation procedure. In particular, compared with sham stimulation, patients generally reported an overall improvement of sleep

only after the M1 rTMS, with only part of them reporting more easy falling asleep after both M1 and S1 stimulation; the overall quality of sleep did not change significantly. The single-pulse TMS assessment, repeated after each session, showed a more prolonged CSP after M1 stimulation compared with baseline and a trend toward an higher rMT value, whereas MEPs amplitude remained basically unchanged; conversely, S1 and sham stimulations did not produce any variation. No clinical or neurophysiological effect was observed in healthy controls.

Conclusion: The distinctive profile to TMS related to motor and somatosensory complaints we found in RLS patients might be considered a target of specific repetitive paradigms of stimulation. If this study provides valuable information at the individual level, TMS might prompt a design of an instrument for an innovative non-pharmacological approach.

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Prepulse inhibition and auditory startle response in meis1 knock-out mice

A. Salminen¹, L. Garrett², B. Schormair¹, S. Hölter², W. Wurst², J. Winkelmann¹

¹ Institute of Human Genetics, Helmholtz Zentrum München, Germany

² German Mouse Clinic, Helmholtz Zentrum München, Germany

Introduction: Response to an auditory stimulus may be inhibited by a so-called prepulse. Patients with restless legs syndrome (RLS) have altered acoustic startle reactivity (Frauscher 2007). Meis1 is the strongest genetic risk factor for RLS. We investigated the prepulse inhibition (PPI) in Meis1 knock-out mice, a potential animal model for RLS.

Materials and methods: Heterozygous Meis1 knock-out mice (Meis1tm1Mtor on a C57BL6/JolaHsd background, Azcoitia 2005) and their wildtype littermates were used for the experiments. A primary screen of the mice was performed in four groups of 15 animals: heterozygous mutant females, heterozygous mutant males, wildtype females and wildtype males. The mice were tested at the age of 10 weeks. The animals were subjected to auditory stimuli with and without a prepulse 50 ms before the stimulus. The test was performed at four different prepulse intensities (67, 69, 73 and 81 dB). PPI and acoustic startle reactivity (ASR) of the mice were recorded. Secondary screening was performed in a similar cohort of 60 mice in an attempt to replicate the results.

Results: In primary screens, PPI was significantly decreased at prepulse intensities of 69 dB ($p = 0.001$) and 73 dB ($p = 0.029$) and globally ($p = 0.019$) in all mutant mice compared with wildtype animals. The results were replicated in the secondary screening: PPI was decreased at prepulse intensities of 69 dB ($p = 0.002$), 73 dB ($p = 0.001$) and 81 dB ($p = 0.009$), as well as globally ($p < 0.001$) in mutant mice compared with controls. We observed sex-dependent changes on ASR in both screens.

Conclusion: Meis1 knock-out mice have reduced PPI. This suggests disturbance in sensorimotor gating in Meis1 knock-out mice. In addition, the transgenic mice show a sex-dependent decrease or increase in ASR, resembling findings in human RLS patients.

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Periodic limb movements of sleep in patients with history of stroke

W. Si

Department of Neurology, Urumqi General Hospital, Lanzhou Command, PLA, Urumqi, Xinjiang, China

Introduction: The relationship between stroke and periodic limb movements of sleep (PLMS) was controversial. The aim of this study was to assess the frequency of PLMS in patients with a history of stroke, and the related factors and clinical outcome of stroke.

Materials and methods: Ninety-eight consecutive patients with a history of stroke were enrolled in this study. We reviewed the medical and polysomnographic records of these patients. Stroke outcome was estimated by the Barthel Index (BI) and the modified Rankin Scale (mRS).

Results: Forty-seven patients (47.96%) had a PLMS index $> 5/h$. The average PLMS index (PLMI) was 37.58 ± 26.04 . Logistic regression analysis showed an association between diabetes and PLMS after controlling for AHI and age ($p = 0.03$; CI = 1.13–11.06). Gender, BMI, hemoglobin, glucose values, cholesterol, triglyceride, lipoprotein(a), urea and creatinine were similar in both groups ($p > 0.05$). The stroke outcome was not significantly different between groups with and without PLMS ($p > 0.05$).

Conclusion: Patients with a history of stroke had a greater prevalence of PLMS than general population. Diabetes was closely related to PLMS in patients with stroke. BI and mRS was inappropriate to evaluate the clinical outcome of stroke which was not severe.

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Premature birth and fetal growth restriction may lead to disturbed sleep in childhood

S. Yiallourou^{1,2}, S. Hollis¹, A. Odoi¹, A. Weichard¹, E. Wallace^{1,3}, R. Horne^{1,2}

¹ The Ritchie Centre, Monash Institute of Medical Research and Prince Henry's Institute and Monash University, Melbourne, Australia

² Department of Paediatrics, Monash University, Melbourne, Australia

³ Department of Obstetrics and Gynaecology, Monash Medical Centre, Australia

Introduction: Fetal growth restriction (FGR) is associated with increased risk of prematurity and neurodevelopmental delay. FGR alters sleep state distribution in utero and delays circadian rhythm maturation in infancy. Currently, few studies have investigated the long-term consequences of FGR on sleep. Accordingly, we assessed effects of FGR on sleep during childhood.

Materials and methods: Overnight polysomnography was performed on children aged between 5 and 12. Three groups of children were studied: (1) 11 preterm FGR children (born at 30 ± 1 weeks' gestation; birth weight: 1117 ± 125 g, mean \pm SEM), 6 preterm children (born at 30 ± 1 weeks' gestation; birth weight: 1627 ± 331 g) with appropriate weights for their gestational age (AGA) and 10 term-born (control) children. Children were classified as FGR if they had evidence of absent or reversed end-diastolic flow of the umbilical artery on their fetal Doppler ultrasounds, indicating placental insufficiency. Non-rapid eye movement sleep (NREM) and rapid-eye movement sleep (REM) were scored in the following stages NREM1 (N1), NREM2 (N2), NREM3 (N3) and REM sleep. Total sleep time (TST), wake after sleep onset (WASO %) and sleep efficiency (SE %) was assessed.

Results: There were no differences for either age or weight at the time of testing between the three groups studied. Compared with term and preterm AGA born children FGR children had a higher amount of N2 sleep (preterm FGR children $59 \pm 1\%$ vs term children $45 \pm 2\%$ vs preterm AGA children $39 \pm 2\%$, $p < 0.05$) and a lower amount of N3 sleep (preterm FGR children $25 \pm 1\%$ vs term children $29 \pm 3\%$ vs preterm AGA children $35 \pm 4\%$, $p < 0.05$). Preterm AGA children had reduced SE%, TST and higher WASO compared with IUGR ($p < 0.05$) and term children ($p < 0.05$).

Conclusion: Preterm birth and FGR have long-lasting effects on sleep in children. N3 sleep is important for brain maturation and consolidation of memory and poor sleep is associated with impaired neurocognition in childhood. Sleep disturbance and its potential impact on neurodevelopment in FGR and preterm children warrants further investigation.

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Association between habitual activity and knowledge of public health guidelines in Canada

A. Leblanc¹, M. Tremblay², C. Boyer², M. Borghese², J. Chaput², G. Leduc², P. Longmuir²

¹ University of Ottawa, Canada

² Children's Hospital of Eastern Ontario Research Institute, Canada

Introduction: The purpose of this study was to examine associations between child's habitual activity (physical activity, sedentary behaviour, sleep) and knowledge of current Canadian public health guidelines; perceptions of physical activity and sleep were also examined.

Materials and methods: Data for this study were obtained through the Canadian Assessment of Physical Literacy (CAPL) subsample of the International Study of Childhood Obesity, Lifestyle and the Environment (ISCOLE) ($n = 223$, 38.1% boys). Knowledge of the guidelines, perceptions of physical activity, self-report quality/quantity of sleep, and habitual screen time were obtained via self-report. In prompted questioning, children were asked to identify current physical activity and screen time guidelines. Children were also asked to self-report their quality and quantity of sleep, what they would do to improve a sports skill, and what they would do if they wanted to improve their fitness. Sleep, sedentary behavior, and physical activity were captured by 7-day accelerometer, using a 24-hour wear time protocol. Generalized linear models (ANCOVA) were used to determine the relationship between habitual activity, and knowledge of guidelines, and self-perceptions of PA/sleep. Sex, waist circumference, maturity offset, parental education (mother and father), and annual household income were included as covariates in all models.

Results: Children averaged 9.5 hours of sleep, 8.5 hours of sedentary behaviour, and 58 minutes of moderate- to vigorous-intensity physical activity daily. Girls accumulated more sleep than boys (mean difference = 14.5 minutes, $p < 0.01$); boys engaged in significantly more moderate- to vigorous-intensity physical activity than girls (mean difference = 8.7 minutes, $p < 0.0001$); Most (77%) of children could correctly cite physical activity guidelines; fewer (18%) could correctly cite screen time guidelines. Children's knowledge of physical activity and sedentary behaviour guidelines did not differ by accelerometer measured physical activity, sedentary behaviour, or sleep duration. In adjusted models, longer sleep duration, higher

physical activity, and lower sedentary behavior were associated with better self-reported sleep quality. Also in adjusted models, higher physical activity and lower sedentary behaviour were associated with better self-perceptions of physical activity; no associations were found with sleep duration.

Conclusion: Most children can identify current physical activity guidelines yet few knew screen time guidelines. Future work should improve messaging associated with guidelines and aim to create 24-hour recommendations to include sleep.

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Association between sleep and dietary patterns in preschool children

Y. Song, F. Jiang

Department of Developmental and Behavioral Pediatrics, Shanghai Children's Medical Center affiliated with Shanghai Jiao Tong University School of Medicine, Shanghai, China

Introduction: Accumulating evidence indicates that short sleep duration is related to childhood obesity. Although the exact mechanism is unclear, food intake has been suggested to be a potential mediating factor. The association between sleep and dietary patterns are largely underreported in China.

Materials and methods: Our aim is to evaluate the association between sleep and dietary patterns in preschool children. Participants included 1650 preschool children (aged 5.07 ± 0.97 years, of which 49.5% were boys) from 11 kindergartens of Hongkou district in Shanghai, China. Socio-demographic information, sleep and dietary patterns were collected by validated parental questionnaires.

Results: The average total sleep duration was 9.41 ± 0.54 hours. Two major dietary patterns were identified in the study based on factor analysis: 'traditional' and 'western'. Short sleep durations decreased odds of eating fruit (OR = 0.55, 95% CI 0.32–0.95) and vegetables (OR = 0.51, 95% CI 0.29–0.89). With regard to the midpoint of sleep, individuals who had earlier midpoint of sleep associated with higher traditional dietary pattern scores (OR = 1.60, 95% CI 1.19–2.17) but lower western dietary pattern scores (OR = 0.50, 95% CI 0.37–0.67), and a greater chance of taking more vegetables (OR = 2.77, 95% CI 1.55–4.96) but less dessert (OR = 0.72, 95% CI 0.54–0.97) and soft drinks (OR = 0.09, 95% CI 0.01–0.73).

Conclusion: Short sleep duration and late midpoint of sleep were significantly associated with dietary patterns in Chinese preschool children. Our findings may guide the management of preschool childhood obesity.

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Sleep disorders in children with asthma

D. Che, M. Lu

Shanghai Children's Hospital, China

Introduction: Both OSA and asthma involve airway obstruction, and airway inflammation, a characteristic of asthma associated with

OSA. Except sleep-disordered breathing, sleep fragmentation should be paid more attention in asthmatic population. There is little data on sleep in children with asthma and association with severity of lung disease.

Materials and methods: A prospective study was conducted in asthma children. A total of sixty-four children with asthma were enrolled in the study. Subjects were questioned for daytime sleepiness using the Paediatric Daytime Sleepiness Scale (Epworth Scale), and sleep complaints using Michigan Scale. Enrolled asthma children finished lung function, such as spirometric measurements (FVC, FEV1, PEF as a percent predict). Complete overnight polysomnography techniques were performed on all subjects before and after asthma control, to evaluate the association between sleep disorder and asthma control.

Results: (1) Studies have shown decreased quality of sleep defined as reduced sleep time, reduced sleep quality, snoring, difficulty in maintaining sleep, and daytime sleepiness in asthmatic children, especially in non-well controlled asthmatics. Non-well controlled asthmatic children had a significant decrease in sleep efficiency [SE; 76.3% (W) vs 79.1% (N); $p < 0.05$], prolonged rapid eye movement (REM) latency [150.5 min (W) vs 88 min (N); $p < 0.05$], and reduction in percentage of REM sleep [12.7 (W) vs 18.3 (N); $p < 0.05$]. The data suggest that the prevalence of pediatric sleep-disordered breathing and sleep fragmentation could be very high among children with asthma, no matter well-controlled or non-well controlled. (2) Non-well controlled asthmatic children had a higher apnea-hypopnea index ($p < 0.05$) and apnea-hypopnea-related arousal index ($p < 0.05$) as compared with well-controlled asthmatics. (3) SE indicated the degree of sleep disruption, was correlated with FEV1. However, there was no significant correlation between SE and oxygen desaturation or SE and end-tidal pCO₂.

Conclusion: It is concluded that asthmatic children have significant sleep fragmentation. OSA may coexist with asthma. Sleep disruption is associated with severity of lung disease, but is not directly correlated with the degree of nocturnal hypoxemia or hypoventilation.

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Emotional, behavior problems and sleep in premature infants

Y. Chuang¹, Y. Huang¹, C. Guillemainault²

¹ Sleep Center and Child Psychiatry Department, Chang Gung Memorial Hospital and Chang Gung University, Taipei, Taiwan

² Stanford University Sleep Medicine Division, Stanford, CA, USA

Introduction: Previous study showed children with sleep disordered breathing (SDB) demonstrating more emotional, behavior problems such as hyperactivity, and lower social competency. Premature infants have more SDB problems than full-term infants. We wondered whether there is a relationship between sleep problems and emotional and behavior problems in preterm infants.

Materials and methods: We enrolled neonates of gestational age less than 37 weeks. Basic obstetric and birth data were collected as baseline data. The participants were followed up at 6, 12, 18, and 24 months and at every 6 months of corrected age. Premature infants were tested by actigraphy, and night-time polysomnography initially. They were followed up and evaluated for their sleep habit with Chinese Brief Infant Sleep Questionnaire (CBISQ) and sleep diary. They were also assessed development with Bailey-Scales of Infant Development (BSID) – II and the Denver Developmental Screening Test (DDST). These assessments were done and filled out by the parents or the caregivers at each visit. The infant emotional and social behavior were evaluated by Brief Infant-Toddler Social and Emo-

tional Assessment (BITSEA), and Communication and Symbolic Behavior Scales Developmental Profile (CSBS DP) Infant-Toddler Checklist.

The raw data were analyzed with the software PASW Statistics (SPSS) version 18. Demographic statistics were performed by t test and chi-squared test. Correlation of emotional, behavior and sleep data was analyzed by Pearson's correlation.

Results: We enrolled 201 premature infants, but only 88 subjects completed all examination and questionnaire assessments at each visit. The mean of gestation age was 31.56 ± 3.19 weeks, and the mean of birth body weight was 1684.80 ± 543.04 g. Enrolled premature infants were divided into two groups: Group 1: premature infants with apnea-hypopnea index (AHI) > 1 and Group 2: infants with AHI < 1 .

DDST shows a highly significant difference in gross motor skill between Group 1 and Group 2. The other three categories also showed more problems in Group 1 than in Group 2. Although BSID-II results showed no significant difference between these two groups, MDI and PDI showed more problems in Group 1 than in Group 2.

BITSEA showed significant difference in problem composition and competence composition ($p = 0.000$). In CSBS DP result, the symbolic composite is highly significant with $p = 0.03$. The means of the other three composites and total score were higher also in Group 1 than in Group 2.

Conclusion: Our data showed that preterm infants with SDB have greater impairment in mental and motor development compared with those without SDB. Also the SDB-preterm infants have more emotional, social function, and symbolic behavior development delay.

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Relationship between oral flow patterns, nasal airway, and respiratory events during sleep

M. Suzuki

Department of Otolaryngology, Teikyo University Chiba Medical Center, Japan

Introduction: We hypothesized that different kinds of oral flow (OF) patterns exist during sleep. The aim of this study was to clarify the relationship between OF patterns, nasal airway obstruction, and obstructive respiratory events such as flow limitation, RERA, hypopnea, and apnea.

Materials and methods: We conducted an observational cross-sectional study of 85 Japanese adults.

Nasal flow and OF were measured separately by PSG. Nasal air flow was measured with pressure and thermistor sensors at the nostrils. For the OF measurement, another pressure sensor cannula with its tip cut off was positioned 2 cm in front of the lips.

Nasal resistance was measured with an anterior rhinomanometer in the supine position 1 h before sleep studies. On the basis of nasal endoscopy and X-ray findings, subjects were classified as those with or without nasal obstruction: those with nasal obstruction had nasal resistance ≥ 0.41 Pa/cm³/s and nasal disease such as nasal deviation, nasal allergy, or nasal polyp; those without nasal obstruction were those with nasal resistance ≤ 0.18 Pa/cm³/s and no nasal disease or complaints of nasal obstruction.

Results: OF could be divided into three main patterns: OF after a respiratory event (OF post-event), OF during a respiratory event (during-event OF), and spontaneous arousal-related OF (SpAr-related OF). OF post-event refers to OFs that begin at the end of flow reduction, are preceded by respiratory arousal, and are accompanied by postapneic hyperventilation. During-event OF refers to OFs that occur during nasal flow reduction. SpAr-related OF refers to OFs

that begin during stable breathing, are preceded by spontaneous arousal, but are not accompanied by apnea or hypopnea. Multivariate regression analysis showed that nasal obstruction was predictive of SpAr-related OF. Only 1.3% of SpAr-related OFs led to apnea or hypopnea. SpAr-related OF was negatively correlated with the AHI. In contrast, the other two types of OF led mainly to obstructive respiratory events, and their percentages of all OF had positive correlations with the AHI.

Comparative studies between patients with and without nasal obstruction revealed that the percentage of SpAr-related OF duration in relation to total OF duration was significantly higher in patients with nasal obstruction. On the other hand, there was no significant difference between patients with and without nasal obstruction in the percentages of OF post-event duration, or during-event OF.

Conclusion: SpAr-related OF was associated with nasal obstruction, but not with respiratory events, and it functioned as a “nasal obstruction bypass” mainly in normal subjects and patients with mild SDB. By contrast, the other two types were related to respiratory events and were typical patterns seen in moderate and severe SDB.

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Liraglutide 3.0 mg reduces severity of obstructive sleep apnea and body weight in obese individuals with moderate or severe disease: scale sleep apnoea tria

A. Blackman¹, G. Foster², G. Zammit³, R. Rosenberg⁴, L. Aronne⁵, T. Wadden⁶, B. Claudius⁷, C. Jensen⁷, E. Mignot⁸

¹ Toronto Sleep Institute, Medsleep and University of Toronto, Toronto, ON, Canada

² School of Medicine, Temple University, Philadelphia, PA, USA

³ Clinilabs Sleep Disorders Institute, New York, NY, USA

⁴ Neurotrials Research, Atlanta, GA, USA

⁵ Weill Cornell Medical College, New York, NY, USA

⁶ Perelman School of Medicine, University of Pennsylvania, PA, USA

⁷ Novo Nordisk, Soeborg, Denmark

⁸ School of Medicine, Stanford University, Palo Alto, CA, USA

Introduction: Obesity is strongly associated with obstructive sleep apnea (OSA) and weight loss has been shown to reduce disease severity. This randomized, double-blind, parallel-group trial compared the effects of liraglutide 3.0 mg to placebo, both as adjunct to diet (500 kcal/day deficit) and exercise, on OSA severity and body weight.

Materials and methods: Obese individuals without diabetes who had moderate OSA (apnea–hypopnea index [AHI, number of apnea/hypopnea events per hour of sleep] 15–29.9 events/h) or severe (AHI \geq 30 events/h) OSA and were unwilling/unable to use continuous positive airway pressure therapy were randomized 1:1 to liraglutide 3.0 mg or placebo, both as adjunct to diet and exercise, for 32 weeks. The primary endpoint was change in AHI after 32 weeks. Of 359 randomized individuals (mean baseline age 48.5 years, males 71.9%, AHI 49.2 events/h, severe OSA 67.1%, body weight 117.6 kg, BMI 39.1 kg/m², HbA1c 5.7%), 276 (76.9%) completed the trial (Clinicaltrials.gov ID: NCT01557166). Pre-specified efficacy analyses were performed on the data from the full analysis set, which included all randomized participants, using the last-observation-carried-forward imputation method. The safety analysis set included all randomized participants who were exposed to \geq 1 dose(s) of trial drug. Continuous endpoints were analyzed using an ANCOVA model

and categorical endpoints using logistic regression. Data presented are observed means. Exploratory analyses of the influence of weight loss on selected endpoints were conducted post hoc.

Results: After 32 weeks, the reduction in AHI was significantly greater with liraglutide 3.0 mg versus placebo (–12.2 vs. –6.1 events/h, $p = 0.02$). Supporting the AHI reduction, endpoints related to oxygen saturation, polysomnographic measures of sleep quantity and efficiency, and quality of life also improved with liraglutide 3.0 mg, albeit statistically non-significantly versus placebo. Liraglutide 3.0 mg produced significantly greater mean weight loss than placebo (–5.7 vs. –1.6%, $p < 0.001$) and enabled more individuals to achieve \geq 5% (46.3% vs. 18.5%, $p < 0.001$) and $>$ 10% (23.4% vs. 1.7%, $p < 0.001$) weight loss. Post-hoc analysis showed a relationship between weight loss and change in AHI. There were also significantly greater reductions in neck circumference (–2.2 vs. –1.3 cm, $p = 0.001$), HbA1c (–0.4% vs. –0.2%, $p < 0.001$) and systolic blood pressure (SBP, –3.4 vs. 0.0 mmHg, $p < 0.001$) with liraglutide 3.0 mg versus placebo. After 32 weeks, heart rate increased by about 2 beats/min with liraglutide 3.0 mg versus placebo. The safety profile of liraglutide 3.0 mg was generally consistent with that previously seen with liraglutide doses up to 1.8 mg in type 2 diabetes. Nausea and diarrhea were the most common adverse events with liraglutide 3.0 mg (27% and 17% of individuals); most events were mild/moderate and transient.

Conclusion: As an adjunct to diet and exercise, liraglutide 3.0 mg was generally well tolerated and produced significantly greater reductions than placebo in AHI, body weight, SBP and HbA1c in obese individuals with moderate/severe OSA. The results also indicate that weight loss improves OSA-related parameters.

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Increased risk of pneumonia in patients with obstructive sleep apnea: A nationwide retrospective cohort study

Y. Chou¹, C. Liao²

¹ Department of Physical Medicine and Rehabilitation, China Medical University Hospital, Taiwan

² Department of Anesthesiology, Taipei Medical University Hospital, Taiwan

Introduction: The association between obstructive sleep apnea (OSA) and pneumonia was not completely understood. The purpose of this study is to investigate the risk of pneumonia in patients with OSA.

Materials and methods: Using Taiwan’s National Health Insurance Research Database, we conducted a retrospective cohort study and identified 4745 adults aged 20 years and older with newly diagnosed OSA in 2000–2007. Non-OSA cohort consisted of 18,980 adults without OSA, frequency-matched for age and sex and randomly selected from the same data set. Events of pneumonia were considered as outcome during the follow-up period between 2000 and 2008. Adjusted hazard ratio (HR) and 95% confidence interval (CI) of pneumonia associated with OSA was calculated in the multivariate Cox proportional hazard model.

Results: During the follow-up period, there were 1250 newly diagnosed pneumonia cases. The incidences of pneumonia for OSA cohort and non-OSA cohort were 15.0 and 10.5 per 1000 person-years, respectively, with an adjusted hazard ratio (HR) of 1.43 (95% CI 1.24–1.65). For women, the adjusted HR of pneumonia associated with OSA was 1.72 (95% CI 1.37–2.17) higher than men’s 1.28 (95% CI 1.06–1.55).

Conclusion: Patients with OSA had higher risk of pneumonia compared with non-OSA controls, and this risk was more significant in

females. Prevention of pneumonia is needed in this susceptible population.

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Snoring and depression in Japanese population aged 65 and over: Japan Gerontological Evaluation Study (JAGES)

S. Furuya¹, A. Ikeda², K. Kondo³, T. Tanigawa²

¹ Faculty of Medicine, Juntendo University, Tokyo, Japan

² Department of Public Health, School of Medicine, Juntendo University, Tokyo, Japan

³ Center for Preventive Medical Science, Chiba University, Chiba, Japan

Introduction: According to recent studies, snoring is associated with psychological disorders. However, there is little evidence of the association in elderly people. The objective of the present study is to estimate the association between snoring and depression among Japanese aged population.

Materials and methods: Using a self-administered questionnaire, we collected data from 14,599 people aged 65–100 (8067 men and 6532 women). We used Geriatric Depression Scale (GDS) to assess depressive symptom. Five or more scores on GDS were considered as having depressive symptom. We performed multivariate logistic regression model stratified by gender to examine the association between snoring frequency and depressive symptom and each item of GDS. In multivariate model, we adjusted for age, BMI, smoking cigarette, drinking alcohol, years of education, physical activity, which were significantly associated with snoring frequency in χ^2 test ($p < 0.05$).

Results: We found that snoring frequency was significantly associated with depressive symptom; men: OR (95% CI) = 1.19 (1.03–1.39) for sometimes and 1.71 (1.45–2.02) for daily; women: OR (95% CI) = 1.16 (1.01–1.33) for sometimes and 1.94 (1.59–2.35) for daily. Among items of GDS, memory problem was the most strongly associated with snoring frequency.

Conclusion: Snoring frequency was significantly associated with depressive symptom among Japanese elderly and, in particular strongly associated with memory problem.

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All-cause mortality from obstructive sleep apnea in male and female patients with and without continuous positive airway pressure treatment: A registry study with 10 years of follow-up

P. Jennum¹, P. Tønnesen¹, R. Ibsen², J. Kjellberg³

¹ Danish Center for Sleep Medicine, University of Copenhagen, Denmark

² Minds, Århus, Denmark

³ Danish National Institute for Local and Regional Government Research, Copenhagen, Denmark

Introduction: CPAP have been shown to reduce mortality in middle aged OSA patients. More information is needed about the effect on mortality of continuous positive airway pressure (CPAP) in patients with obstructive sleep apnea (OSA), especially for women.

Materials and methods: We employed a historical cohort study design, using data from 25,329 patients with a diagnosis of OSA se-

lected from the Danish National Patient Registry for the period 1999–2009. We used Cox proportional hazard function to evaluate the all-cause mortality from OSA in middle-aged and elderly males and females, who were treated or not with CPAP.

Results: Female OSA patients had a lower mortality than males, irrespective of whether they received CPAP treatment. CPAP treatment improved survival, as illustrated by the hazard ratio of 0.62 ($p < 0.001$). This effect was dependent on gender: CPAP had no significant effect on 20–39 year old males and females, but the overall mortality in this age group was small. Survival was increased by CPAP in 40–59 and 60+ year-old males, but no such effect was observed in females. Positive predictors of survival were young age, female gender, higher educational level, and low 3-year prior comorbidity as estimated by the Charlson comorbidity index. Negative predictors for survival were male gender, age 60+ years, no CPAP treatment, prior comorbidity, and low educational level.

Conclusion: CPAP therapy is associated with reduced all-cause mortality in middle-aged and elderly males, but no significant effect was found in females.

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Respiratory sleep disturbances and its relationship with liver function in obese patients

V. Santiago-Ayala¹, M. Valencia-Flores¹, M. Reséndiz-García¹,

A. Castaño-Meneses¹, G. Gaytán², A. Mendoza¹,

S. Santiago-Ayala¹, A. Torre¹

¹ Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán, Mexico

² Facultad de Psicología, Unam, Mexico

Introduction: Obstructive sleep apnea (OSA) may contribute to the development of liver injury, however it remains controversial, and obesity could be a confounder factor. The aim of this study was to determine the presence of liver function impairment in obese patients with and without OSA.

Materials and methods: One hundred twenty-one obese patients (44 men, 77 women) referred by suspected OSA were included. Informed consent was obtained and the study was approved by the Local Ethics Committee. Exclusion criteria included alcoholism, smoking, hypothyroidism, or medications that may affect sleep. Liver function was assessed by laboratory tests. Polysomnography (PSG) was performed on two consecutive nights. Patients were diagnosed and classified according to the apnea-hypopnea index (AHI) in two groups: OSA-Group (AHI ≥ 5) and non-OSA-Group (AHI < 5). Elevated liver enzymes were defined as serum ALT, AST two to three times above the upper normal limit.

Results: Patients were 38.2 ± 11.6 years old with BMI = 48.8 ± 9.6 kg/m²; 58.3% had some alteration in liver (total bilirubin or direct bilirubin, indirect bilirubin, alkaline phosphatase, total protein, serum albumin and globulins) function. Seventy-six percent ($n = 92$) of the sample had OSA with an AHI = 40.3 ± 34.3 , whereas in non-OSA Group the AHI = 2.1 ± 1.3 . There were no statistically significant differences in the percentage of abnormal level of liver enzymes between the groups OSA-Group (13%) and non-OSA-Group (19.5%), $\chi^2 = 0.409$, $p = 0.522$, but the time of SaO₂ $\leq 65\%$ was associated with alteration in alanine transaminase (ALT) ($\rho = 0.217$, $p = 0.018$) and serum album $\rho = -0.209$, $p = 0.02$.

Conclusion: Hepatic dysfunction was found to be common in obesity (58%) and the main alteration in elevation of two to three times in ALT is associated with severe hypoxemia rather than the AHI.

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Severe obstructive sleep apnea significantly increases all-cause mortality in a Chinese population: An observational cohort study

H. Yi¹, J. Zou¹, C. Wang², S. Yin¹

¹ Department of Otolaryngology, The Affiliated Sixth People's Hospital, Otolaryngology Institute of Shanghai Jiao Tong University, Shanghai 200233, China

² Department of Vital Statistics, The Shanghai Municipal Center for Disease Control and Prevention, Shanghai 200336, China

Introduction: Obstructive sleep apnea (OSA) is associated with various health risks, including death. However, the role of OSA as a risk factor for death has never been studied in China. This study aimed to assess whether OSA is associated with increased risk for all-cause mortality in a Chinese population.

Materials and methods: In this observational cohort study, consecutive patients with OSA diagnosed by polysomnography were included in follow-up visits until subsequent death was verified or until February 28, 2014. The Kaplan–Meier method, the log-rank test, and the Cox proportional hazards regression analysis were used to determine the effect of OSA on the composite outcome of death from any cause.

Results: Among 5650 enrolled subjects, 4939 (87.4%) had OSA. The median observation period of the cohort was 5.3 years (interquartile range, 2.7–8.3 years) or 31,555 person-years. The mean apnea–hypopnea index (AHI) at baseline in the patients with OSA was 40.3, compared with 2.2 in the control group. The all-cause mortality risk adjusted for age, sex, and body mass index (BMI) was significantly associated with increased AHI ($p < 0.05$). Among all enrolled subjects, the all-cause mortality risk for severe OSA (AHI > 30) increased by 2.48-fold (95% confidence interval [CI], 1.49–4.10; $p < 0.001$), compared with those with an AHI ≤ 30, independent of age, sex, BMI, and the potential effect of OSA treatment. Similarly, after excluding participants who had reported being treated for OSA, the hazard ratio of severe OSA for all-cause mortality increased significantly to 2.54 (95% CI, 1.51–4.27; $p < 0.001$), compared with that of the group with an AHI ≤ 30.

Conclusion: Increased OSA severity, particularly severe OSA, significantly increased the risk for death from any cause in a Chinese population, and this association was independent of age, sex, and BMI.

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Prevention of new vascular events in patients with obstructive sleep apnea and stroke, using CPAP: A randomized controlled trial

A. Gupta¹, G. Shukla¹, M. Afsar¹, S. Poornima², Goyal¹, D. Vibha¹, Behari¹

¹ All India Institute of Medical Sciences, New Delhi, India

² Institute of Human Behaviour & Allied Sciences, New Delhi, India

Introduction: Stroke is common cause of death and disability, with high healthcare costs. It has been established that obstructive sleep apnea hypopnea (OSAH) is an independent risk factor for stroke. The objective was to assess the effect of CPAP treatment in prevention of new vascular events among stroke patients with OSAH.

Materials and methods: Consecutive patients presenting to a single unit of neurology services at our center, with history suggestive of first arterial stroke (hemorrhagic and ischemic) within 6 weeks from ictus, with CT Scan or MRI evidence of the same, with normal consciousness (Glasgow Coma Scale eye and motor scores of 10), with or without cognitive impairment, and patients not requiring life support were enrolled in the study. Patients with previous history of stroke, other neurological illnesses like Parkinson's disease, neuroinfections, neuromuscular disorders, etc. and known primary sleep disorders apart from sleep disordered breathing were excluded. Patients were interviewed for prior history suggestive of sleep-disordered breathing and other stroke risk factors. Patients underwent polysomnography (PSG) at least 6 weeks from ictus. All patients with an apnea–hypopnea index (AHI) of greater than 15 were randomized to nightly PAP treatment, following a titration PSG (group 1) and Non PAP (best medical treatment) (group 2). Patients were assessed for their clinical status, including neurological examination, detailed Neuropsychological assessment and sleep details, at enrolment, 6 weeks later and at 3, 6 and 12 months from randomization and treatment initiation.

Results: A total of 679 consecutive stroke patients were screened; 492 patients fulfilled inclusion criteria and were asked for consent. Among these, only 116 patients consented and turned up for PSG. Eighty-three patients had AHI > 15 and were eligible for randomization. Seventy patients (34 in group 1 and 36 in group 2) were randomized. Four patients crossed over from group 1 to group 2. Final analysis was carried out on 70 patients i.e. 30 in group 1 and 40 in group 2. On base line both groups were age (group 1 68.53.41 ± 9.85, group 2 52.69 ± 13.23 $p = 0.81$) and sex (24M vs. 33M respectively, $p = 0.79$) matched. Their modified rankin scale was group 1 = 2.25 ± 1.86, group 2 = 1.65 ± 1.81, $p = 0.31$. Baseline Barthel Index of group 1 = 83.61 ± 29.24, group 2 = 84.44 ± 24.54, $p = 0.92$. The Baseline AHI was group 1 = 38.72 ± 28.30, 12 (20.71–45.25), group 2 = 25.03 ± 14.74, 19.89 (15.59–33.14) $p = 0.1$. The mean CPAP pressure prescribed was 12 (8–20) cm H₂O. On 1 year follow-up, the total number of vascular events (cardio-cerebro-vascular) 1 (3.33%) in group 1 vs 6 (15%) in group 2 ($p = 0.23$). Barthel Index, MRS scores and neuropsychological performance were not significantly different between the two groups.

Conclusion: These findings suggest favorable outcome in terms of recurrence of vascular events, using CPAP treatment for OSAH in stroke patients.

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Association between objective snoring time and carotid atherosclerosis: Gender difference

A. Pack¹, B. Riegel², J. Chirinos¹, A. Hanlon², C. Shin³

¹ University of Pennsylvania Perelman School of Medicine, USA

² University of Pennsylvania School of Nursing, USA

³ Korea University School of Medicine, South Korea

Introduction: Controversy persists about whether snoring can cause cardiovascular disease, independent of obstructive sleep apnea (OSA) and other cardiovascular risk factors. The purpose of the

present study was to examine the independent association between snoring, objectively measured by microphones, and carotid atherosclerosis, after minimizing the possible confounding effect of OSA.

Materials and methods: Two hundred thirteen men and 91 women who underwent a full-night home-based sleep study between 2012 and 2013 were enrolled. Respiratory events, including snoring and apnea/hypopnea, were measured using a portable sleep device (T3, Noxmedical). Snoring sound was objectively measured by a built-in microphone and then manually scored. Percentage of snoring time was calculated by dividing the total duration of three or more consecutive snore events by total sleep time and multiplying by 100. According to snoring time across night, participants were divided into three groups: nonsnorers (0%), mild (snoring time: 1–25%), and moderate to heavy snorers ($\geq 25\%$). Carotid atherosclerosis was defined as mean intima-media thickness (IMT) and presence of plaque on both common carotid arteries.

Results: The three snoring groups were matched by age, body-mass index, cholesterol, blood pressure, and glucose levels, using weights from generalized boosted-propensity score models. After excluding those who have OSA, diagnosed by a high apnea/hypopnea index (AHI) greater than 5, mean IMT increased with increasing time of snoring across the night in women: nonsnorers (0.707 mm), mild (0.718 mm), and moderate to heavy snorers (0.774 mm). Moderate to heavy snorers had significantly higher IMT than nonsnorers ($p = 0.0075$) and mild snorers ($p = 0.0239$). However, the study revealed no significant difference in carotid IMT between male snorers and nonsnorers. Prevalence of plaque on carotid arteries was not different among the three groups with different snoring times for both genders.

Conclusion: Our findings suggest that snoring at least one fourth of a night's sleep may accelerate subclinical changes in carotid atherosclerosis in women, but not in men. Further investigation is needed to identify underlying mechanisms as well as clarify gender differences.

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Leukocyte telomere length predicts oxidative stress and the severity of obstructive sleep apnea syndrome

H. Kim

Chung-Ang University College of Medicine, South Korea

Introduction: We aimed to assess whether systemic oxidative stress is increased in patients with obstructive sleep apnea syndrome (OSA) and whether excessive telomere length shortening is a characteristic feature of OSA patients that can predict oxidative stress levels.

Materials and methods: We used quantitative PCR to measure telomere length using peripheral blood genomic DNA. Telomere lengths were compared in an age- and body mass index (BMI)-dependent manner in 34 healthy volunteers and 43 OSA subjects. We also performed reactive oxygen species assay to examine the concentration of hydrogen peroxide in the peripheral blood of healthy volunteers and OSA subjects.

Results: We found that the serum concentration of hydrogen peroxide was considerably higher in OSA patients, and that this was closely related with the severity of OSA. Significantly shortened telomere length was observed in the circulating leukocytes of the

peripheral blood of OSA patients, and telomere length decreased more acutely in an age- and BMI-dependent manner. An inverse correlation was observed between the concentration of hydrogen peroxide and the telomere length of OSA patients and excessive telomere length shortening was linked to respiratory disturbance index of OSA patients.

Conclusion: The results provided evidence that telomere length shortening is associated with the apneic events of OSA and may be an important biomarker for predicting the burden of oxidative stress in the peripheral blood of OSA patients.

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Provoked periodic breathing in simulated moderate and high altitude in healthy young adults

S. Pramsohler¹, H. Gatterer², M. Faulhaber², N. Netzer²

¹ Hermann Buhl Institute for Hypoxia and Sleep Medicine Research, Germany

² Department of Sports Science and Psychology, University of Innsbruck, Austria

Introduction: It is common sense that periodic breathing increases linear with greater heights. Cut off points for periodic breathing at specific altitudes are not known and seem to be very individualized. Our aim was to study the difference of breathing patterns in healthy adults between simulated 3500 and 4500 m.

Materials and methods: Twelve male and six female subjects with a mean age of 24.78 ± 1.86 had a 12 channel PSG randomly assigned at either 3500 or 4500 m simulated altitude (normobaric hypoxia, Low Oxygen Systems; Berlin-Buch, Germany).

| | 3500 m | 4500 m |
|------|------------------------|---------------------------|
| | Mean Stdv. | Mean Stdv |
| TST | 417 min \pm 45,5 min | 325,17 min \pm 85,8 min |
| SaO2 | 84,8% \pm 2,7% | 76,8% \pm 3,5% |
| HR | 69,2 bpm \pm 8,3 bpm | 78,6 bpm \pm 10,1 bpm |
| AHI | 44,1 \pm 37,6 | 68,6 \pm 48,3 |

Results: We have seen a highly significant decrease in total sleeping time and arterial oxygen saturation as well as an increase of the heart rate (HF) on 4500 m compared with 3500 m. No significant difference in the AHI and frequency of arousals could be seen. Central hypopneas changed to central apneas with the higher altitude.

Conclusion: Sleep overnight in increasing simulated altitude at the cut off from moderate to high altitude goes along with decreasing oxygen saturation at a higher HF and reduced TST but with an unchanged total AHI.

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Nocturnal blood pressure fluctuations: Superposition phenomena in patients with obstructive sleep apnea syndrome – Risk factor for nocturnal cardiovascular events?

A. Patzak¹, G. Kuchler², I. Fietze³, H. Hein⁴

¹ Charité-Universitätsmedizin Berlin, Germany

² Somnomedics GmbH, Randersacker, Germany

³ Interdisziplinäres Schlafmedizinisches Zentrum, Charité-Universitätsmedizin Berlin, Germany

⁴ Schlaflabor Reinbeck, Germany

Introduction: Obstructive sleep apnea syndrome (OSAS) is correlated with cardiovascular diseases. Noninvasive continuous blood pressure (BP) measurements using the pulse transit time (PTT) show that apneas/hypopneas are accompanied by transient BP increases. Additional increases of the BP baseline may cause extreme high BP values and induce non-dipping and inverse-dipping behavior.

Materials and methods: Twenty-five polysomnographic recordings of patients with OSAS (AHI > 30) were analyzed. Physiological measures were recorded using SOMNOscreen® (SOMNOmedics GmbH). BP was determined using the PTT. Increases of the BP baseline >10 mmHg/20 min, which occurs during a period of apneas, were considered as “superposition” for analysis.

Results: A total of 55 superpositions were detected. The average increase of the BP in these areas was 15.91 mmHg (+/–8 mmHg) with a range from 8 to 49 mmHg. Average duration of superposition was 17 minutes (+/–8 minutes). Superpositions went along with an increase of time spent in apnea as well as a decrease of the SpO2 value. Superposition occurs more often during REM (73%) or in supine sleeping position (64%).

Conclusion: We demonstrated a new phenomenon of nocturnal blood pressure fluctuations (NBPF) namely the superposition of BP, which reflects sympathetic activation and may be important for the development of OSAS related cardiovascular events and hypertension. Further, the study shows the significance of continuous BP measurements for NBPF evaluation during sleep.

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Association of SLC6A4 and 5-HTR2A gene polymorphisms with different phenotype obstructive sleep apnea in Chinese Han population objective

G. Yin¹, J. Ye¹, D. Han², W. Zeng^{1,2}

¹ Beijing Tsinghua Changgung Hospital, China

² Beijing Tongren Hospital, China

Introduction: To investigate the association of SLC6A4 and 5-HTR2A gene polymorphisms with different phenotype obstructive sleep apnea (OSA).

Materials and methods: All the exons and promoter regions of SLC6A4 and 5-HTR2A gene first underwent genetic analysis in 49 OSA and 47 controls in Chinese Han population. According to the primary results, 40705T/G, 40912T/G of SLC6A4 and –1438G/A of 5-HTR2A were chosen for further genetic analysis in 365 OSA and 110 controls. Chin surface electromyography (sEMG) of routine polysomnography during normal breath and obstructive apnea were quantified in all the OSA subjects. The sEMG change from normal breath to obstructive apnea was expressed as percent compensated electromyography value (PCEV), $PCEV = (\text{normal breath sEMG-apnea sEMG})/\text{normal breath sEMG}$. The OSA subjects were divided into three subgroups based on the PCEV. The frequency of genotype and allele was compared between different subgroups.

Results: The PCEV of OSA patients varied from 1% to 92% in this study, which implies that the neuromuscular defect is different between OSA subjects and the PCEV can reflect this kind of difference. The genotype and allele frequency of –1438G/A showed statistic difference between OSA patients and controls ($p < 0.001$), but no significant difference was found between different PCEV OSA subgroups. On the contrary, the gene type and allele frequency of 40705T/G and 40912T/G showed statistic difference between different PCEV OSA subgroups ($p < 0.01$, 0.05 respectively), while no statistic difference was found between OSA patients and controls.

Conclusion: The polymorphism of 40705T/G and 40912T/G may be involved in susceptibility to OSA through neuromuscular pathway,

while the –1438G/A polymorphism may through other ways affect the incidence of OSA.

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The utility of cumulative histogram method with chin emg for diagnosis of REM sleep behavior disorder

H. Yamamoto¹, H. Tanaka¹, N. Ohki², H. Kawashima¹

¹ Gifu Mates Sleep Clinic, Japan

² Norupro Light Systems, Inc., Japan

Introduction: Rapid eye movement sleep without atonia (RWA) is the polysomnographic feature of REM sleep behavior disorder (RBD). We aimed to validate the new method for RBD detection, the Cumulative Histogram Method (CH Method) developed to overcome the disadvantages of manual RWA scoring, which are time consuming and observer based.

Materials and methods: Nineteen RBD patients and 20 age-matched controls recruited from patients with treated sleep breathing disorder were selected for this study. All participants underwent digitally synchronized video-PSG according to American Academy of Sleep Medicine (AASM) 2007 Ver.2.1 standards, and including flexor digitorum superficialis (FDS) muscles' electromyography (EMG) at the Gifu Mates Sleep Clinic between September 2008 and October 2014. RBD was diagnosed according to ICSD-2. Exclusion criterion was apnea-hyponea index higher than 20/h. Manual quantification of “any” (either tonic or phasic) EMG activity, tonic chin EMG activity, and phasic chin and FDS EMG activity was performed during REM sleep according to the 2007 AASM Ver.2.1.

The CH method was performed by special software (NoruPro Light Systems, Inc., Kokubunji, Japan), the procedure for calculating the parameter to detect RBD from the cumulative histograms of chin EMG level each REM and NREM periods. The parameter to detect RBD, REM sleep atonia ratio (RAR), was defined as the ratio of 75% value in REM and the 25% value in NREM on each histogram.

We examined the correlation between RAR and manually derived parameters, the percentage of 30-s epochs meet the criteria of “any”, tonic and phasic EMG activity to assess the utility of RAR.

Results: The RBD group consisted of 19 patients (17 men, 2 women) with a mean age of 66.2 ± 4.8 years, and the control group consisted of 20 patients (17 men, 3 women) with a mean age of 65.2 ± 4.9 years. The percentage of 30-s epochs meet the criteria of “any”, tonic, phasic EMG activity, and RAR in RBD group were $37.3 \pm 20.3\%$, $27.0 \pm 20.0\%$, $14.2 \pm 10.8\%$, and 1.74 ± 0.65 , and those in control group were $0.7 \pm 1.3\%$, $0.5 \pm 0.8\%$, $0.7 \pm 1.3\%$, and 1.04 ± 0.05 . All parameters were higher significantly in RBD group than control group ($p < 0.01$). Sensitivity and specificity of the percentage of 30-s epochs meet the criterion of “any” activity was 73.7%, 100.0% (cutoff point; 27.0%) for diagnosis RBD, and those of RAR was 78.9%, 100.0% (cutoff point; 1.26). RAR correlated well with the percentage of 30-s epochs meet the criteria of “any” and tonic activity ($r = 0.80$, $p < 0.001$, $r = 0.75$, $p < 0.001$). However, correlation with the percentage of 30-s epochs meet the criterion of phasic activity was moderate ($r = 0.66$, $p < 0.001$). It took about 5 minutes to calculate RAR in contrast, it took more than 15 minutes to calculate manually derived parameters.

Conclusion: RAR via the CH method could detect RBD as well as manually derived parameters, such as the percentage of 30-sec epochs meet the criterion of “any” activity, and provide useful for both research and clinical information more quickly and objectively.

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Extracting movement, sleep stages, and breathing pauses from respiration patterns

B. Goparaju, B. Westover, M. Bianchi
Massachusetts General Hospital, USA

Introduction: Multi-night automated sleep analysis would address key limitations in current clinical practice. However, the gold standard multi-physiology approach may not be feasible. We tested the hypothesis that abdominal respiration patterns, which are easily tracked by contact and non-contact methods, can predict body movements, sleep-wake staging, and pauses in breathing.

Materials and methods: We initially optimized parameters in proof-of-principle datasets from our sleep center ($n = 10$ for sleep-wake staging and movements in non-sleep apnea, $n = 50$ for sleep apnea). A combination of spectral content and envelope tracking algorithms were implemented, followed by brute force optimization (for OSA and movement) and machine learning classification (for sleep-wake staging). We then tested the algorithm in 25 subjects undergoing clinical PSG for any reason, using a commercially available respiration belt for in-lab and at-home measurement comparisons.

Results: Validation of binary staging (wake versus sleep) yielded sensitivity and specificity values of 80% and 90% respectively, while REM versus NREM sub-classification was less accurate. Movement classification showed sensitivity of 90% and specificity of 85%, using independent EMG auto-scoring as the gold standard. Detecting apneas and hypopneas using respiration pattern alone showed heterogeneous accuracy depending on the degree of movement and wakefulness present in the record. Finally, the home versus lab testing indicates that respiration monitoring is feasible and that night-to-night variability shows inter-individual differences.

Conclusion: The dynamics of respiration movement can inform several important aspects of sleep-wake physiology. Limited channel in-home repeated measures may provide adjunct information to gold-standard laboratory testing. Future directions include leveraging big data "in sleep medicine to optimize predictive algorithms and ensure broad external validity."

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Validation of two popular commercial devices for the assessment of sleep in children

E. Toon¹, M. Davey², S. Hollis³, G. Nixon⁴, R. Horne⁴, S. Biggs⁴

¹ The Ritchie Centre, MIMR-PHI, Department of Psychological Sciences, Monash University, Melbourne, Australia

² Melbourne Children's Sleep Centre, Monash Children's, Monash Medical Centre, Melbourne, Australia

³ The Ritchie Centre, MIMR-PHI, Melbourne, Australia

⁴ The Ritchie Centre, MIMR-PHI, Department of Paediatrics, Monash University, Melbourne, Australia

Introduction: Up to 40% of children experience sleep problems which affect daytime functioning. Current clinical sleep assessment tools are expensive and have limited accessibility. Recently, there has been a surge in the public popularity of commercial sleep assessment devices which provide an attractive alternative. However, these devices are not yet validated.

Materials and methods: Sixty-two patients (66% male; mean age 8.0 ± 3.9 years) scheduled for clinical assessment of suspected

sleep-disordered breathing were recruited. During their clinical polysomnography (PSG), children wore both an actiwatch (Actiwatch 2: Philips Respironics) and Jawbone UP[®] on their non-dominant wrist. A smartphone, with a sleep application (MotionX[®] 24/7) activated, was placed underneath the bottom bedsheet, near the child's shoulder, at lights out. All devices recorded simultaneously. Total sleep time (TST), sleep onset latency (SOL), wake after sleep onset (WASO), sleep efficiency (SE) and number of awakenings were calculated for all devices. Data from PSG, actigraphy and UP[®] were coded into sleep or wake (0 = wake, 1 = sleep) for every 1-minute epoch from lights out to 6 AM. Data were not available in 1-minute epochs for MotionX[®] 24/7. Paired-samples t-tests compared TST, SOL, WASO, SE and number of awakenings between all devices. Epoch-by-epoch comparisons between PSG and actigraphy and UP[®], separately, determined sensitivity (% of epochs recorded as sleep by both devices), specificity (% of epoch recorded as wake by both devices) and accuracy (ratio of agreement to total epochs available) for actigraphy and UP[®]. Bland-Altman plots were used to determine if a systematic bias existed in UP[®] when compared with PSG.

Results: When compared with the PSG data, actigraphy showed a significant difference in mean TST (+25 min, $p < 0.01$), SOL (+6 min, $p < 0.001$) and WASO (-19 min, $p < 0.05$), but not SE. UP[®] showed a significant difference to PSG in the means of all sleep characteristics, except TST. UP[®] recorded longer SOL (+11 min, $p < 0.001$) and WASO (+17 min, $p < 0.001$), and reduced SE (-3.9%, $p < 0.001$). MotionX[®] 24/7 recorded a significantly longer mean TST (+90 min, $p < 0.001$) and increased SE (+13.3%, $p < 0.001$). SOL (-15 min, $p < 0.001$) and WASO (-50 min, $p < 0.001$) were significantly shorter when recorded by MotionX[®] 24/7 as compared with PSG. The mean number of awakenings were overestimated by actigraphy (+3, $p < 0.01$), and underestimated by UP[®] (-15, $p < 0.001$) and MotionX[®] 24/7 (-17, $p < 0.001$). Epoch-by-epoch comparisons against PSG revealed that actigraphy had a sensitivity of 97%, specificity of 48%, and an accuracy of 86%. UP[®] had a sensitivity of 92%, specificity of 69%, and an accuracy of 87%. Both devices were better at assessing sleep than wake; however, UP[®] had considerably higher specificity than actigraphy, indicating that UP[®] was better at detecting true wake. Bland-Altman analyses indicated good agreement between PSG and UP[®], with no systematic bias in the latter for TST, SOL, WASO or SE.

Conclusion: This study found that UP[®] effectively assessed sleep when compared with PSG, and was more effective in assessing wake than actigraphy. The MotionX[®] 24/7 did not accurately assess sleep duration or WASO. Commercial wrist-based sleep assessment devices may be a cost-effective alternative to examine sleep duration and quality in children.

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Smartphone-based electromyography system [EMG] for screening Willis-Ekbom disease [WED] during suggested clinical immobilization test [SCIT]

B. Geisler¹, T. Saad¹, C. Ng¹, T. Macdonald¹, C. Grecu¹, G. Mcallister¹, O. Ipsiroglu²

¹ Capstone Design Project, Departments of Electrical and Computer Engineering, University of British Columbia, Vancouver, Canada

² Sleep/Wake Behaviours Clinic and Research Lab, Division of Pediatrics, Department of Pediatrics, Faculty of Medicine, University of British Columbia, Vancouver, Canada

Introduction: The impact of WED on sleep/wake-behaviours has not been fully recognized/explored in many patient populations. Due to subjective diagnostic methods, WED might often be missed/

misdiagnosed. Our goal is to develop a smartphone-based EMG-system that can provide clinicians with an objective measure in clinical practice during the SCIT.

Materials and methods: A student-team of the Capstone Design Project, an interdisciplinary program offered by the UBC Departments of Electrical and Computer Engineering [<http://www.ece.ubc.ca/courses/capstones>] assigned for developing the hard- and software solutions in collaboration with the Sleep/Wake-Behaviour Research Lab [Department of Pediatrics, UBC].

The task criterion was that the completed EMG system should be small, non-invasive, user-friendly, fast, accurate, and low-cost (defined as under \$500) for use in clinical practice. Several possible hardware and software platforms were evaluated based on these principles along with safety, sustainability and ethics considerations.

Results: (1) The combination of a Bitalino-based hardware and an Android-based software was chosen as the most suitable solution. (a) Bitalino [<http://www.bitalino.com/>] is a hardware platform designed for acquiring physiological signals and was selected based on an evaluation of overall system design, application development support, feasibility, sustainability, and value for its cost with respect to other hardware options. (b) Android [<https://source.android.com/>] was chosen to be the software platform of choice due to the wide range open-source resources, community support, and ease of future developments. (2) A functional prototype was implemented, which can acquire EMG data, transfer it via a wireless Bluetooth interface to a mobile phone, and graph the EMG signal on the mobile phone's screen. The prototype is a 25 g (without battery), 4 × 2 × 1.5 cm, single-channel hardware prototype and a software application usable on any mobile phone running Android 4.0 or higher. With the addition of more sensors, the system is scalable to acquire data from up to five different channels. The system also features a 3.7 V, 700 mAh rechargeable battery that can be interchanged with higher capacity alternatives.

Conclusion: The described prototype shows excellent potential to enable the acquisition and analysis of EMG signals during the Suggested Clinical Immobilization Test, to provide clinicians with an objective measure of activity and tone, and to support clinicians' observations.

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Expert video analysis (EVA)-video-viewer-prototype for annotating sleep/wake behaviour videos

H. Garn¹, G. Kloesch², D. Wong^{3,4}, G. Mcallister³, A. Barbosa⁵, E. Vatikiotis-Bateson⁶, S. Stockler⁷, O. Ipsiroglu³

¹ Technical University of Vienna and Austrian Institute of Technology L University of Vienna Y of British Columbia, Austria

² Sleep Lab Department of Neurology, Medical University of Vienna, Vienna, Austria

³ Sleep/Wake Behaviour Clinic and Research Lab, BC Children's Hospital, University of British Columbia, Canada

⁴ WP IV Person Centered Medicine, TIDE, BC, Canada

⁵ Federal University of Minas Gerais, Belo Horizonte, Brazil

⁶ Cognitive Systems Program, University of British Columbia, Canada

⁷ Treatable Intellectual Disability Endeavour – British Columbia (TIDE-BC), Division of Biochemical Diseases, Department of Pediatrics, Faculty of Medicine, University of British Columbia, Canada

Introduction: In sleep medicine, polysomnography applied in a hospital/hotel-based lab setting has proven its usefulness in the diagnosis of sleep disorders, but has limitations. We claim that motor events can also be monitored through a video camera, and analyzed using customized software.

Materials and methods: Currently, automatic detection and analysis of video streams to quantify features characterizing motions indicative of disorders (e.g. REM-Sleep-Behaviour) is not available. Some efforts have been described, but the development of an expert video analysis (EVA) software that performs automatic classifications of patient's motion poses some challenges. Before starting the development of image processing algorithms for detection and classification of motion events, the events derived from the recorded videos need to be described in terms of mathematical features. Therefore a representative number of video sequences have to be annotated by clinicians, and in a consensus meeting, subspecialists have to agree on the classification of events. This clinical event database will provide the necessary information for the development of the EVA-software and support further facilitation of medical diagnoses.

Results: We present the recently developed 'EVA-Video-Viewer-Prototype' software with a user interface, compatible with standard PC hardware, software and databases. This software allows (a) marking and (b) annotation of medically relevant epochs, as it allows re-playing sleep videos together with EMG, audio or EEG signals in (a) still images or (b) real time, (c) continuously at various speeds (most important in fast-forward modus) or (d) jumps from motion event to motion event. There is room for editing comments (e.g. annotation, classification of motor events, which can be structured hierarchically according classification guidelines). A menu and navigation buttons make the EVA-Video-Viewer-Prototype user-friendly. An attached structured database enables a user-friendly collection and management of large data files (e.g. 800 MB recordings).

Conclusion: The new tool enables the establishment of a simple user-friendly clinical database of video recordings. The database will form the core for further research and will be the scientific basis for the future development of automatic analysis software for sleep/wake behaviour analyses from stand-alone video recordings.

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An ultrasonic contactless sensor for breathing monitoring

P. Arlotto¹, M. Grimaldi¹, R. Naeck², J. Ginoux³

¹ Protee Laboratory, EA3819, Toulon University, France

² Clinical Research Unit, Hôpital Ste Musse, Toulon, France

³ ISITV, Toulon University, LSIS, UMR CNRS 7296, France

Introduction: When obstructive sleep apnea is suspected, poly(somno)graphy is performed. The presence of numerous sensors and nasal cannula can disrupt sleep and cause many arousals which induces a bias in the measurement, i.e., an underestimation of apneas.

Materials and methods: This work investigates an analysis of the viability of an ultrasonic device to quantify the breathing activity, without contact and without any perception by the subject.

Based on a low power ultrasonic active source and transducer, the device measures the frequency shift produced by the velocity difference between the exhaled air flow and the ambient environment, i.e., the Doppler effect. After acquisition and digitization, a specific signal processing is applied to separate the effects of breath from those due to subject movements from the Doppler signal. The distance between the source and the sensor, about 50 cm,

and the use of ultrasound frequency well above audible frequencies, 40 kHz, allow monitoring the breathing activity without any perception by the subject, and therefore without any modification of the sleep quality which is very important for sleep disorders diagnostic applications.

Results: Our device was tested in parallel with a polygraph (Cid102L, Cidelec®, France). The concordance rate between the data collected by nasal cannula pressure and our prototype shows an almost perfect agreement.

Conclusion: This work is patented (FR.13/57569) and clinical tests will be carried out in the sleep laboratory of Toulon's hospital. Already it seems very appropriate to quantify the respiratory activity in children. An Ultrasonic Contactless Sensor for Breathing Monitoring, *Sensors* 2014, 14, 15371–15386.

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Obstructive sleep apnea and its influence on intracranial aneurysm

T. Jung¹, J. Ryoo², H. Cho¹, M. Jang¹, J. Lee³, H. Kim¹

¹ Department of Otorhinolaryngology – Head and Neck Surgery, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, South Korea

² Department of Radiology, Samsung Medical Center, Seoul, South Korea

³ Health Promotion Center, Samsung Medical Center, Seoul, South Korea

Introduction: OSA is well known to a wide variety of adverse health outcomes and a highly prevalent disorder that affects 5–14% of middle age. In many previous reports, OSA also affects blood vessel wall. However there are no reports that have considered the association between OSA and intracranial aneurysm (IA).

Materials and methods: We conducted a retrospective cross-sectional study from August 1997 to April 2012. Five hundred sixty-four patients who underwent PSG (polysomnography) and wanted to check up brain magnetic resonance angiography (MRA) or brain computed tomography angiography (CTA) at the Center for Health Promotion of the Samsung Medical Center in Korea were included in the study. All participants completed a self-administered health questionnaire and received a detailed physical examination during the health screening program. Presence and size of IA was measured on the CTA or MRA.

Results: The mean (SD) age of study participants was 55.6 (8.5) years and 82.3% of study participants were male. The prevalence of IA was significantly higher among those who have family history of cerebrovascular disease ($p = 0.033$), who has OSA ($p = 0.030$). Multiple linear regression analysis revealed that OSA, alcohol drinking, family history of cerebrovascular disease had an increased prevalence of IA. The OSA group had significantly larger aneurysm size compared with the non OSA group ($p = 0.013$). Surgical treatment of IA was more needed in moderate to severe OSA group than normal to mild OSA group ($p = 0.014$).

Conclusion: We think that OSA may be another important risk factor for formation and growth of IA.

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Regional neocortical gray matter structure and sleep fragmentation in older adults

A. Lim¹, D. Fleischman², R. Dawe², L. Yu², K. Arfanaki², A. Buchman², D. Bennett²

¹ University of Toronto, Canada

² Rush University, USA

Introduction: Fragmented sleep is common in older adults; however its neurobiological basis is unclear. Neocortical phenomena such as sleep spindles and slow waves may influence sleep fragmentation by modulating the response to arousing stimuli. However, there are few studies relating regional neocortical structure to objectively measured sleep fragmentation in older adults.

Materials and methods: We studied 141 community-dwelling adults (mean age 81.5 years, 72% female) with normal cognitive function participating in the Rush Memory and Aging Project (Bennett et al., 2012). None had a history of stroke or were taking sedative/hypnotic medications. We quantified sleep fragmentation from 7 days of actigraphy using the metric kRA and related this to total cortical gray matter volume, and regional gray matter volume in 34 cortical regions quantified by automated morphometric reconstruction of magnetic resonance imaging data. We used a permutation-based approach to determine statistical significance and account for multiple comparisons.

Results: Lower total cortical gray matter volume was accompanied by greater sleep fragmentation (estimate +0.0025 change in kRA, SE 0.0.0008, $p = 1.9 \times 10^{-3}$ per 1 SD decrease in volume). Lower gray matter volumes in five regions were accompanied by greater sleep fragmentation after accounting for multiple comparisons: the inferior frontal gyrus pars orbitalis (estimate +0.0030, SE 0.0007, $p = 1.4 \times 10^{-5}$) and the adjacent lateral orbitofrontal cortex (estimate +0.0027, SE 0.0007, $p = 1.8 \times 10^{-4}$), the posterior cingulate (estimate +0.0023, SE 0.0007, $p = 9.7 \times 10^{-4}$) and the adjacent precuneus (estimate +0.0023, SE 0.0007, $p = 2.3 \times 10^{-3}$), and the banks of the superior temporal gyrus (estimate +0.0020, SE 0.0006, $p = 1.4 \times 10^{-3}$). These associations were unchanged after accounting for the presence or absence of depression; vascular diseases such as heart disease, or peripheral vascular disease; or vascular risk factors such as hypertension, diabetes, and smoking. Decreased gray matter thickness in the same regions was also nominally associated with greater sleep fragmentation.

Conclusion: Our observations are compatible with the hypothesis that decreased gray matter volume and thickness in several brain regions previously implicated in sleep spindle generation, slow wave generation, and the response to arousing stimuli, may contribute to sleep fragmentation in some older adults.

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Associations between self-reported sleep duration and cognitive performance in older adults: A systematic review and meta-analysis

J. Lo¹, G. Cheng², K. Loh¹, R. Leong¹, M. Chee¹

¹ Duke-NUS Graduate Medical School, Singapore

² Hong Kong Shue Yan University, Hong Kong

Introduction: Existing findings are equivocal about the associations of self-reported short and long sleep with cognitive functions in older adults. Here, we adopted meta-analytic procedures to quantify the risk for poor performance in five cognitive domains for short and long sleepers.

Materials and methods: We performed a systematic search of publications in English using MEDLINE, PUBMED, PSYINFO (1990–2013), and manual searches. Inclusion criteria were (a) original article, (b) either a cross-sectional study or a prospective cohort study with sleep duration assessed at baseline and cognitive performance/status assessed at least 1 year later, (c) assessment of sleep duration with self-reported measures, (d) objective assessment of cognitive performance, (e) sleep duration as an exposure variable and cognitive performance as a criterion variable, (f) report of descriptive or inferential statistics that could be converted to odds ratios (OR) and 95% confidence intervals (CI), (g) participants aged 55 years and above, (h) participants with normal cognition at baseline. We pooled the extracted OR and 95% CI using a random effects model. We used funnel plots and Egger's test of intercept to determine the possibility of publication bias. Between-study heterogeneity in effect size was assessed using Q statistics and I^2 values. Moderator analyses were performed to investigate whether differences in effect sizes across studies could be attributed to the type of study (cross-sectional or prospective), the cognitive domain assessed, and the age and gender composition of the samples.

Results: The 11 cross-sectional and 7 longitudinal studies analyzed provided 35 independent samples ($n = 97,624$). Self-reported short and long sleep elevated the odds for poor cognitive functions in older adults by 1.40 times (95% CI: 1.27–1.56) and 1.58 times (95% CI: 1.43–1.74) respectively. There was no strong evidence for publication bias (Egger's test for short sleep: $p = 0.71$; long sleep: $p = 0.18$). There was significant between-study heterogeneity in the effect sizes of both short and long sleep ($Q = 55.82$, $p = 0.01$, $I^2 = 39.09$; $Q = 61.62$, $p = 0.001$, $I^2 = 48.07$). Moderator analyses revealed that effect size varied between cross-sectional and prospective studies and across cognitive domains. Cross-sectional studies showed that extreme sleep durations were significantly associated with poorer multiple-domain performance, working memory and executive function, verbal memory, and attention, but not speed of processing. In contrast, for prospective cohort studies, we found significant long-term impact of self-reported short and long sleep on multiple-domain performance only.

Conclusion: Both self-reported short and long sleep are risk factors for poor cognitive performance in older adults. Furthermore, extreme sleep durations do not uniformly impact all cognitive domains in both cross-sectional and prospective studies.

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An epidemiological study of Chinese medicine-based diagnostic classification of insomnia with comorbidity of depression and anxiety

T. Li, Z. Zhang

The University of Hong Kong, Hong Kong

Introduction: Insomnia is common in Hong Kong. The introduction of Chinese medicine (CM)-based diagnostic classification may provide an alternative approach in exploring its effective treatment. Our purpose was to determine associations of sleep pattern,

medication-seeking behavior and comorbid depression and anxiety with CM-based subtypes in patients with insomnia.

Materials and methods: Subjects screened with the DSM-IV criterion for insomnia were recruited in Hong Kong. Information of subjects' demographic, sleep pattern and general management for insomnia were collected. Two registered Chinese medicine practitioners were present to evaluate the CM-based diagnostic classification via face-to-face interviews. Two standardized questionnaires, the Beck's Depression Inventory (BDI) and Beck's Anxiety Inventory (BAI) were used to evaluate insomnia and comorbid mood and anxiety status.

CM theories involve the functions of the five viscera and are widely adopted to classify patients into various diagnostic subtypes in clinical context. The concise classification is the Deficiency and Excess subtypes. In this study, association analysis was conducted to examine correlates between CM subtypes and demographic, clinical variables, treatment mode and comorbid measurement scores.

Results: A total of 446 subjects (51 males and 395 females) were recruited. The prevalence of Deficiency subtypes was 62.8%. Medical seeking behavior for insomnia was uncommon with less than half of the subjects (47.1%) consulting a medical practitioner. Of those who sought treatment, 29.5% of the subjects went for both Chinese and western medications, whereas those who opted for CM management alone accounted up to 47.1%. Despite the low alertness for medical consultation for insomnia, over-the-counter drugs were not popular. Only 19.1% had purchased drugs without doctors' advice. Within those, 48.2% chose proprietary Chinese medicines, and 51.8% western drugs. The data supported work hours ($p = 0.038$), deep sleep ($p = 0.017$) and visits to acupuncturists ($p = 0.023$) as significant predictors for Deficiency subtype. Besides, subjects of Deficiency subtype had a significantly greater chance of improved clinical outcome after taking Chinese medicines (OR = 0.504, 95% CI 0.312–0.813) and acupuncture treatment (OR = 0.431, 95% CI 0.200–0.929). Approximately 55.5% had comorbid depression and 60.2% had comorbid anxiety. However, further analysis comparing these comorbid symptoms between Deficiency and Excess subtypes showed no significant difference.

Conclusion: Although the findings do not suggest CM subtype classification as a promising predictor for psychiatric comorbidities, significant associations of several clinical outcomes were revealed. Further investigation on other clinical variables could be carried out in the future to understand better the epidemiology of insomnia in Hong Kong from a CM perspective.

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Selective activation of LH-GABA->TRN causes rapid arousal

C. Gutierrez Herrera¹, S. Jogo², A. Adamantidis¹

¹ Inselspital/University of Bern, Switzerland

² McGill University, Canada

Introduction: The sleep-wake cycle is a highly-conserved physiological process across all vertebrates that result from a complex, yet undefined, inhibitory/excitatory balance between neural circuits distributed throughout the brain. Subpopulations of lateral-hypothalamic-GABA neurons are active during wake, NREM or REM sleep states, suggesting a strong anatomical and functional heterogeneity.

Materials and methods: Here, we investigate the role of GABA neurons from the lateral hypothalamus (LH) on sleep–wake states. We targeted the expression of channelrhodopsin-2 opsin (ChETA) to the LH-GABA cells of VGAT::Cre mice. To study the anatomical connectivity between the LH and the TRN, we used both anterograde and retrograde labeling. In vitro patch clamp recordings confirmed the functionality of this connectivity by optically stimulation (5 ms pulses of 473 nm blue light) to elicit postsynaptic responses in TRN cells. Pharmacology to block GABAA receptor was used to confirm the GABAergic nature of the elicited photocurrents. EEG/EMG recordings were used to characterize sleep/wake changes in response to optogenetic stimulation. Optic fibers were implanted either in the LH or TRN of ChETA and control (YFP) mice. We used semichronic (semi-chronic (1–20 Hz during 10 s, every minute over 1 h) and stage-dependent optical stimulations to screen for effective frequencies that modulate architecture of the sleep–wake cycle. For the anesthesia experiment, level of anesthesia was determined by the lost of righting reflex and in the EEG recordings and the onset of burst suppression mode. Animals were stimulated for 5 s of continuous blue light bilaterally three times with 5 min intervals in between stimulations.

Results: We identified anatomical connections between LH GABA neurons in other brain areas including locus coeruleus, septum, and reticular thalamic nucleus (TRN). Using a bilateral optical activation (1–20 Hz, 10 s every minute over 1 h), we showed that LH-GABA cells at 20 Hz, but not 1 Hz, resulted in a twofold increase in wake duration. In addition, we activated LH-GABA cells at different sleep states on their transition to wake. We found that a single stimulation at 1–20 Hz, over 10 s induced a rapid switch from sleep to wakefulness (<2 s) during NREM and significantly increases wakefulness duration in ChETA compared with control animals. Interestingly, this is not observed when LH-GABA cells are activated during REM sleep. Further, we showed a functional connectivity in LH-RTN. Here, local optical activation in vitro of LH-GABA terminals in the TRN induced GABAA-mediated IPSCs in reticular neurons, as well as a desynchronization of cortico-thalamic loops and short latency NREM sleep-to-wake transitions in vivo. Further we observed that during stable anesthetized states, optical activation of LH-GABA terminals in the TRN, inhibiting the activity of TRN cells, causes cortical reactivation in animals expressing ChETA but not in controls.

Conclusion: Collectively, these data suggest that GABA projections from the LH→TRN represents a direct arousal circuit to thalamic and cortical structures. Furthermore, our results suggest that activation of a subpopulation of LH-GABA neurons induces rapid wake from sleep, through inhibition of TRN cells and subsequent reactivation of thalamo-cortical loops.

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Sleep patterns and quality in Omani adults

I. Juma

College of Medicine In Squ, Oman

Introduction: Since the start of the industrial revolution, sleep pattern and quality have been continuously changing worldwide. This is associated with an emergence of sleep disorders and increased prevalence of cardiometabolic abnormalities. This part of the study aims to investigate the sleep patterns of Omani adults in relation to sleep quality.

Materials and methods: This cross sectional study was ethically approved by the College of Medicine in Sultan Qaboos University in April 2014. Informed consent forms were obtained from subjects

before study enrollment. Two thousand questionnaires were randomly distributed among Omani adults aged 18–65 years in Muscat region. Five hundred subjects (66.8% female and 33.2% male) who fulfilled the inclusion criteria were categorized into five age groups in years, 18–24, 25–34, 35–45, 46–54, and 55–65, based on Ministry of Health criteria. In addition to demographic data and sleep habits, sleep quality (SQ) and daytime sleepiness (DTS) were assessed using the Pittsburgh Sleep Quality Index (PSQI) and the Epworth Sleep Scale (ESS) respectively. PSQI scores of 5 or less represented good sleep quality while scores more than 5 were considered as poor sleep quality. In relation to daytime sleepiness, subjects were divided into four categories as per ESS scores; zero score for normal subjects, 1–6 mild DTS, 7–9 moderate DTS, and ≥10 were defined as severe DTS. Subjects who slept less than 7 h were considered as short sleepers. Finally, data were collected, entered, tested for normality and analyzed using descriptive, univariate (χ^2 test) and multivariate (Kruskal–Wallis test) packages of SPSS version (21).

Results: The predominant sleep patterns among Omanis were either polyphasic having more than two sleep periods per day (49.60%) or biphasic having two sleep periods (42.4%). The sleep patterns were not associated with gender ($p=0.888$) or age ($p=0.06$). However, there was an obvious trend between sleep patterns and age; younger and elderly groups expressed higher prevalence toward polyphasic pattern (54.81% and 68.00 % respectively).

Night sleep duration was insignificant ($p=0.063$) among all sleep patterns with an average of 6.18 h. This was confirmed with elevated prevalence of short night sleepers (67.60%), which was dominant among biphasic and polyphasic sleepers. This was in contrast regarding the average sleep duration within 24 h. ($p=0.000$). Polyphasic sleepers had longer sleep duration with an average of 7.96 h that was significantly attributed to long siesta (73.27%).

Daytime sleepiness was significantly different across sleep patterns ($p=0.000$) with an average of 8.97. Monophasic and biphasic patterns were associated with moderate DTS (6.74 and 8.60) (20.60%), whereas polyphasic pattern was linked to severe DTS (9.66) (52.80%). Furthermore, 47% were poor sleepers with an average score of 5.50. This was insignificantly different across all sleep patterns ($p=0.107$) although the PSQI average score for polyphasic pattern (5.65) indicated poor sleep quality.

Conclusion: Sleep pattern among Omanis is directed toward polyphasic, which is associated with short night duration, long siesta, and severe DTS, hence poor sleep hygiene and quality. Further studies will be conducted soon to associate between this sleep pattern of Omanis and cardio-metabolic risk using metabolic biomarkers.

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Impaired postural stability in sleep disordered breathing patients

F. Degache¹, Y. Goy², S. Vat³, J. Haba Rubio³, O. Contal¹, R. Heinzer³

¹ University of Health Sciences, Health Research Unit, University of Applied Sciences and Arts Western Switzerland, Lausanne, Switzerland

² Institute of Sports Sciences, Department of Physiology, Faculty of Biology and Medicine, University of Lausanne, Lausanne, Switzerland

³ Center for Investigation and Research in Sleep (CIRS), University Hospital of Lausanne (CHUV), Switzerland

Introduction: Postural stability depends on the coordination of the central nervous system with visual sense, proprioceptive and vestibular information. Sleep deprivation has been shown to affect this function. The objective of this study was to assess the effects of sleep disordered breathing (SDB) on postural stability.

Materials and methods: One hundred fifty-eight subjects referred for suspected SDB had an overnight sleep study and were placed on a posturographic platform in the late afternoon before the nocturnal recording. This platform allows measuring the center of pressure (CoP) oscillations and to calculate: total displacement of CoP in x and y axis, mean surface and speed of CoP displacement, and the LFS ratio (length of CoP displacement \times surface of CoP trajectory).

Results: Ninety-eight men and 60 women were included. Mean age \pm SD was 45.4 \pm 5.5 years old, BMI 27.5 \pm 5.6 kg/m² and apnea-hypopnea index (AHI) 13.6 \pm 16.1/h. AHI was <5/h in 65 (41%) subjects, 5–15/h in 43 (27%), 15–30/h in 30 (19%), and >30/h in 21 (13%). In patients with an AHI >5/h vs AHI <5/h, we observed an important increase in LFS (+21%, $p < 0.001$), in xy length (+23%, $p < 0.001$) and in mean speed (+23%, $p < 0.001$). After controlling for age and BMI in linear regression models, there was a positive association between LFS and AHI ($p = 0.04$) and negative associations between mean SaO₂ and LFS ($p < 0.007$), mean SaO₂ and mean speed ($p = 0.01$), and between SaO₂ and xy length ($p = 0.01$). There was a trend for an association between LFS and % time with a SaO₂ < 90% ($p = 0.07$). Increasing SDB severity categories were also associated with increasing LFS ($p < 0.001$).

Conclusion: SDB severity and nocturnal SaO₂ levels are associated with impaired daytime postural stability.

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Nocturia prediction and polysomnographic (PSG) features of patients with sleep breathing disorders (SBD)

V. Mancilla¹, J. Miranda¹, V. Sosa², S. Hernandez², A. Poblano³, S. Verde³, H. Marin⁴, U. Jimenez³

¹ School of Medicine, National University of Mexico at Zaragoza, Mexico

² Faculty of Medicine, National University of Mexico, Mexico

³ Sleep Disorders Clinic, Faculty of Medicine, National University of Mexico, Mexico

⁴ Cooperative University of Colombia, Colombia

Introduction: Nocturia is the need to get up, to void, during the night at least once; each void is preceded and followed by sleep. There are not studies designed to determine how PSG features could predict nocturia.

Materials and methods: The aim of the study was to identify PSG variables predicting number of urinations in SDB. We collected 400 charts of patients with PSG confirmation of snoring, obstructive sleep apnea/hypopnea syndrome (OSAHS) mild, moderate, and severe. We calculated by means of multiple regression analysis, equations for each SDB, and for use or not of continuous positive airway pressure (CPAP) device. We weighted following variables: age, rapid eye movements sleep latency (REML), heart rate awake (HRAwake), HR in slow waves sleep (HRSWS), oxygen saturation in non-REM sleep (SO₂-NREM), SO₂ in REM, minimum SO₂ (min-SO₂), apnea/hypopnea index (AHI), % of total awake (% awake), sleep efficiency index (SEI), and arousals (Ar).

Results: Fifty-two percent were women, with $x = 46.5$ years of age. The subjective assessment of nocturia presented a significant multiple regression model (MRM) ($r = 0.54$, $p < 0.001$). For the entire sample we found in the objective evaluation a significant model ($r = 0.53$, $p < 0.001$). Without CPAP use, MRM predicted nocturia also

($r = 0.62$, $p < 0.001$). The best model was obtained by studying OSAHS moderately with objective nocturia assessment ($r = 0.70$, $p < 0.001$).

Conclusion: Our MRM predicted that as the severity of SDB increases, urination increases as well. MRM increased prediction by adding the following variables: % awake, AHI, REML, HRAwake, HR-SWS, and Ar, SEI, SO₂, and % REM sleep.

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Predictors and associated factors of obstructive sleep apnea in gestational diabetes patients

P. Sirijanchune, V. Tantrakul, P. Panburana, J. Pengjam
Ramathibodi Hospital, Mahidol University, Thailand

Introduction: Gestational diabetes (GDM) is one of the most common problems in pregnancy. This related to high morbidity and complications of both maternal and fetal outcomes. Obstructive sleep apnea in pregnancy (OSA) is also a problem of concern. The combination of GDM and OSA is far more complicated.

Materials and methods: Prospective study demonstrated predictors and factors associated with OSA in gestational diabetes patients. Participants were enrolled to screening OSA with complete sleep questionnaire information and physical examination. The OSA was evaluated by using portable monitoring devices. An apnea-hypopnea index >5 times/h. was diagnosed as OSA. Factor associated gestational diabetes patients with and without OSA was compared by Student's t-test. The predictors related to OSA were performed after adjust other potential confounding factors by multivariate logistic regression analysis.

Results: All 33 gestational diabetes patients were recruited to the study. Mean age was 33.24 \pm 3.79 years. Mean gestational age at enrollment was 18.11 \pm 6.11 weeks. The mean body weight pre pregnancy was 71.56 \pm 18.65 kg. There were 18 patients (54.55 %) diagnosed with pre pregnancy obesity by BMI > 28 kg/m². OSA was diagnosed in 16 pregnant patients with diabetes. Incidence of OSA in gestational diabetes is 48.5%. Gestational diabetes OSA patients had significantly higher pre pregnancy body weight and body mass index (BMI) compared with non OSA patients (body weight 80.69 \pm 21.44 kg, compared with 62.97 \pm 10.16 kg, $p = 0.004$; BMI 31.90 \pm 8.88 compared with 25.00 \pm 3.32, $p = 0.005$). Gestational diabetes OSA patients had higher pre pregnancy obesity more than non OSA patients. (obesity 75.00% compared with 35.29%; $p = 0.037$) Neck circumference in OSA group was also significantly higher than in non OSA group (36.47 \pm 3.65 cm, compared with 34.41 \pm 1.51 cm; $p = 0.04$). Body weight pre pregnancy remained the only significant predictor of OSA in gestational diabetes patients with odds ratio 1.17 and 95% confidence interval 1.01–1.36.

Conclusion: The incidence of OSA in gestational diabetes patients was high. The body weight pre pregnancy is a great predictor for OSA in gestational diabetes patients. The pre pregnancy body weight, BMI, pre pregnancy obesity and neck circumference were important factors associated to OSA in gestational diabetes patients.

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Obstructive sleep apnea induces hearing function impairment

T. Vorlova¹, O. Dlouhá², D. Kemlink¹, K. Sonka¹

¹ Department of Neurology, First Faculty of Medicine, Charles University and General University Hospital, Czech Republic

² Department of Phoniatics, First Faculty of Medicine, Charles University and General University Hospital, Czech Republic

Introduction: Findings regarding obstructive sleep apnea (OSA) impact on hearing quality are so far inconsistent. Presence of snoring sound and vibration burdening inner ear combined with well known impact of OSA on central nervous system per se implicates hypotheses, that OSA might lead to cochlear function impairment.

Materials and methods: Studied cohort included adult male sent to our sleep unit by physicians suspecting OSA as the cause of problem. The subjects underwent standard neurologic and ENT examination, polysomnography and carotid ultrasound examination. Normal neurological and ENT status, the absence of other diseases affecting sleep (e.g. PLMS), brain functions and hearing, no drugs influencing hearing were the inclusion criteria of the study. In total 46 male (47.4 ± 5.7 years old, BMI 29.1 ± 3.6) formed a group and underwent audiometry, otoacoustic emission (OAE) and brainstem auditory evoked potentials (BAEP) examination. The group was divided according to apnoea/hypopnoea index (AHI) into two subgroups: AHI < 15 (15 subjects) and AHI > 30 (17); there were no subjects with AHI between 16 and 30.

Results: OAE and BAEP in the groups AHI 0–15 and AHI >30 do not differ significantly according to statistical analysis. This demonstrates that the pathway from the inner ear into the brain in OSA patients remains intact.

Audiometry using 4000 and 8000 Hz revealed statistically significant higher auditory threshold in patients with AHI >30 (29.1 ± 19.7 dB resp. 33.2 ± 21.0 dB) than in patients with AHI 0–15 (14.6 ± 9.3 dB resp. 11.8 ± 4.0 dB). The auditory thresholds within stimulation of all frequencies correlated with the age. The auditory threshold within 8000 Hz stimulation correlated also with BMI, time with oxygen saturation below 90%, oxygen desaturation index and AHI. This suggests direct organ of Corti lesion or the impairment of vascular supply in inner ear in OSA patients.

Conclusion: This study confirmed the hypothesis of hearing function impairment localized in the organ of Corti in OSA patients.

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Respiratory disturbance variable (RDV) and its relationship with oximetry instability

A. Bassi, J. Díaz, J. Arancibia, E. Vivaldi

Facultad de Medicina Universidad de Chile, Chile

Introduction: We have proposed a new method to quantify sleep-disordered breathing that extracts a continuous Respiratory Disturbance Variable (RDV) based on the normalized coefficient of variation of the envelope of the standard nasal-cannula signal. We present an assessment of RDV through its correlation with a measure of oximetry instability (OI).

Materials and methods: In 71 PSG studies of moderate and severe obstructive sleep apnea (OSA) cases the RDV was calculated for each 30-second epoch. For each epoch, the nasal-cannula (PTAF) signal was band-filtered (0.05–5 Hz). From that filtered signal (fs), the Hilbert transform was obtained (HTfs). The filtered signal envelope (fse) was then computed following a standard calculation: $fse = \sqrt{fs^2 + HTfs^2}$. The mean (μ) and standard deviation (sd) of fse as well as their ratio, the coefficient of variation of the envelope (CVE = sd/μ) were calculated. RDV is a normalized version of CVE, dividing it by the coefficient of variation of the Rayleigh distribution (≈ 0.523). The full length of PSG studies was segmented according to RDV values. The RDV range 0.50–4.00 was subdivided into 14 categories using 0.25 unit grouping intervals. The oximetry instability was calculated as the logarithm of the standard deviation of the 300 samples for each epoch (30 s at 10 Hz) followed by a five-epoch

Gaussian smoothing. For each RDV category the average of the corresponding OI values was plotted. A simple linear regression model was calculated with the RDV level as the regressor and OI as the regressand. Coefficient of determination assessed the goodness-of-fit of the regressions.

Results: Higher values of RDV reflect increasing departure from normal sinusoidal breathing, with the threshold for conventionally abnormal breathing being around 1.0. Here we report the relationship between a given level of RDV and OI. OI is an objective indicator of breathing disturbance effects that is less sensitive to inter-individual variability than standard oximetry drops thresholds. A simple linear model using as regressor RDV in the range 0.5–4.0 and OI as regressand was highly significant. The adjusted R^2 was 0.7483 ($p \ll 0.001$).

Conclusion: RDV, a measurement that can be automatically computed from routine PSG data, can appropriately reflect the effects of disturbed breathing on oximetry. Both RDV and OI tend to increase together as breathing become less stable, a result that allows further research of the underlying instability of the central breathing control.

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Obstructive sleep apnea syndrome and ocular disorders

R. Wix Ramos¹, I. Tormo Canto², R. Wix Ramos³,

E. Rocío Martín⁴, J. Pastor Gómez⁵

¹ 32720, Spain

² Spain

³ Venezuela

⁴ Spain

⁵ Spain

Introduction: There is increasing evidence that obstructive sleep apnea syndrome (OSAS) is being considered as an independent risk factor in ophthalmology disorders. OSAS may compromise optic nerve head perfusion and cause glaucomatous optic neuropathy. The purpose of this study is to evaluate the possible association between OSAS and ocular disorders.

Materials and methods: In this retrospective study, 100 consecutive patients in a sleep unit coming from ophthalmology were included. Sleep history specific, included Epworth test to value de sleepiness, Epworth ≥ 14 sleepiness moderate or severe. In overnight polysomnography (PSG), the parameters measured included nasal airflow (nasal cannula), thoraco-abdominal movements (inductive respiratory bands), and arterial oxygen saturation

(pulse oximetry), snoring, limb movement, and body position, scored in 30-s epochs according to American Academy of Sleep Medicine (AASM) standardized criteria for sleep scoring and the diagnosis of OSAS and calculation of Apnea-Hypopnea Index (AHI). The subjects with $AHI \geq 30$ were accepted as OSAS severe and moderate $15 \leq AHI < 30$. Diagnosis of ophthalmology diseases was confirmed by a specialist. Pearson coefficient correlation test was used to explore the relationship between the OSAS and ophthalmology diseases. Descriptive statistics were performed, with quantitative variables expressed by mean \pm SE; all statistical analysis was performed using Sigmaplot and SigmaStat 3.5.

Results: One hundred patients, age between 33 and 88 (\bar{x} : 75 ± 8) years old. BMI: 28 ± 4.5 . BMI has a positive relationship with AHI. Others cardiovascular risk factors in 78% of patients.

Sleepiness moderate or severe by Epworth test in 14% of the patients, there is no significant relationship between Epworth and AHI.

Polysomnography findings: sleep efficiency $68 \pm 16\%$, Stage 1 and Stage 2: $74 \pm 12\%$, slow-wave sleep: $11 \pm 6\%$ and REM sleep: $13 \pm 7\%$. Not OSAS or OSAS mild in 16% patients, 10% patients with OSAS moderate and 74% with OSAS severe. Ocular diseases: ischemic optic neuropathy 34%, glaucoma 20%, cataracts 6%, floppy eyelid syndrome: 6%, retinopathy 5%, others ocular disorders 29%. Ocular diseases and OSAS: glaucoma with 95% OSAS moderate or severe, ischemic optic neuropathy 85% with OSAS, cataracts 100% with OSAS, floppy eyelid syndrome OSAS 100%, retinopathy OSAS 100%, other ocular disorders 69% OSAS moderate or severe.

Conclusion: Positive correlation between OSAS and ophthalmology diseases p value: 0.0001. The ophthalmologist and the sleep physician need to be aware of this association so that both sleep disorders and the related ophthalmologic disorders can be better diagnosed and treated.

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Oral JZP-110 phase 2b study for the treatment of excessive sleepiness in adults with narcolepsy: Results of a randomized, double-blind, placebo-controlled trial

J. Black¹, T. Swick², N. Feldman³, R. Doekel Jr.⁴, M. Khayrallah⁵, G. Bream⁵, C. Ruoff⁶

¹ Jazz Pharmaceuticals, Inc., USA

² Houston Sleep Center, USA

³ St. Petersburg Sleep Disorders Center, USA

⁴ Sleep Disorders Center of Alabama, USA

⁵ Aerial Biopharma, USA

⁶ Stanford Sleep Medicine Center, USA

Introduction: To evaluate JZP-110, a wake-promoting agent with dopaminergic and noradrenergic activity, for treatment of excessive sleepiness in adults with narcolepsy.

Materials and methods: This double-blind, placebo-controlled study randomized adults with narcolepsy to once-daily placebo ($n = 49$) or to a JZP-110 dose of 150 mg/day during weeks 1–4 and 300 mg/day during weeks 5–12 ($n = 44$). Efficacy endpoints included change from baseline in average sleep latency on the 40-minute Maintenance of Wakefulness Test (MWT); Clinical Global Impression-Change (CGI-C); Patient Global Impression-Change (PGI-C); and change from baseline on the Epworth Sleepiness Scale (ESS).

Results: At week 4, changes from baseline were significantly greater with JZP-110 150 mg versus placebo: increased mean MWT sleep latency (9.5 vs 1.4 minutes; $p < 0.0001$); decreased ESS scores (5.6 points vs 2.4 points; $p = 0.0038$); and more patients with improvement on the CGI-C (80.0% vs 51.1%; $p = 0.0066$) and PGI-C (82.5% vs 44.4%; $p = 0.0003$). At week 12, following an additional 8 weeks of 300 mg/day, JZP-110 resulted in significantly greater improvements from baseline than placebo: increased mean MWT sleep latency (12.8 vs 2.1 minutes; $p < 0.0001$); increased mean sleep latency on each of the five MWT trials ($p < 0.005$); decreased ESS (8.5 points vs 2.5 points; $p < 0.0001$); and more patients with improvement on the CGI-C (86.0% vs 38.3%; $p < 0.0001$) and PGI-C (93.0% vs 38.3%; $p < 0.0001$). Three subjects (6.8%) on JZP-110 discontinued due to adverse events. The most common adverse events with JZP-110 vs placebo were: insomnia (22.7% vs 8.2%); headache (15.9% vs 10.2%); nausea (13.6% vs 6.1%); decreased appetite (13.6% vs 0%); diarrhea (11.4% vs 6.1%); and anxiety (11.4% vs 0%). Two serious adverse events (conversion disorder, acute cholecystitis) in the JZP-110 group were considered unrelated to treatment.

Conclusion: In adults with narcolepsy, JZP-110 at doses of 150 and 300 mg/day was well tolerated and significantly improved objective and subjective symptoms of excessive sleepiness.

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Immunohistochemical screening for auto-antibodies in recent onset type 1 narcolepsy and after H1N1 vaccination

A. Van Der Heide¹, I. Hegeman-Kleinn¹, E. Peeters², G. Lammers¹, R. Fronczek¹

¹ Leiden University Medical Centre, The Netherlands

² Medisch Centrum Haaglanden, Den Haag, The Netherlands

Introduction: In narcolepsy, based on the tight HLA-DQB1*06:02 association, an autoimmune attack targeting hypothalamic hypocretin (orexin) neurons is hypothesized. So far, no direct evidence for an autoimmune attack was found. One of the major limitations of previous studies was that none included patients close to disease onset.

Materials and methods: We screened serum of 21 narcolepsy type 1 patients (13 male, 8 female) close to disease onset (median duration of symptoms 11 months; range 2–48 months) for antibodies against hypocretin neurons using immunohistochemistry. In 17 patients hypocretin-1 was measured; all were hypocretin-1 deficient. Twenty patients were HLA-typed and were positive for DQB1*06:02. Six patients were vaccinated against H1N1 before onset of narcoleptic symptoms. Positive controls were a patient and a control subject that have autoantibodies against hypocretin neurons; described in our previous study.

Results: No autoantibodies against hypocretin neurons could be detected, including the patients that were vaccinated against H1N1. The two positive controls were still positive.

Conclusion: We found no evidence for autoantibodies in serum of narcolepsy patients close to disease onset including patients vaccinated for H1N1. This finding not necessarily contradicts the autoimmune hypothesis. For future studies, however, it could be of interest to focus on T-cell immunology.

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Do microRNAs target hypocretin?

A. Holm¹, J. Thomas¹, S. Gammeltoft¹, P. Jennum², B. Kornum¹

¹ Molecular Sleep Laboratory, Department of Diagnostics, Glostrup Hospital, Denmark

² Danish Center for Sleep Medicine, Department of Clinical Neurophysiology, Glostrup Hospital, Denmark

Introduction: Type 1 narcolepsy is hypothesized to be autoimmune. However, this has never been confirmed experimentally. We speculate whether downregulation of hypocretin expression could be a possible disease mechanism in cases of narcolepsy with low but still detectable levels of CSF-hypocretin. Here we investigate specific microRNAs that target and downregulate hypocretin.

Materials and methods: In silico analysis predicted 14 miRNAs to target human prepro-hcrt and 14 miRNAs to target murine prepro-hcrt. For four of these the targeting was confirmed in vitro in hcrt-positive human and murine cell line, and with the luciferase reporter assay. In vivo targeting was tested by intracerebroventricular injections of miRNAs in 4 day old mice. In vivo experiments in adult

mice are currently ongoing. HCRT mRNA was analyzed by qPCR, while hcrt-1 peptide was analyzed in a radioimmuno assay.

Results: We found that endogenous levels of prepro-hcrt in human and murine cells were repressed by the four miRNAs. We observed a 60–80% reduction of hcrt expression in cells transfected with the miRNAs compared with the un-transfected and negative control analyzed by qPCR. We validated the miRNA targeting by luciferase reporter assay to investigate if HCRT is a direct target of the miRNAs. Next, we investigated these findings in vivo. We injected miRNAs intracerebroventricularly in mouse pups as we have been able to detect hcrt-1 peptide in mouse brains already from the day of birth. Earlier reports state that hcrt is not present before day 10 (post natal). miRNA-injections in 4 day old mice showed a similar decrease in prepro-hcrt expression. Further in vivo experiments are ongoing.

Conclusion: We have shown that specific miRNAs can downregulate hcrt in vitro and in vivo. We speculate whether elevated levels of these miRNAs can cause hcrt deficiency in narcolepsy and other sleep and neurologic disorders. In this case, miRNA based treatments may hold potential as a future treatment for sleep disturbances.

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Incidence of narcolepsy in Germany

G. Mayer¹, U. Drechsel-Bäuerle², I. Schmidtman³,
B. Keller-Stanislawski², D. Oberle²

¹ Department of Neurology, University of Marburg/Hephata Klinik Schwalmstadt, Germany

² Department Safety of Medicinal Products and Medical Devices, Paul-Ehrlich-Institut, Federal Institute for Vaccines and Biomedicines, Langen, Germany

³ Imbei Institute of Medical Biometry, Epidemiology and Informatics, Johannes Gutenberg University of Mainz, Germany

Introduction: Following the 2009 pandemic, reports of an association between an AS03 adjuvanted H1N1 pandemic influenza vaccine and narcolepsy were published. Besides determining background incidence rates for narcolepsy in Germany this study aimed at investigating whether there was a change in incidence rates of narcolepsy between pre- and postpandemic period.

Materials and methods: We conducted a retrospective study on the incidence of narcolepsy within the period from 1 January 2007 to 31 December 2011 in Germany including patients with an initial diagnosis of narcolepsy (ICD 10 Code G47.4). In order to validate the completeness of the number of cases captured, an additional capture–recapture investigation was performed in the federal state Rhineland-Palatinate. Based on the number of cases recorded and the demographics provided by the Federal Statistics Office, raw incidence rates were calculated and adjusted for incomplete capture of cases using an established capture–recapture estimate. In order to compare incidence rates between periods, incidence density ratios (IDR) were calculated. Using interrupted time series (ITS) methods, differences between the prepandemic, pandemic and postpandemic period were analyzed.

Results: A total of 342 sleep centers were invited to participate in the study. Adequate and suitable data were provided by 233 sleep centers (68.1%).

A total of 1198 patients with an initial diagnosis of narcolepsy within the observed period were included, of whom 106 (8.8%) were children and adolescents under the age of 18 years and 1092 (91.2%)

adults. Within the scope of the capture–recapture investigation in Rhineland-Palatinate, a total of 80 incident cases of narcolepsy were recorded.

In children and adolescents, the age-standardized adjusted incidence rate significantly increased from 0.14/100,000 person-years in the prepandemic period to 0.50/100,000 person-years in the postpandemic period (incidence density ratio, IDR 3.57; 95% CI 1.94–7.00). In adults, no significant increase was detectable (0.56/100,000 PY in the prepandemic period, 0.67/100,000 PY in the postpandemic period; IDR 1.20; 95% CI 0.83–1.74).

From spring 2009, the incidence of narcolepsy in children and adolescents continuously increased.

Conclusion: Our study provides valid estimates for the incidence of narcolepsy in Germany. These are in line with the estimates reported for other European countries. In children and adolescents, incidence rates significantly increased between pre- and postpandemic period with the incidence rates starting to go up in spring 2009.

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Insomnia and self-perceived disability in workers with delayed recovery after mild traumatic brain injury/concussion

T. Mollaveya^{1,2,3}, B. Pratt⁴, C. Shapiro^{5,6}, J. Cassidy^{7,8,9},
A. Colantonio^{3,10}

¹ Graduate Department of Rehabilitation Science, Faculty of Medicine, University of Toronto, Canada

² Collaborative Program in Neuroscience, University of Toronto, Canada

³ Toronto Rehab – University Health Network, Ontario, Canada

⁴ Dalla Lana School of Public Health, University of Toronto, Canada

⁵ Toronto Western Hospital, University Health Network, Ontario, Canada

⁶ Youthdale Child and Adolescent Sleep Clinic, Ontario, Canada

⁷ Faculty of Health, Institute of Sport Sciences and Clinical Biomechanics, University of Southern Denmark, Denmark

⁸ Division of Health Care and Outcomes Research, University Health Network, Canada

⁹ Division of Epidemiology, Dalla Lana School of Public Health, University of Toronto, Canada

¹⁰ Acquired Brain Injury Research Lab, University of Toronto, Canada

Introduction: Insomnia is a common complaint among persons with mild traumatic brain injury (mTBI). However, its impact on recovery after mTBI/concussion has not been characterized. Clarifying the association between insomnia and self-perceived disability may serve the vital role in understanding rehabilitation outcomes, including return to work after the injury.

Materials and methods: Adults with mTBI/concussion sustained at the workplace were recruited from the largest rehabilitation hospital in Ontario between May 2012 and May 2014. Demographic, occupational, and health status data were collected from questionnaires, insurer records, and clinical assessment at the time of recruitment. The Insomnia Severity Index (ISI) measured the primary independent variable and the Sheehan Disability Scale measured perceived disability outcome. This variable was highly skewed and therefore classified as “mild/moderate” and “marked/extreme” disability. Bivariate associations were assessed by two-sided t-tests and

chi-square tests. A logistic regression model was fitted using variables selected from the literature. Model fit was assessed using the Hosmer–Lemeshow goodness of fit statistic, AIC criterion, and the ratio of the deviance value/degrees of freedom. Multinomial logistic models with several categorizations of the outcome were compared with the binary logistic model.

Results: Of 94 workers (61.2% male) with mTBI/concussion, with a mean age of 45.2 ± 9.9 years and a median time since injury of 197 days, the majority (56%) were on work disability. Compared with those reporting mild/moderate disability, individuals reporting marked/extreme disability had more severe insomnia ($p = 0.002$), depression ($p < 0.0001$) and greater pain ($p < 0.0001$). In the fully adjusted logistic model, a one-point ISI increase was associated with a 1.16 (95% CI 1.03–1.30) greater odds of reporting higher disability. No other covariates remained significant. Multinomial models using disability categories based on tertiles and established cutpoints exhibited loss of precision, though the main point estimates remained similar.

Conclusion: While insomnia was significantly associated with greater disability, depression and pain were not, suggesting that they may be partially explained by poor sleep. Increasing awareness of the impact of insomnia, assessment and treatment at the early stages after the injury is warranted.

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Novel allosteric inhibitors of TNF-R1 modulate post-traumatic sleep and restore functional outcome following experimental diffuse TBI in the mouse

R. Rowe¹, J. Harrison¹, H. Zhang², A. Bachstetter³, L. Van Eldik³, D. Hesson², M. Greene², J. Lifshitz¹

¹ Barrow Neurological Institute at Phoenix Children's Hospital, USA

² Perelman School of Medicine, University of Pennsylvania, USA

³ Sanders-Brown Center on Aging, University of Kentucky College of Medicine, USA

Introduction: Clinical studies indicate as many as 70% of traumatic brain injury survivors suffer from sleep–wake disturbances. We have previously shown brain injury acutely increases sleep in the mouse, as well as cortical levels of inflammatory cytokine tumor necrosis factor- α (TNF- α), suggesting a relationship between inflammation, sleep regulatory cytokines, and sleep.

Materials and methods: Compounds were synthesized and tested in vitro for efficacy in blocking downstream targets of TNF-R1 activation. Compounds blocking downstream signaling were tested in adult male C57BL/6J mice using increased post-traumatic sleep as a diagnostic of TBI. Mice were subjected to moderate midline fluid percussion injury ($n = 33$; 1.3 atm; 6–10 min righting reflex time) or sham injury. Immediately following TBI or sham injury, mice were given intraperitoneal injections of a TNF-R1 inhibitor (C7, SGT11, F002) or vehicle. Post-traumatic sleep was measured using non-invasive piezoelectric sleep cages. Compounds which modulated post-traumatic sleep were then tested for efficacy on functional recovery ($n = 38$). Sleep was measured for 24 hours following injury. At 1–7 days post-injury, sensorimotor outcome was assessed by Rotarod and a modified Neurological Severity Score (NSS). Cognitive function was measured using Novel Object Recognition (NOR) at day 6. At day 7 post-injury, tissue was collected for Iba-1

immunohistochemistry for analysis of microglia activation. Cortical tissue was collected from a separate cohort of mice 3 hours following brain-injury and cytokine levels were evaluated. Compounds were administered at a high (20 mg/kg) or low (2 mg/kg) dose immediately following injury. Two doses (immediately and 24 hours post-injury) of 2 mg/kg were administered in functional and histological studies.

Results: Compounds tested in vitro confirmed the inhibition of TNF-R1 activation. Compounds dose dependently inhibited NF- κ B activation as demonstrated by I κ B phosphorylation measured by western blot. Compounds modulated post-traumatic sleep in the mouse. There was a significant increase in the percent of post-traumatic sleep over the first 6 h post-injury in vehicle-treated mice compared with shams. C7 and SGT modulated post-traumatic sleep; however, F002 mice slept similarly to vehicle-treated brain-injured mice. Compounds C7 and SGT led to functional recovery following diffuse TBI. Diffuse TBI led to sensorimotor deficits as measured by the rotarod task. By 3 days post-injury (DPI), SGT attenuated motor deficits and increased improvement in latency to stay on the rod. Diffuse TBI led to immediate neurological deficits measured by a modified Neurological Severity Score (NSS). At 3 and 5 DPI, SGT attenuated neurological deficits, by 7 DPI; all injured groups recovered to uninjured sham performance. Diffuse TBI led to cognitive impairment measured by the novel object recognition task (NOR). Both C7 and SGT improved cognitive performance to uninjured sham levels. Compounds C7 and SGT modulated post-traumatic sleep in the light cycle following TBI. Microglia activation was not affected by administration of compounds; however, a decrease in acute inflammatory cytokines was measured.

Conclusion: In conclusion, an increase in sleep remains diagnostic of traumatic brain injury and post-traumatic sleep permits precision medicine in identifying therapeutic candidates. Our data suggest pharmacological inhibition of the TNF pathway contributed to an accelerated recovery of function following TBI, thus confirming inflammation is an important therapeutic target for TBI.

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Orderly dissolution of thalamo-cortical responses to pain: Studies with intracortical electrodes in humans

L. Garcia-Larrea¹, S. Mazza², C. Perchet¹, L. Claude¹, M. Magnin¹, H. Bastuji¹

¹ Neuropain, Center for Neuroscience of Lyon, INSERM and University Lyon 1, France

² Laboratoire des Mécanismes Cognitifs, University Lyon 2, France

Introduction: The brain regions responding consistently to painful stimuli are collectively called “Pain Matrix” (PM). The PM comprises low-level sensory networks, regions commanding cognitive access to consciousness, and networks regulating emotional reappraisal of immediate percepts. Virtually no data exist in humans on the differential behaviour of these sub-processes during sleep stages.

Materials and methods: We recorded thalamic and cortical responses to thermo-nociceptive laser stimuli during waking and all-night sleep in 25 patients with pharmaco-resistant epilepsy implanted with intracortical and intra-thalamic electrodes. Brain regions sampled covered the parietal, frontal, external and internal temporal lobes, including amygdala and hippocampus. Responses were obtained during pre-sleep waking, and then during N2 and REM sleep.

Results: In waking state, at least 10 cortical regions showed consistent responses during the 1-s period following noxious stimuli. Most of these responses arose from sensory cortices (operculo-insular) and mid-anterior cingulate regions, but very reproducible field potentials were also obtained from dorsolateral frontal (BA 45, 46, 9, 10), posterior parietal (BA 40, 5, 7) and medial temporal regions (hippocampus, amygdala). Sleep onset was asynchronous, the thalamus being deactivated minutes before all cortical areas, while awakening was synchronous in thalamus and cortex. Passage from waking to light sleep (N2) was characterized by moderate attenuation of sensory and mid-cingulate activity, contrasting with severe attenuation of responses from parieto-frontal networks. Sleep spindles did not block cortical noxious responses, and sometimes even enhanced them. REM-sleep was uniquely characterized by the disappearance of mid-anterior cingulate activity linked to attentional and motor reactions, with a preservation of sensory nociceptive responses. Thus, the dissolution of consciousness is associated with orderly changes in cortical responses to phasic pain stimuli. Networks essential to maintain declarative consciousness-memory are among the first to become unresponsive, while low-level sensory cortices remain active for much longer. Sleep spindles do not block sensory responses to pain and a striking dissociation between sensory and attention-orienting responses characterizes REM-sleep.

Conclusion: The differential dynamics of cortical activation to pain stimuli is consistent with altered intracortical connectivity and 'local sleep' theories. Whether a potentially dangerous stimulus such as noxious heat succeeds to disrupt sleep is probably determined by the interaction between activities in such different networks, and their cross-synchronization through thalamic nuclei.

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Risk factors of frequent nightmares among the general Finnish adult population

N. Sandman^{1,2}, K. Valli¹, E. Kronholm², A. Revonsuo¹, T. Laatikainen², T. Paunio²

¹ University of Turku, Finland

² National Institute for Health and Welfare, Finland

Introduction: Nightmares are intensive disturbing dreams that awaken the dreamer from sleep. Frequent nightmares can be a serious problem and are often related to mental disorders and increases risk for suicide. The current study investigates risk factors for frequent nightmares in a representative population sample of Finnish adults.

Materials and methods: The current study utilized data from surveys of 2007 and 2012 of the National FINRISK Study from Finland (N = 13 922). The surveys consist of random cross sectional population samples from adults aged 25–74 who filled in a comprehensive health questionnaire including items on sleep and mental well-being and participated in a physical examination.

Nightmares were assessed with self-estimated frequency during the last month. Their association with items measuring sociodemographic factors, other sleep problems, mental health, life satisfaction, alcohol consumption, medication and physical health were investigated. For statistical analyses Pearson chi square, one-way ANOVA, multinomial logistic regression and factor analysis were used.

Results: Insomnia and depression symptoms as well as the use of hypnotics and antidepressants are major risk factors for frequent nightmares ($p < 0.001$). Strong associations also exist between nightmares and life dissatisfaction, self-estimated poor physical

health, heavy use of alcohol and several measures of self-estimated anxiety and stress symptoms ($p < 0.001$). Nightmares are also more common among women than men and among elderly than young ($p < 0.001$).

In addition to these strong associations, there are various factors that have statistically significant associations with nightmares with modest effect sizes. These include sleep duration and chronotype that have previously been identified as nightmare risk factors.

Conclusion: A wide variety of factors related to psychological and physical well-being are associated with nightmare frequency. As such, there does not appear to be a single leading cause for nightmares but frequent nightmares are related to decrease in well-being that may be caused by many different factors.

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Association between sleep characteristics and mild cognitive impairment: The HypnoLaus/Psycholaus study

J. Haba-Rubio¹, N. Tobback¹, D. Andries¹, M. Preisig², E. Castelao², M. Tafti¹, R. Heinzer¹, J. Popp²

¹ Center for Investigation and Research in Sleep (CIRS), Lausanne University Hospital (CHUV), Switzerland

² Department of Psychiatry, Lausanne University Hospital (CHUV), Switzerland

Introduction: Recent research has identified relationships between sleep duration and quality and increased risk of cognitive decline and dementia. The aim of this study was to explore the association between subjective sleep complaints and objective sleep structure measured by polysomnography (PSG), and cognitive deficits in a large unselected general population sample.

Materials and methods: Data from the participants of a population-based cohort study (HypnoLaus/Psycholaus, Lausanne, Switzerland) was collected. Assessments included socio-demographic, personal and treatment history. Sleep-related complaints and habits were investigated using the Pittsburgh Sleep Quality Index (PSQI) and the Epworth Sleepiness Scale (ESS). All subjects underwent a complete PSG at home. Diagnostic information of the cognitive function was collected using the Clinical Dementia Rating Scale (CDR). Participants with a global CDR score > 0.5 were considered as having mild cognitive impairment (MCI), and compared with subjects without cognitive deficits (CDR score = 0, control group).

Results: Two hundred sixty subjects (mean age: 60.9 ± 12 years, 52% women) with MCI were identified. Compared with 301 controls without cognitive deficits (mean age: 61.1 ± 11.5 years, 54% women), after adjusting for age, gender and level of education, MCI subjects reported poorer sleep quality (PSQI score: 5.5 ± 0.2 vs. 4.9 ± 0.2) and higher ESS scores (5.2 ± 0.2 vs. 4.7 ± 0.2), although the differences were not statistically significant ($p = 0.07$ and $p = 0.09$, respectively). Concerning PSG sleep variables, subjects with MCI spent less time in REM sleep (73.9 ± 1.9 vs. 79.5 ± 1.7 min, $p = 0.037$ and 19 ± 0.4 vs. $20.2 \pm 0.3\%$, $p = 0.038$) and had higher apnea/hypopnea index (AHI) in NREM sleep (21.2 ± 1.1 vs. $17.9 \pm 1/h$, $p = 0.046$). No significant differences were found between groups concerning other sleep related parameters (as the total sleep time, the sleep latency, the time spent in slow wave sleep, the arousal index, the AHI, the desaturation index, the periodic leg movement index), nor for the intake of drugs potentially influencing sleep (neuroleptics, antidepressants, hypnotics).

Conclusion: Compared with subjects without cognitive deficits, subjects with MCI showed a trend toward more sleep-related complaints and higher sleepiness scores. They had lower REM sleep duration and higher AHI in NREM sleep, but we did not find major differences concerning other objective sleep variables measured by PSG.

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Effect of conditioned stimulus exposure during slow-wave sleep on fear memory extinction in humans

J. He¹, H. Sun², S. Li³, W. Zhang², J. Shi³, S. Ai³, Y. Li⁴, X. Li², X. Tang⁴, L. Lu^{1,5}

¹ Peking University Sixth Hospital/Institute of Mental Health and Key Laboratory of Mental Health, National Institute on Drug Dependence, Peking University, China

² Peking University Sixth Hospital/Institute of Mental Health and Key Laboratory of Mental Health, China

³ National Institute on Drug Dependence, Peking University, China

⁴ Sleep Medicine Center, Translational Neuroscience Center, West China Hospital, Sichuan University, China

⁵ Peking-Tsinghua Center for Life Sciences and PKU-IDG/McGovern Institute for Brain Research, Peking University, China

Introduction: Repeated exposure to a neutral conditioned stimulus (CS) in the absence of a noxious unconditioned stimulus (US) elicits fear memory extinction. The aim of the present study was to investigate the effects of mild tone exposure (CS) during slow-wave sleep (SWS) on fear memory extinction in humans.

Materials and methods: We recruited 66 healthy volunteers and conducted this experiment in a sleep laboratory on two consecutive nights. The main purpose of the first night was to exclude participants who had primary sleep disorders. We also asked them to complete the Pittsburgh Sleep Questionnaire Index (PSQI) to investigate sleep habits and assess the subjective sleep quality. On the experimental night, all of the healthy volunteers underwent an auditory fear conditioning paradigm, during which tones served as the CS, and a mild shock served as the unconditioned stimulus (US). Three groups were exposed to the CS for 3 or 10 min or an irrelevant tone (control stimulus, CtrS) for 10 min during SWS. The fourth group served as controls and was not subjected to any interventions during sleep. All of the subjects completed a memory test 4 h after SWS-rich sleep to evaluate the effect on fear extinction. Additionally, we conducted similar experiments using an independent group of subjects ($n = 30$) during the daytime to test whether the memory extinction effect was specific to the sleep condition. Totally, we recruited 96 healthy volunteers (44 male; age, 24.0 ± 2.4 years [mean \pm SD]) and 83 participants included in the final analysis.

Results: A total of 96 healthy subjects completed the study but 13 subjects were excluded from the final analysis. No significant differences exist in age, body mass index (BMI), systolic blood pressure (SYS), diastolic blood pressure (DIA), and PSQI score between the six groups. All of the participants' PSQI scores were <5 , indicating that they had regular sleep habits and good sleep quality. We compared polysomnography (PSG) data between 2 days to roughly determine the sleep architecture with and without CS+ presentation, and the sleep profile appeared to be unchanged. We then compared mean EEG power for tone-on and tone-off blocks and no significant differences observed for the following frequency bands, such as delta, theta, alpha, etc., which confirmed that the subjects remained asleep during tone stimulus presentation. Concerning the behavior results, participants who were re-exposed to the CS either during SWS (SWS-3 min CS group and SWS-10 min CS group) or

wakefulness (Wake-10 min CS group) showed attenuated fear responses, whereas fear memory remained intact in the 10 min CtrS group, which suggested that this manipulation only affected fear memory which was reactivated by re-exposure to the CS during sleep.

Conclusion: Repeated CS exposure during SWS resulted in memory extinction without altering sleep profiles that may be comparable to exposure therapy applied during wakefulness. Moreover, our findings introduce an alternative approach that may safely reduce fear in patients and have potential clinical value.

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Partial directed coherence and memory impairments in OSA participants in a population based study (EPISONO) from Sao Paulo, Brazil

A. Lino De Souza¹, J. Ricardo Sato², L. Bittencourt¹, S. Tufik¹

¹ Universidade Federal de Sao Paulo, UNIFESP, Brazil

² Universidade Federal do ABC, UFABC, Brazil

Introduction: OSA is a common sleep disorder with neurocognitive impairments. The pathophysiological mechanisms underlying the side effects of OSA in brain activity are not completely understood. We aim to verify the association between apnea-hypopnea-index (AHI), PDC (partial directed coherence) and short/long memory evaluations in a population based sample from Brazil.

Materials and methods: The EEG recordings from 938 valid full night polysomnography (PSG) were analyzed from a total base of 1101 participants of EPISONO study. Socio-demographic variables (sex, age, schooling), BMI, apnea-hypopnea-index (AHI) were measured. In order to assess some cognitive (memory) impairments, 16 questions were asked about retrospective (RM) (e.g. "Did you lost things like newspaper or glasses frequently") and prospective memory (PM) ("Did you decide to do something but forget it afterwards?") related to day-life activities. Partial directed coherence (PDC) was calculated using EEG recording for each one of four PSG electrodes (C3-C4, O1-O2). PDC is a measure of brain connectivity (based on Granger causality) that shows only direct flows between channels in both ways. Forward and backward PDC levels were measured between Central and Occipital hemispheres. Linear regressions and a path analysis were calculated with RM and PM scores as dependent variables. PDC levels in each sleep stage (S1, S2, S3-4, REM) and AHI were independent variables on the model. Age, BMI and sex were used as covariates for all models.

Results: We found some negative correlations between PDC levels of connectivity and AHI levels in central and occipital hemispheres in S3-4 and REM stages. Adjusting for participants' BMI, sex and age, lower PDC levels were associated with higher AHI levels in central electrodes on S3-4 stage (AHI over 30, C3-A1 to C4-A2 = 0.53; backward = 0.51 vs. AHI lower than 30, C3-A1 to C4-A2 = 0.76, backward = 0.59). Among occipital electrodes in REM stage we also have a negative association (AHI over 40, C3-A1 to C4-A2 = 0.51; backward = 0.38 vs. AHI lower than 40, C3-A1 to C4-A2 = 0.60, backward = 0.71). Finally, a path analysis model presents a moderation effect of AHI on the association between PDC values and RM and PM scores, supporting the consideration that lower scores of RM and PM are more associated with lower PDC coherence in participants with higher AHI levels.

Conclusion: The lack of information shared between brain hemispheres during sleep is associated with long-term hypoxia due to AHI severity, leading to cognitive impairments. EPISONO is a cross-sectional population-based study and this design avoids to estimate the participants time-length with OSA without treatment. This is the main limitation of our study.

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Effective add-on treatment with fenofibrate in patients with nocturnal frontal lobe epilepsy

M. Puligheddu¹, M. Pistis², M. Melis², A. Muntoni², G. Pillola², F. Marrosu¹, G. Milioli³, S. Riccardi³, F. Orlandini¹, L. Parrino³

¹ Sleep Disorders Center, University of Cagliari, Italy

² Department of Biomedical Sciences, University of Cagliari, Italy

³ Sleep Disorders Center, Department of Neurosciences, University of Parma, Italy

Introduction: Nocturnal frontal lobe epilepsy (NFLE) is an idiopathic partial epilepsy with a family history in about 25% cases with autosomal dominant inheritance (ADNFLE). One of the key pathogenetic mechanisms is a gain of function of neuronal nicotinic acetylcholine receptors (nAChRs) containing the mutated $\alpha 4$ or $\beta 2$ subunits.

Materials and methods: Notably, a number of patients are drug-resistant to conventional antiepileptic compounds, and therefore their treatment represents an unmet clinical need. Fenofibrate, a common lipid-regulating drug, is an agonist at peroxisome proliferator-activated receptor alpha (PPAR- α), a ligand-activated transcription factor whose activation negatively modulates $\beta 2^*$ -nAChR function. In a mutated mouse model (CHRNA4-S252F) displaying the disease genotype and phenotype chronic fenofibrate diet markedly reduces the frequency of large spontaneous inhibitory post-synaptic currents (sIPSCs) recorded from cortical pyramidal neurons and prevents nicotine-induced increase of sIPSC frequency. To test the clinical effectiveness of fenofibrate, 12 patients affected by NFLE/ADNFLE and non-responders to traditional therapy were recruited. Four patients reported a family history of epilepsy with confirmed $\alpha 4\beta 2$ mutation. Eight patients described parasomnias or nocturnal motor events in first-grade relatives. The fenofibrate add-on therapy consisted of 600 mg/day for 6 months. Daily seizures diary and quality of life by means of the EPI-QoL questionnaire were monitored. Video-polysomnographic (VPSG) recordings were carried out before (T0-FEN) and at the end of adjunctive fenofibrate therapy (T1-FEN) to quantify nocturnal motor-behavioral events, conventional sleep measures and CAP parameters. Comparisons were based on the Wilcoxon test.

Results: One patient dropped out of the study due to increased hepatic enzymes, which returned to normal range after drug discontinuation. A total of 345 epileptic motor events were counted during VPSG recordings of NFLE patients at T0-FEN. Approximately 85% of seizures (233) emerged during NREM sleep: 287 were classified as minor motor events and mainly occurred during stage 2, while the remaining 28 seizures were classified as major events. At T1-FEN, VPSG recordings showed a significant reduction of NREM sleep seizures (-185 ; $p < 0.002$). In particular, major events dropped to a total of three seizures ($p < 0.021$) and minor events dropped to 139 ($p < 0.0087$). Although none of the subjects displayed severe discomfort in relation to their pathological condition, the scores of seizure rate changed and quality of life showed a significant improvement at T1-FEN, though no correlation emerged between EPI-

QoL and reduction of seizure frequency. When compared with T0-FEN, sleep efficiency (+5%) and total sleep time (+57 minutes) were significantly increased ($p < 0.05$), while wake after sleep onset (-26 minutes) and CAP rate (-8%) were significantly reduced ($p < 0.05$) at T1-FEN. REM sleep and NREM stages showed no significant differences.

Conclusion: In those NFLE/ADNFLE patients lacking a response to traditional antiepileptic therapy, add-on fenofibrate promotes a significant curtailment of seizure frequency and improves sleep duration, continuity and stability. These findings confirm a dysfunctional role of nicotinic receptors in NFLE and offer new perspectives on the investigation and treatment of epilepsy.

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Circadian phase, vigilance state, and posture affect blood pressure in humans

D. Boivin¹, Y. Wei Hsien², P. Boudreau¹, G. Dumont³

¹ Douglas Mental Health University Institute/Department of Psychiatry, McGill University, Canada

² Douglas Mental Health University Institute, Canada

³ Electrical and Computer Engineering, University of British Columbia, Canada

Introduction: It is well known that blood pressure (BP) varies throughout the day with lower levels observed during nocturnal sleep. This diurnal rhythm can be explained by the effects of circadian phase, sleep, and postural changes. The aim of this study is to test the influence of these factors on BP.

Materials and methods: Ten men and one woman (mean age \pm SD: 22.6 ± 3.4 years) were studied individually in time isolation for 60 consecutive days. After 2 baseline days on their regular sleep/wake schedule, subjects underwent a 72-h ultradian sleep-wake cycle (USW) procedure. This procedure consists of 60-min wake periods in dim light (< 10 lux) alternating with 60-min naps in darkness. Subjects remained in a semi-recumbent posture throughout the first 48 h of the USW procedure (baseline). During the last 24 h of this procedure, subjects changed to a sitting and standing position 5 and 10 min after lights on times, respectively. BP was measured 1, 6, 11, 16 and 21 min after lights on. Changes in BP (Δ BP) were computed between supine and standing postures during the postural change segment of the USW procedure and at equivalent times during the baseline segment. Circadian phase was assessed from core body temperature (CBT, $4 \times / \text{min}$) which minimum was determined by a dual-harmonic regression and assigned a circadian phase of 0° . BP and Δ BP were averaged per subject by 60-circadian degree bins and analyzed using non-linear mixed models.

Results: During the baseline segment of the USW procedure, systolic and diastolic BP (SBP, DBP) as well as mean arterial pressure (MAP) significantly varied across circadian phases with peak values at $15:30 \pm 0:29$, $16:42 \pm 0:49$ and $15:07 \pm 0:57$, respectively, during wake periods ($p < 0.05$). During naps, only the circadian rhythm of SBP was significant and peaked at $19:03 \pm 1:01$ ($p < 0.05$). A significant circadian rhythm was observed for Δ SBP with a peak at $2:47 \pm 1:30$ at baseline. During the postural changes segment of the USW procedure, BP measures varied with circadian phase during naps ($p < 0.05$) but not during wake periods. A significant circadian variation in Δ DBP from supine to standing posture after lights on was observed and peaked in the middle of the night at $3:25 \pm 1:14$.

Conclusion: Our observations indicate that the circadian rhythm of BP is modulated by napping behaviour and postural changes.

Postural changes produced a greater increase of DBP at night at a time when DBP is at its lowest. These results have implications for professionals on call and on irregular schedules.

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Changes in circadian rhythm, sleep and psychological state of Chinese Antarctic winter-over expeditioners

N. Chen¹, C. Xu¹, Q. Wu², Y. Xiong¹, G. Chen³, D. Song³

¹ Institute of Basic Medical Sciences, Chinese Academy of Medical Sciences, School of Basic Medicine Peking Union Medical College, China

² Department of General Surgery, Beijing Jishuitan Hospital, China

³ Beijing Institute of Technology, China

Introduction: There are summer (December–February) and winter (March–November) at Zhongshan Station (69°22′24″S, 76°22′40″E) in Antarctica with 2-month polar nights and 2-month polar days respectively. The unique light–dark cycle may increase risks of sleep disturbances and circadian desynchrony of Chinese winter-over members, and thus do harm to physical and mental health.

Materials and methods: The study was carried on 17 male winter-over members (age 36.8 ± 10.3 years) of the 27th Chinese Antarctic Expedition, in 10 months of three critical occasions: departure from Shanghai in November 2010, winter-over period (from March to October 2011) at Zhongshan Station, returning Shanghai in April 2012. Sequential urine samples in 48-hours were obtained, and the major melatonin metabolite 6-sulfatoxymelatonin (aMT6s) and cortisol in urine were assessed. The aMT6s circadian rhythm was analyzed by a cosine curve-fitting method. Sleep parameters were derived from wrist actigraphy and sleep diaries. The psychological states and team function were evaluated via a series of questionnaires.

Results: The acrophase of aMT6s rhythm was delayed by 1.94 h, 1.69 h ($p < 0.05$) in March, April 2011, by 2.31 h, 3.17 h ($p < 0.001$) in June, July, by 2.70 h in September, and by 2.42 h ($p < 0.05$) in March 2012. The sleep start time and end time were delayed ($p < 0.05$) from March to September in 2011, and returned back to normal when winter came to end. Sleep duration, efficiency and latency showed no significant change. The total score of morningness–eveningness questionnaire showed a significant decline from May to July, suggesting that the subjects had greater evening phase preference in polar nights. Urinary cortisol increased in April and May ($p < 0.05$). The anxiety and stress scales showed stress increased in April ($p < 0.05$), while anxiety decreased in March, September, October ($p < 0.05$). The Profile of Mood States showed that depression score increased in April ($p < 0.05$), while confusion score increased in April, May, June ($p < 0.05$). The Global Seasonality Score assessed by Seasonal Pattern Assessment Questionnaire increased significantly in July ($p < 0.05$), while the number of subjects who met the criteria for subsyndromal seasonal affective disorder (S-SAD) is two to five during the winter. Team-member exchange quality decreased in October ($p < 0.05$).

Conclusion: Wintering-over in Antarctica caused the following problems: desynchronized circadian rhythm, sleep disturbances, incidence of S-SAD, occurrence of negative affect and less exchange in team. The results provide data for establishing monitoring, assessing, prevention and treatment systems, and gain importance since wintering in Antarctic stations is analogous to long-term space missions.

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Circadian melatonin profile in opium and amphetamine dependent patients

H. Khazaie, H. Ahmadi, M. Ghadami

Sleep Disorders Research Center, Kermanshah University of Medical Sciences, Kermanshah, Iran

Introduction: The aim of this study was to investigate the relationship between opium and amphetamine dependency with the serum melatonin levels in the presence of circadian rhythm sleep disorders (CRSD).

Materials and methods: Forty four male amphetamine-dependent and opium-dependent patients with more than 1 year substance dependency enrolled in this study. The diagnoses of sleep disorders were established by a psychiatrist and were made on the basis of the criteria of ICSD-II using the patients' sleep logs. The control group consisted of 12 healthy male subjects. Blood samples were drawn every 4 h through an intravenous catheter. Serum melatonin levels were assayed using an enzyme-linked immunosorbent assay (ELISA) kit. Repeated measures analysis of variance (ANOVA) was used to assess differences between the melatonin levels at six separate times.

Results: The serum melatonin levels of the control subjects were significantly higher than both opium-dependent and amphetamine-dependent patients at 24:00, 4:00 and 8:00. The serum melatonin level of the opium-dependent patients were significantly lower than the amphetamine-dependent patients at 24:00 (26.9 ± 11.4 vs. 41 ± 19.4, respectively; $p = 0.006$) and were significantly higher than the amphetamine-dependent patients at 16:00 (12.7 ± 5.1 vs. 8.9 ± 4.1, respectively; $p = 0.011$).

Conclusion: This is an evidence of the effects of substance dependency on disruption in the circadian cycle of melatonin secretion in opium and amphetamine dependent patients.

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New technologies to improve fatigue rest management systems (FRMS) –Heart rate variability (HRV) and the time structure of man (BRAC)

D. Reisinger¹, J. Zeitlhofer², P. Hauschild²

¹ Austrian Airlines, Flight Safety Department, Vienna, Austria

² Sigmund Freud Private University, Vienna, Austria

Introduction: Fatigue risk management is an essential component within airlines safety management systems. In order to reduce the risk of fatigue-induced incidents and accidents airlines are required to implement fatigue risk management system (FRMS) by 2016. Newly developed algorithms clearly shows if and how adaptive the autonomic nervous system (ANS) is.

Materials and methods: This study uses the symptomatology of individuals with different defects resulting from stressful life circumstances and compares with healthy individuals.

The measurement of HRV and newly developed algorithms enables us to detect the capability of the ANS-reaction to strain and relaxation. This adds significant value according to rhythm-shift individuals suffering from jet-lag or irregular shift work.

In 16 normals (6 males, 10 females; age 45.73 ± 10.59), 12 depressives (7 males, 5 females; age 48.17 ± 7.27), 23 burnouts (18 males, 5 females; age 46.04 ± 8.53), and 21 patients with insomnia (17 males, 4 females; age 46.87 ± 7.56) 24 hour-recordings were performed.

Analysis of BRAC serves as an early detection and warning system if the capability of the individual's ANS adaption to strain or relaxation is reduced, if the rhythms shift deviate from optimum. Deficits of an individual with respect to alertness, power of concentration, ability to respond to strain can be detected and counter-measures can be initiated before these deficits reach a critical value.

The aim of the analysis is to show the relationship between an individual's level of strain and its capability to relax; moreover a long-term preservation of the individual's performance can be maintained.

Results: Different variables of heart rate variability (HRV) chronodynamic BRAC rhythmicity may be helpful for an objective support to improve the diagnostic process of sleep and activation in the future and preventive diagnostic for disorders of fatigue and burnout. The HRV-BRAC algorithm is an preventive intervention-tool to help humans to find better synchronization to their own basic rest and activation within the day-cycle.

Analysis of activation and relaxation rhythms shows a distinct difference between healthy individuals and those with psychological disorders, such as depression, sleep disorder or fatigue.

Looking at the ratio between strain and relaxation, vegetative balance (weighted mean frequencies) within the control group is 101%. This is an indication that the individual has the capability to recover from the strain induced by daily pressure.

For individuals with symptoms such as depression, fatigue syndrome and sleep disorders the capability of the ANS to adapt is reduced, which causes a degradation with respect to the capability to adapt to bio-rhythms – day-cycle and BRAC. The capability of these individuals to recover is clearly reduced.

Using the BRAC-Algorithm, the capability of these individuals to recover is reduced by 75% on average (85% for depression, 82% for fatigue syndrome and 74% for sleep disorders).

Conclusion: Assessing an individual's capability to regulate the ANS through HRV-measurement delivers objective parameters to detect increasing risk for psychological disorders and fatigue syndrome before becoming virulent.

Crew members get an objective assessment for their strain evaluation to avoid fatigue risks.

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Chronobiology of melatonin in climacteric women: New approaches on the treatment of insomnia

N. Semenova, I. Madaeva, L. Kolesnikova, E. Solodova, O. Berdina, L. Sholokhov
Scientific Centre of Family Health and Human Reproduction Problems, Russia

Introduction: Some studies have shown that sleep problems are reported by 39–47% of perimenopausal women and 35–60% of postmenopausal women. The role of regulator of circadian rhythms has been assigned to melatonin hormone.

Materials and methods: One hundred forty-six climacteric women divided into perimenopausal ($n = 72$) and postmenopausal group

($n = 74$) were examined. Each group was divided into control (without sleep disorders) and main group (with sleep disorders). Melatonin concentrations were determined in the saliva that was collected four times a day (6–7 AM, 12–1 PM, 6–7 PM, 11 PM–12 AM). Statistical analysis was performed by parametric and non-parametric tests with $p < 0.05$ as the level of significance.

Results: 45.8% perimenopausal and 59.5% postmenopausal women had sleep disorders. Perimenopausal women often complained on difficulties falling asleep and difficulties of morning awakenings, while postmenopausal women often complained on frequent awakenings during sleep and snoring. Insomnia Severity Index both in perimenopause and in postmenopause corresponded to sleep disorders. Sleep disorders in the perimenopausal women were associated with an increase in melatonin levels in the early morning and with a decrease in its concentration in daytime and in the evening in comparison with women of control group. The circadian rhythms of melatonin secretion in the group of postmenopausal women did not correlate to the occurrence of sleep disorders.

Conclusion: To normalize and shift chronobiological rhythms of melatonin secretion in the complex treatment of sleep disorders in perimenopausal women therapy with melatonin in the evening and light therapy in the early morning hours is recommended.

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Distribution and heritability of diurnal preference (chronotype) in a rural Brazilian family-based cohort, the Baependi study

M. Von Schantz^{1,2}, T. Taporoski³, A. Horimoto³, N. Esteban³, H. Vallada³, J. Krieger³, M. Pedrazzoli², A. Negrão³, A. Pereira³

¹ University of Surrey, UK

² University of São Paulo, Brazil

³ University of São Paulo Medical School, Brazil

Introduction: We have studied diurnal preference (chronotype) as part of a longitudinal family-based cohort study of a highly admixed population in Baependi, a small rural town in the state of Minas Gerais in Brazil with universal access to electricity, but a cohesive and conservative culture and very limited migration.

Materials and methods: Eight hundred twenty-five participants (497 females) between 18 and 89 years of age (average \pm SD = 46.4 ± 16.3), belonging to 112 different families, were included in this study. Ninety-six participants lived in the rural, and 728 in the municipal zone of Baependi. All participants completed the Horne–Östberg morningness–eveningness questionnaire (MEQ).

Results: Participants completed the morningness–eveningness questionnaire (MEQ), where a higher score represents greater morningness. The average score was 63.5 ± 11.2 . There was a significant ($p < 0.0001$) linear increase in MEQ as a function of age, and a non-significant trend toward greater morningness in men. Morningness was significantly ($p < 0.0001$) higher in the rural (70.2 ± 9.8) than in the municipal zone (62.6 ± 11.1). The general morningness in this population was so high that, by age 50, more than 50% of them would be classified as extreme morning type based on the typology originally published with the scale (scores 70–86), and only one single subject beyond this age would be classified as a (moderate) evening type. The deviation from the otherwise close fit to the regression line at higher MEQ scores caused a non-normal distribution based on the Kolmogorov–Smirnov test ($D = 0.0504$, $p = 0.0301$). Unadjusted heritability of MEQ was 0.21. However, the inclusion of age and gender as covariates raised this value to 0.48. The added inclusion of age \times age and age \times gender did not change this value. However, when age, gender, and municipal versus rural residence were all added as covariates, heritability was calculated as 0.38.

Conclusion: The Baependi population is strongly shifted toward morningness, particularly in the rural zone, so that the linear increase in MEQ score flattens as the morning types reach the arithmetic top of the scale in middle age. The reported heritability is more similar to previous twin studies than previous family studies.

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Insomnia and all-cause mortality: A register-linked study among Finnish, Norwegian and Lithuanian women and men

T. Lallukka¹, A. Podlipskytė², B. Sivertsen³, J. Andruskienė², G. Varoneckas², E. Lahelma¹, R. Ursin⁴, G. Tell⁴, O. Rahkonen¹

¹ Department of Public Health, University of Helsinki, Finland

² Lithuanian University of Health Sciences, Lithuania

³ Norwegian Institute of Public Health, Norway

⁴ University of Bergen, Norway

Introduction: Evidence on the association between insomnia symptoms and mortality is limited and inconsistent. We examined the association between key insomnia symptoms and subsequent all-cause mortality in three national cohorts to improve generalizability. In addition, key covariates were considered.

Materials and methods: The Finnish data comprised 6605 employees of the City of Helsinki, aged 40–60 years at baseline in 2000–2002. Mortality data were derived from the Statistics Finland until the end of 2012 (213 events). The Norwegian cohort included 6236 participants, aged 40–45 years at baseline in 1997–1999. All-cause mortality data until the end of 2012 were derived from the Norwegian Cause of Death Registry (160 events). The Lithuanian cohort comprised 1602 citizens of Palanga, aged 35–74 years at baseline in 2003. Mortality data were derived from the regional mortality register until the end of 2013 (141 events). In all cohorts, insomnia symptoms comprised difficulties initiating and maintaining sleep that were examined separately and as a sum score. Covariates were age, marital status, education, alcohol consumption, physical inactivity, obesity and self-rated health. Cox regression analysis was used to yield hazard ratios (HR) and their 95% confidence intervals (95% CI). All analyses were stratified by cohort and gender.

Results: In the Finnish cohort, frequent difficulties initiating sleep were associated with all-cause mortality among men after adjusting for age (HR 3.88; 95% CI 1.79–8.42). The association remained after adjustment for all covariates (HR 2.74; 95% CI 1.21–6.23), whereas no significant associations between insomnia symptoms and all-cause mortality were found among women. Similarly, in the Norwegian cohort, a strong association between frequent difficulties initiating sleep and all-cause mortality was found among men after adjusting for age (HR 5.80; 95% CI 2.64–12.76) as well as for all covariates (HR 3.95; 95% CI 1.64–9.49). Among Norwegian women an age-adjusted association was suggested (HR 2.16; 95% CI 1.00–4.64), but it attenuated and did not reach statistical significance. In the Lithuanian cohort, insomnia symptoms were not statistically significantly associated with all-cause mortality, although the patterns of the associations were suggestive of a similar association between difficulties falling asleep and mortality as among the other cohorts.

Conclusion: Difficulties initiating sleep were strongly associated with all-cause mortality among Norwegian and Finnish men. Contrasting effects of insomnia symptoms highlight the need to distinguish different symptoms and examine women and men separately.

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Polysomnographic and MSLT data in a large sample of patients with unexplained chronic fatigue and their relation with subjective scores

E. Tobback, A. Mariman, I. Hanouille, L. Delesie, D. Vogelaers, D. Pevernagie

Department of General Internal Medicine, University Hospital Ghent, De Pintelaan 185, B-9000 Ghent, Belgium

Introduction: This study aimed to assess objective parameters of sleep and sleepiness in a large sample of patients with unexplained chronic fatigue (UCF) and their relationship with subjective dimensions. A subanalysis was performed according to fulfilment of minor criteria within the 1994 CDC definition of chronic fatigue syndrome (CFS).

Materials and methods: Patients were recruited in a tertiary referral centre for UCF. Objective sleep parameters were derived from standard in-laboratory polysomnography (PSG) and multiple sleep latency testing (MSLT). As insomnia was hypothesized [1], PSG variables from both an insomnia and a good sleeper control group were selected from the literature for comparison [2]. Validated questionnaires assessed subjective dimensions of mental and physical health (Medical outcomes study short form 36), sleep quality (Pittsburgh sleep quality index), daytime sleepiness (Epworth sleepiness scale) and fatigue (Chalder fatigue scale).

Results: Out of 377 eligible patients, 245 subjects were included (mean age 38.6 years, SD 10.69, 86.1% female). PSG demonstrated decreased total sleep time and sleep efficiency as well as increased sleep latency and wake after sleep onset, similar to objective sleep parameters from the primary insomnia group and significantly different from good sleepers. Within the patients with UCF, both the Fukuda positive and negative subgroups showed similar objective results. PSG and MSLT data did not correlate with fatigue scores and only weak correlations were found between these objective data and mental health and subjective sleepiness. The latter was not substantiated by MSLT data. In UCF, subjective scores of fatigue and daytime sleepiness correlated weakly with objective indices derived from a single night PSG and MSLT.

Conclusion: The objective sleep parameters are characterized by an insomnia phenotype. No difference was found between Fukuda positive and negative patients. With further confirmation, validated treatments of insomnia, e.g. cognitive behavioural therapy may have a role in the management of UCF, including CFS.

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The effects of middle-of-the-night administration of hypnotic drugs on next-morning on-road driving performance

J. Verster¹, A. Van De Loo¹, M. Moline², T. Roth³

¹ Division of Pharmacology, Utrecht University, The Netherlands

² Eisai Inc, USA

³ Sleep Disorders and Research Center, Henry Ford Health System, USA

Introduction: As sleep maintenance problems are common, treatments enabling people to more rapidly fall asleep after middle-of-the-night (MOTN) awakenings, without impairing next morning alertness, are needed. The effects of MOTN administration on morning driving ability, i.e. a potentially dangerous daily activity that can be impaired, are reviewed.

Materials and methods: PubMed and Embase were searched for on-road driving studies that examined the effects of MOTN administration of hypnotics on morning driving performance.

Results: Four on-road driving studies were identified which all originated from The Netherlands. Each study applied a standardized 100-km highway driving test in normal traffic. Participants were instructed to drive with a steady lateral position and constant speed of 95 km/h. Primary outcome measure of the driving test was the Standard Deviation of Lateral Position (SDLP, cm), i.e. the weaving of the car.

Zolpidem (10 and 20 mg, oral immediate release tablets) significantly impaired on-road driving in a dose-dependent manner, when tested 4 hours after MOTN administration. Gaboxadol (15 mg) and zopiclone (7.5 mg) also significantly impaired next-morning driving after MOTN administration. In contrast, buffered sublingual zolpidem tartate (3.5 mg) and zaleplon (10 and 20 mg) did not significantly affect driving 4 hours after MOTN administration. Driving performance after MOTN administration of benzodiazepine hypnotics was not examined.

Conclusion: Driving was not affected 4 hours after MOTN administration of sublingual zolpidem tartate (3.5 mg) or zaleplon (10 and 20 mg). Significant driving impairment was found after MOTN administration of zolpidem (10 and 20 mg), gaboxadol (15 mg), and zopiclone (7.5 mg).

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Blood lead levels and sleep quality in workers of lead–zinc companies

M. Yoosefian¹, K. Sadeghniai Haghighi¹, O. Aminian¹, E. Naraqi²

¹ Occupational Sleep Research Center, Baharloo Hospital, Tehran

University of Medical Sciences, Tehran, Iran

² Imam Hossein Hospital, Zanjan, Iran

Introduction: Effects of lead on creating a variety of sleep disruption is not well understood and most studies have been confined only to subjective chief complaint of insomnia and in some studies standardized tests are used.

This study assessed the relationship between blood lead level and sleep quality of exposed workers.

Materials and methods: It was a cross-sectional study. Workers of four lead–zinc companies in Iran were studied.

Blood lead level (BLL) concentrations were evaluated and sleep quality assessed with standardized sleep questionnaires. These questionnaires were Insomnia Severity Index (ISI), Epworth Sleepiness Scale (ESS), Pittsburgh Sleep Quality Index (PSQI) and sleep apnea test (STOP-BANG).

Statistical analyses were performed using SPSS 16 software.

Results: Four hundred twenty-five workers were studied. Mean of BLL was 34.7 ± 16.7 $\mu\text{g/dl}$.

Association between BLL and questionnaires scores shows that increasing BLL was associated with higher odds of abnormal ISI score, ESS score and PSQI score (p for trend 0.000), but not for STOP-BANG score (p for trend 0.57).

High BLL was associated with difficulty falling asleep, difficulty staying sleep, waking up too early and shorter duration of sleep.

Conclusion: Lead increase risk of of sleep disorders. It is concluded that workers exposed to lead at levels considered safe might be at risk of sleep disorders. We should select ways to further reduce environmental and occupational lead exposures.

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The effect of caffeine consumption on sleep parameters is dependent on ADORA2A c.1083T>C genotypes in a large population-based cohort from São Paulo, Brazil

R. Nunes, D. Mazzotti, C. Hirotsu, M. Andersen, L. Bittencourt, S. Tufik

Universidade Federal de São Paulo, Brazil

Introduction: Associations between the c.1083T>C adenosine A2A receptor (ADORA2A) polymorphism and sensitivity to caffeine have been previously described. We aimed to investigate the effect of this variant on the association between caffeine consumption and sleep parameters in a population-based cohort from Sao Paulo, Brazil.

Materials and methods: The genotyping of the ADORA2A polymorphism was performed in 926 subjects of the Sao Paulo Epidemiologic Sleep Study (EPISONO) that underwent full-night polysomnography and evaluation of caffeine consumption.

Results: This study have shown significant differences in the proportion of slow-wave sleep in relation to caffeine consumption only in TT genotype carriers. Those who consumed one dose or less in the day before the polysomnography showed a greater proportion of this sleep stage ($22 \pm 8.5\%$) than those who consumed two or more doses ($20 \pm 7.7\%$; $p = 0.046$). Differences were also found in the patterns of REM sleep in homozygous TT, where an increase in the percentage of REM sleep in those who consumed two or more doses of caffeine ($20\% \pm 6.9\%$) in relation those who consumed one dose or less ($18\% \pm 6.3\%$; $p = 0.034$). We did not find such associations in TC or CC genotype carriers.

Conclusion: This study showed that variants in ADORA2A gene may influence sleep patterns in response to caffeine consumption and this might help to explain the interindividual variability of this phenotype.

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Can sleep disturbances predict suicide risk in patients with schizophrenia-spectrum disorders? A 8-year naturalistic longitudinal study

S. Li¹, J. Lam², J. Zhang², M. Yu², J. Chan², C. Chan², C. Espie³, D. Freeman³, O. Mason¹, Y. Wing²

¹ University College London, UK

² The Chinese University of Hong Kong, Hong Kong

³ University of Oxford, UK

Introduction: Disrupted sleep is one of the prominent presenting symptoms implicated in the clinical course of psychotic disorders. The aims of this study were to examine the prevalence of sleep disturbances, particularly insomnia and nightmares, and their associations with the risk of suicide attempts in patients with schizophrenia-spectrum disorders.

Materials and methods: A 8-year prospective observational study was conducted in a consecutive cohort of psychiatric outpatients diagnosed with schizophrenia-spectrum disorders. Patients recruited from a university-affiliated psychiatric outpatient clinic completed a detailed sleep questionnaire assessment at baseline in 2006. Relevant clinical information, including patients' comprehensive clinical history since their attendance of psychiatric services until 8 years after their completion of the baseline questionnaire, was reviewed.

Results: Four hundred and twelve patients with psychosis were recruited at baseline, and 383 patients diagnosed with schizophrenia-spectrum disorders were included in the analysis. Prevalence of frequent insomnia and frequent nightmares was 24% and 10%, respectively. Patients with frequent insomnia were more likely to be married ($p < 0.01$) and less likely to have completed a higher education ($p < 0.05$). They were also more likely to be prescribed more than one psychotropic medication ($p < 0.01$), especially antidepressant ($p < 0.05$) and benzodiazepine ($p < 0.01$), and to report a better drug compliance ($p < 0.5$). Frequent nightmares were associated with comorbid physical illness ($p < 0.05$). Frequent insomnia reported at baseline was significantly associated with an increased incidence of suicide attempt during the follow-up period (HR = 5.08, 95% CI = 1.51–17.11, $p < 0.01$) after adjusting for the demographic and clinical characteristics as well as past history of suicide and hospitalisation. Comorbidity of nightmares and insomnia was associated with an increased risk of suicide attempt (HR = 6.97, 95% CI = 1.23–39.55, $p < 0.05$) over the 8 years of follow-up.

Conclusion: Sleep disturbances are commonly reported in patients with schizophrenia-spectrum disorders. The prospective association between sleep disturbances and suicidal risk underscores the need for enhanced clinical attention and sleep-focused treatment in the integrated clinical management of schizophrenia.

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Implication of the striatopallidal pathway in Parkinson's disease (PD) related sleep disorder

Y. Cherasse¹, B. Zhang², Y. Urade¹, M. Lazarus¹

¹ International Institute for Integrative Sleep Medicine (WPI-IIIS), University of Tsukuba, Japan

² State Key Laboratory of Medical Neurobiology, Fudan University, Shanghai, China

Introduction: PD is the second most common neurodegenerative disease in the world. Most research on PD has focused on defining disease mechanisms. However, PD is also characterized by significant cognitive impairment and sleep disturbance. Alleviation of these cognitive and sleep symptoms remains a major need in the clinical management of PD.

Materials and methods: Adenosine A2A receptors (A2ARs) are highly expressed in the striatum where they co-localize with dopamine D2 receptors in the indirect pathway. Our central hypothesis is that the A2A receptors in striatopallidal neurons function as a "brake" mechanism on wakefulness and cognitive flexibility in PD models.

We started experiments characterizing the effect of dopaminergic neurons deletion on sleep and then we defined the role of the striatopallidal pathway in control of arousal and cognition by pharmacogenetic manipulation with the DREADD approach in normal and PD models mice (6-OHDA injected mice).

Results: The results indicated that stereotaxic micro-injection of 6-OHDA (4 µg diluted into 1 µl of artificial CSF) bilaterally into the nucleus accumbens (NAc) or directly into the substantia nigra pars compacta (SNc) of C57BL/6 male mice dramatically reduced the total sleep amount. This effect is particularly severe during dark phase (NREM: -11% in SNc injected mice, -24% in NAc injected mice; REM: -40% in SNc injected mice, -58% in NAc injected mice).

Using A2A-Cre mice, DREADD receptors were expressed solely on the indirect pathway neurons by using stereotaxic microinjection of viral vectors carrying the DREADD systems into the striatum. Pharmacogenetic excitation of A2AR-expressing neurons in the NAc via hM3Dq by CNO produced a robust increase in NREM sleep in mice.

Conclusion: We expect the proposed study to define a novel role of the indirect pathway and striatopallidal A2ARs in normal striatal integration of motor function, arousal and cognition, and to identify novel strategies for treating sleep disturbance and cognitive impairment in PD using A2AR antagonist.

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Somatization symptoms in elderly with suspect of sleep-disordered: Is it effect of age or of sleep quality?

M. Fagundes¹, E. Ferreira¹, B. Peukert², C. Fiori¹, M. Pedrosa¹, L. Borges³, R. Pacheco¹, C. Montanari³, D. Martinez²

¹ Graduate Program in Cardiology and Cardiovascular Sciences, UFRGS, Brazil

² Graduate Program in Medical Sciences, Universidade Federal do Rio Grande do Sul, Ufrgs, Brazil

³ Cardiology Division, Hospital de Clinicas de Porto Alegre (HCPA), UFRGS, Brazil

Introduction: The instrument of psychological assessment, SCL-90R, includes the somatization scale. We tested the hypothesis that the somatization score of the SCL-90R would be higher in older people and with reductions in the amounts of total sleep, deep sleep, and REM sleep than in elderly people.

Materials and methods: Patients with suspected sleep disorders who underwent overnight polysomnography in a sleep clinic were selected in two age groups: 100 patients older than 80 years (the oldest old) and 156 controls with exactly 60 years. All participants answered a demographic questionnaire and psychiatric symptoms questionnaire (SCL-90R). To predict somatization symptoms linear regression analysis was performed controlling for multiple polysomnographic variables and to potential confounders.

Results: The older patients had lower sleep time (vs. 5 h 34 min 6 h 25 min; $p < 0.001$), lower percentage of time in deep sleep (10% vs. 17%; $P < 0.001$), and REM sleep (9% vs. 14%; $p < 0.001$). The somatization score was higher in older subjects in total (0.99 vs. 0.76; $p = 0.016$) due to only three symptoms: (1) weakness or dizziness ($p < 0.001$); (2) weakness in parts of your body ($p < 0.001$); and (3) heavy arms and legs ($p = 0.028$). Among the elderly 60 years and in older subjects women had higher scores than men in the somatization symptoms, 1.05 vs. 0.39, $p < 0.001$, and 1.19 vs. 0.73, $p = 0.002$,

respectively. The correlation between sleep efficiency and somatization scores was non-significant in the groups. Multiple regression analysis was used as the model to explain the somatization scores as regressors: sleep stages ($p > 0.05$) and sleep efficiency ($p = 0.008$) was highly significant (adjusted $R^2 = 0.2$; $p < 0.001$). The main regressor was sex ($p < 0.001$).

Conclusion: Individuals over 80 years old had lower sleep efficiency and higher symptom of somatization scores. In this sample, the decline in sleep efficiency with age seems to explain the somatization symptoms when adjusting for sex.

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Growth and development of upper airway and surrounding tissues in non-snoring children

S. Liu, Y. Zhou, X. Gao

Department of Orthodontics, Peking University School and Hospital of Stomatology, China

Introduction: The study aims to determine the feature of growth and development in the upper airway and surrounding tissue by longitudinal observation and measurement of non-snoring children under strict controlling of age and sleep breathing status.

Materials and methods: The study recruited children aged 8–13 coming for consultation in the Department of Orthodontics, School and Hospital of Stomatology Peking University between 2008 and 2012. Sixty children with no obvious skeletal deformities finally left in the study after questionnaires, polysomnography (PSG) to rule out sleep disorders.

Children were divided into six groups. Comparative analysis was done for observations of morphological and functional changes by cephalometric tomographic data (10 subjects in each group, male:female 1:1) and mixed longitudinal data of MRI (8-year group: 7 subjects, male:female 1:6; 9-year group: 15 subjects, male:female 3:12; 10-year group: 21 subjects, male:female 7:14; 11-year group: 18 subjects, male:female 11:7; 12-year group: 13 subjects, male:female 10:3; 13-year group: 7 subjects, male:female 6:1).

Results: Cephalometric analysis revealed significant differences in PNS-R, UPW, SPP-SPPW, PAS, V-LPW, ANS-Ptm, Go-Me, N-ANS, N-Me, Co-Go, H-CVP, H-SN, H-FH, SPT, TGL and TGH in six groups. MRI analysis revealed (a) volume and transverse dimensions in nasopharynx, glossopharynx and laryngopharynx were significantly different in six groups; (b) mean CSA and sagittal dimension in laryngopharynx increased significantly as age grew; (c) inter-ramus dimensions M, AD in velopharynx, inter-ramus dimension M in glossopharynx, the volume of the tongue V and the volume the soft palate SP increased significantly as age grew.

Conclusion: The development of the upper airway during the peak period of growth in children in axial images of MRI mainly manifested as the increase of transverse dimension. Velopharynx showed no three-dimensional changes as age grew, but the enlargement of laryngopharynx was relatively obvious.

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Sleep spindle alterations in patients with Parkinson's disease

J. Christensen^{1,2,3}, M. Nikolic², S. Warby⁴, H. Koch^{1,2,3}, M. Zoetmulder^{2,5}, R. Frandsen², K. Moghadam⁶, H. Sorensen¹, E. Mignot⁷, P. Jennum^{2,8}

¹ Department of Electrical Engineering, Technical University of Denmark, Denmark

² Danish Center for Sleep Medicine, Department of Clinical Neurophysiology, Glostrup Hospital, Denmark

³ Stanford Center for Sleep Sciences and Medicine, Psychiatry and Behavioral Sciences, Stanford University, Stanford, CA, USA

⁴ Center for Advanced Research in Sleep Medicine, Sacré-Coeur Hospital of Montréal, University of Montréal, Quebec, Canada

⁵ Department of Neurology, Bispebjerg Hospital, Denmark

⁶ Department of Biomedical and Neuromotor Sciences (Dibinem), University of Bologna, Italy

⁷ Stanford Center for Sleep Sciences and Medicine, Psychiatry and Behavioral Sciences, Stanford University, Stanford, CA, USA

⁸ Center for Healthy Aging, University of Copenhagen, Denmark

Introduction: The aim of this study was to identify changes of sleep spindles (SS) in the EEG of patients with Parkinson's disease (PD).

Materials and methods: Spindles were manually identified at a central scalp location (C3-A2) in 15 patients with PD and 15 age- and sex-matched control subjects by five sleep experts. Each SS was given a confidence score indicating the SS as either "definite", "possible" or "maybe". By using a group consensus rule, 901 SS were identified and characterized by their (1) duration, (2) oscillation frequency, (3) maximum peak-to-peak amplitude, (4) percent-to-peak amplitude and (5) density. For both groups, the part of identified SS that would not count as a SS according to the criteria stated by AASM were computed. Finally, the inter-expert reliability was for each group computed as the mean Cohen's Kappa across the 10 available expert pairs. Between-group comparisons were made for all SS characteristics computed.

Results: Significant changes for patients with PD versus control subjects were found for the duration, oscillation frequency, maximum peak-to-peak amplitude and density. Specifically, the duration was found to be longer, the oscillation frequency was found to be slower and the maximum peak-to-peak amplitude was found to be higher in patients versus controls. We also found a significantly lower reliability in scoring definite SS in patients compared with controls, and a non-significant trend of a lower reliability in patients compared with controls when scoring definite/possible SS. No significant differences were found between groups for the parts of abnormal SS.

Conclusion: We conclude that SS are significantly altered in patients with PD, but that due to high inter-subject variability in disease progression and severity, future longitudinal studies are needed to investigate the clinical utility of the SS morphology changes as well as their value as prognostic biomarkers.

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Effect of sleep intervention using a summer holiday workbook for junior high-school students

Y. Oka¹, F. Horiuchi², K. Kawabe²

¹ Center for Sleep Medicine, Ehime University Hospital, Japan

² Department of Neuropsychiatry, Ehime University Graduate School of Medicine, Japan

Introduction: Sleep habit is largely influenced by various factors including media exposure and irregular daily schedule especially in adolescents. The aim of our study was to develop a sleep education workbook for summer holiday targeting junior high-school students and to elucidate its effectiveness.

Materials and methods: This study was conducted at Kuma Kogen town in Japan. Three educational sessions were included in the workbook; (1) self-management of sleep habits, (2) daytime light exposure and outside activity, and (3) self-control of media exposure before bedtime. Achievement of each sessions and effect of the intervention were analyzed.

Results: One hundred and one workbook has been returned to us so far. 69.5% of students were able to work well on the material. Achievement of the goal on each topics was reached in 72.6% for sleep-wake schedule, 50.7% for optimal light exposure and 51.7% for appropriate media use. Improvement of sleep and daytime quality of life after summer holiday was experienced in 56.5% of students; 24.5% of them are refreshed in the morning, 28.1% of them improved initiation of sleep and 45.6% of them are more active during daytime.

Conclusion: Sleep education material for summer holiday intervention was developed for Japanese junior high-school students and was effective in improving the awareness of good sleep hygiene among children and also improved nocturnal and daytime quality of life.

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Nocturnal wakefulness at 3 months predicts toddler cognitive, language and motor abilities

E. Tham¹, B. Broekman¹, D. Goh², O. Teoh³, Y. Chong¹, P. Gluckman¹, K. Godfrey¹, M. Meaney¹, A. Rifkin-Graboi¹, J. Gooley⁴

¹ Singapore Institute for Clinical Sciences, Agency for Science, Technology and Research (A*STAR), Singapore

² Department of Paediatrics, University Children's Medical Institute, National University Health System, Singapore

³ Department of Paediatrics, KK Women's and Children's Hospital, Singapore

⁴ Program in Neuroscience and Behavioral Disorders, Duke-NUS Graduate Medical School Singapore, Singapore

Introduction: As sleep problems are common in Asia, this study investigated if sleep plays a role in predicting developmental outcomes in Singaporean children. Most research is based on cross-sectional studies. Here we investigated whether sleep quality measured by nocturnal wakefulness at 3-months predicts cognitive, language and motor performance at 24-months.

Materials and methods: In this study a subset of 159 infants were included from the larger Growing Up in Singapore Towards healthy Outcomes (GUSTO) cohort study (Soh et al., 2013). Inclusion criteria were term born infants between 37 and 41 of gestational age, APGAR score ≥ 9 , normal birth weight (2500–4000 g), and no maternal complications during pregnancy.

Primary caregivers completed the Brief Infant Sleep Questionnaire (Sadeh, 2004) when the infants were 3- and 24-months old.

Nocturnal wakefulness was assessed by the question 'How much time does your child spend in wakefulness from the time he/she falls asleep in the evening to waking up the following morning?'. The Bayley scales of infant and toddler development screening assessment was conducted during a home visit when the infants were 24-months old.

The data for nocturnal wakefulness were square-root transformed due to a positive skew and standard Z-scores were calculated. Nocturnal wakefulness at age 3-months and Bayley's cognitive, language and motor measures age 24-months were analyzed using generalized linear models in SPSS, controlling for effects of gender, ethnicity and maternal education.

Results: Increased amount of time spent in nocturnal wakefulness during infancy predicted poorer Bayley's scaled scores for across the cognitive, language and motor domains.

For the cognitive scale, every 1 standard deviation (SD) increase in 3-months' nocturnal wakefulness (i.e. poor sleep quality) predicted a 0.67 point decrease in Bayley's cognitive scores ($t_{154} = -2.58$, $p = .011$). For the language scale, every 1 SD increase in nocturnal wakefulness predicted a 0.81 and a 0.58 decrease in receptive language ($t_{153} = -2.98$, $p = 0.003$) and expressive language scores respectively ($t_{153} = -2.51$, $p = 0.013$). In addition to cognition and language, every 1 SD increase in nocturnal wakefulness also predicted a 0.75 decrease in gross motor performance ($t_{152} = -2.50$, $p = 0.013$). In contrast, there was no significant relationship between 3-months nocturnal wakefulness and 24-month fine motor performance ($t_{153} = -0.87$, $p = 0.39$).

Conclusion: Since longer nocturnal wakefulness is a marker of poor sleep quality, results highlight that early measures of infant sleep quality from as young as 3-months of age are useful predictors of cognitive, language, motor performance during toddlerhood. This suggests that sleep is important for multiple developmental outcomes throughout childhood.

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How effective is the music intervention in improving sleep quality among elder people? Results of a randomized control trial

Q. Wang¹, S. Chair¹, E. Wong¹, X. Li²

¹ The Nethersole School of Nursing, Faculty of Medicine, The Chinese University of Hong Kong, Hong Kong

² Faculty of Nursing, College of Medicine, Xian Jiaotong University, China

Introduction: Poor sleep quality is commonly reported in elder people. Given the side-effects of pharmacological treatments, a safe and effective non-pharmacological intervention is needed to improve elder people's sleep quality. The study examined the effectiveness of music therapy on sleep quality in Chinese elder people.

Materials and methods: A randomized control trial was conducted in communities of Xian, China. Elder people with poor sleep quality (Pittsburgh Sleep Quality Index, PSQI > 7) were recruited and allocated to either the control or the intervention group. The control group received standardized sleep hygiene education. Besides education, the intervention group listened to the music for 30 minutes per night at home, for 12 weeks. A music database including 169 pieces of soft and slow music without lyrics, was provided. All

participants received standardized telephone calls every 2 weeks. The sleep quality measured by PSQI was assessed at baseline and after 4, 8 and 12 weeks of intervention. Repeated measure analysis of variance (RANOVA) was used to compare the sleep quality between groups across time.

Results: A total of 32 elder people was allocated to each group (N = 64). The mean age was 69.38 (60–81) years. The two groups had similar demographic characteristics and sleep quality at baseline. All participants completed the whole study and no side-effects were reported. The intervention group showed continuously reductions in global PSQI: from 13.53 at baseline to 9.28 at 4-weeks, 8.28 at 8-weeks and 7.28 at 12-weeks. Though the control group also showed similar improvements (12.26 at baseline, 9.59 at 4-weeks, 8.72 at 8-weeks and 8.72 at 12-weeks), the intervention group demonstrated greater improvements in sleep quality than the control ($p=0.020, 0.012, 0.001$ for 4-, 8- and 12-week follow-up respectively). RANOVA analysis revealed significant group-by-time interactions in global score and three components of PSQI: sleep latency, sleep efficiency and daytime dysfunction (all $p < 0.05$).

Conclusion: Listening to soft and slow music improved the sleep efficiency, shortened sleep latency, and reduced daytime dysfunction. Music therapy is a safe and effective non-pharmacological intervention in improving the sleep quality of community-dwelling elder people.

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Sleep quality in Chinese overweight and obese elder people

Q. Wang¹, S. Chair¹, E. Wong¹, X. Li²

¹ The Nethersole School of Nursing, The Chinese University of Hong Kong, Hong Kong

² Faculty of Nursing, College of Medicine, Xian Jiaotong University, China

Introduction: Poor sleep quality is among the most common complaints in elder people. Fitness and depression are reported as risk factors for poor sleep quality. This study aimed at assessing the sleep quality and exploring its influencing factors in Chinese overweight and obese elder people.

Materials and methods: A cross-sectional design was used. Elder residents aged over 60 years and with a body mass index (BMI) ≥ 23 kg/m² were recruited from four community centers in Xi'an, China. Sleep quality was assessed by Pittsburgh Sleep Quality Index (PSQI >7). Besides demographic characteristics, possible influencing factors of medical history, living conditions, medical payment methods, depressive symptoms (measured by the 15-item Geriatric Depression Scale, GDS-15) and lifestyles were collected by structured questionnaire. Multiple linear regression analysis was employed to detect the influencing factors of sleep quality.

Results: A total of 284 elder residents were recruited, of which 184 (64.8%) were women and the mean age was 70.4 (SD = 6.44) years. The participants had a mean BMI of 26.16 (range: 23.00–36.73) kg/m², and 179 (63.0%) were obese with a BMI ≥ 25.0 kg/m². The mean PSQI score was 7.84 (SD = 4.46, range 0–20), and 139 (48.9%) participants had poor sleep quality (PSQI >7). The GDS-15 revealed a mean score of 2.27 (SD = 2.73), and 40 (14.1%) elder people had depression (GDS-15 >4). In the bivariate analyses, participants with different age, gender, religion beliefs, BMI, health status,

satisfaction to one's health, availability of medical insurance, and habits in drinking tea or coffee revealed different PSQI scores ($p < 0.05$). Finally, factors of depression, health status, BMI, availability of medical insurance, gender, religion and age entered into the final regression model for sleep quality (p values < 0.05 , adjusted $R^2 = 0.226$).

Conclusion: The sleep quality was poor in Chinese overweight and obese elderly. Factors of depression, health status, BMI, availability of medical insurance, gender, religion and age could predict their sleep quality. Future interventions that focus on fitness and psychological well-being should promote the sleep quality of Chinese overweight and obese elderly.

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The correlation of insomnia and MMSE-Thai 2002: Results from a study of thai elderly population

T. Awirutworakul¹, C. Sukying¹, U. Udomsubpayakul²

¹ Department of Psychiatry, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand

² Statistical Unit, Research Center, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand

Introduction: Although Mini-Mental Status Exam (MMSE) has been widely used as cognitive screening instrument, MMSE scores could be affected by many conditions including insomnia. The objective of this study was to examine the correlation between insomnia and the MMSE score in the community-dwelling elderly after being adjusted for age and educational level.

Materials and methods: We analyzed data from a national epidemiologic study of cognitive impairment in the elderly which included 40,111 community-based individuals, aged 60 years and older. Cognitive function and insomnia conditions were measured by using the 30-item MMSE-Thai 2002 and insomnia questionnaire.

Results: The prevalence of insomnia was 53.7%. Subjects with insomnia had lower mean MMSE score than subjects without insomnia (21.56 ± 4.80 vs 23.41 ± 4.73). The correlation between insomnia and MMSE score was significant after controlling for age ($1.41-1.60$; $p < 0.05$). Sub-analysis on level of education (not attend school, 1–4 years of education and over 4 years of education), with different cut-off score (14, 17 and 22), also found the lower mean MMSE scores among insomnia subjects compared with non-insomnia subjects (17.56 ± 4.66 vs 18.60 ± 4.67 , 22.95 ± 4.23 vs 24.20 ± 4.23 and 26.20 ± 3.29 vs 27.16 ± 3.28). There were significant correlation between insomnia and MMSE scores in every group of educational level ($p < 0.01$). When each insomnia condition (difficulty initiating sleep, difficulty maintaining sleep and early morning awakening) was examined, the result yielded significant correlation in all conditions of insomnia with MMSE scores ($1.62-1.83$; $p < 0.001$, $1.49-1.70$; $p < 0.001$ and $1.32-1.52$; $p < 0.001$, respectively).

Conclusion: We concluded that insomnia of all conditions had correlation with the total score of MMSE-Thai 2002 and this relationship should be taken into consideration while interpreting the result.

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How do people with and without insomnia evaluate their sleep: Are they different?

S. Bailes¹, C. Fichten², R. Amsel³, D. Rizzo⁴, R. Grad⁵, M. Baltzan⁶, A. Pavilanis⁷, B. Capozzolo⁸, E. Libman¹

¹ Jewish General Hospital, McGill University, Canada

² Jewish General Hospital, McGill University, Dawson College, Canada

³ McGill University, Canada

⁴ Jewish General Hospital, Université de Montréal, Canada

⁵ Jewish General Hospital, McGill University, Herzl Family Practice Centre, Canada

⁶ McGill University, OSR Medical, Canada

⁷ St-Mary's Hospital, McGill University, Canada

⁸ OSR Medical, Canada

Introduction: The term “sleep quality” appears often in sleep research, but exactly what it refers to is unspecified. We analyzed two questionnaires that each included a sleep quality item and evaluated the correlates and predictors of these, using the other questionnaire items.

Materials and methods: Participants were 88 primary care patients recently diagnosed with OSA: 57 patients seeking cognitive-behavior therapy for insomnia (CBT-I-DIMS), and 26 community participants with no insomnia or OSA (Control Group). OSA participants were divided into DIMS (difficulty initiating and maintaining sleep) and No DIMS groups based on typical research criteria (i.e., at least 31 minutes of undesired wake time at least three times per week with a problem duration at least 1 month). All participants completed a series of questionnaires, including the Sleep Symptom Checklist (SSC) and the Sleep Questionnaire (SQ). On the SSC, participants rate the severity of several sleep-related symptoms from 0 to 3 (very severe), including “Poor Sleep Quality”. The SQ asks the respondent about several sleep parameters as well as sleep related experiences, including “Sleep Quality” rated from 1 (very poor) to 10 (very good).

In order to reduce the number of variables into more coherent dimensions, a principle components factor analysis with varimax rotation was performed for individual items from the SQ and the SSC, excluding the two sleep quality items. Subscale scores, based on the factor structure, were then used in regression analyses to predict the sleep quality items.

Results: Initial analyses included 34 items from the two questionnaires. The optimal rotated solution yielded five factors based on 24 items. These factors were assigned descriptive labels as follows: Daytime Difficulty, Sleep Initiation, Sleep Continuity, Psychological Distress, and Sleep Apnea. A Non Refreshed factor was added from two items that did not load strongly on other factors, yet were moderately correlated with sleep quality.

Analysis of variance, comparing the different groups revealed that the groups with DIMS were similar and significantly different from the groups with no DIMS in their pattern of subscale scores. Therefore, the groups were combined into No DIMS and DIMS groups in order to conduct regression analyses.

Linear regression analyses predicting each of the two sleep quality items were carried out separately for each of the No DIMS and DIMS groups. Results indicated that Sleep Continuity and Non Refreshed subscales were important predictors of sleep quality for both groups. For the No DIMS group, Daytime Distress and Sleep Apnea were also important predictors of sleep quality.

Conclusion: Sleep continuity and feeling refreshed in the morning are important determinants of the subjective experience of sleep quality for people with and without insomnia.

Daytime experience is a particularly salient aspect of sleep quality in individuals.

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The patient' view of CPAP treatment: A preliminary study of patient-reported outcomes

K. Conrod¹, D. Rizzo², D. Tran², R. Grad³, A. Pavilanis⁴, S. Bailes⁵, L. Creti⁵, C. Fichten⁶, E. Libman⁵

¹ Jewish General Hospital, Canada

² Jewish General Hospital, Université de Montréal, Canada

³ Jewish General Hospital, McGill University, Herzl Family Practice Centre, Canada

⁴ St-Mary's Hospital, McGill University, Canada

⁵ Jewish General Hospital, McGill University, Canada

⁶ Canada

Introduction: Symptom presentation in OSA is variable and may include complaints of poor sleep, poor daytime functioning, and psychological distress. CPAP treatment is the gold standard, but many patients are non-adherent. Here we investigate views of adherent and non-adherent OSA patients 2 years after diagnosis.

Materials and methods: Participants were 12 individuals (six males, six females) 45 years of age and over (median = 59; range = 45–74) who underwent overnight polysomnography and were diagnosed with OSA. All completed a phone interview 2 years after diagnosis and a treatment recommendation of CPAP. The interview included questions about daytime functioning, sleep quality and emotional well-being (rating scales, 0–3). Participants were also asked to openly discuss their thoughts regarding treatment (i.e., difficulties comfort, etc.).

Results: Participants were divided into two groups according to self-reported treatment adherence. Seven participants were in the “adherent” group and five participants in the “non-adherent” group. Pre-treatment health-related quality of life (SF-36) scores were similar for both groups. At 2 year follow-up, the adherent group was characterized by significantly ($p < 0.05$, Mann–Whitney U) better daytime functioning, sleep quality and emotional well-being. Non-adherent participants reported strong negative views related to diagnosis and CPAP adjustment (e.g., “I do not want to sleep with a machine!”), whereas adherent participants reported more positive experiences (e.g., “I can't live without my CPAP machine!”).

Conclusion: These preliminary data indicate that although the two groups started out at the same level, adherent participants experienced better daytime functioning, sleep quality and emotional well-being than non-adherent individuals. Understanding adherent users' experiences may help practitioners tailor treatment recommendations with the aim of improving adherence.

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Study of sleep disorders in flight group and comparison with land group in an Iranian private aviation company in the year 2010

K. Sadeghniaat¹, S. Khazaei¹, O. Aminian¹, P. Momeni²

¹ Society of Occupational Medicine, Iran

² Iran

Introduction: This research studies the prevalence of sleep disorder in pilot population by using the standard questionnaires, and it can be the foundation of complementary studies and executive

measures to improve public health and prevent the complications of these disorders.

Materials and methods: In this study, historical cohort was done on ground staff and flight crew personnel of private airlines that have been randomly selected. All participants were asked to complete two standard questionnaires ISI (insomnia) and ESS (daily excessive sleepiness review). Daily excessive sleepiness is considered as ESS > 10 and insomnia as 8 > ISI.

Results: The prevalence of sleepiness in 27% of ground staff 24% of flight crew and the prevalence of insomnia in the ground staff was 60% and 66% in the Flight crew. In this study the relationship between insomnia and two variables, age over 50 years (pv: 0/005 year) and more than 20 years of experience (pv: 0/020) is also significant.

Conclusion: It is proved in this study that the daily extreme sleepiness has high prevalence in the pilots and also insomnia is the most complication in this group.

Acknowledgements: In summary we can say that according to the results of this study particularly complaints of difficulty initiating sleep, Frequent awakening during sleep and waking up early morning and excessive daily sleepiness due to special occupational conditions in these individuals have a high prevalence.

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PTSD-related paradoxical insomnia: An actigraphic study

H. Khazaie, M. Ghadami, M. Nasoori, B. Khaledi Paveh
Sleep Research Center, Department of Psychiatry, Kermanshah University of Medical Sciences, Kermanshah, Iran

Introduction: Sleep disturbance is a common self-reported complaint by PTSD patients. However, there are controversies in documenting objective indices of disrupted sleep in these patients. The aim of the present study was to assess of sleep disturbances in veterans with chronic PTSD, by subjective and objective records.

Materials and methods: Thirty two PTSD patients with complaints of insomnia who evaluated by Clinician Adminstrated PTSD Scale version 1 (CAPS), completed Pittsburg Sleep Quality Index (PSQI), for subjective evaluation of sleep. For objective evaluation participants underwent two consecutive overnight actigraphic records. Total Sleep Time (TST), Sleep Latency (SL), Sleep Efficiency (SE) and Number of Awakening after Sleep Onset (NASO) were measured in all participants.

Results: Participants underestimated TST, SE as well as NASO in the questionnaire relative to actigraphy and overestimated SL (p < 0.0001 for TST, SE, SL and p: 0.03 for NASO, respectively).

Conclusion: Objective sleep architecture does not adversely affect veterans with chronic PTSD. Cognitive-behavior therapy (CBT) may be considered as a potential treatment of insomnia complaint for these patients.

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The preliminary study on parenting styles, emotion, interpersonal relationship in childhood of insomnia patients

W. Wang, G. Li, X. Lv, L. Hong, X. Zhou
Guang'anmen Hospital China Academy of Chinese Medical Sciences, China

Introduction: Chinese old saying: from a person's three years old can know his grew up stage, from the person's seven years old can know his old stage. The research aimed to study the connection

between insomnia patients and normal volunteers on parenting styles, emotion, and interpersonal relationship in childhood.

Materials and methods: Selected 79 insomnia patients from the clinic and 79 normal volunteers. Selected childhood parenting styles, childhood emotion, childhood interpersonal relationship of Guang'anmen memory-tracing personality inventory (GMPI) as observation indexes. And then to analyze the data.

Results: There is statistical significance between two groups on three dimensions. The score of insomnia group is higher than normal group on severe and punishment of parenting styles, anxiety dimensions of emotion, as well as the communication behavior dimension of interpersonal relationship (p < 0.05).

Conclusion: The research results and the existing literature supported that severe and punishment parenting styles and indecent communicative behavior may lead to anxiety, which make people more likely to suffer from insomnia.

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The traditional Chinese medicine pathogenesis review of insomnia

G. Li, W. Wang, L. Hong, J. Zhang, F. Feng
Psychology and Sleep Department of Guang'anmen Hospital of China Academy of Chinese Medical Sciences, China

Introduction: Insomnia is a very common sleep disorder. In China, one of the most important treatment method is traditional Chinese medicine (TCM), such as herbs, acupuncture, qigong, TCM psychotherapy, etc. What is the pathogenesis of TCM for insomnia? This article will do a simple introduction.

Materials and methods: Turn to the ancient medical books and modern literature. Summarized etiology and pathogenesis of insomnia, from the Huangdi Neijing period to modern TCM theory.

Results: There are many traditional Chinese medicine theories of insomnia. Theoretical source is Huangdi Neijing. Under the influence of ancient naive materialism philosophy and the guidance of holistic concept of TCM, Neijing period insomnia theories mainly were imbalance of Yin and Yang, disharmony of Ying Wei, dysfunction of viscera. In addition, Huangdi Neijing thinks sleep and circadian phenomenon of nature is appropriate. From Ming dynasty Zhang Jing-yue's mind theory occupied an increasingly important position. Until today the mind theory is still the very important clinical theory of insomnia, and some physicians even think mind plays a fundamental role in sleep. Many theories of modern insomnia schools of thought contend, and this has prompted Chinese medicine theory of insomnia gradually get rid of the Neijing, zhang Jing-yue period' Yin and Yang, Ying Wei and Mind theory. Sentiment theories and constitution theories gradually rise. Obviously insomnia has more relationship with mental and psychological factors. It is difficult to fundamentally cure insomnia by simply emphasizing the body factor and external factors. Modern TCM study of insomnia also began to pay more attention to psychological factors. But large sample, multicenter research and using the international unified evaluation index are still rare.

Conclusion: At present, traditional Chinese medicine's understanding of the pathogenesis for insomnia mainly have Yin and Yang theory, Ying and Wei theory, mind theory, theory of Zang-fu organs, sentiment theories and constitution theories.

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Insomnia prevalence among physicians and nurses in a night shift in a second healthcare level hospital in México

D. Ortega Díaz, V. Sánchez González
University of Guadalajara, Mexico

Introduction: Insomnia is a sleep disorder characterized by inability to fall asleep or keep awake, despite being in according time and adequate condition. In hospital scope, staff working in night shift is particularly susceptible to develop this disorder. There are few prevalence data about this disorder among Mexican population.

Materials and methods: This is a transactional, observational and descriptive trial. We took into account all medical and nursing staff working in a Mexican regional hospital. The instrument used in this study is known as Athens Insomnia Scale (AIS) an eight-question test that evaluates the criteria proposed by the ICD-10. According to the Mexican population validated version of AIS there is a cut-off of 6 points score to determine if the patient has insomnia (the score obtained ranges from 0 to 24). Prior informed consent, each subject answered the questionnaire personally.

Results: Fifty-one patients were obtained. Eighty-eight percent (n = 45) were female and 12% (n = 6) were men. Of the total population, 21.5% (n = 11) were physicians and 78.5% (n = 40) were nurses. 56.8% (n = 29) of respondents subjects obtained a higher score than 6 points, being classified as subjects with insomnia. The prevalence of insomnia among physicians was 45.4% (n = 5) and in nursing was 60% (n = 24). The age group with the highest prevalence of insomnia was the 50 years old and older with 75%, followed by the 20–29 years old group with 60.7%, the 57% 30–39 years old group and 40–49 years group old with the lower prevalence of 20%. The prevalence in men was 66.6% and in women was 55.5%. 48.2% (n = 14) of subjects with insomnia have at least one family member who has trouble sleeping. Twenty-four percent (n = 7) of subjects with insomnia have been working or rotating night shifts for less than 6 months, 45% (n = 13) is between 6 and 24 months and 31% (n = 9) over 2 years.

Conclusion: The prevalence of insomnia was similar to that reported in other prevalence studies with Mexican patients. Seventeen percent of subjects with insomnia admitted having suffered some kind of accident during or after working hours. Strategies are needed in hospitals to educate workers about insomnia and prevent self-perpetuating habits for this disorder.

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Validity of the Vietnamese version of the Pittsburgh sleep quality index

N. To, N. Nguyen

Ho Chi Minh City University of Medical and Pharmacy, Vietnam

Introduction: As a neurological problem, insomnia or any other sleep disorders was always hardly noticed at the beginning and even harder to evaluate its consequences at the end.

Materials and methods: It is essential to identify a valid sleep quality measurement that can be widespread in the community in order to assist effectively the clinicians on sleep complaints evaluation. This study aims to examine the Pittsburgh Sleep Quality Index (PSQI) on Vietnamese patients with sleep disorders as a general measure of sleep quality. After the forward–backward translation, 122 subjects who had sleep complaints were recruited to answer the PSQI; 36 of them filled in the PSQI again 2 weeks later and 86 of them slept over night at the Clinic for a polysomnography.

Results: Overall the Cronbach's alpha coefficient was 0.789 which indicated a good internal consistency. Correlation coefficient was 0.77, test–retest reliability coefficient was 0.79. Limit of agreement analysis showed an oscillation range from –4.51 to 5.45 of PSQI score, the within-subject coefficient of variation showed that 95% measurements will have 27.25% difference compared with the mean score. At cut-off 5, the sensitivity and specificity were 87.76% and 75%, respectively; area under the curve was 0.7583.

Conclusion: The current findings support the Vietnamese Pittsburgh Sleep Quality Index as a reliable tool and can be used for assessing sleep disorder on Vietnamese patients or community screening.

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The clinical effect of low resistance thought induction sleep-regulating technique on insomnia

L. Hong¹, G. Li¹, Q. Diao², Y. Wang¹, W. Wang¹

¹ Guang'anmen Hospital, China Academy of Chinese Medical Sciences, China

² Beijing Xiaotangshan Hospital, China

Introduction: This study aimed to evaluate the efficacy of a therapeutic approach drawn from traditional Chinese medicine, low resistance thought induction sleep-regulating technique (TIP3-2), for acute treatment of insomnia.

Materials and methods: One hundred twenty primary insomnia patients were randomly divided into two groups, and the cases of two groups are TIP3-2 90 and zopiclone 30. The patients in medication group were given 3.75–7.5 mg zopiclone half an hour before going to bed. The patients in TIP3-2 group were given sleep-regulating technique treatment twice a week, 30 min a time, and listened to the relaxing music every night before sleep. Changes in Pittsburgh Sleep Quality Index (PSQI) scale, polysomnography (PSG) and self-made sleep confidence scale were observed before and after treatment. The period is 4 weeks. SPSS 17.0 statistical software is utilized for all statistical analysis.

Results: TIP3-2 group demonstrated significant improvements in the PSQI indices of sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, sleep medication, daytime function, total score ($p < 0.01$). As well as PSG indices of sleep duration, sleep efficiency, awakening times ($p < 0.05/0.01$) and sleep confidence scale indices of difficulty sleeping, easy to wake up onset of sleep, wake up early, being easily interfered by environment during sleep, many dreams or nightmares, total score ($p < 0.05/0.001$). There are significant differences between the two groups in sleep quality, awakening times, daytime function and sleep confidence.

Conclusion: It has curative effect of Low Resistance Thought Induction Sleep-regulating Technique (TIP3-2) for insomnia, can significantly improve sleep confidence, and is better obviously than zopiclone.

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A clinical study on the effect of traditional Chinese medical psychotherapy of thought imprint psychotherapy in lower resistance state to insomnia with estazolam dependence

W. Wang, F. Wang

Guang'anmen Hospital, China Academy of Chinese Medical Sciences, Beijing, China

Introduction: Traditional Chinese medicine contains abundant knowledge of psychology and unique psychological or psychosomatic therapies. The techniques of thoughts imprint psychotherapy in lower resistance state (TIP) applied in the treatment of sleeping pills withdrawal has becoming more and more standardized.

Materials and methods: To divide 70 out-patients with Estazolam's dependence insomnia into two groups, namely TIP group and the controlled group. Each group has 35 patients. The TIP group received TIP treatment. The controlled group received supervised BZDs withdrawal treatment. The intervention period was 4 weeks, and with 4 weeks of follow-up. All the patients were recorded and measured by Estazolam's dose and BWSQ in their pretreatment, 1, 2, 3, 4 and 8 weeks after treatment.

All the patients were measured by PSQI and calculated of Estazolam's decreasing dosage rate according to the Estazolam's dosage in their pretreatment, 4 weeks and 8 weeks after treatment. All the patients were measured by SCL-90 and PSG in their pretreatment and 4 weeks after treatment. All the statistics are analyzed by the software SPSS17.0.

Results: Estazolam's dosage: After 3 and 4 weeks of intervention, Estazolam's dosage was reduced significantly in the TIP group compared with the controlled group ($p < 0.05$). The effect was stable with 4 weeks' follow-up. BWSQ: After 3 and 4 weeks of intervention, the total score of BWSQ was significantly lower in the TIP group compared with the controlled group ($p < 0.05$). The effect was stable with 4 weeks of follow-up. PSQI: After 4 weeks of intervention, the global sum, subjective sleep quality, sleep duration, habitual sleep efficiency and daytime dysfunction were significantly lower in the TIP group compared with the controlled group ($p < 0.05$). PSG: After 4 weeks of intervention, sleep stages of 3 and 4, and REM sleep were significantly more in the TIP group compared with the controlled group ($p < 0.05$). The percentage of stages of 3 and 4 and REM sleep were significantly higher in the TIP group compared with the controlled group ($p < 0.05$). Mental state (SCL-90): After 4 weeks of intervention, the global sum, somatization and anxiety were significantly lower in the TIP group compared with the controlled group ($p < 0.05$).

Conclusion: TIP may help to reduce or stop the taking of sleeping pills, improve withdrawal syndrome, subjective and objective sleep quality, and mental state, and has good compliance and safety. TIP has certain clinical application value.

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Thoughts on localization of insomnia treatment and innovative techniques in China

W. Wang, G. Li, X. Zhou, X. Liu

Psychology and Sleep Department, Guang'anmen Hospital, China Academy of Chinese Medical Sciences, China

Introduction: Despite the growing evidence base and that there is now overwhelming evidence for cognitive behavioral therapy on

insomnia (CBT-I) in Western countries, CBT-I still has not been widely adopted in China. One reason for the slow adoption may be that CBT-I does not fit well with Chinese traditions and cultural characteristics.

Materials and methods: Analyzed the characteristics of the Chinese culture and the Chinese character. Summed up the characteristics of Chinese people who suffer from insomnia. Reviewed the Chinese traditional treatment methods and the localization innovation methods.

Results: Compared with the West, the East dominant Confucianism is a kind of spiritual experience theory. It does not care about the logical argument. For the Chinese, the only working experience is the truth. To "help" is the oriental judgment standard of knowledge value. Chinese who are under the influence of spiritual knowledge system insomnia have their own characteristics. Such as always feel their body not strong. Emotional and sexual problems are often the reasons behind the insomnia. They seek attention attached to the environment have a tendency to pursuit perfect happen cognitive distortions. And insomnia is the result of shifting attention and psychological escape. The reason to the hospital for insomnia patients are the spirit and psychological illness. And they think that insomnia is a medical or physical disease not psychological. It just suit the characteristics to treat mind with things to treat psychology through body of traditional Chinese medicine (TCM) hence the inheritance and development. With the development of clinical and western culture and psychotherapy theory were introduced into China the localization of TCM psychotherapy innovation therapy (Low Resistance Thought Induction Psychotherapy TIP for short) arises at the historic moment.

Conclusion: Local treatment in accordance with Chinese cultural characteristics is the trend of China's psychological treatment and the mainstream for the treatment of insomnia.

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Clinical and polysomnography characteristics of five Chinese patients with fatal familial insomnia

L. Wu, S. Zhan, X. Wang, H. Lu, J. Ye, J. Jia

Department of Neurology, Xuan Wu Hospital, Capital Medical University, Beijing, China

Introduction: Fatal familial insomnia (FFI) is a rare autosomal dominant prion disease characterized clinically by sleep loss, cognitive decline, dysautonomia, neuropsychiatric symptoms and motor signs. This study is aimed to investigate clinical features and lab test characteristics of five Chinese patients with FFI.

Materials and methods: Five patients with diagnosis of FFI during the period 2009–2014 at our hospital were retrospectively reviewed. The clinical features and the results of the complementary tests (14-3-3 protein, EEG, polysomnography, MRI, FDG-PET, and genetic analysis) were summarized.

Results: Two male and three female patients were recruited in this study. The median age at onset of five cases was 39.5 years (from 19 to 62). Clear family histories were identified in three patients, in which one male and one female are from the same pedigree. Sleep disturbances appeared in all cases and lasted in the whole clinical courses. Rapidly progressive memory loss, sympathetic symptoms, movement disturbances, myoclonus, illusion and hallucination were also frequently observed. 14-3-3 protein in CSF was negative in all four tested patients. Brain MRI did not figure out special abnormality. EEG showed diffused slow waves without periodic spike discharges (PSD) in all five patients. PET of one patient demonstrated glucose uptake decline of left thalamus and bilateral inferior

parental lobe. SPECT of one patient showed blood perfusion decline in bilateral thalamus and basal ganglia, medial temporal lobe. Polysomnography (PSG) of all these five cases showed reduction in sleep time and sleep structure alterations, which is characterized by absence or decrease of sleep spindles and K complexes, deep-sleep stage and REM stage loss. D178N mutation and the methionine/methionine homozygosity at the polymorphic 129 codon of the PRNP gene were found in all five cases.

Conclusion: Chinese FFI cases is typically characterized by rapidly progressive dementia, sleep loss and neuropsychiatric symptoms. Polysomnography and genetic test of PRNP are the most useful complementary tests for the diagnosis of FFI.

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Survey on the clinical features of female insomnia patients

Z. Xuanzi¹, B. Yoann¹, W. Weidong²

¹ Beijing University of Chinese Medicine, China

² Guang Anmen Hospital, China Academy of Chinese Medical Sciences, China

Introduction: Survey on the clinical features of female insomnia patients.

Materials and methods: This research is based on clinical cases from the sleep outpatient clinic of Guang'anmen Hospital. One hundred thirty-one cases of female patient with principally insomnia who came to the clinic between 2004 and 2005 are here surveyed and analyzed.

Results: In terms of age, female insomnia patients are mainly more than 65 years old or between 41 and 45 years old, with a ratio of respectively 19.8% and 16.0%. In terms of profession, they are mainly employees or cadres, with a ratio of 22.1% and 16.8%. The trigger factors are mainly environmental factors and mental exhaustion, with a ratio of respectively 75.6% and 67.7%. The concomitant diseases are principally depression and hypertension, with a ratio of 25.2% and 16.8%. In terms of duration, the most frequent duration is 1–5 years, with a ratio of 33.6%. In terms of degree of insomnia, they are mainly medium and severe insomnia patients, with a ratio of 40.5% and 29.8%.

Conclusion: The clinical features of a typical female insomnia patient are being a middle aged or old working woman, with environmental or mental trigger factors and psychosomatic diseases such as depression or hypertension, and having a long and severe insomnia when consulting in clinic.

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The utility of a nocturnal sleep onset REM period in the diagnosis of narcolepsy in clinical setting

H. Kawashima, H. Tanaka, H. Yamamoto, E. Tanahashi
Gifu Mates Sleep Clinic, Japan

Introduction: Several studies have shown that a nocturnal sleep onset REM period (nSOREMP) is highly specific for adult narcolepsy with cataplexy. This finding is reflected in the new ICSD-3 classification of narcolepsy. Yet, it is unclear if the presence of nSOREMP is specific for narcolepsy at clinical settings in Japan.

Materials and methods: This study was designed as observational, cross-sectional, and retrospective case control study. We performed a retrospective review of sleep study reports and clinical charts of patients who had consecutive PSG and MSLTs at the Gifu Mates Sleep Clinic from 2008 to 2014 in order to diagnosis hypersomnia. Diagnosis coding was based on ICSD-2 criteria. A nSOREMP was defined as a REM period occurring ≤ 15 minutes from sleep onset on ICSD-3 criteria. Inclusion criteria for this study were the patients were older than 10 years, complained excessive daytime sleepiness (EDS), underwent MSLT successfully, recognized that their mean habitual sleep time was more than 7-hours via their self-reported documents. Exclusion criterion was that the patients' confirmed apnea-hyponea index was more than 15.0 per hour. Primary outcome was defined as positive predictive value for narcolepsy diagnosis in patients with nSOREMP. Other outcomes were factors to consider with presence of nSOREMP. Otherwise, narcolepsy was diagnosed by MSLT findings or CSF finding. However, CSF finding was difficult to obtain usually. Therefore we used MSLT findings as surrogate outcome for narcolepsy diagnosis.

Results: The patient group that meet our selection criteria consisted of 52 patients (32 men, 20 women) with a mean age of 26.7 ± 12.6 years, 8 patients (15.4%) have narcolepsy with cataplexy, 5 patients (9.6%) have narcolepsy without cataplexy, 10 patients (19.2%) have idiopathic hypersomnia, 19 patients have insufficient sleep syndrome, 3 patients (5.8%) have mild sleep related breathing disorder, and 7 patients (13.5%) have others. The prevalence of nSOREMP positive was 13.5%. The prevalence of cataplexy in nSOREMP positive group was 85.7%, which was significantly higher than negative group ($p < 0.001$). Sleep latency and stage R latency on PSG were shorter significantly in nSOREMP positive group than negative group ($p < 0.05$, 0.001). Mean sleep latency on MSLT was shorter significantly in nSOREMP positive group than negative group ($p < 0.001$). The number of SOREMP on MSLT was more frequent significantly in nSOREMP positive group than negative group ($p < 0.001$). In the case with nSOREMP, sensitivity for positive MSLT findings ($MSL \leq 8$ minutes plus ≥ 2 SOREMPs) was 43.8%, specificity was 100.0%, and diagnosis accuracy was 82.7%. Stage R latency on PSG was proved to be an independent contribution factor for positive MSLT finding via logistic regression analysis, and the odds ratio was 0.97 ($p < 0.01$).

Conclusion: An nSOREMP may be a "stronger" diagnostic key marker than "replacement" of one SOREMP in the MSLT on ICSD-3 criteria, especially for case of cataplexy, even though without cataplexy.

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Health related quality of life in Korean patients with narcolepsy

T. Kim, S. Joo, S. Hong

St. Vincent's Hospital, College of Medicine, The Catholic University of Korea, South Korea

Introduction: The aim of this study is to evaluate the health-related quality of life (HRQoL) in Korean patients suffering from narcolepsy.

Materials and methods: Subjects included 55 narcoleptic patients diagnosed at the St. Vincent Hospital, South Korea, who met the International Classification of Sleep Disorders (ICSD) criteria for narcolepsy. A standardized face to face interview was used to inquire about the disease and its burdens to the patients. HRQoL was recorded using the 36-item short-form Medical Outcomes Study (SF-36). Factors of influence on decreased HRQoL were evaluated by using correlation analyses.

Results: In our study 78.2% of patients showed Pittsburgh Sleep Quality Index (PSQI) over 6, and 74.5% of patients suffered from

excessive daytime sleepiness which was measured by Epworth Sleepiness Scale (ESS) over 11. 54.5% of subjects showed Beck Depression Inventory (BDI) score over 14. All domains of SF-36 were statistically correlated with both by BDI and ESS (inverse correlation). Physical functioning, role limitations due to physical health, role limitations due to emotional problems, mental health, social functioning, bodily Pain and general health except vitality were significantly correlated with PSQI (inverse correlation).

Conclusion: The quality of sleep, daytime sleepiness, depressive symptoms correlate with HRQoL. Daytime sleepiness is more highly correlated with social functioning while overnight sleep disturbance is more highly correlated with mental health. More studies are needed to confirm these results, so we will recruit normal health group and insomnia patients.

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The relationship of narcolepsy and psychology

G. Li, W. Wang, F. Wang, X. Liu

Psychology and Sleep Department, Guang'anmen Hospital, China Academy of Chinese Medical Sciences, China

Introduction: Narcolepsy is a disease of chronic central nervous system dysfunction. The pathogeny of it is unclear. Its exact cause has not been determined. Although its incidence is not high, it has a great impact on patients.

Materials and methods: Accessed to relevant literature, analysis of predisposing factors, simultaneous phenomena, the relationship with certain mental or psychological illness of narcolepsy. And from the existing research results of narcolepsy to find the relationship between the narcolepsy and autoimmune, while there is a certain causality between autoimmune and psychological, neuroendocrine. Then we looked for narcolepsy psychotherapy effectiveness evidence from clinical research.

Results: There is an obvious history of psychological stress or psychological problems before narcolepsy. It is very high probability of the narcolepsy patients with mental disease. Modern medicine thinks that narcolepsy may be an autoimmune diseases. In the spirit–endocrine–immune theory (NEI theory), emotional changes of mental stress would affect the immune function directly or indirectly. The narcoleptic psychotherapy cue validity, and this shows there is close relationship of narcolepsy and psychology. At present, symptomatic treatment cannot cure narcolepsy, suggesting that our clinical treatment of narcolepsy should pay attention to the psychological factors. It is very necessary to make psychological measurement and psychological intervention to narcolepsy patients.

Conclusion: Clinical and research show that narcolepsy has a close relationship with the psychology.

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Symptoms and occurrences of narcolepsy: A retrospective study of 162 patients during a 10-year period in Eastern China

H. Wu¹, J. Zhuang¹, W. Stone², L. Zhang¹, Z. Wang¹, Y. Yang¹, X. Li¹, Z. Zhao¹

¹ Department of Neurology, Changzheng Hospital, Second Military Medical University, Shanghai, China

² Department of Psychiatry, Beth Israel Deaconess Medical Center and Harvard Medical School, Boston, MA, USA

Introduction: Our study was designed to assess symptomatology and occurrences of narcolepsy in Eastern China between 2003 and 2012. Herein we reported the substantial changes in the occurrence and clinical features of narcolepsy over the last decade.

Materials and methods: We performed a retrospective analysis of 162 Han Chinese patients with narcolepsy at Changzheng Hospital, Shanghai, China. Clinical histories and precipitating factors were recorded, in addition to narcolepsy and H1N1 winter flu pandemic (pH1N1) occurrences. The occurrences were also compared between the Changzheng Hospital and the People's Hospital, Beijing, China.

Results: In our sample, narcolepsy occurred 1.73 times more frequently in men than in women. Most of patients were children, which peaked to 91% in 2010. Excessive daytime sleepiness (EDS), disrupted nocturnal sleep, cataplexy, and weight gain were the four major symptoms. We found that 40% of patients had identifiable precipitating factors. The occurrence of narcolepsy in 2010 showed an approximate threefold difference from the baseline levels at the Changzheng Hospital, which showed positive relationships with occurrences of pH1N1 in Shanghai and the occurrence of narcolepsy at the People's Hospital.

Conclusion: Our findings show the interactive effects of geography and H1N1 disease in relation to narcolepsy in Han Chinese populations and strengthen the theoretic hypothesis that immune and mental factors may facilitate the onset of narcolepsy.

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A clinical and genealogical report on a family with six cases of narcolepsy

L. Yanjiao, F. Fan

China

Introduction: We report a family with six cases narcolepsy in Shanxi province in China, describe the characteristic of the cases, and raise an advice that the relationship of genetic and psychological factors is required.

Results: This family is from Shanxi province in China, and is of Han nationality. A study showed that the incidence of narcolepsy in the Chinese is 0.034%. The incidence in Shanxi province has not been reported; a family report has not been made either. The familial inheritance is obvious. All of the four generations have someone showing the symptom of narcolepsy. And both males and females have the possibility of becoming the victim. Among the six cases, four patients have shock or punishment before onset. The further study of the relationship of genetic and psychology factors is required.

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The causal link between epilepsy and sleep disturbance

H. Im, S. Baek, C. Yun, S. Park

Department of Neurology, Seoul National University Bundang Hospital, South Korea

Introduction: Insufficient and disrupted sleep is known to be associated with impairment of quality of life. We evaluate the difference in sleep disturbance between patients with epilepsy and normal people, and determinate the relative contributing factors among these factors by comparison with normal control and within the epilepsy group.

Materials and methods: Two hundred one patients diagnosed with epilepsy attending epilepsy outpatient clinics and 2836 normal people were recruited. Participants completed the questionnaire booklet containing the following scales, Epworth Sleepiness Scale (ESS), Pittsburg Sleep Quality Index (PSQI), Insomnia Severity Index (ISI), Goldberg anxiety scale, Patient Health Questionnaire-9 (PHQ-9) and information of snoring and consumption of alcohol and cigarette. Univariate and multivariate binary regression models were used to analyze the interrelationship associations and sleep disturbance (poor sleep quality, daytime sleepiness, clinical insomnia).

Results: Epilepsy group suffered two to three times more poor sleep quality, excessive daytime sleepiness, clinical insomnia, insufficient sleep and anxiety disorders than normal control. By multivariate analysis, epilepsy itself and mood disorders are common contributing factors in sleep disturbance in total participants of two groups. The dependent factor of sleep problems in patients of epilepsy was seizure control for the last 1 year.

Conclusion: Epilepsy itself and recent seizure control are important factors in sleep disturbance. Clinicians should consider optimal seizure control and improvement of their sleep and mood problem as an integrated approach of epilepsy care. It may finally result in successful disease control and improvement of quality of life.

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Quality of sleep in young onset Parkinson's disease: Any difference from older onset Parkinson's disease?

R. Mahale, R. Yadav, P. Pal
India

Introduction: Sleep disorders occur commonly in Parkinson's disease (PD). Young-onset Parkinson's disease (YOPD) is termed when the age of onset of motor symptoms is between 21 and 40 years. Literature on the quality of sleep in YOPD are limited. The present study aimed at determining the quality of sleep in YOPD patients.

Materials and methods: The study was prospective, cross-sectional and hospital based. Patients presenting with features suggestive of parkinsonism (n = 156), who visited the neurology outpatient services at the National Institute of Mental Health and Neurosciences (NIMHANS) Bangalore, India were enrolled in the study. The enrolled patients satisfied the UK Parkinson Disease Society Brain Bank criteria. Based on the age of onset of motor symptoms, they were grouped into young onset (21–40 years) and older onset PD. The study period was from October 2010 to December 2011. Staging of PD was done using modified Hoehn and Yahr staging (H&Y) and severity of motor symptoms of PD was assessed using Unified Parkinson Disease Rating Scale III (UPDRS III). Evaluation of sleep was carried out using the Parkinson's disease sleep scale (PDSS), Pittsburgh Sleep Quality index (PSQI) and Epworth Sleep Scale (ESS).

Results: One hundred and fifty six PD patients were recruited in the study, of which 51 patients were YOPD (mean age 43.5 ± 6.4 years) and 105 patients were OOPD (mean age 61.2 ± 8.0 years). The frequency of patients with insomnia was higher in OOPD when compared with YOPD group. Fourteen patients (27.5%) with YOPD and 58 patients with OOPD (55.2%) had complaints of insomnia ($p = 0.001$). Similarly, the frequency of nightmares was lower in YOPD

(7.8%) when compared with OOPD (24.8%) group ($p = 0.012$). The mean hours of actual sleep per night were higher in YOPD patients with statistical significance. Global PSQI score was better in YOPD group with statistical significance indicating good overall sleep quality in YOPD patients. The total ESS score was significantly lower in YOPD than in OOPD patients ($p = 0.019$) indicating lower incidence of daytime sleepiness in patients with YOPD. The total PDSS score was significantly better in YOPD patients ($p = 0.018$).

Conclusion: The highlight of study is the overall better quality of sleep with lesser incidence of insomnia, nightmares, daytime sleepiness and restlessness during sleep in patients with YOPD.

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Repetitive intracerebroventricular (ICV) microinjection of orexina regulates sleep homeostasis and hastens recovery from deep barbiturate anesthesia induced sleep

O. Mchedlidze, N. Maglakelidze, M. Babilodze, E. Chkhartishvili, S. Dzadzamia, V. Tsomaia, E. Chijavadze, N. Nachkebia
Laboratory of Neurobiology of Sleep-Wakefulness Cycle, I. Beritashvili Center of Experimental Biomedicine, Georgia

Introduction: Study evaluates hypothalamic orexinergic system as the neuronal substrate for speed up regulation of sleep homeostasis and sleep-wakefulness cycle recovery from deep barbiturate anesthesia. Pre-clinical evidences concerning the effects of OrexinA ICV microinjection in animals under barbiturate anesthesia are very sparse and therefore investigation of this question is highly topical.

Materials and methods: In wild white rats (n = 12) surgery and implantation of stainless screws for EEG registration was made under chloralhydrate anesthesia. In control group 7–10 days after surgery deep anesthesia was induced by sodium ethaminal (Nembutal 70 and/or 80 mg/kg). EEG registration of sleep-wakefulness cycle by SAGURA EEG&PSG SYSTEM was started immediately and lasted continuously for 48 hours.

In experimental animals deep anesthesia was produced likewise controls and immediately after disappearance of righting reflex in vivo microinjection of OrexinA in lateral ventricle (-0.92 from Bregma; L – 1.6; H – 3.6) at the doses 10–20 $\mu\text{g}/5\mu\text{l}$ was made twice daily with 1 hour interval among them. EEG registration of sleep-wakefulness cycle continued immediately after OrexinA microinjection and lasted continuously for 48 hours.

Recovery from deep barbiturate anesthesia induced sleep was evaluated by appearance of righting reflex and by eight distinct parameters indicating the normalization of sleep homeostasis and recovery of normal EEG and behavioral signs of sleep-wakefulness cycle behavioral states. Statistical processing was made by Student's t-test.

Results: Repetitive in vivo ICV microinjection of OrexinA in lateral ventricle significantly shortens the time of righting reflex re-appearance from both cases of anesthesia-induced sleep. Increase of OrexinA content in CSF significantly contributes to the acceleration of recovery from anesthetic sleep. The latency of the first normal episode of wakefulness was shortened twice than in controls. The first fragments of wakefulness were soon followed by slow wave sleep episodes significantly different from EEG picture of anesthetic sleep. Replacement of anesthetic slow wave sleep by slow wave sleep characteristics for intact animals took significantly shorter time in experimental animals than in controls.

Conclusion: Repetitive ICV microinjection of OrexinA significantly shortens deep barbiturate anesthesia time and accelerates recovery of behavioral and EEG signs of wakefulness which is then followed by speed-up of normal slow wave sleep recovery.

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The relationship between sleep, depression, and traumatic brain injury: A study of Ontario workers with head trauma

T. Mollayeva¹, M. Scherer², T. Belben¹, P. Thurairajah³, A. Colantonio¹

¹ University of Toronto, Canada

² Southlake Regional Health Centre, Canada

³ ABI Research Lab, Canada

Introduction: While current literature reports associations between psychiatric illnesses and sleep dysfunction, traumatic brain injury (TBI) and sleep dysfunction, and TBI and psychiatric illnesses, the relationship between all three variables has not been examined.

Materials and methods: A retrospective analysis of data from a consecutive sample of medical records of 106 head injured workers was performed. Abstracted data included that related to occupation, cause of head injury, diagnoses of TBI and sleep disorders, self-reported sleep complaints, mental health functioning, and demographic details.

Results: The majority of workers with head trauma were diagnosed with mild TBI or concussion. Diagnosis of TBI was associated with increased odds of post-injury worsening of sleep (odds ratio 5.8, 95% confidence interval: 1.8–18.9). Among those with TBI, those with worsened sleep were significantly more likely to experience depression ($p = 0.003$). A primary sleep disorder was established in 37.8% of our TBI sample, including new diagnoses and diagnoses in those with history of a sleep disorder.

Conclusion: Self-perceived worsening of sleep was associated with brain injury. A diagnosis of depression was significantly related to sleep quality in those with TBI. When faced with sleep complaints in persons with head trauma, the clinician's first task must be identification of underlying abnormalities for proper differential diagnosis and treatment.

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Memory consolidation and INOS expression during different sleep stages in Parkinson's disease

D. Wu¹, I. Tseng², R. Yuan³, C. Hsieh¹, C. Hu¹

¹ Department of Neurology, Shuang Ho Hospital, Taipei Medical University, New Taipei City, Taiwan

² College of Nursing, Taipei Medical University, Taipei, Taiwan

³ Department of Neurology, Taipei Medical University Hospital, Taipei, Taiwan

Introduction: PD is a neurodegenerative disease, characterized by motor and non-motor dysfunctions. Compelling evidence suggests that nitric oxide is important in both sleep regulation and memory consolidation. This study explored changes in the biolog-

ical molecules during different sleep stages and the effects of sleep on memory consolidation in PD.

Materials and methods: Ten PD patients and 14 volunteers without PD were included. The gene expression of inducible nitric oxide synthase in all sleep stages was measured by real-time PCR based on polysomnography-guided peripheral blood sampling. In the meantime, the efficiency of memory consolidation of sleep in subjects was measured with Wechsler Memory Scale III.

Results: Inducible nitric oxide synthase expression increased in all sleep stages among PD patients. In PD patients, inducible nitric oxide synthase expression decreased in rapid eye movement sleep. Regarding the memory consolidation, the controls improved their logic memory tasks after sleep and patients improved in visual reproduction tasks.

Conclusion: Inducible nitric oxide synthase expression was different in PD patients and its expression was not the same in different sleep stages. Sleep might enhance memory consolidation and there are different memory consolidation profiles between PD patients and controls.

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Sleep quality of patients with Parkinson's disease with and without comorbid depression

C. Wu¹, J. Chang², K. Chen¹, Y. Pan¹, S. Lin¹, H. Lai¹

¹ China Medical University Beigang Hospital, Taiwan

² China Medical University Hospital, Taiwan

Introduction: Patients with Parkinson's disease (PD) often suffer from sleeping problems and had poorer sleep quality. On the other hand, patients with PD often have comorbid depression. The aim of this study is to investigate the sleep quality and parameters in patients with PD with or without comorbid depression.

Materials and methods: We enrolled 40 patients with PD from Neurosurgery Department of Local Medical Hospital and suggested for pre-Deep Brain Stimulation (DBS) evaluation. They were interviewed by board-certified psychiatrists for diagnosis of psychiatric disorders, if any, and they were assessed with Beck Depression Inventory (BDI), and Pittsburg sleep Quality Index (PSQI).

Results: Twenty-nine patients had complete data. Fourteen patients (48%) patients with PD had moderate depression ($BDI > 19$). When we compared the sleep quality and other sleep factors of the depressed group and non-depressed group ($BDI < 14$), the depressed group had poorer sleep quality, shorter sleep duration, and lower sleep efficiency.

Conclusion: Although patients with PD had been reported to have poor sleep quality and sleep problems, our study showed that patients with PD with depression had poorer sleep quality, sleep efficiency, and shorter sleep duration when compared with those patients with PD but without depression.

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The importance of creating an interdisciplinary network to study sex and gender differences in sleep

H. Attarian¹, M. Mallampalli², C. Carter²

¹ Feinberg School of Medicine, Northwestern University, USA

² Society of Women's Health Research, USA

Introduction: Normal sleep patterns, sleep disorders and therapeutics vary greatly between men and women. Some are biological; others are environmental, social and cultural. Not recognizing these differences leads to gender bias. The Society for Women's Health Research's (SWHR) scientific, interdisciplinary and collaborative forum is essential to increase awareness of these differences.

Materials and methods: SWHR is a non-profit organization founded in 1990 dedicated to advancing the field of sex-based biology in order to bring focus to the diseases and conditions that affect women predominantly or disproportionately compared with men. They have not only created multiple disease and organ system based groups, but also within each group there is a deliberate integration of scientists from basic and animal science and clinical research with the focus on advancing science, advocacy and education. On October 24 and 25, 2013 SWHR sought to create a unique network called the Interdisciplinary Studies In Sex Differences (ISIS) network on sleep to primarily increase awareness of sex and gender differences in the sleep field. The inaugural roundtable meeting included basic scientists, epidemiologists, clinical researchers, clinicians and educators from the field of sleep medicine in the United States and these attendees represented several scientific fields including neurology, neurobiology, psychology, nursing, psychiatry, physiology, pulmonology and behavioral sciences.

Results: The recommendations of the group included creating the ISIS network to fill the following gaps in knowledge and public awareness: (1) hormonal effects on sleep mechanisms; (2) sex differences in pharmacodynamics of existing drugs; (3) fetal outcomes to maternal poor sleep quality; (4) utilizing sex specific cell and animal models to better understand pathophysiology of sleep disorders in women; (5) social determinants of sleep complaints and diagnoses based on sex, gender, age and ethnicity; (6) developing screening and diagnostic tools specific to women; (7) treatment efficacy and compliance specific to women; and (8) sex and gender specific links between sleep disorders and co-morbid conditions such as pain and psychiatric illnesses. The ISIS network has already met thrice and the results have been a well-received leading to a review paper in the Journal of Women's Health (<http://online.liebertpub.com/doi/pdf/10.1089/jwh.2014.4816>), prime time television appearance by its program director (<http://www.today.com/video/today/55542848>) and multiple blog posts on popular news media outlets (<http://www.huffingtonpost.com/society-for-womens-health-research/>). In addition, the interdisciplinary collaborative network has begun working on identifying research projects to increase the robustness of the data and the reach of its message.

Conclusion: As in most of medicine, gender bias remains a problem in the study of sleep disorders. The ISIS sleep network plans to increase awareness of sex and gender differences in the sleep research community and the public and efficiently and effectively remedy gender bias at all levels of health care.

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Sleep efficiency and sleep quality among male inmates in Nigeria

O. Fakorede, P. Onifade, O. Majekodunmi
Neuropsychiatry Hospital, Aro, Abeokuta, Nigeria

Introduction: The average Nigerian inmate is exposed to harsh prison conditions with resultant physical and psychological (mental) sequelae. Yet, no sleep research has been carried out among these

inmates. This study aimed to determine the sleep efficiency and quality of Nigerian inmates as well as a reversal in their sleep pattern.

Materials and methods: The subjective sleep efficiency and sleep quality of 300 male inmates were determined as well as their demographic, clinical and forensic correlates. A sleep efficiency score of >85% is described as normal while a Pittsburgh Sleep Quality Index score of ≤5 was defined as good sleep quality. The reversal of sleep pattern was also investigated.

Results: About two-thirds (67%) of the respondents were yet to be convicted of their offences. This group was also significantly younger ($t = -7.84$, $p \leq 0.001$), lived in more crowded cells, shared sleeping material ($\chi^2 = 47.21$, $p \leq 0.001$) and used psychoactive substances ($\chi^2 = 4.93$, $p = 0.026$). About 95% of inmates awaiting trial have spent less than 5 years in the prison while only about 20% of their convicted counterpart has spent same.

Majority of the respondents (94%) had sub-normal sleep efficiency while about a third (37.7%) had poor sleep quality. However, only a small proportion (1%) reported a reversal in their sleep-wake cycle. None of the correlates investigated demonstrated a significant association with any of the outcomes except self-perception of sleep problem and poor sleep quality ($\chi^2 = 125.31$, $p \leq 0.001$).

Conclusion: Overcrowding is still common in prisons. Though a large proportion of inmates had poor sleep quality, a greater percentage experienced sub-normal sleep efficiency. Efforts should be made in improving the Nigerian prison conditions and identifying possible factors responsible for poor sleep efficiency and sleep quality among this vulnerable group.

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What should I ask to know if my patient needs a diagnostic (respiratory) polysomnography (PSG)?

H. Glass¹, A. Molina², A. Guimarães³, G. Berigo³, M. Neves²

¹ Federal District Health Department, Brazil

² Santa Lucia Hospital, Brasilia, Brazil

³ Escola Superior de Ciências da Saúde, Brazil

Introduction: Because polysomnography (PSG) is expensive, screening is necessary. A lot of questionnaires are available for the screening of sleep apnea, disturbed sleep and measurement of daytime sleepiness. At WASM 2009, I asked which one(s) should I use, and got no useful answer.

Materials and methods: All patients referred to our sleep center for diagnostic PSG, most because of snoring, hypertension and/or arrhythmias, were included. At PSG-test night, Epworth Sleepiness Scale – ESS, our questionnaire (LS), which assessed: age, neck circumference (NC), body mass index (BMI); previous stroke (SK), myocardial infarction (MI), thyroid diseases (TD), diabetes (DM), hypertension (HY), loud snoring (SN), witnessed apneas (WA), heart diseases (HD), allergies (AG), rhinitis (RH) as Y/N questions; and agitated sleep (AS), nightmares (NM), sleepwalking (SW), sleep talking (ST), sleep movements (SM), insomnia (IN), sleepiness while driving (SD), car accidents due to inattention (CA), sleep pills use (SP) were categorized (example: never/seldom/sometimes/frequently); Mini Sleep Questionnaire (MSQ); and a questionnaire (SS) with 83 dichotomous questions (Y/N) assessing sleep breathing disorders, insomnia, daytime sleepiness, leg movements, narcolepsy and

gastro-esophageal reflux symptoms, where applied. Four hundred thirty-one (173♀ + 258♂) patients received ESS and LS and 197 (83♀ + 114♂) also MSQ and SS questionnaires. They had no previous experience with these questionnaires and were not referred due to screening. Patients with (A+ = apnea-hypopnea index, AHI ≥ 10) and without sleep apnea (A- = AHI < 10) were compared using two-sided X2 (Fisher's exact test) for dichotomous variables, ANOVA for categorized variables and t test for continuous variables at 95% significance.

Results: LS variables: X2-test significant (%Y A+ × %Y A-, p) HY (37.7% × 15%, p < 0.001); MI (4% × 0.6%, p = 0.03); RH (19.5% × 29.2%; p = 0.032); DM (15.4% × 6.9%; p = 0.005); SN (88.1% × 74.3; p < 0.001); WA (66.4% × 33.6%; p < 0.001); and X2-test non-significant for HD (13.2% × 8.2); SK (1.6% × 1.7%); AG (23% × 31.4%); TD (9.4% × 9.3%). Patients with hypertension, previous myocardial infarct, diabetes, loud snoring, witnessed apneas are more likely to have apneas, but patients with rhinitis are less likely to have apneas.

ANOVA was not significant for any categorical variables. Neck circumference, BMI, and age are important variables. t-Test (mean ± SE; A+ × A-; p) was significant for NC (40.96 ± 0.26 × 38.42 ± 0.38; p < 0.001); age (50.46 ± 0.87 × 42.26 ± 1.08; p < 0.001) and BMI (29.8 ± 0.38 × 26.34 ± 0.36; p < 0.001); but MSQ and ESS could not discriminate patients with and without apneas: MSQ (33.17 ± 1.22 × 34.41 ± 1.22; p < 0.001) and ESS (9.30 ± 0.33 × 9.32 ± 0.39; p = 0.956). It was remarkable that out of 83 SS questions, only "I do not feel refreshed when I wake up" (42.6% × 59.4%, p = 0.035) was significant.

Conclusion: This study shows that comorbidities, like HY, MI, diabetes, and anthropometric variables, like NC, age and BMI, symptoms witnessed by bedpartners, like loud snoring and apneas, are more reliable for detection of patients with sleep apnea. The only symptom that was more frequent in apnea patients was non-restorative sleep.

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Delayed sleep time and sleep restriction effects on executive functions and reading comprehension

T. Gómez Fernández

Universidad Nacional Autónoma de México, Mexico

Introduction: Sleep restriction and sleep delayed time contributes to worse prefrontal activity that regulates reading comprehension function in adolescent population. It is not clear which of these two sleep variables explains better the worsening in prefrontal activity when retrieval cues in reading comprehension tasks vary in difficulty.

Materials and methods: Sleep diaries were completed for 2 weeks. The sleep diary instrument was adapted for adolescent population. Those participants who showed clinical symptoms of sleep somnolence, depression and learning disabilities through self-administrated validated instruments for Mexican population were excluded from analysis. After completing sleep diaries, 132 participants were tested in nine neuropsychological tasks of the Executive Functions and Frontal Lobes Battery (BANFE) as well as in a Reading Comprehension instrument that includes an easy and difficult condition in information retrieval. Averages of total sleep time was calculated in weekdays and weekend. The first was compared with the 9.2 hours of sleep recommended for adolescent population. Delayed sleep time was obtained with the difference in sleep onset in weekdays and weekend.

Averages of correct answers were also calculated for the cognitive tasks.

Results: Participants showed 5.9 (1.6) hours of sleep time in average on weekdays and 9.8 (0.67) hours on weekend. Adolescents presented 1.8 (0.45) hours in average for sleep delayed time. Significant correlations were found between sleep duration, delayed sleep time and the averages of correct answers in the cognitive tasks. The correlations were also found in executive tasks and the two conditions of retrieval difficulty in the reading comprehension task. When comparing the sleep duration in weekdays and delayed sleep time effects on cognitive tasks, the second one showed greater effect over the executive performance particularly on the difficulty retrieval condition of the reading comprehension task.

Conclusion: Participants are sleep deprived and present tendency to delay sleep onset. Both sleep variables correlate with prefrontal performance. Particularly delayed sleep time predispose adolescents to malfunction in prefrontal activity that regulates reading comprehension ability and to exhibit low academic grades. This worsening is better observed when retrieval implies major complexity.

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Predictors of poor sleep quality and excessive daytime sleepiness in Turkish adults with type 2 diabetes

B. Kara¹, Ö. Kılıç²

¹ School of Nursing, Gulhane Military Medical Academy, Turkey

² Department of Endocrinology and Metabolism Diseases, Gulhane Military Medical Academy, Turkey

Introduction: The purpose of this study was to determine the prevalence of poor sleep quality and excessive daytime sleepiness in Turkish patients with type 2 diabetes and identify the effects of demographic and disease-related characteristics and physical activity on poor sleep quality and excessive daytime sleepiness.

Materials and methods: The study was designed as a cross-sectional survey. Two hundred fifty patients with type 2 diabetes who were followed by a diabetes outpatient clinic in Ankara, Turkey were enrolled in this study. Inclusion criteria were aged 18 years or older, diagnosed with type 2 diabetes for at least 1 month, ability to communicate in Turkish and agreeing to participate in the study. Exclusion criteria were a severe comorbid condition, major psychiatric disorder, cognitive impairment, sleep disorders, alcoholism, pregnancy, lactation, clinical instability and working in the night shift. The study group consisted of 180 patients (59.4% female). This study was approved by the Hospital's Local Ethics Committee. Written informed consent was obtained from all participants. Data were collected through face-to-face structured interviews and medical records. A questionnaire form, the Pittsburgh Sleep Quality Index (PSQI), the Epworth Sleepiness Scale (ESS) and the short version of the International Physical Activity Questionnaire (IPAQ-S) were used to collect data. Descriptive statistics, reliability analyses and logistic regression analysis were used for the analysis of data. The level of significance was set at 0.05 in all tests.

Results: The patients' mean age was 55.4 ± 17.1 years (range = 19–88) and the median disease duration was 108 months (range = 1–575). The global PSQI mean score of the patients was 7.1 ± 4.2 (range for subscales = 0–3) and 63.3% had poor sleep quality (PSQI ≥ 5). The median ESS score was 4 (range = 0–24). The excessive daytime

sleepiness (ESS ≥ 10) was reported by 21.7% of the patients. Patients who took care of themselves (odds ratio (OR) = 0.44; 95% confidence interval (CI): 0.22–0.91), those who had financial difficulties (moderate income vs. adequate income: OR = 2.17; 95% CI: 1.04–4.52, inadequate level vs. adequate income: OR = 4.19; 95% CI: 1.20–14.71, respectively), those with poor self-rated health (OR = 0.43; 95% CI: 0.20–0.95) and patients who had a higher waist circumference (OR = 1.03; 95% CI: 1.01–1.06) were more likely to have poor sleep quality. Excessive daytime sleepiness was more common among patients who had a higher body mass index (OR = 1.09; 95% CI: 1.02–1.16) and postprandial plasma glucose (OR = 1.01; 95% CI: 1.00–1.01) and those with poor sleep quality (OR = 4.18; 95% CI: 1.51–11.60). The IPAQ-S score was not associated with poor sleep quality and excessive daytime sleepiness ($p > 0.05$).

Conclusion: Poor sleep quality and excessive daytime sleepiness were prevalent among patients with type 2 diabetes. This study emphasized the importance of implementing appropriate interventions by taking into account the factors contributing to the poor sleep quality and excessive daytime sleepiness in patients with type 2 diabetes.

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Predictors of poor sleep quality in older Turkish adults with hypertension

B. Kara, E. Tenekeci

School of Nursing, Gulhane Military Medical Academy, Turkey

Introduction: Sleep duration and quality may contribute to both the high prevalence of hypertension and its poor control. The purpose of this study was to investigate the prevalence of poor sleep quality and determine the risk factors for poor sleep quality in older Turkish adults with hypertension.

Materials and methods: The study was designed as a cross-sectional survey. A total of 170 patients with hypertension attending a cardiology outpatient clinic in Ankara, Turkey were enrolled in this study. Inclusion criteria were aged 60 years or older, diagnosed with essential hypertension for at least 1 year, treated with antihypertensive medications for at least 1 month, ability to communicate in Turkish and agreeing to participate in the study. Exclusion criteria were secondary hypertension, a severe comorbid condition, major psychiatric disorder, cognitive impairment, sleep disorders, alcoholism, clinical instability and working in the night shift. The sample included 128 patients (57% female). Following ethical approval by the Hospital's Local Ethics Committee, the purpose and procedure of the study were explained to all participants and written informed consent was obtained. Data were collected through face-to-face structured interviews and medical records. A questionnaire form, the Pittsburgh Sleep Quality Index (PSQI), the Epworth Sleepiness Scale (ESS), the short version of the International Physical Activity Questionnaire (IPAQ-S) and the Visual Analogue Scale for Fatigue (VAS-F) were used to collect data. Descriptive statistics, Mann-Whitney U test, Spearman's correlation coefficients and logistic regression analysis were used for the analysis of data. p Values less than 0.05 were considered to be statistically significant.

Results: The patients' mean age was 70.5 ± 8.6 years (range = 60–89) and the median disease duration was 13 years (range = 1–48). The global PSQI mean score of the patients was 7.49 ± 5.08 . Out of total 128 patients, 63.3% had poor sleep quality. The global PSQI scores were higher in females ($z = -2.29$; $p = 0.022$), those who were not working ($z = -2.51$; $p = 0.012$), those who were living with alone ($z = -2.03$; $p = 0.043$) and patients with poor self-rated health

($z = -2.90$; $p = 0.004$). There were positive correlations between the global PSQI score and age ($r = 0.25$; $p = 0.004$), the ESS score ($r = 0.28$; $p = 0.001$) and the VAS-F fatigue subscale score ($r = 0.41$; $p < 0.001$). The global PSQI score was negatively correlated with hemoglobin value ($r = -0.40$; $p < 0.001$), as well as the IPAQ-S score ($r = -0.38$; $p < 0.001$) and the VAS-F energy subscale score ($r = -0.43$; $p < 0.001$). In logistic regression analysis, a lower level of hemoglobin (adjusted odds ratio (OR) = 0.72; 95% confidence interval (CI): 0.57–0.90) and lower IPAQ-S scores (adjusted OR = 0.99; 95% CI: 0.99–1.00) were associated with poor sleep quality, after adjusting for all other covariates.

Conclusion: Poor sleep quality was prevalent among older adults with hypertension. This study suggested the need for evaluation of sleep quality and associated factors for optimal management of older adults with hypertension.

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The relationship between quality and regularity of sleep based on Korean adolescents' sleep duration by age

Y. Kwon, S. Oh, J. Hong

Kinesiology Department of Inha University, South Korea

Introduction: The lack of sleep among adolescents is a prevalent issue around the world. This study attempts to explore when sleep duration reduces by studying Korean adolescents' sleep duration by age, and to examine the relationship between a decrease in sleep duration and quality and regularity of sleep.

Materials and methods: Total 2278 adolescents (1077 females, 1201 males) between the ages of 10 and 19 years residing in Incheon, Korea participated in this study. Sleep duration and regularity were measured by Sleep Regularity Test (Kwon, Kim, & Oh, 2013), and Pittsburgh Sleep Quality Index (Buysse, Reynolds, Monk & Hoch, 1991) was used for measuring sleep quality. Sleep Regularity Test is a tool to calculate average sleep duration and scope with sleep and wake-up time for 7 days, and measured sleep regularity by substituting the Sleep Regularity Formula (average sleep time/sleep range), which has secured its validity by comparing the sleep pattern of Korean shift workers and that of non-shift workers. If the total score of sleep quality is below 5, it is considered as good sleep quality; if over 5, considered as poor sleep quality.

Results: It was shown that the sleep duration of Korean adolescents consistently reduced at age 10–19 years. From age 10 (543.87 ± 48.98 min) to 16 (457.40 ± 55.26 min) years, it decreased by about 15 minutes in average, and dropped significantly at age 17 (373.14 ± 68.32 min). From age 15 (5.20 ± 3.17), sleep quality was shown as poor sleep quality (total > 5), and the lowest quality of sleep was observed at age 19 (8.60 ± 3.13). The period between age 16 (5.25 ± 2.87) and 17 (8.05 ± 2.75), in which the sleep duration drastically decreased, also demonstrated a significant decrease in sleep quality. The sleep regularity kept decreasing from age 10 (85.74 ± 7.23) to 18 (71.24 ± 15.13) years, slightly increased at age 19 (72.62 ± 14.76), and greatly decreased from age 12 (85.63 ± 9.07) to 13 (78.99 ± 10.63), and from age 16 (75.04 ± 12.15) to 17 (71.84 ± 14.93).

Conclusion: As Korean adolescents get older, they sleep less. Short sleep affects the quality and regularity of sleep negatively. Sleep duration decrease most noticeably at 16–17 that they graduate middle school and enter high school. To improve problems lying in adolescents' sleep, schools will need to make plans.

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graduate middle school and enter high school. To improve problems that lay in adolescents' sleep, schools will need to make plans.

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Self-reported sleep duration and levels of inflammatory markers: Similarities and differences across genders

R. Leong, J. Lo, M. Chee

Centre for Cognitive Neuroscience, Neuroscience and Behavioral Disorders Program, Duke-NUS Graduate Medical School, Singapore

Introduction: Existing studies are equivocal regarding the associations between self-reported sleep duration and levels of inflammatory markers in men and women. Here, we characterized the gender-specific relationship between self-reported sleep duration and fibrinogen, high-sensitivity C-reactive protein (hs-CRP), and interleukin-6 (IL-6) in relatively healthy Chinese older adults.

Materials and methods: The sample consisted of 74 older adults (mean \pm SD of age = 70.7 \pm 6.5 years; 38 males) from the Singapore-Longitudinal Aging Brain Study. In Phase 4 of the study (November 2011 to April 2013), their self-reported sleep duration was assessed with the Pittsburgh Sleep Quality Index (PSQI). Levels of fibrinogen, hs-CRP, and IL-6 were assessed via venous blood samples. Hierarchical regression analyses were performed to examine whether the associations between self-reported sleep duration and the three inflammatory markers were moderated by gender. Age was included as a covariate.

Results: The average of self-reported sleep duration was 6.5 h (SD = 1.1; range = 3.0–8.5), and fibrinogen 3.2 g/l (SD = 0.6; range = 2.2–4.7), hs-CRP 1.1 mg/l (SD = 1.2; range = 0.2–6.5), and IL-6 2.1 pg/ml (SD = 0.2; range = 2.0–3.2). Controlling for age, regression analyses revealed that the level of fibrinogen was higher in women than in men ($p = 0.03$). There was a borderline non-significant effect of sleep duration on fibrinogen ($p = 0.07$). Interestingly, the interaction between gender and self-reported sleep duration was also borderline non-significant ($p = 0.06$), indicating that in women, levels of fibrinogen tended to increase with shorter sleep duration (partial $r = -0.33$, $p = 0.06$ after controlling for age). No such association was found for men (partial $r = 0.14$, $p = 0.41$). Neither the main effect of sleep duration, gender nor the gender \times sleep duration interaction was significant for hs-CRP ($p > 0.20$) or IL-6 ($p > 0.35$).

Conclusion: Among relatively healthy Chinese older adults, the association between short self-reported sleep duration and higher levels of inflammatory markers tended to be more prominent in women than in men and for fibrinogen than for hs-CRP and IL-6. A limitation of this study is small sample size and hence, insufficient power.

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Investigation on the awareness of sleep medicine in a university of traditional Chinese medicine

Y. Lu, Y. Sun, Y. Ma, H. Li, Y. Chang, Y. Tong, S. Sun

Guang'anmen Hospital, China Academy of Chinese Medical Sciences, China

Introduction: Numerous publications have emphasized the importance and necessity of sleep medicine in traditional Chinese medicine (TCM) and its education. However, it remains unclear whether sleep medicine has gained enough attention in TCM education. This survey was conducted to TCM students, aiming to evaluate their knowledge and awareness on sleep medicine.

Materials and methods: Forty-seven fifth-year medical students from Beijing University of Chinese Medicine were enrolled in this study. A nine-item questionnaire was designed to collect information, including (1) sleep stages, (2) the definition of sleep, (3) names of sleep diseases that they know, (4) names of facilities for sleep monitoring instrument, (5) their access to knowledge on sleep medicine, (6) the relationship between the sleep diseases and other diseases, (7) academic associations/societies of sleep medicine.

Results: About sleep stages, 36.2% of the participants thought they probably knew it, and 63.8% did not know it at all. For the definition of sleep, only 4.3% of the participants knew a little, and 94.7% did not know it at all. In terms of sleep disorders, 17% could name at least three names correctly, 38.3% and 29.8% could name only two and one correct names respectively. For sleep devices, only 19.1% of the people knew it and other people did not. Upon investigating their knowledge access to sleep medicine: 44.7% of the people referred to textbooks, 27.7% to extracurricular books, 14.9% to the Internet, 12.8% to mass media, 8.5% to courses of practice, and 6.4% of the people never acquired knowledge on sleep medicine. For the relationship between the sleep disorders and other diseases, 8.5% of them only knew the association with hypertension, 46.8% were aware of the association, but could not name it specifically, and 42.6% of the people did not know it at all. All of the participants did not know any academic associations/societies of sleep medicine.

Conclusion: Study indicates that TCM students learn little knowledge on sleep disorders from systematical education. To arouse students' awareness on sleep disorders, we suggest medical schools cooperating with academic associations and providing students with diverse access to obtaining sleep-related knowledge on campus, like establishing elementary courses or holding seminars.

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Validation study of the Filipino version of the children's sleep habits questionnaire

K. Mabilangan, M. Moral-Valencia

University of Santo Tomas Hospital Section of Child Neurology, Philippines

Introduction: Sleep disorders is probably one of the significant underdiagnosed condition that can lead to substantial morbidity in children. It is therefore important to evaluate sleep habits and possible sleep disorders among children in clinical practice. Thus, there is a need for a screening tool that can be understood by most Filipinos.

Materials and methods: The CSHQ was forward translated to Filipino, synthesized and back-translated to an English version. An expert committee reviewed the pre-final Filipino version and was pilot tested. Validation analysis was done thereafter.

Results: A total of 300 children of varying age groups were included in the study. Results showed that the Filipino version of CSHQ was accurate, reliable and internally consistent as a measurement of a child's sleeping profile. The Filipino CSHQ was also able to distinguish if a child has sleeping problems based on a high CSHQ score.

Conclusion: The translated version of CSHQ was as effective as the original English questionnaire in determining the sleep habits of children. This version can be a valuable instrument in other sleep-related studies for children in the future.

Acknowledgements: To Dr. Judith Owens who helped me pursue this research. Thanks to Dr. Moral and UP – Sentrong Wika for facilitating the translations and reviewing the tool. Dr. Venus Rosales for assisting me in the manuscript and statistics. Dr. Valencia who supported all aspects of this research.

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Short term and long term outcome of palatal surgery (palatal muscle plication and palatal buried suture) for SDB patients

P. Mahakit

Phramongkutklao Hospital, Thailand

Introduction: Palatal surgery is a treatment for simple snorers to reduce movement of soft palate and as adjunct surgery with tongue base surgery for OSA patients. Aims of palatal surgery is to reduce snoring loudness, preserve normal function and avoid unfavorable complications such as VPI.

Materials and methods: Two hundred and one snoring patients who had indication to do other surgery (such as tonsillectomy, septoplasty) and 78 patients with OSA who refuse to use CPAP underwent palatal surgery (palatal muscle plication for redundant soft palate and palatal buried suture for web type soft palate) as mainstay and adjunct surgery for simple snoring and OSA patients respectively. Patient selection depend on symptoms, BMI, ESS, Friedman classification and PSG. Snoring score were assessed in all patients for short term (4–6 months) and long term follow up (18–24months). Repeated polysomnographies were done only in OSA patients for long term follow up.

Results: For simple snoring patient, short term success rate was 84% and long term success rate was 68%. For OSA patients, short term success rate was 81% and long term was 72%. Temporary dysphagia, voice change and abnormal taste perception was 12%, 10% and 6% respectively.

Conclusion: Palatal surgery was a reliable technique as mainstay and adjunct surgery for simple snorer and OSA patients with high success rate and acceptable complications.

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The Pittsburgh sleep quality index as a screening tool for sleep dysfunction in clinical and non-clinical samples: A systematic review and meta-analysis

T. Mollayeva¹, P. Thurairajah², S. Mollayeva^{3,4}, C. Shapiro^{4,5,6}, K. Burton⁷, A. Colantonio^{8,9,10}

¹ Rehabilitation Science Institute Neuroscience Program, University of Toronto, Canada

² Clinical Research Project Assistant, Canada

³ Department of Cell and Systems Biology/Department of Ecology and Evolutionary Biology, Faculty of Arts and Science; Acquired Brain Injury Research Laboratory, University of Toronto, Canada

⁴ Youthdale Child and Adolescent Sleep Clinic, Ontario, Canada

⁵ Department of Psychiatry and Ophthalmology, University of Toronto, Canada

⁶ Toronto Western Hospital, University Health Network, Ontario, Canada

⁷ Department of Medical Imaging, Institute of Health Policy, Management and Evaluation, University of Toronto, Canada

⁸ Toronto Rehabilitation Institute, University Health Network, Canada

⁹ Work and Health, Canada

¹⁰ Department of Occupational Science and Occupational Therapy, University of Toronto, Canada

Introduction: This review appraises the process of development and the measurement properties of the Pittsburgh sleep quality index (PSQI), gauging its potential as a screening tool for sleep dysfunction in non-clinical and clinical populations; it also compares non-clinical and clinical populations in terms of PSQI scores.

Materials and methods: MEDLINE, EMBASE, PsycINFO, and HAPI databases were searched. Critical appraisal of measurement properties was performed using COSMIN.

Results: Of 37 reviewed studies, 22 examined construct validity, 19 – known-group validity, 15 – internal consistency, and 3 – test–retest reliability. Study quality ranged from poor to excellent, with the majority designated fair. Internal consistency, based on Cronbach's alpha, was good. Discrepancies were observed in factor analytic studies. In non-clinical and clinical samples with known differences in sleep quality, the PSQI global scores and all subscale scores, with the exception of sleep disturbance, differed significantly.

Conclusion: The best evidence synthesis for the PSQI showed strong reliability and validity, and moderate structural validity in a variety of samples, suggesting the tool fulfills its intended utility. A taxonomic analysis can contribute to better understanding of sleep dysfunction as either a dichotomous or continuous construct.

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Relationship between sleep disorders and urologic diseases

M. Moradi¹, H. Khazaie²

¹ Department of Urology, Kermanshah University of Medical Sciences, Kermanshah, Iran

² Sleep Disorders Research Center, Kermanshah University of Medical Sciences, Kermanshah, Iran

Introduction: Recently some investigator studied relationship between sleep disorders and some urological and nephrologic diseases. In this presentation we review some important article about sleep disorders and urological and nephrology diseases.

Materials and methods: Nocturia is a symptom that adversely affects the quality of life, and is especially frequent in older men. It has been reported to cause some problems, including an increased risk of nighttime falls, fatigue due to awakening during the night, decreased work efficiency and even traffic accidents. It has been shown that patients with one or no incidents of nocturia had significantly fewer sleep disturbances than patients with two or more. Nevertheless, as stated by Yoo et al. (2010) the degree of sleep disturbance might be more than what the study determined, because some people mask or omit their sleep problems. Nocturia is regarded as one of the most bothersome lower urinary tract symptoms (LUTS). It has been suggested that the most common causes of LUTS are benign prostatic hyperplasia (BPH). Wada et al. (2013) show that transurethral resection of the prostate diminishes nocturnal urinary frequency and partly improves sleep quality in patients with nocturia and lower urinary tract symptoms suggestive of benign prostatic obstruction. Furthermore they show that persistent sleep disorder after transurethral resection of the prostate is associated with persistent voiding and storage symptoms.

Results: Chou et al. (2014) in an interesting study show that patients with Sleep Apnea (SA) are associated with increased longitudinal risk of benign prostate hyperplasia (BPH) development, thus early treatment of SA may be important for BPH prevention.

Kaynak et al. (2004) concluded in their study that a nocturnal voiding frequency of more than three times is common in severe obstructive sleep apnea syndrome (OSAS) and those clinicians should have a high degree of suspicion of severe OSAS in subjects who complain of more than three nightly incidents of nocturia. In the current study Afsar (2013), investigated the relationship between self-reported nocturnal sleep duration (NSD) and daytime sleepiness with 24-h urinary protein excretion (UPE) and 24-h urinary albumin excretion (UAE) were investigated in patients with newly diagnosed type 2 diabetes mellitus. Sağlam et al. (2013) investigated the roles of age, metabolic syndrome, nocturnal polyuria and sleep disorders in patients with lower urinary symptoms.

Conclusion: As we see nowadays have been shown reciprocal relationship between sleep disorders and some urological and nephrology diseases.

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Sleep disorders and diabetes

Z. Wang, P. Wang, Y. Lv, X. Wu, Q. Sun

The First Hospital of Norman Bethune College of Jilin University, China

Introduction: Sleep plays an important role in the balance of psychological, emotional, and physical health. Sleep disorders and subjective complaints of poor sleep have been shown to be related to abnormal glucose metabolism and diabetes risk.

Materials and methods: Both short and long sleep duration may increase risk of type 2 diabetes (T2DM). Recent meta-analysis showed that short sleep predicts the incidence of type 2 diabetes, while long sleep duration predicts the incidence of diabetes. Long but not short sleep duration is associated with insulin restriction (IR) and insulin secretion. The suppression of slow-wave sleep (SWS) without any reduction in total sleep time resulted in decreased insulin sensitivity, reduced glucose tolerance, and increased risk of T2DM. Sleep deprivation are also associated with diabetes, obstructive sleep apnea (OSA), is a major risk factor for insulin resistance and possibly diabetes, even in lean individuals. Initial OSA severity and its physiologic consequences predicted subsequent risk for incident diabetes among people with OSA. The role of OSA to DM development seems to be gender-dependent and there are higher incidence in women than that in men. T2DM incidence is increased with the degree of severity, untreated OSA may lead to sympathetic surges, high blood pressure, hyperglycaemic excursions and increased glycaemic variability, and may induce oxidative stress and an inflammatory response. It was shown that REM-AHI was also an independent predictor of diabetes except for overall AHI during total sleep time.

Results: Circadian clock disruption are also associated with diabetes, disruption of the circadian clock for shift-work or bad sleeping habits, can cause severe disturbances in endocrine rhythms, which may lead to diabetes. The mechanisms that sleep disorders may lead to diabetes is that sleep disorders might contribute to the development of insulin sensitivity or impaired glucose metabolism directly, and might indirectly effect the incidence of diabetes via the irregularity of appetite and leading to weight gain. Sleep disorders might cause the change in sympathetic nervous system activity and hypothalamic–pituitary–adrenal activity, which could lead to insulin resistance. Long-term sleep disorder may cause neuroendocrine function change significantly, increase the level of plasma hormones, glucose and adipokines level, which results in insulin resistance and obesity, and increases the risk of diabetes mellitus. At the same time, the disorders such as the abnormality of neural

system and neurotransmitter, acute and chronic diabetes complications could affect the patients' sleep mode and quality and lead to sleep disorder.

Conclusion: Sleep disorders and diabetes mellitus have close relationship. Diagnosing and treating sleep disorders in time can prevent diabetes or improve DM patients' metabolic complication and the quality of life.

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Screening for sleeping problems: Comparison of an innovative smartphone-based sleep log and traditional 2 week sleep diary

C. Wu^{1,2}, S. Wu³, Y. Lin²

¹ Degree Program of Biomedical Science and Engineering, National Chiao Tung University, Taiwan

² Department of Otolaryngology – Head and Neck Surgery, Kaohsiung Veterans General Hospital, Taiwan

³ Department of Industrial and Systems Engineering, Chung Yuan Christian University, Taiwan

Introduction: Information collected in daily sleep diary can provide doctors a more comprehensive picture of patient's recent sleep patterns and make a better arrangement. We wanted to evaluate the smartphone-based sleep log and traditional 2 week sleep diary as a test for screening sleeping problems in the adult male patients.

Materials and methods: A total of 10 participants were recruited. All patients were male and have Epworth Sleepiness Scale (ESS) score of 10 points or more. All patients completed smartphone-based sleep log and traditional 2 week sleep diary at the same time for 14 nights. The patient received smartphone-based sleep log test. A free sleep monitor App was downloaded from Android market and it was used to monitor patient's sleep pattern. The smartphone has an accelerometer sensor build-in and it could receive a record of body movement overnight. Besides, the smartphone has a build-in microphone sound receiver and it could record significant noises during sleep including, sleep talking, cough and snoring. Three sleep specialists, doctor A, B and C, reviewed the smartphone-based sleep log's clinical data and made a first comment. The patient was also asked to finished 2 week sleep diary (from American Academy of Sleep Medicine) at the same time. Their sleep partners were asked to monitor snoring sounds. Three sleep specialists, doctor A, B and C, reviewed the 2 week sleep diary and made a second comment. The first comments were compared with the second comments. The agreement was defined as the concurrence between the first comments and second comments.

Results: Laboratory-based polysomnography is the most commonly used test in the diagnosis of sleep disorder syndrome. Unfortunately, growing interest in this diagnosis has resulted in increased waiting times for polysomnography, as well as a delay in diagnosis and treatment. Due to medical supplies being scarce, primary health care faces difficult triage decisions such as "Who gets to receive polysomnography at first priority?" Clinical information collected in daily sleep diary can provide doctors a more comprehensive picture of patient's recent sleep patterns and make a better arrangement. Three sleep specialists A, B and C were enrolled to read the report of smartphone-based sleep log and 2 week sleep diary. When compared with the first comments, which was made via a smartphone-based sleep log and the second comments, which was made via 2 week sleep diary, the three sleep specialists obtained diagnostic agreement of 100%, 100% and 100%, respectively. Other data including, "The time the person went to bed and woke up?," "when the person awoke during the night?" and "Snoring or not" were also collected and the results of the two

methods also showed highly concurrence. The results of the study showed that the smartphone-based sleep log is a reasonable screening tool.

Conclusion: The smartphone-based sleep log is a reasonable screening test to be utilized to rule out sleeping problems in the patient with abnormal ESS scores. More signals, including oximetry, blood pressure and heart rates will be enrolled in our further smartphone-based sleep log studies.

Acknowledgements: Sleeping disorder is one of the most frequent diseases in male adults. And the issue of sleeping disorder is actually not just a health problem, it is also an educational, an economic, and a quality of life problem. We would like to thank to all the patients who join this project.

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Prevalence of rapid eye movement sleep behavior disorder: A population-based study

H. Im¹, J. Lee¹, Y. Ha¹, S. Lee², C. Shin², C. Yun¹

¹ Department of Neurology, Seoul National University Bundang Hospital, South Korea

² Institute of Human Genomic Study, College of Medicine, Korea University Ansan Hospital, South Korea

Introduction: Rapid eye movement sleep behavior disorder is reported to predominantly affect elderly male and precede neurodegenerative diseases. The purpose of this study is to investigate the prevalence of RBD in middle adulthood.

Materials and methods: This was a cross-sectional analysis from the ongoing prospective cohort study, the Korean Genome and Epidemiology Study (KoGES). We included 2868 adults (male 49.27%, range 49–80 years, 59.3 ± 7.2) who participated in the KoGES evaluation, 2012–2013 were utilized in this study. All subjects were asked to fill out the RBD Screening Questionnaire, and probable RBD was defined when the score was ≥5. Sleep specialists confirmed the presence of clinical RBD by telephone interview of subjects with probable RBD.

Results: After screening, four hundred subjects (male 47.8%, 59.6 ± 7.2 years) were diagnosed as probable RBD. Among them, 396 subjects (male 44.9%, 59.5 ± 7.2 years) were interviewed. Forty eight subjects (male 50%, 50.1 ± 8.4 years) were diagnosed as clinical RBD. The prevalence was to be 1.67%. There was no gender difference, 1.70% in male and 1.65% in female ($p < 0.001$). Disease duration was 7.8 ± 5.1 years (range 1–20). Prevalence in the age group was 2.44% in 50–60 years old, 1.30% in 60–70, 5.97% in older than 70 years.

Conclusion: We presented the prevalence of clinical RBD from large-scale epidemiologic cohort in middle-to-late adulthood. There was no gender difference.

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Dream features of Russian population suffering from sleep paralysis

L. Boriskina, M. Poluektov, E. Korabelnikova

I.M. Sechenov First Moscow State Medical University, Russia

Introduction: Isolated sleep paralysis (ISP) is the episode of hypotonia with an inability to move or speak during awakening or coming into sleep. The prevalence of ISP is 15–40% among people younger 30 years. ISP could be accompanied vivid dreams.

Materials and methods: The goal of this study was to explore dream content of patients with ISP in Russian population.

Participants: Twenty-five people with ISP including 12 men (48%) and 13 women (52%) were studied. Mean age was 26 ± 5.6 years. Control group consisted from 18 healthy subjects, 8 men (44.4%) and 10 women (55.6%) with age is 25.9 ± 7.6 years.

Methods: Original questionnaire based on dream content analysis method by Korabelnikova E.A. was used. Dream reports were recorded immediately after awakening in detail.

Results: Frequency of episodes of IPS were follows: low frequency (1–2 times per month or less) in 20 (80%) cases, medium frequency (1–2 times per week) in 4 (16%) cases and high frequency (every day or 1 time every 2 days) in 1 case (4%). 6 (24%) participants had 2 or more episodes of ISP per night. Only four (16%) participants estimated these attacks as problem for well-being. Twenty-three participants (92%) experienced a different kind of hallucinatory experiences during the attack. 2 of them (8%) had auditory hallucinations, 2 (8%) – tactile, and in other 19 (25%) hallucinations were complex. Negative emotions in dreams were significantly ($p < 0.05$) less prevalent in ISP subjects 2 (18% of participants) comparing with controls 10 (55.5%), ISP patients also had higher percentage of emotionally neutral dreams than controls (9 (81%) and 5 (27.8%) respectively). Lucid dreams appears more frequently in ISP group (in 7 (63.6%) than in controls (0 subjects).

Conclusion: ISP persons have less negative dream content activity than healthy people. Frequency of lucid dreams in such patients is also higher implying the common basis for ISP and lucid dreams. More lucidity thus could provide a sense of security for persons with ISP making their dreams less frightening.

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Two cases of sleep-related painful erection in Korea

K. Cho¹, D. Kim², M. Lee³, B. Lee¹, Heo¹, Y. Cho¹

¹ Department of Neurology, Yonsei University College of Medicine, South Korea

² Department of Neurology, Sunchunhyang University College of Medicine, South Korea

³ Department of Neurology, University of Ulsan College of Medicine, Gangeung Asan Hospital, South Korea

Introduction: Sleep-related painful erection is characterized by deep penile pain accompanied with erection occurring rapid eye movement (REM) movement period. Since the first description in 1971, there were few reports on this rare disorder. We report two patients confirmed by simultaneous recording with polysomnography and Rigiscan.

Materials and methods: A 47-year-old male visited urology and neurology clinic with the complaint of painful penile erection occurring during sleep period. The penile pain events started at the age of 41, and occurred two to three times per one night, frequently awakening from the sleep. He had no problem with erections during daytime sexual activities except for mild premature ejaculation, and urologic inspection revealed no focal abnormalities. Polysomnography recorded with simultaneous Rigiscan monitoring showed two awakening episodes with painful erection which are time-locked to onset of REM sleep periods, respectively. Medical treatment with Escitalopram was tried, but he was lost to follow-up.

The second patient was a 40-year-old man who suffered from prolonged nocturnal painful events that occurred every night from the age of 12. He had no other urologic symptom and penile

deformities. Again, concomitant recording of polysomnography and Rigiscan was performed. Of the four episodes of penile tumescence during sleep period, later two events were during REM sleep periods, and ended with awakening due to penile pain. Therapy with Escitalporam, amitriptyline and propranolol was subsequently tried, but with only minimal improvement of symptoms.

Results: According to the diagnostic criteria in internal classification of sleep disorders (ICSD-2), the each patient was diagnosed to have chronic, severe SRPE. Decreased sleep efficiency (83% and 69%) found on polysomnography was partly contributed to awakening due to penile pain, suggesting presence of sleep disturbance in these patients.

Conclusion: Despite a low prevalence of SRPE, this condition should be considered in a patient who presents with nocturnal penile pain, because SRPE can be diagnosed with its specific clinical features and confirmed with polysomnography accompanied with Rigiscan.

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Trauma associated sleep disorder: A proposed parasomnia encompassing disruptive nocturnal behaviors, nightmares and REM without atonia in trauma survivors

V. Mysliwiec¹, B. O'reilly², J. Polchinski², H. Kwon², A. Germain³, B. Roth²

¹ 65th Medical Brigade, US Army Meddac, USA

² Madigan Army Medical Center, USA

³ University of Pittsburgh School of Medicine, USA

Introduction: Disruptive nocturnal behaviors (DNB) and nightmares are common symptoms reported by individuals with traumatic event exposure. Although these symptoms are often attributed to post-traumatic nightmares there are clinical features that suggest this is a unique parasomnia as nightmares do not have DNB as part of their diagnostic criteria.

Materials and methods: Case series of four active duty US soldiers with exposure to traumatic events. Patients presented with nocturnal symptoms of DNB and nightmares. Clinical evaluation and attended overnight polysomnogram were performed on each patient. REM without atonia (RWA) was scored by SINBAR criteria. All patients received standard of care treatment for comorbid sleep disorders.

Results: DNB ranged from vocalizations, somnambulism to combative behaviors that injured bed partners. Nightmares were replays of the patient's traumatic experiences. Evidence of autonomic hyperactivity was either reported by night sweats or tachycardia in REM. RWA occurred in all patients with an elevated EMG activity index mean of 20.9% for the four patients. One patient had DNB and a nightmare captured during REM sleep. All patients had clinical improvement with decreased DNB and nightmares with combined therapy of their comorbid sleep disorders and prazosin.

Conclusion: We propose trauma associated sleep disorder (TSD) as a unique sleep disorder encompassing the clinical features, PSG findings and treatment responses of patients with DNB, nightmares and REM without atonia after trauma. Patients appear to have improvement with treatment of their comorbid sleep disorders along with prazosin.

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Parasomnias among shift workers In Norway

S. Waage¹, N. Magerøy², B. Moen³, S. Pallesen⁴, B. Bjorvatn¹

¹ University of Bergen and Norwegian Competence Center for Sleep Disorders, Norway

² Department of Occupational Medicine, Haukeland University Hospital, Norway

³ Department of Global Public Health and Primary Care, University of Bergen, Norway

⁴ Department of Psychosocial Science, University of Bergen, Norway

Introduction: Shift work is associated with sleep problems and impaired health. Parasomnias are undesirable physical events or experiences that occur during entry into sleep, during sleep or arousals from sleep, and are divided into two major groups, non-rapid eye movement (NREM) sleep-related parasomnias and REM sleep-related parasomnias.

Materials and methods: Data were collected from an on-going longitudinal cohort study "SURvey of Shift work, Sleep and Health (SUSSH)" that was initiated in 2008/2009, with annually follow-ups. Data were collected by questionnaires, posted along with a prepaid envelope for return. Initially, a sample of 5400 nurses was randomly selected from the Norwegian Nurses Organization's membership roll which includes most of the nurses in Norway. This study presents findings from the fourth data collection (wave 4) that took place in 2012, including 2198 nurses. The nurses reported (no/yes) whether they had experienced different parasomnias (confusional arousal, sleepwalking, sleep terror, sleep related eating, sleep related violence, sexsomnia, nightmare, dream enactment) during the last 3 months (less than once a month; 1–3 times a month; weekly or more often).

Results: The prevalence of the different parasomnias ranged from 0.3% (injured somebody else during sleep) to 42.4% (nightmare) among day workers only, from 0.0% (sleep related eating; injured yourself during sleep) to 46.8% (nightmare) among night workers only, from 0.7% (sleep related eating; injured somebody else during sleep) to 54.7% (nightmare) among two shift workers and from 0.6% (injured yourself during sleep) to 53.7% (nightmare) among three shift workers. In all work schedules nightmare was the most common parasomnia. Nurses working a two shift schedule (including day and evening) and three shift schedule (including day, evening and night) showed higher prevalence for nearly all parasomnias compared with nurses working day only and night only schedules, but statistical significance was seen only for confusional arousal and nightmares. There were no apparent differences between day only and night only schedules.

Conclusion: To conclude, nurses working rotational shift work schedules reported more confusional arousal and nightmares compared with nurses working daytime only. Most likely this findings can be attributed to circadian rhythm misalignment and sleep deprivation caused by shift work.

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Comorbidity between epilepsy and parasomnia

H. Yilmaz¹, A. Kisabay¹, M. Batum², B. Oktan¹

¹ Celal Bayar University School of Medicine, Department of Neurology, Section of Epilepsy and Sleep Disorders, Manisa, Turkey

² Usak Public Hospital, Turkey

Introduction: The relationship between parasomnia and epilepsy are complex and little is known about the comorbidity of

parasomnia and epileptic seizures. We here aimed to investigate patients to reveal the comorbidity of epilepsy and parasomnia.

Materials and methods: We retrospectively investigated all patients who was evaluated by video EEG polysomnography in our epilepsy and sleep disorders unit last 5 years. The diagnosis of epilepsy was made on clinical and electrophysiological findings. The diagnosis of parasomnia was made according to criteria of International Classification of sleep disorders and video EEG PSG findings.

Results: A total of 114 male (62%) and 71 female (38%) patients were investigated. We have seen that only 81 patients (44%) of 185 patients were true diagnosed as epilepsy parasomnia comorbidity.

Conclusion: Parasomnias and epileptic seizures can coexist in the same subject making the differential diagnosis of these conditions particularly challenging. A greater awareness, among clinicians, of the comorbidities between sleep disorders and epilepsy may help to prevent misdiagnosis and mistreatment.

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Change in the severity of apnea immediately after modified cautery assisted palatal stiffening operation

N. Abdul Rashid¹, M. Mat Baki², N. Tajudin², M. Maaya², A. Mohamed²

¹ Universiti Putra Malaysia, Malaysia

² Universiti Kebangsaan Malaysia, Malaysia

Introduction: Obstructive Sleep Apnea (OSA) is a risk factor for perioperative morbidity and mortality but evidence in the medical literature for postoperative complications requiring intensive care have been inconsistent. Postoperative observation in an intensive care setting may be shrewd but may not be necessary for all patients undergoing upper airway surgery.

Materials and methods: A prospective cross-sectional study was carried out to observe the change in the severity of OSA in adult patients with mild to severe OSA who had undergone modified Cautery Assisted Palatal Stiffening Operation (CAPSO) with adjunct procedures. Their preoperative and immediate postoperative Level III polysomnography results were compared. The results were obtained from a four-channel unattended ambulatory device (Watch PAT100 by Itamar Medical, Israel). The patients were also observed for difficult intubation following induction of general anesthesia pre-operatively, as well as for airway compromise, cardiovascular events and any surgical complications in the immediate post-operative period in the recovery bay and intensive care unit.

Results: Forty patients were recruited but only 21 completed the study. There were 19 male patients and 2 females. The median age was 32.5 years (9.8) (mean value of 34.9 ± 7.8) with the youngest at 24 years and oldest at 53 years. The median body mass index (BMI) was 29.0 (8.2) (mean value of 30 ± 4.5) where the lowest index was 23.2 and the highest was 37.5. 16 patients were a category ASA physical status 1 under the American Society of Anesthesiologists (ASA) Physical Status classification system while the remaining 5 were in the ASA physical status 2 category. The median preoperative and postoperative apnea hypopnea index remained in the severe category, which were 36.0 (51) (mean value of 43.1 ± 28.9) and 46.8 (40.4) (mean value of 40.3 ± 22.6) ($p = 0.77$) respectively. The median preoperative and postoperative oxygen desaturation index increased from 17.6 (47.2) (mean value of 30.8 ± 24.8) to 34.8 (36.3) (mean value of 28.9 ± 19.5) ($p = 0.73$). There was an improvement in the median preoperative and postoperative minimum saturation from 77% (14.5) (mean value of 77 ± 9.8) to 84% (7.5) (mean value of 83 ± 7.5) ($p < 0.05$). No difficult intubations were observed

and there were no respiratory, cardiovascular and surgical complications in the immediate postoperative period.

Conclusion: No worsening of the severity of apnea was observed in the immediate postoperative period in all the study patients with mild to severe OSA who had undergone modified CAPSO with adjunct procedures. Those with ASA physical status 1 and 2 may be safe to be monitored in the general in the immediate postoperative period.

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The effect of antihypertensive drugs on heart rate variability and sleep parameters in hypertensive patients

L. Ko¹, C. Yang², T. Kuo²

¹ Far Eastern Memorial Hospital, Taiwan

² Sleep Research Center and Institute of Brain Science, National Yang-Ming University, Taiwan

Introduction: Hypertension and insomnia are often coexist. Few studies investigated the impact of antihypertensive agents, such as angiotensin II receptor antagonist (ARB)/angiotensin-converting enzyme inhibitor (ACEi) and calcium channel blocker (CCB) on autonomic function and sleep parameters.

Materials and methods: Twenty-seven patients with primary hypertension not under antihypertensive treatment, and 16 and nine patients receiving ARB/ACEi and CCB treatment respectively participated in this study. Forty-eight healthy subjects were recruited as the control group. Their electroencephalogram (EEG), electrocardiogram (ECG), electromyography (EMG), electrooculography (EOG) were recorded with TD1A (a miniature polysomnography) for 24 hours simultaneously. Autonomic function were analyzed with spectral analysis of heart rate variability. The Pittsburgh Sleep Quality Index was assessed in all the subjects recruited.

Results: The heart rate variability analysis revealed a decrease in high frequency (HF) power in the ARB/ACEi treatment group compared with the hypertension without treatment group during REM ($p = 0.026$) and NREM ($p = 0.045$) sleep stages; the REM latency was lengthened in the ARB/ACEi treatment group compared with the healthy controls and hypertensive without treatment group ($p = 0.004$ and 0.015 , respectively), and the other 14 parameters did not differ significantly among four groups. Hypertensive patients with ARB/ACEi treatment alone had significantly higher total PSQI score compared with healthy controls ($p = 0.009$), but a trend toward significant difference compared with hypertensive patients without any treatment ($p = 0.065$).

Conclusion: Hypertensive patients with ARB/ACEi treatment alone had subjective poor sleep quality, and altered sleep structure compared with healthy controls and hypertensive patients without treatment. This group of patients also showed attenuated vagal tone during sleep.

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What kind of sleep is narcotic sleep? How different cannabinoids induce changes in the EEG of mice and the mechanism behind it

O. Malyshevskaya, K. Aritake, Y. Urade

International Institute for Integrative Sleep Medicine (WPI-IIIS), Japan

Introduction: Recently, many kinds of synthetic cannabinoids have been spread globally. Acute administration of synthetic cannabinoids

in rats results in hypolocomotion and increase of EEG in the frequency range 5.0–6.0 Hz (Uchiyama et al., 2012). However, the neurophysiological mechanism responsible for the pro-psychotic properties of cannabinoids is unknown.

Materials and methods: In the in-vivo part of this study we describe the correlations between EEG characteristics and behavior after i.p. injection of cannabinoid substances. Then, we characterize cannabinoid receptor binding using luciferase assay in-vitro system.

WT male mice were anesthetized and implanted EEG and EMG electrodes. After 1 week of recovery period animals were connected to EEG-recording system and tested with vehicle injection i.p. Then, animals were injected i.p. with either tetrahydrocannabinol (THC), endocannabinoids (anandamide), or synthetic cannabinoids (CP-55490, JWH-018, etc). EEGs recorded under experimental conditions were processed and the power spectra analysis of signals was obtained for delta, theta, alpha, beta, and gamma frequencies.

Then, we established luciferase reporter assay in Chinese hamster ovary (CHO) cell line. By retroviral transfection cannabinoid receptors were overexpressed in CHO cells and used for the measuring of agonist/antagonist effect on Gi-coupled receptors. For overexpression we used two classical cannabinoid receptors: CB1 and CB2 and three candidate cannabinoid receptors – orphan G proteins: GPCR 55, GPCR 119, and GPCR18. Because most cannabinoid receptors are GPCR particularly coupled with Gi proteins they can be characterized via an increase or decrease in cAMP. All-in-all this assay is useful for pharmacological characterization of both agonist and antagonist ligands.

Results: Most of synthetic cannabinoid i.p. injections resulted in prolonged hypolocomotion and catatonia for 4–12 hours (depending on the substance and its dose), which was highly significant compared with vehicle or THC injection. Most of synthetic compounds significantly increased the EEG power in a frequency range of 2–3 Hz as compared with control or THC. Moreover, some cannabinoid drugs resulted in behavioral and electrophysiological seizures.

In-vitro data display different binding to CB receptors depending on each substance. Receptor binding of some classical cannabinoids and endocannabinoids was characterized before, but binding of many synthetic cannabinoids was not elucidated yet. Therefore, most of synthetic cannabinoids were characterized in our in-vitro assay. Moreover, we also included in our system candidate cannabinoid receptors, as some cannabinoid substances bind to these receptors.

Conclusion: By combination of cell culture system and in vivo EEG recording, we examined the receptor binding and mechanism of action of various synthetic cannabinoids. All of these compounds have different effects on EEG and they are due to differences in receptor binding, which we show by in-vitro system.

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Effects of gabapentin on breathing sleep parameters in older healthy men: A randomized, double-blind, placebo-controlled study

R. Piovezan, C. Kase, S. Tufik, D. Poyares
Universidade Federal de Sao Paulo, Brazil

Introduction: Gabapentin is prescribed for several conditions, including sleep disorders, such as restless legs syndrome, and more recently, for sleep promotion. Previous well-designed clinical trials addressing polysomnographic (PSG) effects of gabapentin in aged individuals are scarce. We investigated the acute effect of gabapentin on the nocturnal breathing pattern in older men.

Materials and methods: A randomized, double-blinded, single-dose, crossover pilot study involving two treatments, placebo and gabapentin, was carried out after the Institutional Review Board approval. All participants signed the informed consent form before entering into the study. Non-obese men >60 years old without severe or uncontrolled chronic diseases were recruited. Participants were excluded if any of the following criteria were present: psychoactive drugs, sleep disorders (based on sleep complaints and basal polysomnography – PSG), number of apneas/hypopneas per hour (AHI > 15), neuropsychiatric disorders, alcoholism, tabagism, and nocturia.

Randomized participants (n = 8) received 300 mg or placebo at bedtime (from 22:00 to 06:00) and sleep was assessed by PSG. One week later, the same procedure was repeated with the crossover of the treatment. Safety assessment was performed through monitoring of adverse events (AEs) and vital signs measurements right before bedtime and after waking. Groups were compared using Wilcoxon signed rank test. AEs were classified by severity and judged according to the potential relationship with the medication. All comparisons assumed 0.05 as significance level.

Results: AHI was significantly higher in the gabapentin condition (mean = 22.36) than in the placebo condition (mean = 12.21). Minimum oxyhemoglobin saturation during sleep was also lower in the gabapentin night (mean = 82.38%) than in the placebo night (mean = 86%). Only the number of oxygen desaturations per hour (oxygen desaturation index – ODI) during NREM sleep, but not the total ODI, was higher in the gabapentin night (mean = 16.79) than in the placebo night (11.78). There were no differences between treatment conditions in the others PSG parameters. No AEs were reported.

Conclusion: Gabapentin was clinically safe in our aged group. However it impaired some of the sleep breathing parameters, including obstructive AHI. The clinical relevance of this finding with regard to the safety profile of this medication is still uncertain. Long-term clinical trials aimed to elucidate this concern are warranted.

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Influence of shuxin anshen paste on zebrafish behavior

F. Xu, Z. Yang, L. Huang, J. Yuan
China

Introduction: The curative effect of Shuxin Anshen paste is gradually enhanced perhaps because of drug cumulative effect. It can not only improve sleep (sleep quality, sleep time, sleep time, sleep efficiency, etc.), but also can improve the subjective sleep quality, physiological and psychological.

Materials and methods: Zebrafish were exposed to different concentrations of paste and Chinese herb, their behavioral indicators in the tank, including track diagram, movement speed, length, time were recorded and quantified automatically with the video record and track system, watching the movement of zebrafish activity under the photoperiod stimulus.

Results: As the paste concentration increases, the larval locomotor activity gradually reduced. Under the condition of illumination, low dose group can enhance larval locomotor activity ($p < 0.05$); medium and high dose group can reduce larval locomotor activity, but there is no statistical significance. The locomotor activity of ramulus cinnamomi decoction, fossilia oyster decoction, prunus mume and fructus cornel decoction, aconite root, fructus amomi, prunus mume and fructus cornel are significantly higher than control group ($p < 0.05$). Under the condition of dark, medium and high dose

group can reduce larval locomotor activity ($p < 0.05$). The locomotor activity of *sini decoction*, *aconite root*, *prunus mume* and *fructus cornel* are significantly higher than control group ($p < 0.05$), while *sini guigan longmu decoction*, *ramulus cinnamomi decoction*, *rhizoma zingiberis* and *fructus amomi* can significantly reduce the locomotor activity ($p < 0.05$).

Conclusion: Shuxin Anshen paste has inhibitory effect on zebrafish behavior; different pastes of drugs have different effects on zebrafish movement behavior.

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Role of preoptic area thermo TRPV1 channel in sleep and thermoregulation

R. Yadav, L. Vishwakarma, H. Mallick

AIIMS, New Delhi, India

Introduction: The maintenance of body temperature within a narrow range is a major homeostatic function and is critical for survival. Preoptic area of anterior hypothalamus is one of the most important neural sites involved in the body temperature regulation and sleep.

Materials and methods: The study was conducted in 12 male Wistar rats. Surgical procedures were performed for implantation under thiopentone sodium anesthesia (40 mg/kg body weight, i.p.). A bilateral guide cannula (24G) with indwelling styli was implanted with their tips aimed at 2 mm above the POA as per De Groot's atlas. A radio transmitter TA10TAF-40 (Data Science International, USA) for the telemetric recording of body temperature was implanted in the abdomen. K type thermocouple wire was inserted near hypothalamus in order to measure the brain temperature. Brain temperature was recorded at 15 second interval through fluke digital thermometer. Body temperature was recorded telemetrically at 15 second interval. The temperature was measured from 10 AM to 4 PM and injection was given at 12 PM. Temperature data was averaged at 15 minute epochs. TRPV1 agonist, capsaicin injection was given bilaterally (0.2 μ l) at a rate of 0.1 μ l/min using injector cannula at the POA. Saline was used as a control. The site of injection was confirmed by histologically. The statistical comparison was made between pre and post injection record as well as saline matched control.

Results: The body temperature recorded in five rats range between 37.00 ± 0.3 °C and 37.46 ± 0.2 °C and brain temperature 36.7 ± 0.3 °C and 37.2 ± 0.4 °C. The injection of capsaicin (0.2 μ g/0.2 μ l) into preoptic area produced a prompt fall in body and brain temperature. Tbr significantly decreased from 37.1 ± 0.3 °C to 36.5 ± 0.2 °C, 12:15 to 12:30 h, ($p < 0.05$), 36.9 ± 0.2 °C to 36.1 ± 0.5 °C, 12:45 to 13:0 h, ($p < 0.05$), 36.9 ± 0.3 °C to 36.2 ± 0.3 °C, 13:0 to 13:15 h, ($p < 0.05$) and Tb significantly decreased from 37.2 ± 0.2 °C to 35.9 ± 0.6 °C, 12:30 to 12:45 h, ($p < 0.05$). In rats the injection of capsaicin (0.2 μ g/0.2 μ l) into preoptic area of anterior hypothalamus produced a prompt fall in body and brain temperature. TRPV1 agonist (0.2 μ g/0.2 μ l) increase REM sleep.

Conclusion: The TRPV1 channel agonist injection in the POA brings about fall in body and brain temperature by stimulating warm sensitive neurons and increase REM sleep.

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The maintenance of wakefulness test: An electro-physiological measure to better evaluate ADHD adult patients

S. Bioulac¹, C. Chaufton², J. Taillard², A. Claret³, P. Sagaspe², P. Philip²

¹USR CNRS 3413 SANPSY – Child and Adolescent University Psychiatric Department, Bordeaux, France

²USR CNRS 3413 SANPSY, Bordeaux, France

³Child and Adolescent University Psychiatric Department, Bordeaux, France

Introduction: Attention deficit hyperactivity disorder (ADHD) is a common psychiatric disorder with onset in childhood and may persist into adulthood. The aim of this study was to quantify the objective level of sleepiness in ADHD adults and to determine the relationship between excessive daytime sleepiness and their simulated driving performance.

Materials and methods: Forty adult ADHD patients (DSM-IV criteria) and 19 matched healthy control subjects were included. Patients and controls were investigated in a similar way in a sleep laboratory. All the participants answered the Epworth Sleepiness Scale (ESS) and the Manchester Driving Behaviour Questionnaire.

They performed a nocturnal polysomnography followed the next day by a 4 × 40-minute Maintenance Wakefulness Test (MWT), two neuropsychological tests (the Vigilance subtest of the computerized Test Battery for Attentional Performance and the Wechsler digit symbol substitution test), and a 1 hour driving session. All patients were withdrawn from psychostimulant medication for a minimum of 72 hours before starting the study and were without other psychotropic medications for a minimum of 1 month.

The primary outcome measure was the mean sleep latency on the MWT. ADHD patients were divided into three groups defined by their MWT scores. All the participants were allocated as follows: sleepy ADHD (0–19 min), intermediate ADHD (20–33 min), alert ADHD (34–40 min) and control group (34–40 min). The driving performance outcome was the mean of Standard Deviation of Lateral Position (SDLP) of the vehicle during the simulated session.

Results: The sample consisted of 40 ADHD patients (mean age = 35.6 ± 8.5 years, 19 males) and 19 age- and sex-matched healthy control subjects (mean age = 36.3 ± 10.5 , 9 males). The mean ESS was significantly higher in ADHD subjects (12.1 ± 4.4) than in controls (6.0 ± 2.7) ($p < 0.001$). The mean on the DBQ score was significantly higher in ADHD patients (62.1 ± 27.2) than in controls (24.7 ± 13.6) ($p < 0.001$).

On TAP vigilance (reaction time), ADHD patients were slower than controls [$F(1, 57) = 7.87$, $p < 0.01$] and on the Wechsler digit symbol substitution test, ADHD patients had a lower mean number of correct responses than controls [$F(1, 57) = 4.26$, $p < 0.05$].

Based upon the MWT scores, 14 (35%) of our patients were in the sleepy group, 20 (50%) were in the intermediate group, and only 6 (15%) were in the alert group. In the sleepy group, three subjects presented an apnea/hypopnea index (AHI) > 10/h or/and the mean index of periodic limb movements in sleep (PLMS) > 15/h. Moreover, sleepy ADHD patients exhibited significantly deteriorated driving performance compared with the other three groups ($p < 0.01$).

Conclusion: Our study provides new evidence that a significant proportion of ADHD adults exhibit objective excessive daytime sleepiness (EDS), which, in addition, impacts driving simulated performance. EDS, objectively measurable by the MWT, may be a key element to better evaluate these patients.

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Sleep matters? Twenty-four hours' monitoring of daytime and nocturnal changes of heart rate variability in schizophrenic patients on different antipsychotics

H. Huang¹, Y. Yueh-Ming Tai², T. Kuo³, C. Yang⁴

¹ Dr. Happy's Clinic, National Yang-Ming University, National Defense Medical Center, Taipei, Taiwan

² Beitou Branch, Tri-Service General Hospital, National Defense Medical Center, Taipei, Taiwan

³ Institute of Brain Science, National Yang-Ming University, Taipei, Taiwan

⁴ Sleep Research Institute, National Yang-Ming University, Taipei, Taiwan

Introduction: Patients with long-term therapy of clozapine were noted to have higher risk of mortality due to clozapine-related medical illnesses. Our study is to hypothesize the difference of heart rate variability – a predictor of sudden death – between daytime and nocturnal in schizophrenic patients taking clozapine or the other antipsychotics.

Materials and methods: A total of 32 schizophrenic patients were recruited from the chronic ward at the Beitou branch of Tri-Service General Hospital. The case group consists of 10 schizophrenic patients with clozapine treatment of at least 3 months. The remained 22 were controls who were treated with other antipsychotics. All subjects underwent 24-hour HRV recorder by a wireless detector; subjects were asked to do aerobic step exercise for at least 3 minutes. We reviewed whole-day HRV records, which were divided into five statuses, namely, sleep, nap, daytime, exercise and after-exercise. The one-way and repeated measure ANOVA model were applied to compare the differences between five statuses and two groups.

Results: Comparing with controls, a significant higher mean heart rate (HR) was found among case group, as well as significantly lower very-low frequency (VLF) and LF/HF ratio. As lower activity and HR during sleep than during daytime, only the VLF parameter of HRV represented significant difference between clozapine/non-clozapine group and sleep/daytime status. Interestingly, although there is no significant difference in LF/HF between groups and status, a significant interaction between clozapine/non-clozapine groups and sleep/daytime statuses were found. Under the linear models with covariates like age, height, weight and PANSS, the association between clozapine and VLF seems robust even controlling significant effects of body weight.

Conclusion: This study shows that all subjects with schizophrenia have a significantly abnormal autonomic dysregulation during sleeping hours than that during daytime. And patients with schizophrenia on clozapine therapy exhibited marked differences in ANS functioning which reflect a basal autono.

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Sleep disturbances in children with attention-deficit/hyperactivity disorder and learning disorders

A.C. Stokes Brackett, Federec Guatemala

Introduction: Children with (ADHD) commonly experience behavioural sleep problems. Sleep problems are complex in children; the etiology is likely to be multifactorial.

Materials and methods: Our sleep clinic of pediatrics is defined as a multidisciplinary service that offers assistance in sleep disorders, assisted by neurologist and neuropsychologist who perform a wide range of clinical activity. We evaluate 30 patients in 1 year.

Results: We found a significant correlation between ADHD and learning disorders associated with lack of sleep hygiene, daytime sleepiness and sleep apnea.

Sleep disorders have become an increasing health issue and its prevalence and consequences are increasingly seen as a serious public health problem.

Conclusion: The use of drugs in conjunction with neuropsychological intervention have provided broad and distinct benefits to children attending and improve their development prospects. Also, further studies using polysomnography have allowed more accurate diagnoses between the prevalence of nocturnal epilepsy and cognitive impairment associated with it.

Acknowledgements: The evolution of the sleep clinic has led to a better understanding of the broad scope of prevalent problem in the Guatemalan population, which mostly ignores the sleep hygiene and the correlation between it and health.

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Sleep and working memory among individuals with depressive and anxiety disorders

M. Wong¹, E. Lau¹, Y. Wing²

¹ Sleep Laboratory, The University of Hong Kong, Hong Kong

² Department of Psychiatry, The Chinese University of Hong Kong, Hong Kong

Introduction: While working memory deficits and sleep complaints were widely reported among individuals with affective disorders, we aim to investigate the relationship between sleep duration with working memory capacity and learning among individuals with/without depressive and/or anxiety disorders (DepAnx).

Materials and methods: Ninety college students (17–24 years, 60% female) were administered the structured clinical interview for DSM-IV Axis I Disorders for assessment of DepAnx. They completed a sleep diary and wore actigraphy for 5 days before completing a two-back spatial working-memory task (two-back), with performance (accuracy and reaction time (RT)) and learning (differences of accuracy and RT across experimental blocks) measures. The average of 5-day sleep duration <6.5 hours was referred as short sleep duration (SSD). The final sample consisted of 48 healthy controls (26% SSD) and 42 with DepAnx (34%SSD).

Results: The groups were matched on demographics ($p > .05$). A 2×2 factorial model (SSD*DepAnx) was tested on two-back performance and learning measures. There was a significant interaction effect (SSD*DepAnx) on accuracy, $F_{2,88} = 9.376$, $p = 0.003$. Post-hoc analysis (LSD) showed that individuals with neither SSD nor DepAnx had higher accuracy than other groups (mean differences = 0.05 to 0.09, $p < 0.001$ to 0.039). There was a significant main effect of SSD on RT, $F_{1,89} = 4.116$, $p = 0.046$. For learning, there was a significant interaction effect between SSD and DepAnx on the change of RT from block 1 to block 2, $F_{2,88} = 5.895$, $p = 0.017$. Post-hoc analysis (LSD) showed that the DepAnx group without SSD had significantly greater improvement in RT from block 1 to block 2 than the DepAnx group with SSD (mean difference = 144.9, $p = 0.015$).

Conclusion: Short sleep duration was found to associate with worse executive working-memory. Furthermore, DepAnx individuals were more vulnerable to the adverse effect of short sleep duration on learning in working-memory task. Sleep behaviors of individuals with depressive and anxiety disorders therefore warrant clinicians' extra attention especially when working-memory issues were observed.

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The prevalence and characteristics of REM sleep without atonia in patients taking certain antidepressants

K. Lee, K. Baron, R. Soca, H. Attarian
Northwestern University, USA

Introduction: The association of REM sleep without atonia (RSWA) as well as REM behavior disorder (RBD) with the intake of selective serotonin reuptake inhibitors (SSRI) and selective norepinephrine reuptake inhibitor (SNRI) is well established. Their prevalence in this population and the characteristics of those individuals who develop them remain unknown.

Materials and methods: Using the Sleep Cataloguer Software we searched polysomnographic records from October 1, 2007 through October 31, 2013 (a total of 10,746 records) for the following key words: Celexa, Citalopram, Cymbalta, Duloxetine, Pristiq, Desvenlafaxine, Effexor, Venlafaxine, Escitalopram, Lexapro, Fluoxetine, Prozac, Sarafem, Floxyfral, Fluvoxamine, Fevarin, Paroxetine, Paxil, Brisdelle, Sertraline, Zolofit.

The resulting 1444 records (after eliminating duplicate reports) were then searched for RSWA and RBD. We used the AASM scoring criteria to determine RSWA. Reports of patients with known narcolepsy or synucleinopathies were excluded. The remaining records were mined for age, sex, presence or absence of obstructive sleep apnea (OSA), type of antidepressant and diagnosis for which antidepressant was prescribed. We used multiple regression analysis to account for the impact of age, OSA and sex on RSWA prevalence. The significance of the risk ratio was calculated by Fisher exact test.

Results: Out of the 1444 subjects on antidepressants 176 (12.4%) had RSWA compared with 226 out of the entire sleep lab population of 10,746 (2.1%), risk ratio 9.978, (8.149, 12.22) CI 95%, z-score 26.33, Fisher exact $p < 0.0000001$. Seven out of the 176 had RBD (0.48%) compared with 108 out of 10,746 (1%). The difference was significant with a p value of 0.005. The lower prevalence of RBD among those with antidepressant induced RSWA is likely an artifact of the study design as we excluded patients with narcolepsy or with neurodegenerative disorders. None of the seven had developed neurodegenerative disorders as of their last visit. With logistic regression analysis there were no significant differences in mean age between the larger population (53.7) and those with RSWA (52.4) $p = 0.11$ nor was there a difference in the prevalence of OSA in either group $p = 0.25$ (66% of both groups had OSA). Men constituted 53% of the general population and 49% of those with antidepressant induced RSWA, the difference was not significant $p = 0.053$. No single diagnosis and no single SSRI/SNRI was significantly associated with higher risk of RSWA or RBD. These results suggest that age, OSA and gender are not driving the effect.

Conclusion: SSRIs and SNRIs are associated with a higher prevalence of RSWA but not of RBD. This is independent of medication and of the diagnosis for which antidepressants are started. Clinical significance of this remains to be elucidated.

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A quantitative analysis of rapid eye movement sleep atonia in healthy adults

Y. Jung¹, S. Mccarter², E. St. Louis³

¹ Department of Neurology, Mayo Clinic, Rochester, MN, USA

² Center for Sleep Medicine, Mayo Clinic, Rochester, MN, USA

³ Department of Neurology and Center for Sleep Medicine, Mayo Clinic, Rochester, MN, USA

Introduction: Abnormally elevated muscle tone during rapid eye movement (REM) sleep, known as REM sleep without atonia (RSWA), is seen in patients with REM sleep behavior disorder (RBD). Normative values for physiologic atonia during REM sleep are not well established, which makes quantitatively defining RSWA difficult.

Materials and methods: Here, we analyzed phasic and tonic muscle activity in submental and anterior tibialis muscles during REM sleep as well as automated submental REM atonia index (RAI) in neurologically normal adults who had normal polysomnography or primary snoring without RBD or other parasomnia. Statistical comparisons were made in 36 subjects subdivided into four age groups: 20–39 years; 40–59 years; 60–74 years; and ≥ 75 years. p Value < 0.01 was considered statistically significant in order to reasonably correct for multiple comparisons.

Results: Submental and anterior tibialis phasic burst durations were similar across the age groups (0.36 ± 0.29 seconds and 0.41 ± 0.28 seconds, respectively). Combined submental and anterior tibialis phasic muscle activity was increased in subjects aged 60–74 years ($16.8 \pm 15.6\%$) in comparison with the activity observed in subjects aged 40–59 years ($1.7 \pm 1.2\%$). There was a trend for a statistical significant difference in combined submental and anterior tibialis phasic muscle activity between groups 60–74 years and 20–39 years. Anterior tibialis phasic muscle activity in subjects aged 60–74 years showed a trend for statistical significance in comparison with that of younger age groups. No significant differences were seen in submental phasic muscle activity across the age groups. No tonic muscle activity was observed in these subjects. All subjects had submental RAI > 0.9 , indicating absence of RSWA. Men who are older than 60 years had increased anterior tibialis and combined submental and anterior tibialis phasic muscle activity compared with younger men and women (20–59 years) and older women (≥ 60 years). No gender differences were observed in submental phasic muscle activity.

Conclusion: The findings suggest that physiologic REM atonia may be increased in older adults, especially in men, although the study is limited given a small number of subjects used in this analysis. A further study of a large number of healthy adults will be important for quantification of physiologic REM atonia.

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Ictal SPECT in patients with REM sleep behavior disorder

G. Mayer¹, T. Kuwert², P. Ritt², H. Stefan³, M. Bitterlich⁴

¹ Department of Neurology Hephata Klinik, Schwalmstadt/University Marburg, Germany

² Department of Nuclear Medicine, University Erlangen, Germany

³ Department of Neurology, University Erlangen, Germany

⁴ Sleep Medicine Hephata Klinik, Schwalmstadt, Germany

Introduction: Patients with idiopathic REM sleep behavior disorder (iRBD) have the same phenotype. Little is known if different types of RBD share the same pathways during their nocturnal activities. The aim of the study was to compare ictal SPECT of different types of RBD.

Materials and methods: Recording was performed as 22 channel video-EEG polysomnography using an IT-Med system I. Ictal and interictal subtraction SPECT was performed after using a semiautomatic SPECT injection device permitting immediate intravenous application of the radioligand ECD with a latency <10 s between onset of clinical event and injection. Patients were injected with 898 MBq Tc-99m ECD (NeuroLite, Bristol-Myers Squibb). Injection was done when REM sleep lasted > or 10 epochs and complex behavior in REM sleep >10 epochs. Ictal and interictal reconstructed datasets were subtracted pixelwise from each other; the difference images were coregistered to MRI images. Two iRBD, Two with narcolepsy+RBD. One iRBD patient had converted to Parkinson's disease (Hoehn and Yahr 4).

Results: All patients independent of their RBD type displayed a similar pattern of activation in the ictal SPECT. The activation included the premotor areas bilaterally, the interhemispheric cleft, the periaqueductal area, the dorsal and ventral pons and the anterior part of the cerebellum.

Conclusion: The ictal pathway of RBD is the same in iRBD, RBD + PD and narcolepsy + RBD.

Acknowledgements: Co-authors: M. Bitterlich (Hephata Klinik, Schwalmstadt/Germany), T. Kuwert and H. Stefan (University of Erlangen, Department of Neurology, Germany).

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Sleep architectures in young adults with a high number of rhythmic masticatory muscle activity

S. Haraki¹, S. Nonoue², A. Tsujisaka¹, K. Uno¹, A. Mikami², S. Ishigaki¹, T. Mizumori¹, H. Yatani¹, A. Yoshida³, T. Kato^{2,3}

¹ Department of Fixed Prosthodontics, Osaka University School of Dentistry, Japan

² Osaka University Hospital, Sleep Medicine Center, Japan

³ Department of Oral Anatomy and Neurobiology, Osaka University Graduate School of Dentistry, Japan

Introduction: Several studies have reported that sleep bruxism is associated with sleep disturbance. The aim of this study was to assess the polysomnographic characteristics of sleep architecture in young adults with sleep bruxism.

Materials and methods: Twenty six subjects (F9:M17, age: 24.5 ± 2.3 years old, BMI = 20.7 ± 1.7 kg/m²) were recruited. They were enrolled for two-night recordings in the sleep research laboratory at the Osaka University Graduate School of Dentistry. Video-polysomnographic recordings with additional electromyographic recordings from jaw-closing muscles were done for the two consecutive nights. Data from the second night was used for the analysis. Sleep and respiratory variables were scored according to the standard scoring criteria. Rhythmic masticatory muscle activity (RMMA) and non-specific activity were scored based on the jaw-closing muscle electromyographic activities and audio-video records. Subjects were divided into two groups according to the cut-off criteria (RMMA index ≥ 4.0/h). Sleep variables were compared between the two groups.

Results: Twelve subjects (eight subjects with and four subjects without tooth grinding report) were classified into high RMMA group (RMMA index: 6.1 ± 1.9/h; n = 12) and other 14 subjects into low RMMA group (1.6 ± 1.0/h; n = 14). Neither sleep macrostructures (total sleep time, sleep latency, sleep efficiency, the percentage of sleep stages for N1, N2 and N3) nor microstructures (microarousal index and awakening index) differ between the two groups. No group-difference was found for respiratory measures such as apnea-hypopnea index.

Conclusion: Young adults with a high number of RMMA episodes exhibited the normal range of sleep architectures. Therefore, an increased occurrence of RMMA is not associated with altered sleep regulatory processes in young adults.

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Prospective study of iron metabolism and RLS in blood donors

L. Lillo Triguero¹, A. Guillem¹, A. Del Castillo², I. Valdés², R. Del Río³, R. Peraita-Adrados⁴

¹ Neurology Department Gregorio Marañón University Hospital, Madrid, Spain

² Internal Medicine Department Gregorio Marañón University Hospital, Madrid, Spain

³ Sleep Unit – Clinical Neurophysiology, La Paz University Hospital, Madrid, Spain

⁴ Sleep Unit – Clinical Neurophysiology, Gregorio Marañón University Hospital, Madrid, Spain

Introduction: Blood donations may be associated with restless legs syndrome (RLS). Iron deficiency is linked with RLS and regular blood donation may lead to iron deficiency. However, this kind of study has not been replicated in Spain where blood donation is altruistic and regulated.

Materials and methods: We conducted a prospective study in two blood donation units of the Community of Madrid. The sample comprised 179 blood donors, 101 women (56%), and 78 men (44%), with a mean age of 43 years (range, 19–69 years). Blood donors were divided into first or sporadic donors (n = 44, 24.58%) versus regular blood donors (n = 135, 75.42%).

After a physical examination (blood pressure, BMI), and haemoglobin level (discarding for donation those subjects with haemoglobin lower than 12 gr/dl), a complete blood count, serum ferritin, transferrin saturation, and soluble transferrin receptors was performed. For the assessment of RLS we asked four questions. (1) Uncomfortable and unpleasant sensations in the legs such as laying down or sitting; (2) movement such as walking or stretching relieves the unpleasant sensations in the legs partially or totally; (3) the unpleasant sensations during rest or inactivity only occur or are worse in the evening or night; (4) the unpleasant sensations enables you to sleep.

We took into account for analysis (i) ferritin levels, (ii) number of positive answers from the four RLS items and, (iii) the correlation between ferritin level and number of RLS symptoms.

Results: Twenty-eight (15.4%, 18 women) blood donors responded positively to one of the questions [4 (2%) 1-question, 9 (4.5%) 2-questions, 10 (5%) 3-questions and 5 (2.5%) 4-questions]. The mean ferritin level was 48.69 ± 44.3 µg/l in women (range, 6–192) and 131.81 ± 97.99 µg/l in men (range, 15–484). Women had a higher risk to have at least one RLS symptom when adjusted for all variables (p = 0,053). In regular donors the mean ferritin level was 79.72 ± 71.83 µg/l (range, 6–377) significantly lower than in first or sporadic donors 136.47 ± 117.07 µg/l (range, 14–484) (p < 0.007). In regular blood donors the percentage of ferritin < 50 µg/l was higher (49.3%). The level of ferritin was <12 µg/l in seven (4%) donors. There is a significant correlation between ferritin levels and BMI (p < 0.01).

Conclusion: Regular blood donors have ferritin levels <50 µg/l compared with sporadic donors, although there was not a significant association with the number of RLS symptoms. Women donors had lower ferritin levels and a higher risk of RLS when adjusted for all variables.

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Sleep quality in patients on maintenance hemodialysis and peritoneal dialysis

M. Masoumi

Iran

Introduction: Sleep disturbances are common among uremic patients; however, limited data are available on predictors of sleep quality in this population.

Materials and methods: Patients on maintenance HD and PD were consecutively included from two medical centers in Isfahan city (Iran). They completed the Pittsburgh sleep quality index (PSQI) and hospital anxiety and depression scale. Laboratory tests were done for iron state, kidney function, and electrolytes. Univariate and multivariate analyses were performed to find predictors of sleep quality.

Results: About 90 patients were evaluated (53 males, age = 54.2 ± 15.2 years, disease duration = 5.3 ± 4.5 years). Poor sleep quality was frequent in 86.6% of the cases in each group of HD and PD patients. Patients on HD had poorer sleep quality in terms of total PSQI scores and two dimensions of sleep latency and sleep efficiency ($p < 0.05$). Anxiety ($\beta = 0.232$, $p = 0.027$), depression ($\beta = 0.317$, $p = 0.004$), and being on HD ($\beta = 2.095$, $p = 0.009$) were independent predictors of overall poor sleep quality.

Conclusion: Poor sleep quality is highly frequent in patients on maintenance dialysis and mood disorders and being on HD are predictive factors. Further studies are required for better understanding of risk factors associated with poor sleep quality and thus possible treatments in these patients.

Acknowledgements: Various types of sleep disturbances are common among patients with end-stage renal disease (ESRD), ranging from 50% to 80% by subjective manner and in up to 50% of the cases as objectively documented with polysomnography.

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Restless legs syndrome and its association with poor sleep quality, mood disorders, and 1 year cardiovascular mortality in patients on chronic dialysis

M. Masoumi

Iran

Introduction: Restless legs syndrome (RLS) is common among uremic patients. We assessed RLS and its association with sleep quality, psychological well-being, and 1 year cardiovascular mortality in patients on chronic hemodialysis (HD) and peritoneal dialysis (PD).

Materials and methods: Patients on chronic HD and PD were consecutively included from two medical centers in Isfahan city (Iran). Diagnosis of RLS was based on the International Restless Legs Syndrome Study Group criteria, confirmed by the validated Cambridge–Hopkins questionnaire. Patients also completed the Pittsburgh Sleep Quality Index (PSQI) and the Hospital Anxiety and Depression Scale (HADS). Laboratory tests were done for iron state, kidney function, and electrolytes. Patients were followed for 1 year; cardiovascular mortality and new events were recorded. Univariate and multivariate analyses were performed to analyze the data.

Results: Ninety patients were evaluated (53 males, age = 54.2 ± 15.2 years, disease duration = 5.3 ± 4.5 years). RLS was diagnosed in 26.6% of the patients (35.1% in females vs. 20.7% in males, $p = 0.019$). Poor sleep quality was frequent in 86.6% of the cases in each group of the HD and PD patients. RLS severity was associated with poor sleep quality ($r = 0.503$, $p = 0.009$) and depression ($r = 0.380$, $p = 0.05$). Both anxiety and depression were also associated with poor sleep quality ($r = 0.463$ and 0.478 , respectively, $p < 0.001$). In multivariate analysis, having RLS ($b = 1.334$, $p = 0.007$), anxiety ($b = 0.291$, $p = 0.005$), and depression ($b = 0.246$, $p = 0.020$), were independently associated with poor sleep quality.

No specific association between laboratory test results and overall sleep quality was observed. One year new cardiovascular events (26.0% vs. 12.3%, $p = 0.113$) and subsequent mortality (13.0% vs. 7.6%, $p = 0.347$) were more frequent, though not statistically significant, in those with RLS than those without RLS.

Conclusion: Among patients on chronic dialysis, RLS and poor sleep quality are highly frequent. Mood disorders and RLS are important independent predictors of poor sleep quality. On the other hand, RLS may be associated with increased risk of cardiovascular risk and mortality in dialysis patients.

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Home-videosomnography [HVS]: General and movement characteristics of children with cerebral palsy and symptoms of Willis–Ekbom disease [WED]

P.L.A.A. Lelis^{1,2}, G. Mcallister¹, M. Vera L.M. L. Cardoso², W. Hall³, O. Ipsiroglu¹

¹ Sleep/Wake Behaviours Clinic & Research Lab, Division of Pediatrics, Department of Paediatrics, Faculty of Medicine, University of British Columbia, Canada

² School of Nursing, Federal University of Ceará, UFC (Fortaleza, Brazil), Canada

³ School of Nursing, University of British Columbia, University of British Columbia, Canada

Introduction: WED is a neurologic disorder characterized by discomfort of feet, legs, and/or other body parts that is relieved by movements. It is the most frequent cause of insomnia, often accompanied by overnight restlessness. Using HVS, we analyzed the characteristics of restless sleep in children with cerebral palsy and insomnia.

Materials and methods: Our sample was comprised of eight patients with a diagnosis of cerebral palsy (Gross Motor Functioning Classification System levels III–IV), insomnia and restlessness at bedtime and overnight (age range 4 years 5 months–16 years; 4 males, 4 females). We assessed sleep/wake-behaviours and conducted HVS. The clinical assessment concept and HVS-methodologies (equipment and analysis algorithms) have been published recently (Ipsiroglu et al. SS&M 2013; Ipsiroglu et al. Frontiers 2015). The HVS methodology was comprised of three viewing steps: basic overview/classification at 16× normal speed, detailed descriptions at 8 to 4× normal speed, and in-depth descriptions/listening to patient generated sounds in real time. Our HVS descriptions included: general setting and sleep arrangements (e.g. bedroom environment, lighting), secondary patient behaviours (e.g. facial expressions, positioning), total sleep period (TSP), awake time (AT), total sleep time (TST), sleep efficiency (SE), restful/restless sleep, sleep

positions and periods of interest (PoI; i.e. intervals when the child presents some change in his sleep state, e.g. movements).

Results: Clinical assessments: 8/8 patients had insomnia, 6/8 had signs of sleep-disordered breathing; 5/8 patients were investigated for familial WED; all cases were confirmed with HVS. In total, 5/8 patients were diagnosed as 'probably familial WED', 1/8 as 'probably WED', and 2/8 as 'suspected WED'.

HVS-recordings: TSP: mean 7 h 44 min (5 h 27 min–10 h 10 min); AT: 5 h 50 min (2:00 AM–7:20 AM); TST: 6 h 13 min (3 h 14 min–8 h 10 min); SE: 76.8% (42–95%); restful sleep: 4 h 41 min (3 h 16 min–6 h 25 min); restless sleep: 2 h 09 min (1 h 02 min–3 h 14 min). Frequent movement characteristics: (a) head turning; limb/body stretching; (b) arm lifting; face rubbing; hand/finger shaking/twitching; (c) elbow/knee flexing; (d) spasm-like movements of hands/legs/body. Movement patterns showed a 'cascading pattern' and tended to follow three specific stages: (a) the cascading pattern starts with brief twitches/shakes in fingers/hands/feet that initiate a bigger movement in one limb; (b) the movement progresses to head turning, limb stretching, arm/leg lifting and face rubbing; (c) finally, the cascade of movements ends with a generalized body movement, mainly a position change and elbow/knee flexing. Patients varied in initiation of these cascading movement patterns; however, each patient tended to follow the same particular pattern several times in their restless period.

Conclusion: All children/adolescents showed low SE and presented with individual characteristic cascading movement patterns that fragmented their sleep. To our knowledge, this is the first clinical description of sleep-related movement patterns in patients with cerebral palsy, insomnia, and restlessness at bedtime/overnight. We interpret this restlessness as signs of WED.

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Interleukin is altered in restless leg syndrome

S. Ranciaro Fagundes, D. Leite Fagundes

Brazil

Introduction: Restless leg syndrome (RLS) is a sensorimotor. Some researchers showed that interleukin is important in sleep and is modified after physical activity. This paper will focus on the role of IL-6, IL-8, IL-10, IL-15 and TNF in RLS in high body resistance aerobic exercise (marathon) practitioner.

Materials and methods: We applied the International Restless Leg Syndrome Study Group (IRLSG) criteria for 35 recreational runners participating in São Paulo and Curitiba Marathon (42.195 km). Researchers interviewed about physical activity (marathon, half-marathon, running (5–10 Km), swimming, cycling, walking and aerobic). The inclusion criteria was finished the race until 5h. One athlete was excluded; he did not finish the race until 5 h. Plasma concentrations of IL-6, IL-8, IL10, IL-15, TNF, iron and ferritin were obtained three times (basal, immediate and 72 h after the running).

Results: We found 27.27% of the athletes met criteria for RLS based on IRLSG criteria. After endurance no statistically significant differences from the standpoint of IL-10, IL-15, TNF between the group with and without RLS ($p < 0.05$). IL-6 plasma concentration was low at baseline, increased post race and still elevated 72h after (basal = 16.46; post = 43.93; 72 h = 52.95) ($p < 0.05$). IL-8 level was increased initially and then decreased 72 h after the running (basal = 35.39; post = 151.26; 72 h = 32.56) ($p < 0.05$).

Conclusion: IL-6 is involved in hepcidine regulation (key regulator of iron homeostasis). IL-6 and IL-8 increased initially and then decreased, indicating compensatory and adaptive response such as stress in the body. Loss of this mechanism might be associated with sleep disorder. Results suggest that IL-6, IL-8 might be related to RLS.

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Are IL-6 and IL-8 associated with increased risk of restless leg syndrome?

S. Ranciaro Fagundes, D. Leite Fagundes

Brazil

Introduction: Studies indicated that exercise stimulated the releasing of IL-6 and IL-8. IL-6 induces hepcidine (key regulator of iron homeostasis). Evidence showed that RLS is linked to iron deficiency. Interleukin analysis has potential to understanding RLS pathophysiology. Objective: evaluate the role of IL-6 and IL-8 in RLS after endurance exercise.

Materials and methods: The researchers interviewed 35 amateur runners participating in São Paulo and Curitiba Marathon (42.195 km) that finished the race in 5 h. We applied International RLS Study Group (IRLSG) criteria and questions about exercises (marathon, half-marathon, running (5–10 km), swimming, cycling, walking and aerobic). One runner was excluded; he finished the race after 5 h. Plasma concentration of IL-6, IL-8 and iron were determined: basal, immediately and 72 h post-exercise and compared RLS marathon runners and no RLS marathon runners.

Results: We found in our experiment that 27.27% of runners met criteria for RLS based on IRLSG criteria. After the endurance exercise the plasma levels of IL-6 showed very important increase (basal = 16.46; post = 43.93) and still increased after 72 h (52.95) in the group with RLS. Plasma levels of IL-8 increased significantly after the marathon (basal = 35.39; post = 151.26) and in 72 h decreased in RLS runners (RLS runners 72 h = 32.56; no RLS runners 72 h = 46.87) ($p < 0.05$). Baseline, immediately and 72 h after the race values of iron were within the normal range for RLS marathon runners and no RLS marathon runners: basal = 97.12 (SD = 35.79); post = 109.62 (SD = 34.15); 72 h = 86.70 (SD = 26.83) in athletes with RLS.

Conclusion: We found increase of IL-6 concentrations after marathon and still elevated 72 h after the race in RLS athletes. IL-8 showed important decrease after 72 h. These data suggest that IL-6 and IL-8 may be associated with RLS. However, some more intensive studies are required to better understand these mechanisms.

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Is there increased response of IL-6 in restless leg syndrome with physical activity?

S. Ranciaro Fagundes, D. Leite Fagundes

Brazil

Introduction: Research showed that physical activity performed close to bedtime is associated with RLS. Articles demonstrated that

cytokines have a key role in sleep and in response to exercise, a change occurs in the production and secretion of cytokines. Objective: effect of physical activity and IL-6 on RLS and non-RLS marathon runners.

Materials and methods: Thirty five recreational athletes who participated in the São Paulo and Curitiba Marathon (42.195 km) were interviewed. One runner was excluded because he did not finish the race in 5 h. We applied the International RLS Study Group (IRLSG) four criteria to diagnose RLS and asked about their physical activity (marathon, half-marathon, walking, running (5–10 km), aerobic, swimming and cycling). We investigated and compared IL-6 basal, post-race and 72 h later with the training hour, of RLS marathon runners and no-RLS marathon runners.

Results: Our sample showed 27.27% of runners met criteria for RLS. IL-6 increased after the race and was still elevated 72 h later in RLS marathon runners (basal = 16.46; post = 43.93; 72 h = 52.95) ($p < 0.05$). The group with RLS completed 100% of their training in the morning between 6:00 AM and 7:00 AM.

Conclusion: Endurance exercise induces body reaction with compensatory and adaptive mechanism. IL-6 increasing initially. If this mechanism is lost, it may induce sleep disorder. Results: IL-6 in athletes with RLS is elevated without relationship to the training hour. This mechanism of IL-6 in RLS could transform our understanding of RLS.

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What is the real role of interleukins (IL) in RLS?

S. Ranciaro Fagundes, D. Leite Fagundes
UNIFESP, Brazil

Introduction: Cytokine are polypeptides that include: interleukins, chemokine, interferon, tumor necrosis factors, growth stimulating factors and cell stimulating factors. Some cells like astrocytes, microglia, endothelia, and muscle are activated by injuries and become immunologically activated and produce substances including cytokine. Cytokines are important in sleep. Objective: correlation between IL and RLS.

Materials and methods: The researchers interviewed 73 amateur runners participating in three marathons (42.195 km) (São Paulo, Porto Alegre and Curitiba) that finished the race in 5 h. It excluded seven (3♂ hypertensive, 1♂ and 2♀ with hypertension and diabetes, and 1 ♂ refused to participate). We applied the four criteria of International RLS Study Group (IRLSG) to diagnose RLS and information about physical activity (marathon, half-marathon, running, walking, aerobic, swimming and cycling). Sample of venous blood was collected at basal time, immediately after the race and 72 h after the running. It investigated IL-6, IL-8, IL-10, IL-15, TNF, iron and ferritin between runners with RLS and without RLS.

Results: In our sample we found 27.27% of athletes met criteria for RLS according to IRLSG criteria. The group with RLS showed slow secretion of IL-6 immediately after the race and the levels decline slowly too (basal = 16.46; immediate = 43.93; 72 h = 52.95) compared with the group without RLS (basal = 28.24; immediately = 109.76; 72 h = 15.53). IL-8 showed fast secretion after the race in the group with RLS and fast declination after 72 h (RLS basal = 35.39; immediate = 151.26; 72 h = 32.56) (no RLS basal = 37.95; immediately = 82.70; 72 h = 46.87). There was no statistical significance in IL-10, IL15, iron levels and ferritin between the groups.

Conclusion: Cytokines are important in sleep; after exercise is the release of interleukins is expected, more specifically IL-6, and returns to the basal levels after 1.5 h. This dynamic is important and the rupture of this pattern could be responsible for sleep problem. Our results highlight the role of IL-6 and IL-8 in RLS.

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The effects of sleep stage on related heart rate changes associated with periodic limb movements during sleep

W. Si

Department of Neurology, Urumqi General Hospital, Lanzhou Command, PLA, Urumqi, Xinjiang, China

Introduction: It is now well-established that PLMS are associated with a significant increase followed by a decrease in heart rate (HR). The aim of the our study was to evaluate the effects of sleep stage on heart rate (HR) changes associated with periodic leg movements (PLM) during sleep (PLMS).

Materials and methods: All subjects underwent overnight polysomnographic (PSG) recordings with continuous monitoring of HR. Data were collected at the Sleep Disorders Center. Six subjects with a PLMI > 10 were enrolled in our study (six men; 59.17 ± 15.41 years). HR was measured for 5 RR intervals before and 15 RR intervals after the onset of PLMS which were designated as T-5-T-1, onset, T+1-T+15, respectively. In order to eliminate the arousal effect, the PLMs were first sorted into two subgroups of PLM with and without arousal. Then the comparison between sleep stages (light sleep: NREM1, 2; deep sleep: NREM3, 4) were conducted in these two subgroups.

Results: A significant interaction was noted between arousal and interval ($F = 5.50$, $p < 0.001$; see figure 2) only in tachycardia phase, revealing that the heart rate changes of PLMS with MA have a higher amplitude both in tachycardia and bradycardia phase (significant for beats +1 to +7, +12 and +13 and +15; $p < 0.05$). Of the 96 PLM with arousal, a significant group-by-heart beat interaction was found for HR changes associated with PLMS ($F = 2.78$; $p = 0.018$) during tachycardia phase. Heart rate changes in deep sleep had a higher amplitude and a delayed bradycardia, but only reach statistical significance at -5th and -4th heartbeat before and +6th to +8th heartbeat after the onset of PLMS ($p < 0.05$). No interaction ($F = 1.04$; $p = 0.40$) and no significant group effect ($p = 0.26$) were found for HR changes associated with PLMS without arousal during both tachycardia phase and bradycardia phase, revealing that there was no significant difference of HR changes between light and deep sleep when PLM is not accompanying arousal.

Conclusion: The significant difference of PLM-related HR changes between light and deep sleep when arousal existed and lack of such difference when arousal did not exist made us postulate that deep sleep may need a higher lever of autonomic activation to facilitate arousal then light sleep.

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Association between restless legs syndrome and migraine in sleep medicine for multi-center data integration

S. Suzuki¹, K. Suzuki¹, M. Miyamoto², T. Miyamoto³, M. Murata⁴, K. Matsui⁵, S. Nishida⁵, Y. Inoue⁵, K. Hayashida⁶, K. Hirata¹

¹ Department of Neurology, Dokkyo Medical University, Japan

² School of Nursing, Dokkyo Medical University, Japan

³ Department of Neurology, Dokkyo Medical University Koshigaya Hospital, Japan

⁴ Kokubunji Sakura Clinic, Japan

⁵ Yoyogi Sleep Disorder Center, Japan

⁶ Sleep & Stress Clinic, Japan

Introduction: Recent studies have reported an association between restless legs syndrome (RLS) and migraine, indicating a possible shared pathophysiology between two disorders.

Materials and methods: We performed a multi-center cross-sectional study to investigate the prevalence and characteristics of migraine in RLS patients and compared the results with those of our single center study investigating the RLS prevalence in patients with migraine. Thirty three RLS patients among 576 consecutive outpatients with sleep disorders and 262 migraine patients out of 301 consecutive outpatients with headache were included in this study. Semi-structured headache questionnaires based on the International Classification of Headache Disorders second edition were administered to RLS participants. For migraine patients, RLS was diagnosed based on diagnostic criteria proposed by the international RLS study group. Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale were administered to the participants. Depressive symptoms were assessed using the Beck Depression Inventory-II (BDI-II).

Results: Among 33 RLS patients, 48.5% experienced headache. The prevalence rate for migraine was 27.3% in RLS patients. PSQI (8.8 ± 2.9 vs. 9.4 ± 5.1), ESS (6.9 ± 5.0 vs. 9.0 ± 5.6) and BDI-II scores (10.2 ± 8.0 vs. 13.4 ± 11.8) were not significantly different among RLS patients with and without migraine. In contrast, among 262 migraine patients 13.7% suffered from RLS. Active migraine patients with RLS had higher scores of PSQI (8.4 ± 3.6 vs. 5.2 ± 3.1), ESS (10.8 ± 4.9 vs. 8.1 ± 4.8) and BDI-II (18.9 ± 11.0 vs. 12.2 ± 9.2) than those without RLS.

Conclusion: Active migraine patients with concomitant RLS had a more significant impact on sleep quality, daytime sleepiness and depressive symptoms than RLS patients with concomitant migraine. Our study suggests that an association of migraine and RLS may be influenced by the clinical setting.

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STOP-Bang score: A guide for split-night sleep study criteria

Z. Alemohammad, A. Khajeh-Mehrzi, K. Sadeghniaat-Haghighi
Occupational Sleep Research Center, Iran

Introduction: The main goal of this study was to evaluate the predictive parameters of the STOP-Bang questionnaire in screening of obstructive sleep apnea (OSA) and assessing the hypothesis: Patients with high probability of affecting to OSA in STOP-Bang meet the criteria for undergoing split-night polysomnography (PSG) rather than full-night PSG.

Materials and methods: Patients who were admitted to the three sleep clinics and underwent full-night PSG were entered in the study. Patients filled in the STOP questionnaire at their first clinic visit. Weight, height and neck circumference were measured by technicians for computing STOP-Bang score. The apnea-hypopnea index (AHI) was used for diagnosis of OSA which $5 \leq \text{AHI} < 15$, $15 \leq \text{AHI} < 30$ and $\text{AHI} \geq 30$ were considered as mild, moderate and severe OSA, respectively. AHI cut off levels of 20 and 40 were used to evaluate split-night PSG criteria. Sensitivity analysis was performed for identifying predictive parameters.

Results: In assessment of 990 patients, the sensitivities of the STOP-Bang ≥ 3 for OSA diagnosis at AHI threshold of 5, 15 and 30

were 93, 96 and 97.8, and the specificities were 39, 24.5 and 20, respectively. The specificities of the STOP-Bang ≥ 7 for OSA diagnosis at AHI threshold of 20 and 40 were 99.2 and 97.9, and the positive predictive values were 90.5 and 64.3, respectively. Positive LR were 12.5 and 9.7 for stop bang and simplified stop bang respectively.

Conclusion: We found that the STOP-Bang questionnaires could be considered not only as an OSA screening test, but also as a test to determine proper patients for split-night PSG, the consequence of which is cost reduction in OSA management.

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Comparing a portable sleep apnea screener with standard polysomnography in sleep clinic patients

Z. Alemohammad, K. Sadeghniaat-Haghighi
Occupational Sleep Research Center, Iran

Introduction: Obstructive sleep apnea (OSA) is a common disease with serious consequences. Many portable devices have been developed to overwhelm some of limitations in the accessibility of the gold standard test, polysomnography (PSG). This study compares a portable sleep apnea screener with PSG in a sleep clinic population.

Materials and methods: Patients admitted to the sleep lab with OSA or other sleep disorders were recruited during a 3-month period. These participants underwent one night simultaneous recording of PSG and a double channel portable sleep apnea screener in the laboratory. A sleep physician (certified by Board of Registered Polysomnographic Technologists) scored the PSGs manually according to standard criteria. Portable sleep apnea screener data were analyzed automatically with the manufacturer's proprietary software. We compared the apnea-hypopnea indices (AHI) from the PSG and the portable sleep apnea screener to assess the specificity and sensitivity of the device.

Results: One hundred and twenty patients completed the study. The mean age of the participants was 42.4. Mean AHI from PSG and portable device were 31.7 and 30.8 respectively. Using a variety of AHI cutoff values (5, 10, 15, and 30) the sensitivities of the portable device were 96.9%, 88.6%, 87.2%, and 79.6% and the specificities were 45.5%, 71.9%, 69.0% and 90.1% respectively.

Conclusion: In sleep clinic patients, portable device demonstrated acceptable sensitivity and specificity in the lab when compared with standard PSG. The screening capability in the home needs to be verified by further evaluation.

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Association between cephalometric measurements and severity of obstructive sleep apnoea in children and adults

C. Au, A. Li

Department of Paediatrics, Faculty of Medicine, The Chinese University of Hong Kong, Hong Kong

Introduction: Previous studies revealed major differences in aetiology, manifestation and consequences between childhood and

adulthood obstructive sleep apnoea (OSA). However, the possible differential effects of cephalometry on the two conditions have never been assessed. This study examined the association between cephalometric measurements and OSA severity in children and adults.

Materials and methods: Children aged between 6 and 18 years who attended our paediatric sleep disorder clinic with symptoms suggestive of OSA were invited to undergo nocturnal polysomnography (PSG). Controls without habitual snoring were recruited from a concurrent population-based epidemiological study. Both parents and siblings (if any) of each participant were also invited to undergo nocturnal PSG. Partial correlation was used to assess the association between cephalometric measurements and log-transformed obstructive apnoea-hypopnoea index (logOAH) while controlling for age, gender and body mass index. Pediatric (<18 years) and adult (≥18 years) subjects were analyzed separately.

Results: A total of 152 children (81 male) and 220 adults (110 male) were recruited. LogOAH was associated with measures that indicated a lower position of hyoid bone (MP-H, Gn-Go-H and MP-H/Go-Gn) in both pediatric ($r = 0.367, 0.408$ and 0.395 , respectively, all $p < 0.001$) and adult male subjects ($r = 0.244, 0.210$ and 0.256 , respectively, all $p < 0.05$) but not in female subjects. However, the length of soft palate ($r = 0.223, p = 0.018$) and the inclination of mandible ($r = 0.203, p = 0.031$) were positively correlated with logOAH only in adult male but not pediatric male subjects. Retrognathic mandible was significantly associated with logOAH only in pediatric females ($r = 0.323, p = 0.005$) and adult males ($r = 0.230, p = 0.015$).

Conclusion: This preliminary analysis suggested that a lower position of hyoid bone was associated with more severe OSA in both adult and children males. But the contribution of the length of soft palate, inclination of mandible and retrognathic mandible on OSA severity may be different among paediatric and adult subjects.

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The diagnostic potential of the total duration of apnea/hypopnea compared with traditional parameters

W. Bae¹, S. Cheon², C. Kim³, S. Kim⁴, J. Park¹, J. Lee¹, T. Koh¹

¹ Department of Otorhinolaryngology – Head and Neck Surgery, Dong-a University College of Medicine, South Korea

² Department of Neurology, Dong-a University College of Medicine, South Korea

³ Department of Oral and Maxillofacial Surgery, Dong-a University College of Medicine, South Korea

⁴ Department of Psychiatry, Dong-a University College of Medicine, South Korea

Introduction: AHI take only into account the average number of apnea and hypopnea events per hour of sleep regardless of their duration and morphology which could have major effects on the induced physiological stress.

Materials and methods: Total duration of respiratory events (min) per an hour was calculated for each patients and named it DAHI (duration of apnea/hypopnea index). Analysis of each measured parameter by comparison with subjective questionnaires, physical examinations and polysomnographic findings between AHI groups and DAHI groups was conducted.

Results: There was a positive correlation between AHI and DAHI. The WC score, DAHI, O2 desaturation, N1, N2, and arousal index differed significantly among the AHI groups. The mean ESS score, NC,

WC, BMI, AHI, O2 desaturation, N1, N2, REM, and arousal index differed significantly among the DAHI groups. The ESS and SSS were not correlated with the AHI or DAHI. All physical parameters had significant correlations with AHI and DAHI. There were significant correlations of DAHI with N2, the arousal index, and O2 desaturation. There were significant correlations of AHI with N2, REM latency, the arousal index, and O2 desaturation.

Conclusion: The DAHI, a novel method for classifying OSAS patients, might be a useful index for classifying OSAS patients.

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The usefulness of cephalometric measurement as a diagnostic tool for obstructive sleep apnea syndrome: A retrospective study

C. Kim¹, S. Kim², S. Cheon³, W. Bae⁴

¹ Department of Oral and Maxillofacial Surgery, Dong-a University College of Medicine, Busan, South Korea

² Department of Psychiatry, Dong-a University College of Medicine, Busan, South Korea

³ Department of Neurology, Dong-a University College of Medicine, Busan, South Korea

⁴ Department of Otorhinolaryngology – Head and Neck Surgery, Dong-a University College of Medicine, Busan, South Korea

Introduction: The aims of this study were to identify the correlations between lateral cephalometric parameters which seemed to be related to obstructive sleep apnea syndrome (OSAS) severities and polysomnography (PSG) indices and to determine, thereby, the cephalometric parameters reflecting OSAS severity.

Materials and methods: A total of 140 participants (122 males, 18 females) were evaluated by lateral cephalography and PSG. A total of 29 measurements (24 distances and 5 angles) were traced on the lateral cephalograms. The cephalometric and PSG parameters were evaluated statistically to select and validate the cephalometric parameters reflecting OSAS severity.

Results: OSAS has a significant relationship with anatomic deformities of craniofacial and soft tissue. Lateral cephalometry revealed that OSAS patients have a significant vertical airway length, a retrognathic mandible, a thick uvula, a large tongue and a long mid-face length. The position of the hyoid had a tendency to displace inferiorly and/or posteriorly. Using the discriminant variable combination including T1-PNS, SNB, Max U, T1-TT, and N-ANS, 102 of 140 (72.9%) patients were correctly assigned to the normal-to-mild and moderate-to-severe AHI groups.

Conclusion: It seems that lateral cephalometric radiography is an accessible and suitable methodology for evaluation of craniofacial and soft-tissue deformities in their correlations with OSAS severity. Further research on the cephalometric parameters reflecting OSAS severity is needed.

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Associations of subjective and objective assessments of snoring, telomere shortening, and a missense mutation in the SCN2B gene in a population-based study

I. Baik¹, C. Yun², D. Yoon³, C. Shin³

¹ Kookmin University, South Korea

² Seoul National University Bundang Hospital, South Korea

³ Korea University Ansan Hospital, South Korea

Introduction: There are few studies on the association between snoring and telomere length, which is considered an indicator of biological aging, and none includes data regarding genetic effects on this association.

Materials and methods: Our study aimed to explore genetic polymorphisms associated with leukocyte telomere length (LTL) using genome-wide association (GWA) data and evaluate the effects of relevant polymorphisms on the association between subjective and objective assessments of snoring during sleep and LTL. A cross-sectional polysomnography (PSG) study embedded in a population-based cohort from the Korean Genome Epidemiology Study was conducted in 2010–2012. Relative LTL was assessed using real-time polymerase chain reaction in 2011–2012 for Korean men and women aged 50–79 years.

Results: On the basis of GWA analysis data for 2137 participants, two single nucleotide polymorphisms (SNPs), rs594171, a missense SNP located on SCN2B gene, and rs17560636, an intronic SNP located on PRKG1 gene, were selected as the most significant loci associated with LTL (p -value $<10^{-7}$). Among 942 participants who completed a questionnaire-based interview and PSG, we found that habitual snoring reported through the interview and high percentage of time spent snoring during sleep assessed by PSG are inversely associated with LTL (p -value <0.05) even after taking into account potential risk factors; in particular, the inverse association between the objective assessment of snoring and LTL was still significant after further adjustment of the presence of obstructive sleep apnea (OSA). Furthermore, we observed that this association is modified by the SCN2B gene polymorphism; carriers with mutant alleles who snore with greater than 0.5% of total sleep time had shorter LTL than those with a wild allele and time spent snoring less than 0.5% (p -value = 0.004).

Conclusion: These findings suggest that snoring during sleep may affect telomere attrition independent of OSA and that snorers with a particular genetic mutation are more likely to have shorter telomere length.

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Obstructive sleep apnea and morbidity in terms of non-communicable diseases: Observations from a population cohort in West Bengal, India

K. Chakraborty¹, R. Mitra², T. Mahapatra³, N. Chakraborty¹, P. Thompson⁴, A. Musk⁵

¹ Barrackpore Population Health Research Foundation, India

² Barrackpore Population Health Research Foundation, Australia

³ Mission Arogya Health and Information Technology Research Foundation, India

⁴ Sir Charles Gairdner Hospital, University of Western Australia, Australia

⁵ School of Population Health, University of Western Australia, Australia

Introduction: Obstructive sleep apnea (OSA) has been recognized as an important health issue in recent times. It is estimated that about 2–10% of adult population suffer from probable OSA worldwide. In India, overall prevalence of OSA is 13.7% and among habitual snorers it is found to be 46.75%.

Materials and methods: The study will have contains cross-sectional, case control and cohort components to assess burden and

association of snoring and OSA with non communicable diseases (NCDs), prevalence of OSA in the study area, to determine accuracy of snoring being used as a population based screening tool for estimation of OSA, to estimate NCDs and effectiveness of knowledge-based intervention of lifestyle modifications in decreasing OSA and NCDs over time. Assuming two sided significance level of 0.05, power of 80%, 20% non-response rate and ratio of unexposed to expose as 1:1, 2000 adult individuals were recruited from longitudinal study of urban population cohort in Barrackpore, India. The pre-tested questionnaire (based on Wisconsin sleep questionnaire) will be used for collecting OSA data by trained community health workers. OSA will be measured by sleep monitor (Apnea Link). Descriptive analysis of corresponding 95% confidence intervals will be conducted using SPSS 20.0 and SAS 9.2 and inferential analysis will be conducted using bivariate, multivariate, logistics and mixed regression to determine the measures of association (odds ratios) between study variables and corresponding 95% confidence intervals with p value.

Results: The study results will be communicated to the stakeholders also the policy makers to design customized health program and targeted intervention for the prevention and control of OSA and NCDs. In addition scientific communication will be done by publishing articles in aspects of the research outcome in details. The results will be available to the relevant communities through the usual medium.

Conclusion: It is expected the study would provide the incidences of NCDs among subjects having OSA also the temporal relationship of OSA and NCDs, also will provide information on the burden of OSA and its strength of association with NCDs in an urban population cohort of India.

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Do personality traits in obstructive sleep apnea syndrome (OSAS) patients affect their purchase motivation of continuous positive airway pressure (CPAP) machine?

J. Chang, C. Huang, S. Liang, L. Hang

China Medical University Hospital, Taiwan

Introduction: The use of continuous positive airway pressure (CPAP) has been shown to be clinically beneficial for most patients with obstructive sleep apnea syndrome (OSAS). This study sought to determine the factors that may contribute to the decision of purchasing mechanical ventilation including personality.

Materials and methods: Patients with moderate-to-severe OSAS who attended diagnostic polysomnography (PSG and CPAP titration) were included in this study. After personality types were determined using a questionnaire, 101 OSAS patients with Type-D personality were selected and matched at a ratio of 1:1 to OSAS patients with Non type-D personality. The factors that might affect the decision of purchasing CPAP were analyzed using a conditional logistic regression model.

Results: Characteristic differences were only observed in income and sleep habit with or without a partner between the patients with Type-D and non Type-D personalities. Type-D personality was not significantly associated with the motivation of purchasing a CPAP machine, and ESS scores was the only predicting variable in this study.

Conclusion: CPAP adherence was associated with Type-D personality. More studies using population-based and longitudinal designs with randomly selected OSAS patients are needed to correct the potential bias of participant inclusion and to assess the long term impacts of Type-D personality on health status among OSAS patients.

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“Non-dipping” blood pressure and excessive daytime sleepiness in severe obstructive sleep apnea

C. Chang¹, L. Chuang², Y. Lin³, N. Chen²

¹ Department of Pulmonary and Critical Care Medicine, Chang Gung Memorial Hospital, Chiayi, Taiwan

² Department of Pulmonary and Critical Care Medicine, Chang Gung Memorial Hospital, Linkou, Taiwan

³ Health Examination Center, Chang Gung Memorial Hospital, Taoyuan, Taiwan

Introduction: Non-dipping blood pressure and obstructive sleep apnea both have increasing risk of cardiovascular events and mortality. The relationship between non-dipping blood pressure and obstructive sleep apnea was noted. However limited data descriptive the prevalence of sleep apnea with non-dipping hypertension and the relationship with excessive daytime sleepiness.

Materials and methods: The purpose of the present study was to determine the prevalence of non-dipping blood pressure and to evaluate the relationship between excessive daytime sleepiness.

We prospectively enrolled adult patients with habitual snoring who visited our sleep clinics from November 2010 to May 2013. Polysomnography and 24-hour ABPM (ambulatory blood pressure monitor) were performed. Excessive daytime sleepiness was evaluated. Non-dipping blood pressure prevalence and relationship with excessive daytime sleepiness were evaluated.

Results: Thirty patients were dippers (57%) and 23 patients (43%) were nondippers. Nondippers got lower nighttime blood pressure and more excessive daytime sleepiness (ESS ≥ 10) than dippers ($p = 0.045$). ESS was significant negative correlation with blood pressure dipping on systolic, diastolic and mean arterial pressure, $R = -0.313, -0.304, -0.302$ respectively ($p < 0.05$).

Multivariate linear regression models for associations involving SBP (systolic blood pressure) dipping, ESS was only independent predictor of SBP dipping [$\beta = -0.005, p = 0.022, R^2 = 0.099, 95\%$ confidence interval (CI) of $\beta = -0.009$ to 0.000] on stepwise linear regression analyses.

Conclusion: High prevalence of nondippers was noted in severe obstructive sleep apnea. Nondippers experienced more excessive daytime sleepiness. ESS was an independent predictor of dipping values. ABPM may play important role for these high cardiovascular risk groups.

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Effect of continuous positive airway pressure therapy on traditional Chinese medicine constitution in patients with obstructive sleep apnea

Y. Chen^{1,2,3}, N. Chen^{1,4,5}, H. Chang⁶

¹ Sleep Center, Chang Gung Memorial Hospital, Taoyuan, Taiwan

² Center for Traditional Chinese Medicine, Chang Gung Memorial Hospital, Taoyuan, Taiwan

³ School of Traditional Chinese Medicine, College of Medicine, Chang Gung University, Taoyuan, Taiwan

⁴ Department of Pulmonary and Critical Care Medicine, Chang Gung Memorial Hospital, Linkou, Taiwan

⁵ Department of Respiratory Therapy, College of Medicine, Chang Gung University, Taoyuan, Taiwan

⁶ Research Center for Chinese Medicine & Acupuncture, China Medical University, Taichung, Taiwan

Introduction: Obstructive sleep apnea syndrome (OSAS) causes poor sleeping quality, daytime fatigue, quality of life, and so on. In traditional Chinese medicine (TCM) aspect, OSAS is thought to link with some patterns such as of phlegm, static blood and qi vacuity, but lacks objective evaluation in it.

Materials and methods: In order to know the role of TCM constitution in the treatment of OSAS, we used Constitution in Chinese Medicine Questionnaire (CCMQ), Epworth Sleepiness Scale (ESS) and 36-item Short Form Healthy Survey (SF-36) as assessment tools, to evaluate OSAS patients during 12 weeks of continuous positive airway pressure (CPAP) therapy.

Results: Of the 45 individuals with OSAS, scores of four major TCM unbalanced constitutions, “Phlegm-dampness constitution” (44.6 ± 18.4 vs. $36.5 \pm 20.4, p = 0.004$) (Mean \pm SD, baseline vs. week 12), “Qi-deficient constitution” (40.8 ± 15.0 vs. $31.8 \pm 16.0, p < 0.001$), “Damp-heat constitution” (33.1 ± 16.4 vs. $27.6 \pm 15.8, p = 0.008$) and “Yin-deficient constitution” (33.1 ± 16.4 vs. $27.6 \pm 15.8, p = 0.008$), were significantly decreased. And the score of “Balanced constitution” (59.9 ± 12.6 vs. $68.9 \pm 15.0, p < 0.001$) was significantly increased. In the analysis of correlation, all TCM constitution showed no correlation with ESS. In SF-36, the “Physical component” and the “Mental component” had mild to moderate positive correlation with “Balanced constitution” and mild to moderate negative correlation with “Qi-deficient constitution” and “Phlegm-dampness constitution”.

Conclusion: In TCM aspect, CPAP can help improve Phlegm-dampness, Qi-deficient, Damp-heat, Yin-deficient and Balanced constitution in patients with OSAS. And the improvement of TCM constitution is associated with changes of quality of life in both mental and physical components.

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Supine sleep and obstructive sleep apnea syndrome in Parkinson’s disease

V. Cochen De Cock¹, N. Benard Serre², B. Carlander², M. Charif², D. Cugy², S. Bayard²

¹ Clinique Beau Soleil, France

² France

Introduction: Supine sleep is associated with increased obstructive sleep apnea. Patients with Parkinson’s disease complain about difficulties turning around in their bed. The relationship between supine sleep and sleep disordered breathing has never been explored in patients with Parkinson’s disease.

Materials and methods: Fifteen consecutive patients with Parkinson’s disease were compared to (1) 15 age, sex, body mass index and Unified Parkinson’s Disease Rating Scale-III score matched patients with Parkinson’s disease without sleep disordered breathing

and to (2) 11 age and sex-matched patients with severe OSAS alone and (3) to 11 age and sex-matched healthy controls. Outcomes were number of position changes during the night and per hour of sleep and percentage of sleep time spent on the back.

Results: Patients with Parkinson's disease and severe OSAS spent most of their sleep time in supine position ($93 \pm 11\%$) while patients with Parkinson's disease without OSAS ($61 \pm 24\%$, $p < 0.001$), patients with isolated severe OSAS ($50 \pm 28\%$, $p < 0.001$) and controls (40 ± 21 , $p < 0.001$) stayed significantly less on their back. Patients with Parkinson's disease and severe OSAS changed less frequently their position in bed per hour of sleep (0.4 ± 0.5) than patients with Parkinson's disease without OSAS (1.1 ± 0.8 , $p = 0.002$), patients with isolated OSAS (1.2 ± 1.0 , $p = 0.006$) and controls (1.5 ± 0.5 , $p < 0.001$).

Conclusion: Severe OSAS in Parkinson's disease is associated with a major reduction in the number of position changes and an increased supine sleep during the night. In patients with Parkinson's disease, alleviating the difficulties in turning around in bed might reduce supine sleep and improve sleep disordered breathing.

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The study of sleep disordered breathing at an early stage of amyotrophic lateral sclerosis

L. Deng, M. Sun, W. Ding

The Neurology Department of the Second Affiliated Hospital of Nanchang University, China

Materials and methods: By polysomnography (PSG), we detected nocturnal sleep breathing between 31 ALS patients (study group) at an early stage and 30 healthy subjects (control group), compared the difference of related indicators between the two groups, analyzed related factors of SDB on ALS patients at an early stage. By regular follow-up of the patients of the study group, we observed and compared the incidence of respiratory muscle paralysis in 1 year, and analyzed the clinical value of SDB in disease prognosis on ALS patients at an early stage.

Results: (1) Study group compared with the control group, total apnea hypopnea index (AHI), rapid eye movement AHI, non-rapid eye movement AHI, obstructive and mixed AHI have significant higher ($p < 0.01$), nocturnal average SpO₂ and minimum SpO₂ have significant lower ($p < 0.001$ and $p < 0.05$), central AHI have no significant higher ($p > 0.05$). (2) The study group of SDB correlation factor analysis showed that: the patients' body mass index and whether bulbar involvement were negatively correlated with ave SpO₂ ($r_s = -0.450$, $p < 0.05$ and $r_s = -0.421$, $p < 0.05$), the amyotrophic lateral sclerosis functional rating scale revised (ALSFRRS-R) were positive correlated with ave SpO₂ ($r_s = 0.424$, $p < 0.05$), the patients' age, the course of ALS, forced vital capacity (FVC) had no linear regression relationship with ave SpO₂ ($p > 0.05$), the patients' age, body mass index, the course of ALS, FVC, whether bulbar involvement, ALSFRRS-R had no linear regression relationship with AHI and min SpO₂ ($p > 0.05$). (3) The follow-up study of ALS patients for 1 year displayed that: AHI ≥ 5 had significantly higher incidence of dyspnea ($p < 0.05$), ave SpO₂ $\leq 96\%$ had significantly higher incidence of dyspnea ($p < 0.05$), min SpO₂ $\leq 86\%$ had significantly higher incidence of dyspnea ($p < 0.05$).

Conclusion: The ALS patients at an early stage had shown significant SDB, bulbar involvement, and the degree of illness may be the primary correlation factors at an early stage of ALS patients,

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Adiponectin protects rat myocardium against chronic intermittent hypoxia-induced injury via inhibition of endoplasmic reticulum stress

W. Ding, X. Zhang

The First Affiliated Hospital with Nanjing Medical University, China

Introduction: Obstructive sleep apnea syndrome (OSAS) is associated with many cardiovascular disorders such as heart failure, hypertension, atherosclerosis, arrhythmia and cardiac dysfunction. Chronic intermittent hypoxia (CIH) is the key pathological origin of OSAS.

Materials and methods: The rats were randomly divided into three groups: normal control group (NC), chronic intermittent hypoxia (CIH) group, chronic intermittent hypoxia and adiponectin supplement group (CIH + Ad). A series of programmable solenoids and flow regulators decreased the inspired oxygen fraction (FiO₂) from $\sim 21\%$ to $\sim 5\text{--}6\%$ and sustained for 15–20 s over a 1 min period with a rapid reoxygenation to room air levels in the subsequent 1 min period. Intermittent hypoxia events in CIH group and CIH + Ad group were administered from 9 AM to 5 PM and persisted for 35 consecutive days. NC group received the gas-flow exposure as CIH group and CIH + Ad group, but using only room air. Rats in CIH + Ad group were also treated with the intravenous injection of Ad (R&D Inc, USA) at the dosage of 10 μg (rat globular adiponectin, diluted in PBS, free from endotoxins) per time, twice a week for successive 5 weeks. A simultaneous injection of saline (0.5 ml per time) was carried out in NC group and CIH group.

Results: The echocardiograph was used to detect the cardiac dysfunction induced by CIH. In CIH group, LVDs and LVESV were elevated while the LVEF and LVFS were decreased (all $p < 0.05$) compared with NC group. However, the left ventricular function parameters mentioned above were all improved in CIH + Ad group (all $p < 0.05$). Myocardial apoptosis was detected by use of terminal deoxynucleotidyl transfer-mediated dUTP nick end-labeling (TUNEL) analysis, which showed that the apoptosis percentage in CIH group (2.948%) was significantly higher than that in NC group (0.4167%) and CIH + Ad group (1.219%) (all $p < 0.05$). Consistent with TUNEL, the proteins expression of cleaved-caspase3, cleaved caspase-9 and cleaved-caspase12 showed the same result (all $p < 0.05$). Western blot showed that the proteins of ER stress were significantly induced by CIH, while Ad supplement improved the protein expression of ER stress. The DHE showed that the ROS in CIH group significantly stronger than in NC group and CIH + Ad group ($p < 0.05$).

Conclusion: In conclusion, our study suggested that CIH can lead to left ventricle dysfunction, and that Ad can improve the CIH-induced cardiac dysfunction possibly through inhibition the ROS-dependent ER stress and the associated myocardial apoptosis through suppression of ROS.

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Multilevel approach for OSA with bariatric surgery simultaneously, case report and literature review

F. Faras¹, F. Abo-Alhassan², A. Al-Terki³

¹ Zain and Al-Sabah Hospitals, Kuwait

² Al-aAdan Hospital, Kuwait

³ Kuwait Institute of Medical Specialization, Zain and Al-Sabah Hospitals, Kuwait

Results: The surgical approach to treatment of obstructive sleep apnea (OSA) in obese patients has always been controversial. It is well known that both obesity and OSA are closely related. Therefore, the question remains whether the initial treatment for such patients should be a multilevel sleep surgery or bariatric surgery. Herein, we report a case of a morbidly obese patient with OSA, who underwent a combined multilevel sleep surgery and gastric bypass, simultaneously. The patient was followed up for 18 months and his apnea hypopnea index decreased significantly from 53 episodes per minute to 5.2. To the best of our knowledge, there has not been any similar reported case in the literature.

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Bird's eye view of Romanian sleep apnoea obstructive syndrome in the obese Romanian population

F. Mihaltan¹, E. Jeler², I. Munteanu², O. Deleanu¹

¹ Romanian Society of Pneumology – Somnology Section, Romania

² National Institute of Pneumology, Bucharest, Romania

Introduction: The implications of obesity and its consequences at the moment of first diagnosis is quite unknown in Romania. The percentage of obesity in our populations is 35% and the correlation between obesity and sleep apnoea syndrome is unknown.

Materials and methods: Between 1995 and 2013 we screened all the patients who presented to our sleep lab for supplementary investigation. From a sample of 3152 patients with polygraphy and polysomnography, we found 1785 sleep obstructive apnoea syndrome (SOAS).

Results: From this 1785 SOAS 1298 were obese. Our sample of obese patients where 82.28% male and 17.72% female. We found 58.37% severe SOAS, 17.03% moderate and 24.60% mild. We also found a percentage of 2.25% obesity/hypo ventilation syndrome and 5.74% of overlap with SOAS.

We found also a percentage of 14.45% patients with malignant obesity and in all our samples we found that 22.24% were overweight. The percentage of malignant obesity in male of 72.49% was very high in comparison with the female 27.51%. We titrated a number of 3152 patients. The average pressure of CPAP was of 10.86. The compliance was at 2 months of 80% but was diminishing strongly after.

Conclusion: The small number of somnology labs and of somnologist and the deficiency of education are the main causes of late diagnosis of this kind of patients. The absence of the coverage of the therapy from the assurance system is the cause of non compliance to CPAP therapy.

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Long-term therapeutic efficacy of oral appliances in treatment of obstructive sleep apnea-hypopnea syndrome

X. Gong¹, J. Zhang¹, Y. Zhao², X. Gao¹

¹ Department of Orthodontics, Peking University School and Hospital of Stomatology, China

² Department of Stomatology, Capital Medical University, Xuanwu Hospital, China

Introduction: To investigate the long-term efficacy and safety of oral appliances in treating obstructive sleep apnea-hypopnea syndrome (OSAHS) by length of treatment.

Materials and methods: This is a retrospective study to review the usage of oral appliances (OAs) in Chinese OSAHS patients in the past

decades. Ninety-four valid questionnaires were returned among 412 patients with OSAHS receiving OAs treatment. Among those wearers, 22 were willing to take follow-up polysomnography, and 25 patients were willing to take follow-up cephalograms. Tolerance and side-effects of OAs were shown in survey analysis. Efficacy comparisons were carried out between the initial polysomnography measurement and follow-up inspection. Cephalometric analysis was used to investigate skeletal and occlusal variances for safety evaluation.

Results: Longest treatment extended to 147 months, with median value being 74 (30, 99) months. 14.9% patients persisted treatment for over 120 months. Side-effects were temporary and relatively minimal, including tooth soreness (37.2%), dry mouth (33.0%), odd bite feeling (31.9%), excess salivation (30.8%), etc. Polysomnography inspection proved that OAs kept effective on OSAHS in long time tracing, as initial AHI ranging from 24.50 (14.65, 54.05) to 7.40 (2.12, 10.00) and follow-up from 25.55 (11.71, 43.65) to 4.25 (1.38, 7.70). Cephalometric analysis indicated mild and slow variation in skeleton and occlusion after average treatment of 5 years.

Conclusion: Oral appliances provided an effective and safe long-term therapy for patients with OSAHS. Follow-up supervision is recommended for there exists long-term alternation, though minimal in observation.

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Obstructive-sleep-apnea and alveolo-dental sychondrosis

C. Guilleminault¹, V. Abad¹, H. Chiu¹, S. Quo²

¹ Sleep Medicine Division, Stanford University, USA

² Division of Orthodontics, University of California San Francisco, USA

Introduction: Obstructive-sleep-apnea (OSA) is a syndrome with familial risk affecting children and adults. Genetic anomalies can result in tooth agenesis with later development of abnormal craniofacial morphology. Abnormal development of maxilla and/or mandible leads to a narrow upper airway early in life and contributes to development of OSA.

Materials and methods: Retrospective study involving chart review of children (n = 31) and adults (n = 17) with dental agenesis and OSA symptoms. For children, two control groups were evaluated: children with extraction of permanent teeth early in life (n = 8) and children with enlarged adenotonsils (T&A) (n = 62). Data extracted were: clinical complaints, results of sleep questionnaires, clinical evaluation, results of polysomnographic sleep study (PSG), imaging studies, treatment approaches, and follow-up results.

Results: High, narrow, hard palates and mouth breathing during sleep were present in dental groups. Teeth agenesis children and adults had more septal deviation. Apnea-hypopnea indices (AHI) were abnormal in all groups. In children, Kruskal-Wallis H test and chi-square tests showed a significant difference in mean AHI in the different groups (dental agenesis, dental extraction, and T & A group) (p < 0.001). Mean AHI was significantly lower in the pediatric dental agenesis group (p = 0.05). There is progressive and significant increase in AHI with aging with dental agenesis (R² = 0.901, p = 0.0001).

Conclusion: Dental agenesis (often due to genetic mutations) affects facial development and leads to OSA as do early teeth extractions. In children, AHI is low and recognition may be difficult but there is worsening of symptoms and higher AHI with aging in untreated individuals.

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Prevalence of obstructive sleep apnea using the STOP-Bang questionnaire and its correlation to other stroke risk factors in the normal population

P. Gunawan¹, S. Harris², F. Octaviana²

¹ University of Pelita Harapan, Indonesia

² University of Indonesia, Indonesia

Introduction: Obstructive sleep apnea (OSA) is one of the recent known stroke risk factor, and STOP-Bang questionnaire is one of the best screening tool. We were curious to know the prevalence of high risk OSA using the questionnaire and analyze its correlation to other stroke risk factors.

Materials and methods: As much as 202 subjects age ≥ 35 years old who never had a stroke, were analyzed cross sectionally, from five regions of Jakarta, between April 2013 until June 2013. Each subject was interviewed using the STOP-Bang questionnaire, and history of smoking, hypertension, diabetes melitus, dyslipidemia, arrhythmia and central obesity were identified. Prevalence of high risk OSA was obtained from the questionnaire, and every question item along with other stroke risk factors were analyzed in relation to high risk OSA.

Results: Subjects were between the age of 35 and 73 years old, with female slightly more than male (51% vs 49%). As much as 100 subjects (49.5%) had high risk OSA, whereas 70% of them were male and the risk of developing OSA increases with age. Questionnaire's item with the highest odds ratio were neck circumference ($p = 0.000$, OR 23.5; 95% CI 5.5–101.5), followed by observed not breathing ($p = 0.000$, OR 22.9; 95% CI 6.8–77.4), snoring ($p = 0.000$, OR 19.1; 95% CI 9.3–38.9), sex ($p = 0.000$, OR 5.9; 95% CI 3.2–10.8), daytime sleepiness ($p = 0.000$, OR 4.3; 95% CI 2.4–7.7), age ($p = 0.000$, OR 4.1; 95% CI 2.3–7.3) and history of hypertensive treatment ($p = 0.000$, OR 3.9; 95% CI 1.9–8). Body mass index could not be analyzed. Other stroke risk factors that correlate with high risk OSA from the greatest likelihood were arrhythmia ($p = 0.000$, OR 9.5; 95% CI 2.1–42.6), diabetes melitus ($p = 0.000$, OR 4.5; 95% CI 1.9–11), smoking ($p = 0.000$, OR 3.7; 95% CI 1.9–6.9), hypertension ($p = 0.000$, OR 3.6; 95% CI 2–6.5), central obesity ($p = 0.002$, OR 2.6; 95% CI 1.4–4.7), and dyslipidemia ($p = 0.046$, OR 2.1; 95% CI 1–4.1).

Conclusion: All of the questionnaire items, except body mass index, revealed significant difference between high risk and low risk OSA. Other stroke risk factors from the greatest likelihood to coincide with high risk OSA were arrhythmia, diabetes mellitus, smoking, hypertension, central obesity, and dyslipidemia.

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Rare etiologies of sleep disordered breathing

A. Hsu

Singapore General Hospital, Singapore

Introduction: There is paucity of clinical data on sleep disordered breathing due to specific etiologies.

Materials and methods: Four cases of sleep disordered breathing due to rare specific etiologies were identified in a Sleep Disorders Clinic in a tertiary academic hospital between 2005 and 2011. The clinical profile, primary and sleep disorder diagnoses, treatment and follow up outcome of these patients were reviewed.

Results: There were four patients (two males) with age ranging from 34 to 46 years who had overnight full polysomnography performed at the Sleep Disorders Unit in the 6 year study period. Two patients had severe obstructive sleep apnea (OSA) with respiratory disturbance index of 35 and 58 per hour. The primary diagnoses causing OSA were post renal transplant lymphoproliferative disorders of the tonsils and upper airway amyloidosis treated with

tonsillectomy coupled with reduction in the immunosuppressives and continuous positive airway pressure coupled with radiotherapy to the airway respectively. The former patient was cured of OSA with 6 years' follow up and the latter patient had been stable during the 4 years' follow up. The third patient had severe central sleep apnea due to Odine's curse and was initially stabilized with nocturnal non-invasive ventilation (NIV) in T mode but died 4 years later. The last patient had severe hypoventilation secondary to rigid spine syndrome and had been stable for 9 years with NIV in T mode.

Conclusion: Rare etiologies can cause pronounced sleep hypoventilation, obstructive and central sleep apnea. The treatment is targeted at the primary etiology of the sleep disordered breathing. If curative therapy of the primary etiology is not possible, non-invasive positive pressure respiratory support alone can provide stability for good duration of time.

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Obesity and bariatric surgery in obstructive sleep apnea – Our series

R. Js

Life Line Hospital, India

Introduction: Effect of fat deposition on airway anatomy is very important in the pathogenesis of OSA. Level of leptin is increased in obese people and hence affects the breathing function as a result of altered chemo reflex mechanism.

Materials and methods: Data suggest that obstructive sleep apnea is associated with all these factors, but at present the only intervention strategy supported with adequate evidence is weight loss (Young et al. 2002).

Distribution of fat is an important correlate. Fat accumulation in the central, android (apple shape), and upper body correlate with metabolic syndrome, atherosclerosis, and OSA. Waist circumference is more important than BMI, weight, or total fat content.

Increased waist circumference predicts OSA even in non-obese (Grunstein 1993). About 70% of those with OSA are obese (Malhotra et al., 2002). Prevalence of OSA in obese men and women is about 40% (Young et al., 2002). Higher BMI associated with higher prevalence, BMI > 30: 26% with AHI > 15, 60% with AHI > 5, BMI > 40: 33% with AHI > 15, 98% with AHI > 5 (Valencia-Flores 2000).

Results: Reducing caloric intake is the most common form, but difficult long term. Reducing calorie intake is most important: portion of fat vs. protein vs. carbs does not matter in regards to weight loss, satiety, hunger, and satisfaction. Diet + exercise is the most effective method of weight loss recommended for patients who are slightly overweight.

Surgical correction of the upper airway is no longer considered primary therapy.

Surgery for severely obese is considered as the mode of treatment for weight loss, thus helping in treatment of OSA as well.

Gastric banding – restrictive procedure, laparoscopic sleeve gastrectomy – restrictive procedure, laparoscopic Roux en Y gastric bypass – restrictive and malabsorptive procedure are available and will be discussed in this presentation.

Conclusion: Individuals with OSA tend to gain weight due to daytime somnolence and decrease in physical activity. Since potential leptin resistance accompanies OSA, the effects of weight loss by leptin are blunted. Obesity is the most powerful risk factor for obstructive sleep apnea and is essentially the only reversible risk factor.

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Effect of parapharyngeal fat on dynamic obstruction of upper airway in obstructive sleep apnea patients

M. Jang, T. Jung, H. Cho, S. Hong, H. Dhong, S. Chung, H. Kim
Department of Otorhinolaryngology – Head and Neck Surgery,
Samsung Medical Center, Sungkyunkwan University School of
Medicine, South Korea

Introduction: Several researchers suggested that sleep apnea was related with a localized fat tissue around upper airway called parapharyngeal fat pad. The aim of study was to determine whether volume of the parapharyngeal fat pad affect dynamic obstruction of upper airway in sleep apnea patient.

Materials and methods: The main parameters for analyzing the association with the volume of the parapharyngeal fat was the pattern and grade of dynamic upper airway obstruction in drug induced sleep endoscopy, age, body mass index, apnea–hypopnea index and volume of the retropalatal airway.

Results: The volume of the parapharyngeal fat pad was significantly associated with age and body mass index, but had no correlation with apnea–hypopnea index and volume of the retropalatal area. Although the obstruction grade of upper airway was not relevant with the volume of the parapharyngeal fat pad, an enlargement of the volume of the parapharyngeal fat pad had a significant relevance with the concentric obstructive pattern of retropalatal airway.

Conclusion: Because the parapharyngeal fat pad seem to affect collapsibility of retropalatal airway in dynamic obstructive condition, surgeons should consider a palatal operation to prevent not only lateral-to-medial narrowing but also anterior-to-posterior narrowing in a candidate of sleep surgery showing enlarged parapharyngeal fat pad.

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Detection of the upper airway obstruction using electrical impedance tomography: A preliminary study

S. Kim¹, E. Woo², T. Oh², O. Kwon³, S. Jeon¹, Y. Joo⁴

¹ Department of Otorhinolaryngology, Gyeongsang National University Hospital; Institute of Health Sciences, Gyeongsang National University, South Korea

² Department of Biomedical Engineering, Kyung Hee University, South Korea

³ Department of Mathematics, Konkuk University, South Korea

⁴ Department of Otorhinolaryngology, Gyeongsang National University Hospital, South Korea

Introduction: Obstructive sleep apnea (OSA) is caused by occlusion of the upper airway. No real-time imaging technique exists at the moment, which can detect such occlusion during natural sleep. In this study, we tested whether it can be detected using an electrical impedance tomography (EIT).

Materials and methods: A cylindrical agar phantom with 20 cm diameter was constructed. After insertion of small non-conductive hexahedral objects of different length and width within it, a conductivity image was obtained. After attaching the surface electrodes on the neck skin of a healthy subject at the vocal fold level, different conductivity images by opening or closing the vocal fold were obtained. Anatomical landmarks for the surface electrodes to detect

airway changes at the soft palate and tongue base levels were determined on the basis of magnetic resonance images and photographs of a number of subjects. A swallowing maneuver was utilized to simulate airway occlusion, and the conductivity images were obtained at the soft palate and tongue base levels. Lastly, changes in the conductivity image were identified according to the mouth opening and movement of the head, which frequently occurs during natural sleep.

Results: The nonconductive object of small size within the agar phantom was successfully visualized using the EIT system although the shape estimation was difficult. In a human study, airway closure by swallowing was also identified at the vocal fold level by means of the EIT system. Similarly at each of the soft palate or tongue base level, changes in the upper airway conductivity were successfully detected. The background noise level was increased by the movement of the head or mouth opening, but whether the airway occlusion occurs by a swallowing maneuver could be visualized.

Conclusion: The EIT might be a novel real-time technique for detecting the upper airway occlusion although the background noise is an issue to be solved. A further study on the healthy subjects and OSA patients is needed to confirm its feasibility.

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The change of polysomnographic and cephalometric parameters according to mandibular advancement device application

H. Kim¹, S. Hong¹, J. Ahn¹, W. Lee¹, C. Rhee¹, C. Lee¹, P. Yun², J. Kim¹

¹ Department of Otorhinolaryngology, Seoul National University College of Medicine, Seoul National University Bundang Hospital, South Korea

² Departments of Oral and Maxillofacial Surgery, Seoul National University College of Medicine, Seoul National University Bundang Hospital, South Korea

Introduction: There are few studies about both polysomnographic changes and cephalometric changes after MAD application. The aim of this study was to evaluate the cephalometric and polysomnographic changes after mandibular advancement device (MAD) application.

Materials and methods: Total of 90 patients with obstructive sleep apnea (OSA) were enrolled. Full-overnight polysomnography and cephalometry were performed before and at least 3 months after MAD application in 90 patients. Questionnaires for sleep quality and Epworth sleepiness scale were also studied.

Results: The mean (SD) apnea–hypopnea index (AHI) decreased significantly ($p < 0.001$) from 37.6 (20.6) to 12.8 (11.7). The apnea index (AI), hypopnea index (HI), the mean apnea duration, the oxygen desaturation index (ODI), percentage of snoring duration, the Pittsburgh Sleep Quality Index (PSQI) were improved significantly.

The overjet, hyoid to anterior nasal spine, hyoid to gonion, lower anterior face height were improved significantly, but narrowest palatal airway and narrowest lingual airway, soft palate length and soft palate depth were not improved significantly.

Conclusion: The application of MAD significantly improved nocturnal respiratory function and sleep quality in patients with OSA, but did not influence anteroposterior diameter of retropalatal space and retrolingual space.

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High flow nasal cannula therapy for improving obstructive sleep apnea: A case

S. Kim, J. Min, J. Park, Y. Lee, J. Park, Y. Cho, H. Yoon, J. Lee, C. Lee
Division of Pulmonary and Critical Care Medicine, Department of Internal Medicine, Seoul National University College of Medicine, Seoul National University Bundang Hospital, South Korea

Introduction: Although continuous positive airway pressure is the treatment of choice for obstructive sleep apnea, its compliance is low. Therefore, alternative therapeutic strategies are often required.

Materials and methods: High flow nasal cannula therapy is an air compressor which delivers a constant flow rate via the nasal cannula at a maximum of 60 l/m. It can produce positive end expiratory pressure and increase end expiratory pharyngeal pressure, which can help to alleviate upper airway obstruction.

Results: This is a case report of high flow nasal cannula therapy for a 71 year-old man. He had an obstructive sleep apnea and severe desaturation but failed to use continuous positive airway pressure. He underwent titration with high flow nasal cannula under polysomnography. Using high flow nasal cannula at the airflow of 45 l/m, his apnea–hypopnea, respiratory arousal and oxygen desaturation were improved. Importantly, he is very compliant with high flow nasal cannula therapy.

Conclusion: This case showed that if OSA patient is not compliant with CPAP therapy, HFNC can be considered as a second option.

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Addressing lateral pharyngeal wall collapse at the level of velum and oropharynx in obstructive sleep apnea to improve treatment outcomes

S. Kishore
Nova Hospital, India

Introduction: The geometry and calibre of the upper airway among apenic individuals differs from that of normal individuals. There is lot of data supporting the fact that the narrowing is significant predominantly in the lateral dimension based on imaging studies.

Materials and methods: The geometry and calibre of the upper airway among apenic individuals differs from that of normal individuals. There is lot of data supporting the fact that the narrowing is significant predominantly in the lateral dimension based on imaging studies.

Results: The geometry and calibre of the upper airway among apenic individuals differs from that of normal individuals. There is lot of data supporting the fact that the narrowing is significant predominantly in the lateral dimension based on imaging studies.

Conclusion: The geometry and calibre of the upper airway among apenic individuals differs from that of normal individuals. There is lot of data supporting the fact that the narrowing is significant predominantly in the lateral dimension based on imaging studies.

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Can home video-clip predict moderate-to-severe obstructive sleep apnea in children?

T. Kuptanon, N. Chirawutthinan, A. Preutthipan
Ramathibodi Hospital, Mahidol University, Thailand

Introduction: Polysomnography (PSG) has been used as the gold standard to diagnose and assess severity of obstructive sleep apnea

(OSA). But it is costly, time-, labor-, technology-consuming and more importantly, not readily available. Other simple alternative tests are needed.

Materials and methods: Children, aged 3–10 years, who were referred to our sleep laboratory due to suspected OSA who does not have craniofacial syndrome, neuromuscular disease chronic lung disease, cardiovascular disease and severe obesity, were recruited. Parents were instructed to record their own child's video showing how they breathed while asleep 1–3 days prior to undergoing PSG. Five-minute video clips of the most severe one were scored by two pediatric pulmonologists on nine respiratory patterns of OSA. PSG data were used to classify patients into two groups; “moderate-to-severe” when apnea–hypopnea index (AHI) > 5 events/hour of total sleep time (TST) and “mild” when AHI < 5 events/hour of TST. The scores of each respiratory pattern observed from the videos were compared between the two groups using the Fisher's exact test. Univariate and multivariate analyses were conducted. Total video prediction scores were obtained. Cut-off point was determined through area under receiver operating characteristic analysis. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and positive likelihood ratio (PLR) were calculated.

Results: Among 35 patients, 20 (57%) were diagnosed with moderate-to-severe OSA. The occurrence of paradoxical chest movement, continuous snoring and subcostal retraction were shown to be the most important respiratory patterns predicting moderate-to-severe OSA (odds ratios of 9.8, 9.7, 9.7, respectively, $p < 0.05$). The presence or absence of these three respiratory patterns shown on video was scored as 1 or 0 respectively. When total video prediction score > 2 was used as the cut-off point, sensitivity, specificity, PPV, NPV and PLR were 0.95, 0.80, 0.86, 0.93 and 4.8 respectively. When total video prediction score of 3 was used as the cut-off point, sensitivity, specificity, PPV and NPV were 0.43, 1.00, 1.00 and 0.54 respectively.

Conclusion: Home video-clips are shown to be a promising method to predict moderate-to-severe OSA in children. Paradoxical chest movement, continuous snoring and subcostal retractions are the three most useful respiratory patterns observed on video clips. With total prediction score ≥ 2 , such a patient most likely has moderate-to-severe OSA.

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Effect of obstructive sleep apnea on the serum liver enzymes

J. Li, Y. Zhang, C. Mao, J. Huang, F. Han, C. Liu
The Second Affiliated Hospital of Soochow University, China

Introduction: Studies have reported that obstructive sleep apnea–hypopnea syndrome (OSAS) was associated with liver enzymes and fatty liver in recent years. The purpose of this study was to observe the level of serum liver enzymes in subjects and the mechanisms that show how OSAS caused the damage to the liver.

Materials and methods: All consecutive patients referred to overnight polysomnography because of symptoms of sleep apnea between June 2011 and November 2014 were included in the study. According to including and excluding criterions, 540 patients were included in our study. Subjects were grouped as non-OSAS, mild/moderate and severe OSAS according to the AHI values of 0–5 events/hour, 5–14 events/hour, 15–29 events/hour and ≥ 30 events/hour, respectively. We systematically collected the demographical data, including the medical history of hypertension, diabetes mellitus, dyslipidemia and the usage of medicine. All subjects had overnight (lasted more than 7 hours)

polysomnography monitoring performed by E-Series System made by Compumedics Company in Australia. Polysomnographic parameters were recorded including ODI, L-SaO₂, TS90%, TST, etc. Serum aminotransferases (ALT, AST) and gamma glutamyltransferase (GGT) were systematically performed. The upper limit normal cutoff values for ALT, AST and GGT were ≤ 43 , ≤ 38 and ≤ 50 U/l, respectively. Aminotransferase values were categorically recorded as normal or elevated. Patients with elevated liver enzymes were defined as having a level of serum ALT, AST and/or GGT higher than the upper limit of normal.

Results: Elevated liver enzymes was present in 42.3% of patients with OSAS. Elevated GGT was present in 40.3%, which was higher significantly than the patients without OSAS. Elevated AST was present in 12.0% of patients with severe OSAS, which was higher significantly than 4.1% of patients with mild/moderate OSAS ($p < 0.01$).

ALT of the patients with OSAS was (31.42 ± 2.08) mol/l, which was significantly higher than patients without OSAS. The higher the AHI was, the higher the ALT level. The GGT level of the severe-OSAS group was significantly higher than patients without OSAS ($p < 0.05$) and higher than the mild/moderate-OSAS group with no significance ($p = 0.05$).

In partial correlation analysis, the ALT level was negatively correlated with age, that is, younger patients were more easily to have higher ALT level. The ALT level was positively correlated with TST, sleep efficiency, TS90% and AHI, that is, hypoxia and hypersomnia may be the risk factors for the elevated ALT. The GGT level was only negatively correlated with age.

Our study made the ALT level as dependent variable and age, TST, sleep efficiency, TS90% and AHI as independent variables, at last, age, TS90% and AHI entered the regression equation.

Conclusion: Finally, OSAS is an independent risk factor of elevated liver enzymes. The heavier the degree of OSAS is, the higher the liver enzyme levels, excluding obesity. We thought OSAS caused the damage to liver mainly through hypoxia and the duration of hypoxia.

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Submaximal exercise and flow-volume loops in subjects with moderate to severe obstructive sleep apnea syndrome

H. Lin^{1,2}, J. Ong³, C. Lin⁴, C. Hung^{1,3}

¹ Institute of Allied Health Sciences, National Cheng Kung University, Taiwan

² Department of Physical Therapy, Shu-Zen Junior College of Medicine and Management, Taiwan

³ Department of Physical Therapy, National Cheng Kung University, Taiwan

⁴ Tainan Hospital, Ministry of Health and Welfare, Taiwan

Introduction: This studies have used the 6-min walk test (6MWT) applied at force vital capacity response to flow-volume loops (FV-loops) in subjects with moderate to severe obstructive sleep apnea syndrome (OSAS).

Materials and methods: We studied consecutive, newly diagnosed, OSAS subjects (aged >20 years). All patients underwent sleep study at our Sleep Disorders Center in a hospital. Eighteen subjects were divided into two groups based on the apnea hypopnea index (AHI index) (times/h). The study population was divided into two groups: moderate OSAS group (AHI index = $15 \text{ H}^{-1} \leq \text{AHI} < 30 \text{ H}^{-1}$, $n = 6$) and severe OSAS group (AHI index = $\text{AHI} \geq 30 \text{ H}^{-1}$, $n = 11$). Subjects were instructed to walk as far as possible in the designed pathway for 6 minutes. Flow-volume loops (FV-loops) data were

collected from both tasks using the spirometry device (model Pneumotrac 6800, Vitalograph, England). Dyspnea scale was used to measure the rate of perceived exertion (RPE) before and after 6MWT. Each subject underwent a single 6MWT within 1 month of the sleep study. The studies were conducted at the Tainan Hospital, Ministry of Health and Welfare, Taiwan. Normal distribution of all parameters was confirmed with a Kolmogorov–Smirnov test. Statistical analysis for Wilcoxon–Mann–Whitney test was performed (SPSS 17.0; SPSS, Chicago, IL) to compare between groups. A value of $p < 0.05$ was considered statistically significant.

Results: The moderate OSAS group (male = 5, female = 1, age = 43.13 ± 13.19 years; body weight = 71.25 ± 12.93 kg; body mass index = $24.68 \pm 3.74 \text{ kg/m}^2$; AHI index = 20.89 ± 3.10 ; distance = 563.14 ± 65.68 ; mean \pm SD) and the severe OSAS group (male = 9, female = 2, age = 51.27 ± 15.11 years; body weight = 80.25 ± 18.51 kg; body mass index = $29.03 \pm 5.96 \text{ kg/m}^2$; AHI index = 53.56 ± 22.03 ; distance = 525.41 ± 90.90 ; mean \pm SD) were compared based on the AHI index. In both groups, the severity of OSAS (AHI index) from the given information impacted on gender, but not affected by other factors such as age, body weight, and BMI in our study. However, the other parameters, such as heart rate, distance and oxygen saturation, were not significantly different. The FV-loops data had important effects on FEV₁/FVC, FEF 75–85 and FIF50/ FEF50 before-6MWT in the two OSAS groups ($p < 0.05$). The after-6MWT showed changes in FV-loops, especially at FEV₁/FVC, FEF 25–75 and FEF 75–85 in the two OSAS groups ($p < 0.05$).

Conclusion: There were no correlations between the 6MWT distance and the severity of OSAS. There was significant difference in flow-volume loops at before and after-6MWT, which displayed the importance between the two OSAS groups.

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Tongue morphology analysis in upper airway MRI for classification of severe obstructive sleep apnea

T. Mikami¹, K. Yonezawa², Y. Kojima¹, M. Yamamoto³

¹ National Institute of Technology, Tomakomai College, Japan

² National Hospital Organization Hakodate Hospital, Japan

³ Hokkaido University, Japan

Introduction: Morphological features of upper airway soft tissues give much information about the severity of obstructive sleep apnea (OSA), but clinical experience is necessary to evaluate the severity using the MRI. This study proposes a possible objective criterion for classifying severe OSA from the tongue morphology in the sagittal plane.

Materials and methods: The upper airway MRIs of 46 male OSA patients are analyzed in this study. All subjects received overnight polysomnography (PSG) and apnea/hypopnea index (AHI), which shows severity of sleep apnea, is estimated from the PSG results by medical technologists. Ethical approval was received from the Ethical Committee at NHO Hakodate Hospital.

Firstly, tongue region in the sagittal plane of MRI is segmented with manual tracing using image processing software. Then, the center of gravity of the segmented tongue region is calculated. From this point, straight lines are radially extended with the fixed angular

intervals of 7.5°, and the length from the center to the circumference of the tongue region is estimated. Correlation coefficient between the radius length and AHI is calculated for all directions so as to find higher correlated directions with the severity of OSA. In addition, the other features considered in conventional studies such as tongue area, tongue circumference, and neck circumference are also calculated for comparison.

Next, AHI is predicted by multi-regression analysis of our features and then severe OSA is classified if the predicted AHI is greater than 30. The classification results are evaluated with sensitivity and specificity.

Results: Two directions higher correlated with the severity are found; one is the direction to the back of tongue and the other is the direction to the hyoid bone. The first direction is in the opposite angle direction from the second one. The correlation coefficient of the direction to the back of tongue with AHI is calculated to be 0.611 ($p < 0.01$), and that of the direction to the hyoid bone is 0.526 ($p < 0.01$). In the case of conventional features, the correlation coefficient of tongue area, tongue circumference, and neck circumference are respectively calculated to be 0.441 ($p = 0.01$), 0.446 ($p < 0.01$), and 0.482 ($p < 0.01$).

As a result of multi-regression analysis of our two features, the sensitivity and specificity are respectively calculated to be 0.864 and 0.429. Namely, about 87% of severe OSA patients are successfully classified, whereas about 57% of non-severe OSA patients are also classified to the severe category.

Conclusion: Two specific directions in the tongue region can be a possible objective criterion for classifying severe OSA, because they are more highly correlated with AHI than traditional features. But the low specificity indicates that the other features are also necessary for classifying severe OSA.

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Anterior palatoplasty: Why, whom, how

M. Milkov¹, M. Adali², P. Nedev¹, T. Tonchev¹, D. Vicheva³

¹ Medical University, Varna, Bulgaria

² Medical University, Edirne, Turkey

³ Medical University, Plovdiv, Bulgaria

Introduction: Obstructive sleep apnea (OSA) is a common disorder which is characterized by the collapse of the pharyngeal airway. The most common site of obstruction in OSA is the retropalatal region. Many surgical techniques have been introduced to solve the problem on this site.

Materials and methods: The surgery is performed under the general anesthesia. A horizontal rectangular strip of mucosa is removed from the soft palate, down to the muscle layer.

Results: The horizontal stripped area on the soft palate was sutured with an absorbable material and the entire soft palate was transposed anteriorly and superiorly.

Conclusion: The technique has good post surgical outcomes in appropriate cases, according to our experience and literature. The preoperative evaluation and selection of appropriate patients for the technique have critical importance.

Acknowledgements: Anterior palatoplasty is one of the techniques which aims to solve the collapse on retropalatal space.

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Role of hyoid advancement in addressing lateral hypopharyngeal wall collapse in obstructive sleep apnea

V. Paramasivan, S. Arumugam, M. Kameswaran

Madras Ent Research Foundation, India

Introduction: Lateral pharyngeal wall collapse has been found to be a major contributor in obstructive sleep apnea (OSA), and is an important cause of failure of palatal and tongue base surgery, as both of them fails to address the lateral pharyngeal wall collapse.

Materials and methods: Aim of the study is to examine the efficacy of hyoid myotomy and advancement as a treatment of hypopharyngeal obstruction in obstructive sleep apnea. Thirty-two patients with moderate obstructive sleep apnea (OSA) with AHI less than 30 confirmed with overnight Level 1 polysomnogram were included in the study. We took retrospectively the data from 16 patients who underwent palatal surgery with genioglossal advancement (Group A) and 16 patients who underwent palatal surgery, genioglossal advancement and hyoid advancement for patients with lateral hypopharyngeal wall collapse (Group B). Polysomnogram, Epworth Sleepiness Scale (ESS) and Quality of Life (QOL) index were repeated after 6 months and compared with the pre operative value.

Results: The success rate for Group A was 68.8%, whereas, for Group B it was 81.3%. The success rate was defined as more than 50% reduction in apnea-hypopnea index (AHI)/an AHI of less than 20, measured at the end of 6 months. The results of palatal and tongue base surgery improved significantly when hyoid myotomy and advancement was combined.

Conclusion: Critical analysis of the anatomical and physiological factors inducing obstructive episodes and an appropriate treatment plan is vital, to produce successful outcomes in patients with obstructive sleep apnoea syndrome (OSAS). Failure of surgical procedures, are often due to improper selection of procedure.

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Linear and nonlinear analyses of heart rate variability in obstructive sleep apnea with or without white matter change

K. Choi, J. Kim, A. Jung, H. Lee

Medical Science, Ewha Womens University School of Medicine and Ewha Medical Research Institute, South Korea

Introduction: Obstructive sleep apnea (OSA) has been known as an independent risk factor for white matter change (WMC). This study aimed to assess the possibility of cardiac autonomic dysfunction by evaluation of heart rate variability (HRV) using linear and nonlinear analyses in OSA patients with or without WMC.

Materials and methods: Total 227 patients who visited Ewha Medical Center Sleep Center between April 2005 and May 2014 and performed overnight polysomnography (PSG) and 1.5 or 3T brain MRI including FLAIR, T2WI, and T1WI images were reviewed. Among them, 123 patients who were diagnosed as OSA based on PSG were included so far. Detailed clinical characteristics and sleep features were analyzed in OSA patients with or without WMC. Linear spectral and nonlinear heart rate variability (HRV) measures including low frequency [LF], high frequency [HF], LF/HF ratio, Poincaré plot [standard deviation (SD1) and (SD2)], and Detrended Fluctuation Analysis (DFA) were calculated during the entire sleep and different sleep stages, respectively.

Results: In 123 OSA patients (mean age 60.32 ± 13.41 years old), 80 were male while the other 43 were female. Among them, WMC was found in 75 patients (mean age 67.83 ± 9.18 years old, 40 male and 35 female). OSA with WMC group showed a higher apnea–hypopnea index (24.32 ± 19.13 vs 31.90 ± 21.25 , $p = 0.047$) and lower minimal oxygen saturation (82.43 ± 7.28 vs 80.72 ± 8.76 , $p = 0.26$) when compared with OSA without WMC group. Spectral HRV analysis did not show any significant difference between OSA with and without WMC groups (0.811 ± 0.597 vs 0.733 ± 0.176). Nonlinear HRV indices revealed that OSA patients had lower mean value of DFA when compared with the normal control group (0.958 ± 0.179 vs 0.791 ± 0.173), more prominent in OSA with WMC than OSA without WMC groups (0.958 ± 0.179 vs 0.912 ± 0.176).

Conclusion: Patients with OSA exhibited distinctive features in sleep and HRV, especially in OSA with WMC group. This finding suggests that cardiac autonomic dysfunction may be involved as an underlying mechanism in moderate to severe OSA patients to develop WMC.

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Central sleep apnea Cheyne–Stokes respiration are seen more in diastolic dysfunction with preserved ejection fraction and sinus rhythm than systolic heart failure and atrial fibrillation: A paradigm shift in conventional thinking

A. Quan Chan, M. Chan, N. Antonio, L. Patouga, E. Chan, R. Cabe, A. Hsu, M. Maggioli, J. Crespo, G. Tan
Chanwell Clinic Institute for Heart & Sleep Disorders, USA

Introduction: Conventional thinking is that central sleep apnea (CSA) and Cheyne–Stokes respiration (CSR) are often associated with systolic heart failure (SHF) and atrial fibrillation (AF).

Materials and methods: We analyzed 35 instances of CSA, CSR out of 2080 polysomnograms performed over 5 years at Chanwell Clinic.

Results: The average age is 82 years, male/female: 29/6, 29 (86%) have diabetes (DM), 21 patients (60%) have chronic kidney disease (CKD). All (100%) patients have left and right atrial enlargement (LAE, RAE) and left ventricular hypertrophy (LVH), 27 (77%) have diastolic dysfunction with preserved EF (DDFPEF) with average EF 65%. Eight patients have SHF with average EF 42%. DDFPEF grade 1 were seen in 22 patients (63%), DDFPEF grade 2 in 8 patients (23%), DDFPEF grade 3 in 5 patients (14%). SR was seen 21 patients (61%), whereas AF were seen in only 13 patients (39%). Mitral (MR) and tricuspid (TR) insufficiencies were noted in 33 patients (97%). Pulmonary arterial hypertension (PAH, PA >30 mmHg) were found in 20 patients (61%). Eight patients (23%) have aortic valve stenosis. Myocardial infarction (MI) was noted in 15 patients (43%), myocardial ischemia in 15 patients (43%); 3 patients (9%) had no evidence of ischemia/MI.

Conclusion: CSA and CSR are more commonly seen in DDFPEF than in SHF, in NSR than in AF. Progression of DDFPEF is a reflection of aging, chronicity of OSA, DM, CKD. CSA/CSR has much higher prevalence in men than women.

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Decreased plasma orexin-A levels in obese patients with and without obstructive sleep apnea

N. Strueva¹, M. Poluektov², G. Melnichenko¹, L. Savelyeva¹, G. Katsya¹, N. Goncharov¹

¹ Endocrinology Research Center, Moscow, Russia

² I. M. Sechenov First Moscow State Medical University, Russia

Introduction: Neuropeptide orexin-A plays a role in the regulation of sleep–wake cycle and energy metabolism. However, the role of orexins in obesity in humans is poorly understood. The aim of the study was to estimate the influence of obstructive sleep apnea (OSA) on orexin A levels in patients with obesity.

Materials and methods: 29 patients with obesity (17 males and 12 females, age 41 [33; 49] years, body mass index (BMI) 39.2 [35.5; 45.9] kg/m²) were studied. Patients with diabetes mellitus were excluded. Night polysomnography was performed according AASM 2007 criteria. Patients were divided in two groups comparable by age, sex ratio and BMI. First group consisted from 15 obese patients with severe OSA (apnea–hypoxia index (AHI) ≥ 30 episodes/h); second, 14 obese patients without sleep-related breathing disorders (AHI < 5 episodes/h). Control group consisted of 10 subjects (4 males and 6 females), aged 38 [30; 41] years with BMI 22.4 [20.0; 23.4] kg/m². Samples of plasma orexin A were taken after overnight fasting (at 08:00), concentrations of orexin A was measured two times using a commercial (Peninsula Labs) enzyme immunoassay (EIA).

Results: Plasma orexin A concentrations were significantly lower in obese subjects with OSA comparing with controls (42.0 [14; 99.5] vs. 88.0 [60.0; 215.0] pg/ml respectively, $p = 0.04$). In obesity patients without OSAS plasma orexin A was lower than in non-obese subjects (18.0 [14.5; 124.5] vs. 88.0 [60.0; 215.0] pg/ml, respectively, $p = 0.03$). Orexin A levels in patients with OSA and without OSA were not significantly different ($p = 0.9$).

Conclusion: In obese patients with and without obstructive sleep apnea basal secretion of orexin A is diminished. The influence of obstructive sleep apnea on the orexin system in these subjects is not detected.

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Validation of a modified Peruvian version of the Berlin Questionnaire to identify patients at high risk for the sleep apnea–hypopnea syndrome (SAHS)

D. Vizcarra-Escobar, V. Anculle–Arauco, D. Guillen-Mendoza, F. Barbagelata-Aguero, A. Juarez-Belaunde, A. Mariños-Velarde, J. Risco-Roca, A. Mendiola-Yamasato
Hypnos Instituto del Sueño, Peru

Introduction: The aim of our study was to develop a cross-cultural adaptation of the Peruvian version of the Berlin Questionnaire (BQ-PV).

Materials and methods: We made a translation of the original version by the translation–retranslation method. The resulting version was submitted to a panel for discussion where a modified version in Spanish was obtained; this modified BQ was submitted to a group of participants to evaluate the comprehension. As a next step, The BQ-PV was submitted to whole consecutive patients scheduled for an overnight polysomnography (PSG) in our facility. Patients were evaluated by a structured interview; the anthropometric parameters, BQ-PV and Epworth Sleepiness Scale (ESS) were registered. According to the BQ, the patients were divided in two groups: high risk (HR) and low risk (LR) for SAHS. We compared the means of

the HR and LR groups for the demographic data, respiratory disturbances index (RDI), apnea–hypopnea index (AHI), the minimal O₂ saturation and the average O₂ saturation. The internal consistency was evaluated by the Cronbach's alpha test. The predictive parameters for RDI and AHI were calculated.

Results: We included 582 patients (age = 49.66 ± 14.19, BMI = 28.25 ± 4.81, ESS = 9.84 ± 5.41). The internal consistency was 0.699 and 0.657 for the first and second categories respectively. The evaluation of the predictive parameters, for AHI ≥ 5, shows a sensitivity of 67.3%, a specificity of 52.5%, positive predictive value (PPV) of 75.8% and negative predictive value (NPP) of 42.0%. For RDI ≥ 5, the sensitivity and the specificity were 62.1% and 78.6%, respectively, PPV was 99.2% and NPP was 4.9% respectively.

Conclusion: The BQ-PV has a moderate internal consistency. Our validated BQ shows a moderate predictive capacity for identifying SAHS and great variability between AHI and RDI.

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Association between severity of obstructive sleep apnoea (OSA) and obesity in major ethnic groups of an Asian population

H. Wong, Y. Mok, Y. Poh, C. Kam
Changi General Hospital, Singapore

Introduction: The association between severity of OSA and obesity has been well studied in the Whites. However, there is limited data in the Asian population. The aim of this study is to investigate the association between severity of OSA and obesity in major ethnic groups (Chinese, Malays and Indians) in Singapore.

Materials and methods: This is a retrospective study of all subjects who underwent a full polysomnography (PSG) at Changi General Hospital (GGH), a teaching hospital in Singapore, from 1 January 2012 to 31 December 2013. Subjects diagnosed with OSA (RDI > 5/hour) were included in the study. We used RDI (respiratory disturbance index) to measure severity of OSA and BMI (body mass index, kg m²) to measure obesity

Results: Eight hundred twenty-eight subjects were included in the analysis. Mean age was 44.68 (±12.84) and 663 (80.1%) were male. Five hundred seventy-five (69.9%) were Chinese, 175 (21.1%) were Malays and 74 (8.9%) were Indians. The mean RDI was 38.44 (±27.37) and mean BMI was 29.72 (±6.54). Spearman's correlation (*r*) was used to assess the association between RDI and BMI. There was a statistically significant but relatively weak correlation between RDI and BMI in the study population (*r* = 0.374, *p* < 0.01). In the subgroup analysis of the different ethnic groups, the weak correlation between RDI and BMI persisted in both Chinese (*r* = 0.405, *p* < 0.01) and Malays (*r* = 0.333, *p* < 0.01). In addition, no statistically significant correlation between RDI and BMI was seen in Indians (*r* = 0.183, *p* = 0.12). Multiple regression analysis (adjusted for age and gender) showed that in Chinese, for every unit increase in BMI, RDI increased by 2.24 (95% CI 1.91–2.57, *p* < 0.01), as compared with Malays (for every increase unit in BMI, RDI increased by 1.89 (95% CI 1.31–2.48, *p* < 0.01)) and Indians (for every increase unit in BMI, RDI increased by 1.69 (95% CI 0.82–2.55, *p* < 0.01)).

Conclusion: The correlation between severity of OSA (using RDI) and obesity (using BMI) was poor in the Asian population of our study, worst in Indians, followed by Malays and Chinese. Further prospective studies would be required to investigate the reasons for this poor correlation.

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EEG arousals in attention-deficit/hyperactivity disorder (ADHD) children with sleep-disordered breathing (SDB)

Y. Yujing, L. Dabo, H. Zhenyun, Z. Jianwen
Guangzhou Women and Children's Medical Center, China

Introduction: There are many similarities in sleep disturbances between children with SDB and children with ADHD, PSG analysis is widely used in SDB children in the monitoring of macro and micro (EEG arousals) aspects. We mainly compare their detailed EEG arousals variables.

Materials and methods: A total of 119 children with suspected SDB were evaluated by nocturnal video-PSG. All had been independently examined by specialized child psychiatrists and 52 were confirmed to meet the ADHD criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV). The EEG total arousal index (the ARtotl), the respiratory arousal index (the RAI), the limb arousal index (the LAI), and the spontaneous arousal index (SAI) were scored using general AASM criteria, and values in ADHD/SDB and SDB-only (OSAHS, primary snoring (PS)) children compared.

Results: EEG arousals were more common during NREM than REM sleep. Over the night as a whole, no significant between-group differences were found when children with ADHD and OSAHS and OSAHS-alone were compared (RAI: *Z* = -0.459, *p* = 0.646 > 0.008; LAI: *Z* = -0.853, *p* = 0.404 > 0.008) and children with ADHD and PS and PS-only were compared (RAI: *Z* = -1.561, *p* = 0.118 > 0.008; LAI: *Z* = -1.443, *p* = 0.149 > 0.008). When EEG arousal data during rapid eye movement (REM) and non-rapid eye movement (NREM) sleep were separately scored, no significant between-group difference emerged (all *p* values > 0.008).

Conclusion: We found that EEG arousals increased rapidly after NREM (but not REM) sleep commenced. Using our methods and criteria, we found no significant difference in EEG arousal pattern between ADHD/SDB children and SDB children. Our data will aid future work in the area.

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Effect of sertraline on breathing in depressed patients without moderate-to-severe sleep related breathing disorders

B. Zhang, Y. Hao, F. Jia, X. Li, Y. Tang, H. Zheng, W. Liu

Introduction: The effects of selective serotonin reuptake inhibitors (SSRIs) on breathing are not evaluated in subjects without moderate-to-severe sleep related breathing disorders (SRBDs). Further, many symptoms of depression and SRBDs overlap, and so it is interesting whether there are interactions between breathing and psychopathologic symptoms during SSRIs treatment for depression.

Materials and methods: Data were taken from an open-label 8-week trial of sertraline in depressed patients with insomnia (*n* = 31). The depressed patients were administered 50 mg sertraline at 8 AM on the 1st day, and the dosage was subsequently titrated up to a maximum of 200 mg/day during the 8-week trial. All the patients were tested by repeated polysomnography (PSG) (baseline, 1st day, 14th day, 28th day, and 56th day). Sleep disordered breathing events were categorized as apneas, hypopneas, and respiratory event-related arousals (RERAs).

Results: The clinical responses and PSG characteristics improved continuously during the 8-week trial. From the 14th day on, the RERAs index during all-night and non-rapid eye movement (NREM) sleep became stable and significantly higher than baseline and the 1st day (RERA index: 7.3 ± 2.2 at baseline, 7.3 ± 2.5 on the 1st day, 4.4 ± 1.9 on the 14th day, 3.9 ± 1.3 on the 28th day, 4.2 ± 2.0 on the 56th day, $F = 5.71$, $p = 0.02$; NREM-RERA index: 6.2 ± 2.0 at baseline, 6.3 ± 2.3 on the 1st day, 3.2 ± 1.5 on the 14th day, 3.5 ± 0.9 on the 28th day, 3.2 ± 1.7 on the 56th day, $F = 4.92$, $p = 0.03$). Additionally, the NREM-apnea index showed a similar pattern to that of the RERA index and reached a significant difference between baseline (1.0 ± 0.5) and the 14th day (0.5 ± 0.4) ($KW = 4.28$, $p = 0.047$). Compared with the no-improvement group, the improvement group with a decreasing score rate of the respiratory disturbance index ($RDI \geq -50\%$) had a more positive decreasing score rate of slow wave sleep (SWS) ($439.0 \pm 78.2\%$ versus $373.2 \pm 77.9\%$, $T = 3.46$, $p = 0.04$) and a more negative decreasing score rate on the arousal index ($-43.7 \pm 16.7\%$ versus $-26.6 \pm 9.7\%$, $T = 9.16$, $p = 0.01$), Pittsburgh Sleep Quality Index (PSQI) scores ($-65.1 \pm 33.7\%$ versus $-49.6 \pm 21.4\%$, $T = 4.74$, $p = 0.05$), and Epworth Sleepiness Scale (ESS) scores ($-55.7 \pm 21.3\%$ versus $-36.4 \pm 17.5\%$, $T = 6.44$, $p = 0.02$).

Conclusion: Although the sertraline-induced SRBDs improvement seems not to have a significant clinical effect, the SRBDs improvement group with decreasing score of $RDI \geq -50\%$ has better subjective and objective sleep aspects than the no-improvement group. Thus, the SRBDs' improvement was related to SSRIs might have a potential clinical benefit.

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Adiponectin alleviates genioglossal mitochondrial dysfunction in rats exposed to intermittent hypoxia

X. Zhang, H. Huang, W. Ding

The First Affiliated Hospital with Nanjing Medical University, China

Introduction: Genioglossal dysfunction is implicated in the pathophysiology of obstructive sleep apnea syndrome (OSAS) characterized by nocturnal chronic intermittent hypoxia (CIH). The pathophysiology for genioglossal dysfunction and possible targeted pharmacotherapy for alleviation of genioglossal injury in CIH requires investigation.

Materials and methods: Rats in the control group were exposed to normal air, while rats in the CIH group and CIH+adiponectin (AD) group were exposed to the same CIH environment (CIH 8 h/day for successive 5 weeks). Furthermore, rats in CIH+AD group were given intravenous AD supplementation at the dosage of $10 \mu\text{g}/100\text{g}$ weight, twice a week for five successive weeks.

Results: We found that CIH-induced genioglossus injury was correlated with mitochondrial dysfunction, decreased serum concentration of AD, decreased mitochondrial number, impaired mitochondrial ultrastructure and decreased percentage of fiber type I. Compared with the CIH group, there was no significant improvement in impaired mitochondrial structure and function, but also an increase in percentage of fiber type I in the CIH + AD group. Moreover, compared with control group, the rats' genioglossus in the CIH group showed a significant decrease in phosphorylation of LKB1, AMPK and PGC1- α , whereas there was significant rescue of such decrease in the CIH + AD group.

Conclusion: CIH exposure could reduce mitochondrial biogenesis and impair mitochondrial function in genioglossus, while AD supplementation could increase mitochondrial contents and alleviate CIH-induced mitochondrial dysfunction possibly through the AMPK pathway.

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EEG arousals in children exhibiting primary snoring

H. Zhenyun, Y. Yujing, L. Dabo, Z. Jianwen, Q. Shuyao, X. Jiajian,

Z. Jing, Y. Xinhua, L. Shaofeng

Guangzhou Women and Children's Medical Center, China

Introduction: Children with primary snoring exhibit OSAHS clinical symptoms, AHI and LSaO2 do not meet OSAHS diagnostic criteria. Optimal PS treatment options (surgical or otherwise) remain controversial. Working with OSAHS and PS children to seek similarities and differences in the context of EEG arousals is meaningful, and is what we did.

Materials and methods: One hundred boys and 19 girls, aged 4–13 years (mean age, 6.83 ± 2.01 years), whose parents complained of snoring and excessive daytime sleepiness at least 1 year in duration, and who were thus suspected to suffer from SDB served as the test group. Eighteen boys and 12 girls aged 4–13 years (mean age, 5.83 ± 2.91 years) with vocal nodules served as the control group. They all completed full-night PSG (Compumedics E-series, [Melbourne], Australia). Of the 119 test children, 53 were considered to have obstructive sleep apnea/hypopnea syndrome, 66 primary snoring, using American Academy of Sleep Medicine criteria. EEG arousal indices in each group (Total arousal index, Respiratory arousal index, Limb arousal index, and Spontaneous arousal index) were scored using American Academy of Sleep Medicine criteria, and the values of these indices were compared among the three groups. Statistical analysis was performed using the SPSS 19.0 software package. All sample distributions were tested for normality. Differences between groups were analyzed using Mann-Whitney's U test or Wilcoxon's test, if the data were not normally distributed, and Student's t-test otherwise. The Kruskal-Wallis test was used if multiple independent samples did not show normal distributions.

Results: Significant differences in EEG arousal indices were apparent between children with sleep-disordered breathing and controls; all indices were higher in children with sleep-disordered breathing ($p < 0.05$). There is no difference of Total arousal index between primary snoring and obstructive sleep apnea/hypopnea syndrome. In children with primary snoring, the Limb arousal index was higher than in children with obstructive sleep apnea/hypopnea syndrome, and controls ($p = 0.002 < 0.05$; $p = 0.000 < 0.05$), especially during non-rapid eye movement sleep ($p = 0.006 < 0.05$). Respiratory arousal index was notably higher in children with OSAHS than in the other two groups ($p = 0.000 < 0.05$; $p = 0.004 < 0.05$).

Conclusion: Proper attention should be taken with children with primary snoring. There are many similarities between children with OSAHS and children with primary snoring. All of the above may well identify that children with primary snoring should allow planning of appropriate treatment.

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approval, responsibility for content of manuscript; Yujing Yao: Acquisition of data, drafting, final approval; Jianwen Zhong and Shuyao Qiu: Data analysis; Shaofeng Liu: Responsibility for content of manuscript; Chaochen: Revising the work critically.

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An effective model for screening obstructive sleep apnea: A large-scale diagnostic study

J. Zou, J. Guan, H. Yi, S. Yin

Department of Otolaryngology, The Affiliated Sixth People's Hospital, Otolaryngology Institute of Shanghai Jiao Tong University, 600 Yishan Road, Shanghai 200233, China

Introduction: Obstructive sleep apnea (OSA) causes high morbidity and mortality and is independently associated with an increased likelihood of multiple complications. The diagnosis of OSA is presently time-consuming, labor-intensive and inaccessible.

Aim: This study sought to develop a simple and efficient model for identifying OSA in Chinese adult population.

Materials and methods: In this study, the efficiency of Epworth Sleepiness Scale (ESS) and a new established prediction model for screening OSA were evaluated in the test cohort (2032 participants) and confirmed in an independent validation cohort (784 participants).

Results: In the test cohort, a high specificity (82.77%, 95% confidence interval [CI], 77.36–87.35) and a moderate sensitivity (61.65%, 95% CI, 59.35–63.91) were obtained at the threshold of nine for the ESS alone. Notably, sex-stratified analysis revealed different optimum cut-off points: nine for males and six for females. The new generated screening model, including age, waist circumference, ESS score, and minimum oxygen saturation (SaO₂) as independent variables, revealed a higher sensitivity (89.13%, 95% CI, 87.60–90.53) and specificity (90.34%, 95% CI, 85.85–93.77) at the best cut-off point. Through receiver operating characteristics curve analysis, the area under the receiver operating characteristics curve of the model was found significantly larger than that of the ESS alone (0.955 vs. 0.774, $p < 0.0001$). All these results were confirmed in the validation cohort.

Conclusion: A practical screening model comprising minimum SaO₂ and other parameters could efficiently identify undiagnosed OSA from the high-risk patients. Additionally, a sex-specific difference should be considered if the ESS alone is used.

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Evaluation of a two-channel portable device and a predictive model to screen for obstructive sleep apnea in a laboratory environment

J. Zou, L. Meng, H. Yi, S. Yin

Department of Otolaryngology, The Affiliated Sixth People's Hospital, Otolaryngology Institute of Shanghai Jiao Tong University, 600 Yishan Road, Shanghai 200233, China

Introduction: Portable monitors for identifying obstructive sleep apnea (OSA) have been investigated, and were reported to enable

accurate recording of OSA severity. However, more information is needed from different population. This study was to evaluate the efficiency of a portable two-channel sleep apnea device (SleepView) for screening OSA in Chinese population.

Materials and methods: Ninety-three consecutive subjects underwent simultaneous SleepView test and laboratory polysomnography monitoring (PSG). Data were collected and blindly analyzed. The efficiencies of the SleepView device and a newly established predictive model for identifying OSA were evaluated in comparison with PSG.

Results: Good agreement was evident between SleepView and PSG based on the apnea–hypopnea index (AHI) ($r^2 = 0.837$, $p < 0.01$). The median AHI yielded by SleepView was higher than that of PSG: 33.2 (10.5–53.3) vs. 19.2 (5.2–53.6). The sensitivity and specificity of SleepView for a PSG AHI ≥ 5 were 80.28% and 95.45%, respectively, and the cutoff point was 16.8. The areas under the receiver operating curves for PSG AHI ≥ 5 , > 15 , and > 30 were 0.923, 0.924, and 0.979, respectively. When the AHI and the oxygen desaturation index calculated by SleepView were combined with waist circumference, the new predictive model showed a higher sensitivity of 92.96% and a specificity of 95.45% for a PSG AHI ≥ 5 , and the corresponding area under the receiver operating curve was 0.983.

Conclusion: The SleepView device exhibited acceptable diagnostic accuracy for OSA in Chinese population, especially the severe group. A practical predictive model, comprising waist circumference, AHI and oxygen desaturation index, obtained from SleepView, was highly effective for screening even mild OSA.

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Effect of laparoscopic Roux-en-Y gastric bypass surgery on obstructive sleep apnea in a Chinese population with obesity and T2DM

J. Zou¹, P. Zhang², H. Yu³, S. Yin¹, H. Yi¹

¹ Department of Otolaryngology, Shanghai Jiao Tong University Affiliated Sixth People's Hospital, Otolaryngology Institute of Shanghai Jiao Tong University, Shanghai 200233, China

² Department of Surgery, Shanghai Jiao Tong University Affiliated Sixth People's Hospital, Shanghai 200233, China

³ Department of Endocrinology and Metabolism, Shanghai Jiao Tong University Affiliated Sixth People's Hospital, Shanghai 200233, China

Introduction: Bariatric surgery has been reported to be an effective treatment for obstructive sleep apnea (OSA). However, these evidences were not enough for different populations. Thus, we conducted a follow-up study to evaluate the effect of bariatric surgery on OSA in Chinese population with obesity and type 2 diabetes mellitus (T2DM).

Materials and methods: From May 2011 to March 2014, 72 consecutive subjects with obesity and T2DM were recruited for this study. Before and at least 6 months after the laparoscopic Roux-en-Y gastric bypass (LYGB) surgery, all subjects were asked to undergo a polysomnography test. During the sleep centre visit, anthropometric characteristic data, blood samples, and sleep questionnaires were collected.

Results: In total, 44 Chinese participants with OSA were included in the study. Compared with baseline data, the postoperative anthropometric characteristics, blood measurements, and sleep

recording data, such as weight, apnea hypopnea index (AHI) and insulin resistance index, differed significantly ($p < 0.001$). The change in AHI was correlated significantly with preoperative weight ($r = 0.298$, $p < 0.05$), preoperative AHI ($r = 0.729$, $p < 0.001$), preoperative waist circumference ($r = 0.307$, $p < 0.05$), and preoperative IR index ($r = 0.301$, $p < 0.05$). Postoperative AHI was correlated significantly with age ($r = 0.039$, $p = 0.039$) and preoperative AHI ($r = 0.445$, $p = 0.002$), and the following prediction model was generated: $\log_{10}(\text{postoperative AHI}) = 0.626 \times \log_{10}(\text{preoperative AHI}) + 0.010 \times \text{age} - 0.581$.

Conclusion: Our findings indicate that LYGB could be an effective therapeutic intervention in the management of OSA for patients with both obesity and T2DM, and the preoperative AHI and age might be important factors that influence the effort of LYGB.

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Causal effect of sleep duration on adolescent body weight: Evidence from a natural experiment

Y. Do

Seoul National University College of Medicine, South Korea

Introduction: Many epidemiological studies have reported consistent associations between shorter sleep duration and increased body weight. Promoting adequate sleep hours has therefore been proposed for obesity prevention, but causal evidence is limited. This study presents the first population-level causal evidence of the effect of sleep duration on body weight.

Materials and methods: This study uses a quasi-experimental study design that exploits a unique natural experiment in the context of South Korea's highly competitive secondary education. In March 2011, amid growing concerns over the negative consequences of late-night tuition at private tutoring institutes (hagwon), authorities in three of the 16 administrative regions in South Korea decreed adjusting the closing hours of hagwon to 10 p.m. This unique natural experiment involving the policy change in hagwon curfew hours is likely to have caused an increase in sleep duration among a certain group of adolescents but is unlikely to be directly correlated with adolescent body weight. This plausibly exogenous variation in sleep duration allows for an estimation of the causal effect of sleep duration on body weight. An instrumental variable two-stage least squares estimation is employed, using data from the 2009 to 2012 Korea Youth Risk Behavior Web-based Survey.

Results: The main instrumental variable estimation results show that a 1-hour increase in sleep duration led to a 0.56 kg/m² reduction in body mass index, or a 4.3 percentage-point decrease in the probability of overweight/obesity, in the study sample of general high school 10th- and 11th-graders. These estimates are larger in magnitude than those from the standard regression-based method that has been used in most epidemiological studies in the literature. A number of robustness checks conducted exclude several alternative explanations, supporting the causal inference.

Conclusion: Short sleep duration may be an important causal factor in weight problems among adolescent populations. This study also suggests that sleep gain induced by appropriate public policy can help address negative health consequences of short sleep duration in adolescents.

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Association of sleep deprivation with hypertension among adult residents of Makati City, Philippines

C. Escuadra¹, A. Atlas¹, P. Lee², E. Casupanan³, L. Brito⁴, T. Co⁵, M. Sanchez⁶, P. Tiamson⁷, A. Tatco⁸

¹ University of Santo Tomas, Philippines

² Philippines

³ Philippines

⁴ Philippines

⁵ Philippines

⁶ Philippines

⁷ Philippines

⁸ Philippines

Introduction: Hypertension is non-communicable disease that has affected the world continuously. Increasing evidences have associated it with sleep deprivation. Hypertension results to numerous deaths among Filipinos, but there is no evidence relating sleep deprivation with hypertension among Filipinos. Thus, this study aims to determine the association between sleep deprivation with hypertension.

Materials and methods: This analytical cross-sectional study has been approved by the UST-CRS – Ethical Review Committee Board. It involved residents aged 32–59 years old from three identified barangays in Makati City, Philippines. The study was divided into: (1) Phase 1 – questionnaire development and inter-rater reliability testing, and (2) Phase 2 – questionnaire administration and BP assessment. The questionnaire was used for profiling, and assessment of lifestyle, past medical history, family medical history, stress, work, nutrition status, and sleeping hours. Subjects who reported diagnosis of hypertension or showed proof of intake of anti-hypertensive medications were classified as hypertensive. While participants those who were not were included in the 1 week BP assessment protocol. Subjects who reported of <7 hours of sleep per day in a week were classified as sleep deprived. Note that use of 1 week sleep diary was initially implemented. But due to non-compliance of participants, sleep duration was assessed through use of the questionnaire instead. Descriptive statistics was used to describe the demographic characteristics of the subjects. Univariable and multivariable regression were used to determine the association of the different mutable risk factors with hypertension. Stratified analysis was done to assess the effects of possible confounders such as age and gender.

Results: Pilot testing of questionnaire among 115 adults revealed a Cronbach alpha of 0.67, while inter rater test among assessors revealed good reliability.

For phase 2, a total of 190 residents aged 32–59 years old participated in the study. Among them, 110 or 58% were found to be hypertensive while 116 or 61% were found to be sleep deprived. Univariate analysis revealed that sleep deprivation, age, sex, time of work, frequent consumption of salty food, past medical history of stroke and cardiac problems and family history of stroke were associated with hypertension (p value < 0.05). However, multivariate analysis revealed that only age and sleep deprivation are both significant risk factors for hypertension. Analysis also revealed that a person who sleeps for <7 hours a night has 2.31 times more risk to be hypertensive compared with those do not when adjusted for age (p value < 0.05). Furthermore, a person with a decrease in 1 hour of sleep a night has 1.43 times the odds to have hypertension when

adjusted for age (p value <0.05). Sleep deprivation was also found to be associated with hypertension among male participants (p value <0.05) but not among female participants (p value >0.05).

Conclusion: Sleep deprivation among Filipino adults aged 32–59 years old was significantly associated with hypertension when adjusted for age. Also, it was associated with hypertension among male adults but not among females.

The study poses several limitations like lack of temporality, possible recall and misclassification bias, and subjective sleep assessment.

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Sleep deprivation in adolescents: Correlations with school achievement and health related quality of life

M. Gaspar De Matos¹, T. Gaspar², G. Tome², T. Paiva³

¹ University of Lisbon, Portugal

² Lusitana University, Portugal

³ Sleep Medicine Centre & University of Lisbon, Portugal

Introduction: The influence of sleep deprivation on children and adolescents is now broadly evidenced in literature. Will it influence school related features? This study aims to evaluate the influences of sleep duration, weekend variability of sleep, on other adolescents' features, namely those related to school life and school achievement.

Materials and methods: The Health Behaviour in School-Aged Children (HBSC) survey is based on a self-completed questionnaire. The participants were 3164 students (53.7% were girls), attending the 8th and 10th grades, aged 14.9 years old ($SD = 1.23$). Subjective sleep duration during the week and weekends was collected. Sleep variability was considered whenever the difference was 2 hours or higher between the number of hours of sleep in school days and weekends; other variables related to sleep included in the study were fatigue complaints and difficulties in sleep initiation; school related features included were the perception of school achievement, disliking school, feeling pressure with school work and school truancy.

Results: Sleep duration was average 7.5 h during the week ($SD = 1.15$) and 8.8 h during the week-end ($SD = 1.41$), in total average 7.9 h ($SD = 1.0$); 46.6 % of pupils had a gap of 2 h or more between hours of sleep during the week and during the week end (SleepV). Average difference was -1.25 h ($SD = 1.59$). Four multiple regression models were achieved showing adequate fitness, using as dependent variables, (1) perception of low achievement in school, (2) disliking school, (3) feeling pressured with school work, (4) school truancy, were used as independent variables each of the remaining school related variables, plus the existence of; extreme fatigue; total sleep duration, difficulties in sleep initiation. Afterwards, one logistic model associated sleep related variables and school related variables to SleepV.

Conclusion: Poor sleep quality and insufficient sleep duration affected negatively school relatedness and participation during adolescence but, although a significant association was systematically found, it was able to explain only a very low parcel of the total variance, suggesting that although sleep is an important feature in school experiences namely perception of low achievement and lack

of well-being, other important features are to be considered to fully understand this phenomena.

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Chronic sleep deprivation alters theta and gamma powers during REM sleep in mice

B. Kim¹, Y. Kim², E. Hwang¹, R. Strecker², R. McCarley², J. Choi¹

¹ Korea Institute of Science and Technology, Center for Neuroscience, Seoul, South Korea

² Department of Psychiatry, VA Boston Healthcare System and Harvard Medical School, Brockton, MA, USA

Introduction: Chronic sleep restriction (CSR) has been shown to impair people's function, accumulating sleep pressure. However, given its role on memory and emotion, comprehensive reports of rapid eye movement (REM) sleep response with EEG recording were sparse. Here, we focused how CSR alters REM sleep and EEG power spectra.

Materials and methods: We used a high-density EEG method in freely behaving mice. Mice ($N = 9$) were sleep deprived daily for 18-h using periodically rotating wheels, followed by 6-h of sleep opportunity that started at the beginning of each light period. This sleep restriction protocol was repeated for five consecutive days.

High density film electrode (HD electrode), conventional screw, and accelerometer were recorded together to acquire EEG signal and detect body movements. Screw and accelerometer signals were used to define sleep states (Wake, NREM sleep, REM sleep) for full 24-h experiment days, and then we analyzed sleep structural changes from them. In addition, from signals of a 40-channel HD electrode covering the whole skull surface, we obtained topographical mapping of EEG spectral power changes on CSR days. More specifically, we focused on theta and gamma frequency (5–10 Hz; 30–100 Hz), which are prominent oscillations during REM sleep, and analyzed their power, peak frequency changes and co-modulation strength between them.

Results: The REM sleep time during the daily 6-h sleep opportunities increased as the SR days progressed, compared with the corresponding baseline levels. A power spectral analysis of the high-density EEG revealed that low theta power (5–7 Hz) increased significantly in the frontal cortex on SR day 1, then continuously decreased on SR3 and SR5; high theta power (7–10 Hz) was persistently elevated throughout all s, especially in the centro-parietal cortex. A close examination of theta oscillation revealed a transition from unimodal to bimodal oscillation showing that a peak frequency at 7 Hz during baseline was split into two peak frequencies at 7 and 9 Hz. Regarding REM sleep gamma power, a gradual but significant increase in low gamma power (30–50 Hz) was observed near the prefrontal cortex especially on SR3 and SR5, while robust increases in high gamma (70–100 Hz) were observed most significantly in the centro-parietal cortex on SR3. Additionally, the analysis of cross-frequency coupling between theta phase and gamma power showed that modulation of theta on gamma oscillation was not altered during CSR.

Conclusion: CSR produces opposite effects on the low and high theta power of REM sleep in mice. In addition, this study indicates that CSR significantly increases REM gamma power while 18-h acute sleep deprivation does not. Further studies are needed to determine whether theta and gamma power correlates with behavior function.

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Sleep days in Japan

M. Okawa, K. Takahashi

Japan Foundation for Neuroscience and Mental Health, Japan

Introduction: In January 2011, the Japan Foundation for Neuroscience and Mental Health formed the Sleep Health Promotion Organization (SHPO) with the cooperation of the Japanese Society of Sleep Research (ISSR). The main project is a promotion of spreading accurate knowledge and awareness regarding importance of sleep health.

Materials and methods: The Great East Japan Earthquake occurred in March of the same year, causing sleep problems for people forced to live in shelters. SHPO published a brochure for evacuees and distributed them throughout the affected regions. These brochures were highly-evaluated and were requested by many public health centers. After these preliminary activities, we have set up three areas: (1) an establishment of Sleep Days in Japan, (2) trials for public sleep health education at major cities and local towns/villages, and (3) cooperative/promotional activities with the Ministry of Health, Labour and Welfare for sleep health education. Questionnaire was sent to members of the JSSR to establish national Sleep Days.

Results: (1) A spring Sleep Day (March 18th) and fall Sleep Day (September 3rd) were decided and the kickoff meeting open to the public was held in Tokyo. The weeks before and after each Sleep Day were set as sleep health promotion weeks. (2) From March 2012, public lectures were held during the sleep health promotion weeks in spring and fall at five to six major cities throughout Japan including Tokyo. A total of 32 lectures will have been held by March 2015, in 25 of the 47 prefectures throughout Japan. From 2014, public lectures with lecturers dispatched have been held throughout Japan for local governing bodies. In 2014, lectures were held at 30 of the 70 cities that requested lectures. A questionnaire survey indicated that participants were highly interested in the lectures, with 92% of positive responses. (3) Meanwhile, explicit promotional activities that had been about sleep in Japan began from the national “Healthy Japan 21” project in 2001. The government of Japan published the “Seven Sleep Requirements” in 2003 and the renewed “Twelve Requirements for Good Sleep” in 2014. Pharmaceutical corporations and the mass media then held workshops and short courses based on these.

Conclusion: In the future, we hope to develop and expand these activities to target persons related to educational, medical and governmental fields. It is anticipated that multifaceted promotional activities will improve the public health of Japan.

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Monitoring of sleeping animal respiratory pattern using a non-contact bioradar

L. Anishchenko¹, G. Gennarelli², A. Tataraidze¹, Y. Sviryaev³, F. Soldovieri², S. Ivashov¹

¹ Remote Sensing Laboratory, Bauman Moscow State Technical University, Russia

² Institute for Electromagnetic Sensing of the Environment, National Research Council of Italy, Italy

³ Sleep Medicine Laboratory, Federal North-West Medical Research Centre, Russia

Introduction: The monitoring of respiratory pattern of sleeping laboratory animals attracts considerable interest while studying influence of various factors on sleep apnea genesis. Creation of non-contact and low-cost methods for solving this problem, which can be applied for different types of animals, has a high practical value.

Materials and methods: Multi-frequency Doppler radar BioRASCAN-14 designed at Remote Sensing Laboratory of the Bauman Moscow State Technical University was used for non-contact monitoring of respiratory pattern of a sleeping animal. During the experiments, the radar unit was located at the distance of 0.3–1.0 m from a plastic box containing a sleeping rat. Two female rats (4 months old each) were used for the experiments. For each of them, five records of received radar signals were collected, where the duration of every record was no less than 30 minutes. Besides the main goal of demonstrating the feasibility of breathing pattern detection, the other goal of the experiment was to analyze the differences in the respiratory activity of the two rats. Fully automated procedure for experimental data processing was designed. It consist of sequentially applied band pass filtration, movements artifact removal with an adaptive thresholding procedure, inhale peak detection, computation of inter-peak time intervals, and detection of period with shallow low frequency breathing (hypopnea) or complete cessation of breathing (apnea).

Results: The analysis of bioradar records revealed individual features in respiratory patterns of two sleeping rats. The average respiration frequency for rat 1 is about 83 ± 10 acts per min (mean \pm SD), while the same parameter is about 100 ± 11 acts per min (mean \pm SD) for rat 2. These differences are caused by individual physiological features of animals. The experimental results showed that is it not only possible to estimate the respiration frequency of sleeping rat without any physical contact by means of proposed technique, but also to detect slight changes in respiration pattern, e.g. hypopnea episodes, which in case of frequent repetitions (>15 event per hour) may indicate presence of sleep breathing disorders. However, in our experiments, we detected less than three hypopnea episodes per 30 min for all records, thus it was proved that rats under examination had no such sleep disorders. Furthermore, the experimental results revealed the possibility of the proposed technique usage without any modification for non-contact monitoring of other types of biological objects respiration pattern.

Conclusion: The feasibility study of bioradar BioRASCAN for an automated prolonged monitoring of sleeping laboratory animals respiration pattern has been performed. The computational cost is suitable to make the processing in real-time. The results of this study suggest the application of bioradiolocation in realistic operative conditions.

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Screening of periodic limb movements (PLM) via smartphone-connected ballistocardiographic flexible bed sensor strip

F. Sannholm¹, E. Baker¹, J. Paalasmaa¹, M. Partinen^{2,3}

¹ Beddit Ltd, Finland

² Helsinki Sleep Clinic, Vitalmed Research Centre, Helsinki, Finland

³ Department of Clinical Neurosciences, University of Helsinki, Helsinki, Finland

Introduction: Periodic limb movement disorder (PLMD) contributes to a host of adverse health effects. We sought to implement a ballistocardiography-based (BCG) PLM screening tool that is completely unobtrusive (no wearable components) to help in the diagnosis of PLMD.

Materials and methods: A clinical study with 18 volunteers was carried out, wherein synchronized BCG and tibialis EMG signals (left and right leg EMG) during a polysomnography were acquired. PLMs were detected from the BCG signal with our own algorithm, and the result was compared with PLMs detected from the EMG signals based on the AASM criteria. The BCG signals were acquired from a flexible piezoelectric sensor (70 cm × 3 cm, 0.2 mm thick; placed under the bed sheet at the chest level to make it completely unobtrusive). The BCG sensor measures the vibrations caused by body movements, heartbeat, and respiration. The BCG signal was filtered using a bandpass filter (2.5–25 Hz) in order to emphasize movement information in the signal.

Results: The clinical study results show good agreement between standard EMG-identified PLM and those identified through BCG analysis. The BCG-based PLM detection results were evaluated through a comparison of EMG-signal periodic leg movement counts and total leg movement counts. The correlation was found to be 0.83 and 0.80, respectively. Also, the counts of 5-minute epochs containing PLMs were compared, with a correlation of 0.85. We evaluated the accuracy of PLMD detection based on the PLM index (the number of PLMs per hour of sleeping). A case was classified as PLMD if the index was over 5. The specificity for PLMD was 1.0 and sensitivity 0.78 (N = 18); there were no false negatives and only two false positives for PLM out of 7 and 11 cases, respectively, but the small sample size must be kept in mind.

Conclusion: We obtained promising results for screening of sleep-related movement disorders like PLMD. Significant cost savings could be conferred to health care systems with proper implementation. In addition to sensing PLMs, the sensor is sensitive enough to detect sleep related breathing disorders, such as obstructive and central apneas.

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Non-invasive estimation of nocturnal cardiac output in heart failure patients with periodic breathing using multiple regression

H. Dajani¹, K. Hosokawa², S. Ando³

¹ School of Electrical Engineering and Computer Science, University of Ottawa, Canada

² Department of Cardiovascular Medicine, Kyushu University Hospital, Japan

³ Sleep Apnea Center, Kyushu University Hospital, Japan

Introduction: The management of heart failure (HF) patients would benefit from accurate non-invasive estimation of cardiac output (CO). A percentage error less than 30% relative to a reference invasive method has been proposed for clinical acceptability of a non-invasive method. However, available non-invasive CO monitors generally fail to meet this requirement.

Materials and methods: An earlier study showed that a model based on circulatory delay (CD), calculated as the delay between respiratory airflow and SpO₂ that gives highest linear correlation, produces good estimates of Cardiac Index in HF patients with periodic breathing. This work is extended to a multi-variable regression model. Thirty-one HF patients underwent polysomnography (PSG) and cardiac catheterization. The PSG signals were analysed over 7 min intervals, in 2 min steps. To exclude intervals of low signal quality, the cross-power spectrum between respiratory airflow and SpO₂ and the power spectrum of SpO₂ were tested for a distinct peak (at least 2 standard deviations above background) between 0.0083 and 0.05 Hz. In addition, SpO₂ peak power had to correspond to a

minimum saturation excursion of 4%, and intervals with CD outliers were removed. Six patients had no intervals that met these criteria and were discarded, leaving 25 patients. Three variables, CD, average overnight heart-rate (AveHR), and age showed good linear correlation with the invasive CO ($r = -0.666$, 0.413, and -0.6 , respectively), and were used to implement the multiple regression model. To evaluate the predictive ability of the model, cross-validation using the leave-one-out method was used, and performance was evaluated over the 25 estimates.

Results: Percentage error (%) was calculated as $2 \times$ standard deviation of the differences between the 25 reference values and estimates, divided by mean CO. The bias (%) was calculated as the average of these differences, divided by mean CO. The two variable multiple regression model with CD and AveHR gave a percentage error of 28.0%, a bias of -0.3% , and an RMSE of 0.580 l/min, while the two variable model with CD and age gave a percentage error of 28.3%, a bias of 0.5%, and an RMSE of 0.586 l/min. On the other hand, the three variable multiple regression model with CD, AveHR, and age gave a percentage error of 22.3%, a bias of 0.4%, and an RMSE of 0.462 l/min.

Conclusion: With both the two and three variable multiple regression models, performance compares very favourably with percentage errors reported by a large number of studies evaluating methods for non-invasive estimation of CO. Therefore, the proposed approach holds promise in the assessment of cardiac function of HF patients with nocturnal periodic breathing.

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Transversely retropalatal collapsibility measured by regular endoscopy is associated with position independency and apnea-hypopnea index

L. Hsin, L. Lee, H. Li

Department of Otolaryngology, Chang Gung Medical Center, Linkou, Taiwan

Introduction: This study was to investigate whether the retropalatal airway shape and collapsibility defined by regular endoscopy with Müller's manoeuvre could be used for predicting position independency and apnea-hypopnea index (AHI) in patients with obstructive sleep apnea (OSA).

Materials and methods: Shape ratio (transverse diameter [TD]/longitudinal diameter [LD]) in stationary phase (shape ratios-phase) and in Müller's phase (Shape ratiom-phase) and collapsibility (CoITD and ColLD) of the airway at the level of the uvular base were measured using a picture archiving and communication system. Intra- and inter-rater reliabilities were assessed. Associations among endoscopic measurements, AHIs (total, supine, and non-supine), and position independency (defined as a supine AHI of < 2 times of the non-supine AHI) were statistically analyzed.

Results: Reliability tests indicated substantial agreements (>0.7) of all endoscopic measurements between raters and within raters. AHI_{total} was significantly correlated with tonsil size, Friedman stage, shape ratios-phase, shape ratiom-phase, and CoITD. By multivariate analysis, tonsil size and CoITD were two independent variables related to AHI_{total}. CoITD and neck circumference were two independent parameters related to position dependence.

Conclusion: Regular endoscopy with Müller's manoeuvre continues to be an important clinical tool to evaluate the upper airway among OSA patients. A high CoITD is a hallmark of position independency and/or severe OSA.

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Psychological evaluation of depression and sleep to improve the quality of life

A. Kawakubo¹, T. Oguchi²

¹ Graduate School of Contemporary Psychology, Rikkyo University, Japan

² College of Contemporary Psychology, Rikkyo University, Japan

Introduction: Long-term obstruction of sleep may cause various diseases and declines in the quality of life. Indeed, the deterioration of sleep quality has a bidirectional relation with depression. This study examined the relationship between depression and sleep quality with multidimensional psychological methods, which are based on both subjective and objective evaluation.

Materials and methods: We conducted two studies from May through October 2013. Study 1 investigated the relationship between depression and sleep quality. Five hundred twenty (260 female, 260 male) participants answered Internet-based questionnaires. The questionnaires included items on age, gender, occupation, marital status, the Center for Epidemiological Studies Depression Scale (CES-D), and the Pittsburgh Sleep Quality Index (PSQI). Study 2 attempted to estimate the association between depression and sleep quality quantitatively by using a fingertip plethysmogram, which measures oxygen saturation, blood pressure, cardiac output, and autonomic functions. Researchers from different scientific domains have become increasingly interested in fingertip plethysmogram because of its advantages as a noninvasive, inexpensive, and convenient diagnostic measure. Forty-five university students (38 female and 7 male) participated in Study 2. Their fingertip plethysmograms were measured. They also answered the same questionnaires as in Study 1. We used IBM SPSS 22 for data analysis in both studies.

Results: The mean global PSQI score in Study 1 was 5.44 (SD = 2.81). This demonstrated that most of the participants of Study 1 had some sleep problems. First, we assessed the effects of age and gender on sleep quality by analysis of variance (ANOVA). However, there were no significant effects for age ($F(2, 514) = 1.61$, ns, $\eta^2 = 0.00$), gender ($F(2, 514) = 1.14$, ns, $\eta^2 = 0.01$), or the interaction between age and gender ($F(2, 514) = 1.38$, ns, $\eta^2 = 0.01$). Then, we examined the effects of seven components of sleep quality (subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction) on depression by building a psychological model, in which obstructions of sleep quality lead to depression. We assessed the model fit by evaluating the overall pattern of the fit indices. Among sleep qualities, subjective sleep quality, sleep disturbance, and daytime dysfunction affected depression (CFI = 0.998, AGFI = 0.974, RMSEA = 0.031). Furthermore, Study 2 examined the association between indices of the fingertip plethysmograms and self-report questionnaires. We confirmed a significant correlation between depression, sleep quality, and a physiological index provided by the fingertip plethysmogram measurements.

Conclusion: We confirmed an association between depression and sleep quality by comparing with self-reported questionnaires and physiological measurements. Evaluating sleep quality objectively through physiological indices will be promising. Enhancing sleep quality leads to less depression, and may bring out a better quality of life.

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Soundproofing the sleep laboratory

C. Lee, R. Chang, J. Teh Aabisheganaden
Tan Tock Seng Hospital, Singapore

Introduction: Noise control enables a conducive environment for sleep testing. Sleep laboratory should conform to the industry's standard in sound isolation. However, guidelines for sleep laboratory accreditation set by major authorities fail to address the optimal level of noise isolation in a standard room used for sleep testing.

Materials and methods: Spot ambient sound levels are obtained from one of our four sleep testing rooms at different times of the day in the absence of a patient but with all sleep testing equipment turned on. Noise from door opening, lavatory use, human conversations, etc. from nearby sources were also simulated and separately recorded. Extech model 407732 sound level meter kit is used in this project. These values are compared with the standards set by the World Health Organisation and the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).

Results: This project is still ongoing as part of a quality improvement project for enhancing patient's comfort thereby improving sleep quality and efficiency in a testing environment. Results will be ready Fall 2014.

Conclusion: We hope that results of this project will help refine the acoustics of our upcoming new sleep laboratory in another location. We also hope that our results can provide a reference to future in-house, remote or home sleep testing locations acoustic planning.

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Radiofrequency in OSA

N. Shah

M. Dalvi Hospital, India

Introduction: Radiofrequency ablation treatment has emerged as a minimally invasive treatment modality for obstructive sleep apnoea. Application of radiofrequency energy can be said as a quite technologically advanced tool to achieve ablation and thereby stiffening of obstructive tissues.

Materials and methods: A series of around 30 patients were made to undergo RF ablative treatment to the palate, turbinates, and/or the tongue base in accordance to the obstructive tissue identified. Prior thorough clinical examination, flexible endoscopy, sleep study were done in as many cases as possible. The radiofrequency procedures were carried out mainly under local but also general anaesthesia. The outcomes were observed in the patients that followed up as per the protocol of 1 week, 1 month, 3 months and 6 months. They were gauged as the anatomy post procedure, decrease in subjective symptoms, snoring, improvement in daytime fatigue and so forth. We had used the Sutter BM 780 machine with RF probes and all as day care procedures.

Results: We subjectively noticed RF to be a good tool for patients to be able to tolerate under local anaesthesia. There was minimal bleeding and pain scores were variable ranging from mild for few days to prolonged for a few weeks. The anatomy post procedure was amazingly restored with resultant stiffening of structures. RAUP coupled with RF to the palate gave better outcomes than solo therapy.

Conclusion: RF treatment was found to be an effective treatment with a technologically advanced and powerful machine and minimally invasive outpatient procedure.

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Tips and traps on polysomnography interpretation

E. Valle

Interclinica Ribeiro do Valle, Brazil

Introduction: The polysomnography (PSG) is the gold standard exam for investigate sleep disorders. Worldwide guidelines for PSG analysis are well established. The aim of this study is to show how PSG could be more useful and learn to distinguish physiological rhythmicity from pathological signs and artefacts.

Materials and methods: These clinical series presentations were an observational study, retrospective, conducted in our Sleep Disorder Center. Data were selected from six patients that underwent for overnight polysomnography exam. These sleep studies were evaluated using the AASM Manual for the scoring of Sleep and Associated events, version 2.0, 2013.

Results: The results demonstrated that PSG could shows more than sleep breathing disorders, movements during sleep or basic sleep patterns. After a careful analyze, it was reported cases which includes Silent Myocardial Angina, Epileptiform discharges in electroencephalogram (EEG), Physiological signs, Tachyarrhythmia and EEG artefacts. Without a close examination, none of these disorders were reported. The recognition and identification of different signs recorded by PSG is important to obtain the best information and give to patient a better chance to improve his quality of life.

Conclusion: Despite the great improvement in technologies on PSG studies, it was evidenced that PSG study should be evaluated with caution and required an expert assessment for best interpretation.

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Influence of hippotherapy on the sleep of patients with Parkinson's disease at advanced stage

R. Homem, R. Oliveira

Universidade De Brasília, Brazil

Introduction: Parkinson's disease (PD) is neurodegenerative and progressive. While PD progresses the health-related quality of life (HRQL) gets worse. Complications from treatment, such as sleep disturbance, interfere with the HRQL. Physical activities are beneficial to improve sleep quality; however, it is unknown if hippotherapy improves sleep in PD patients.

Materials and methods: The study was conducted with 18 volunteers, 12 with Hoehn and Yahr score greater or equal 3.0 and 6 subjects whose symptoms prevented them of regular physical activities. Nine participants (six men and three women) formed the hippotherapy group (HG) which performed a 10-week hippotherapy program (2 familiarization + 8 hippotherapy weeks, with each session lasting 30 minutes), and nine individuals (six men and three women) formed the control group (CG) which attended lectures on PD twice a week for 10 weeks with each session lasting 30 minutes. HRQL was evaluated by the PDQL – Brazilian validation (PDQL-BR) which consists of 37 items sectioned in four scopes: parkinsonian symptoms; systemic symptoms; social functioning and emotional functioning. The questionnaire is retroactive to last 3

months and classifies all topics as: (1) all the time; (2) usually; (3) a few times; (4) rarely; (5) never. Among the seven questions of the systemic symptoms scope, the question number 19 asks if the patient has difficulties to have a good night's sleep. Participants answered the questionnaire before and after the intervention and differences were compared between groups .

Results: The Shapiro–Wilk test demonstrated a normal distribution for the variables data, then parametric statistics was performed using the one-way analysis of variance (ANOVA). Statistical analysis was performed using the program Statistica 7.0 (StatSoft Inc., Tulsa, OK, USA), adopting a significance level of $p \leq 0.05$.

Although there was a very strong tendency to hippotherapy improves the sleep quality in patients with Parkinson's disease at late stages, the result does not show significant difference: $p = 0.31$.

Conclusion: We concluded hippotherapy is not significant in improving sleep quality in people with PD at advanced stages.

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Sleep and chronotype of Portuguese adolescents: Results from a national survey

E. Meira, M. Cruz, H. Loureiro, I. Duarte, C. Teixeira, C. Pereira

Portuguese Association of Chronobiology and Sleep Medicine, Portugal

Introduction: Sleep is crucial for adolescents development and impacts their physiology. Sleep deprivation is a common status in this age group population. Circadian disruption is a common cause of sleep deprivation in adolescents. The purpose of this study was to characterize sleep of Portuguese adolescents and its interaction with individual chronotypes.

Materials and methods: Six Portuguese schools were included comprising six different urban and rural geographic regions from north to the south of the country included Madeira Island. Cleveland Adolescent Sleepiness Questionnaire (CASQ) was used to assess sleepiness and the Morning Evening Questionnaire (MEQ) was applied to evaluate chronotypes.

Results: Three hundred fifty-four adolescent students (128 males) were enrolled in this study with a mean age of 16.5 ± 1 year old with 12.5% (17.2% of males and 10.2% of females) presenting a weight-for-age z-score above 1.04 (overweight). Mean CASQ score was 32.28 ± 7.8 . MEQ questionnaire revealed a mean score of 49.48 ± 7.5 . Differences between genders were observed for sleep duration on the weekend (538 ± 91 min for males and 570 ± 139 min for female; $p = 0.01$) but not on the weekdays (482 ± 55 min for males and 491 ± 52 min for females). 12.5% of the study sample (11.7% of the males and 12.4% of the females) have a total sleep time on weekdays less than 7 h (91.1% of the overweight group), while 20.3% (16.4% of the males and 22.6% of the females) have 9 h or more of sleep during weekdays. Differences on sleep duration from weekdays to weekend are more pronounced in females (79 ± 84 min) than in males (56 ± 36 min). Regarding chronotype profile as assumed by MEQ questionnaire, 71.1% of the sample showed intermediate type profile whereas 18.1% and 10.8% showed evening-type and morning-type profiles respectively. There was an inverse correlation between sleepiness and chronotype ($\rho = -0.198$; $p = 0.00$) which was slightly stronger for females ($\rho = -0.233$; $p = 0.00$) than for males ($\rho = -0.194$; $p = 0.00$) and there was a positive correlation between higher scorings in MEQ and sleep duration during weekdays ($\rho = 0.31$; $p = 0.00$) for the global sample.

Conclusion: This study highlights the status of insufficient sleep in Portuguese adolescents. Furthermore, it states that chronotype interact with social behaviours which may explain perpetuation of inadequate sleep habits and excessive sleepiness.

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Prevalence and correlates of sleep problems among older Singaporeans

V. Sagayadevan, M. Subramaniam, E. Abdin, J. Ajit Vaingankar, S. Chong
Institute of Mental Health, Singapore

Introduction: Sleep problems often manifest as difficulties in initiating or maintaining sleep. While sleep patterns undergo significant changes with age, sleep problems have been found to indicate underlying medical conditions and reflect overall health status of individuals. The current study examined the prevalence and correlates of sleep problems among older Singaporeans.

Materials and methods: Data were extracted from the Well-being of the Singapore Elderly (WiSE) study, a cross-sectional, epidemiological survey, which was conducted in 2013 among a nationally representative sample of Singapore residents (N = 2565) aged 60 years and above. The respondents were screened for sleep problems through a series of questions under the sleep module of the Geriatric Mental State (GMS) examination. Individuals who admitted having recent trouble sleeping (i.e. 'Have you had trouble sleeping recently?') were further assessed to determine if they faced difficulty in falling asleep, sleep interruption, and/or early morning awakening. Socio-demographic variables, level of disability (WHODAS II), physical activity, use of any type of medication, pain, and presence of chronic physical conditions were also examined in relation to sleep problems.

Results: Overall, 13.1% of older adults in the sample admitted having trouble sleeping. Of those who had trouble sleeping, 48.8% reported having difficulty falling asleep, 69.4% experienced sleep interruption at night, 19.9% reported early morning awakening, and 11.4% endorsed all three sleep problems (i.e., difficulty falling asleep, sleep interruption, and/or early morning awakening). Women (versus men), Indians (versus Chinese), those who had completed secondary education (versus tertiary education), and retirees (versus employed individuals) were significantly more likely to be at higher risk for sleep problems. Older adults with sleep problems were also less likely to have been physically active and reported greater disability in terms of daily activities compared with those who did not have such problems. After adjusting for socio-demographic variables individuals who reported sleep problems were significantly more likely to have a range of chronic physical conditions including pain, heart trouble, arthritis, persistent cough, stomach or intestine problems, and difficulty breathing/asthma. The use of medications, however, was not found to be associated with sleep problems.

Conclusion: Findings offer insight into the correlates of sleep problems among a multi-ethnic population in Singapore. In particular, co-occurring health conditions reiterate the need for clinicians to identify these conditions and treat them alongside sleep problems, which may alleviate sleep-related symptoms, in turn enhancing the older adult's quality of life.

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Associations between sleep patterns and cognitive functioning in adolescents with essential hypertension

O. Berdina, I. Madaeva, V. Dolgikh, V. Polyakov
Scientific Centre for Family Health and Human Reproduction Problems, Russia

Introduction: Sleep reflects the state of brain systems, integrating and coordinating all psychosomatic activity of the individual. It is shown that some objective parameters of sleep are connected with features of mental status. This study aimed to evaluate associations between sleep patterns and cognitive functioning in adolescents with essential hypertension.

Materials and methods: Thirty-eight male adolescents, ages 14–17 years, with essential hypertension underwent polysomnography with the use of GRASS-TELEFACTOR Twin PSG (Comet) with As40 amplifier and an integrated module for sleep SPM-1 (USA). Based on its results, the adolescents were classified into two groups: group A involved 18 adolescents with respiratory disturbances during sleep in the form of episodes of upper airway obstruction, and group B involved 20 adolescents that had a normal pattern of breathing during the sleep. Cognitive tests (Schulte's tables, "60 words" and "Classification of objects") were performed. Statistical data processing was carried out using Excel spreadsheets and computer program BIostat. Correlation analysis of quantitative determination was performed using Spearman rank order correlation coefficient. The revealed correlation were considered significant at $p < 0.05$. The study was approved by the Local Ethics Committee.

Results: This study was shown the correlation coefficients of basic objective parameters of sleep with some cognitive functions in adolescents with essential hypertension with and without respiratory disorders. Revealed that all correlations were significant. As expected, in group A (patients with obstructive sleep disordered breathing) the Spearman correlation coefficient between total minutes of superficial sleep and memory function was negative and reached $r = -0.49$ ($p < 0.05$), whereas total minutes of deep sleep was positively correlated with the memory function ($r = 0.52$, $p < 0.05$). REM percentage was also positively correlated with the memory function ($r = 0.67$, $p < 0.05$). In patients with essential hypertension without violation of the pattern of breathing during sleep (group B) we identified two positive correlations, namely, minimal SaO₂ level was significantly correlated both with attention and memory function ($r = 0.49$ and 0.51 , accordingly, $p < 0.05$).

Conclusion: Adolescents diagnosed with obstructive sleep disordered breathing have more significant correlations between sleep patterns and cognitive functioning than those who do not have respiratory sleep disorders. It may be associated with blood gas abnormalities during sleep, increased arousals, lack of deep sleep and sleep fragmentation.

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Unpleasant dream content and risk of sleep apnea

H. Khazaie¹, M. Masoudi², M. Ghadami¹

¹ *Sleep Disorders Research Center, Kermanshah University of Medical Sciences, Kermanshah, Iran*

² *Imam Reza Hospital, Kermanshah University of Medical Sciences, Kermanshah, Iran*

Introduction: The aim of this study was assess the association between risk of sleep apnea and reported unpleasant dream content in healthy individual.

Materials and methods: In this prospective study, participants completed Berlin questionnaire (BQ) to assess their risk for sleep apnea and also, completed a self-report questionnaire that assessed unpleasant dream experiences over the past month including frequency of recalled dreams. Based on BQ finding, participants was divided in two groups (low and high risk for sleep apnea) and unpleasant dream content were compared between two groups.

Results: Four hundred forty eight participants completed questionnaires. Seventy-two subjects (16%) were diagnosed as high risk for sleep apnea, and 376 (84%) were recognized as low risk. There were no significant differences on items related to the frequency of each unpleasant dream between two groups. Also, 32% of low risk subjects reported infrequent dream recall and 25% reported frequent dream recall, whereas in high risk group, 30% subjects reported infrequent and 30% reported frequent dream recall. There were no significant differences on any of the general measures of dream recall.

Conclusion: This study provides no evidence of an association between frequency of unpleasant dream and risk of sleep apnea. Light sleep, high arousal frequency and impaired short term memory might affect reported dream content as well as dream recall frequency.

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Factors related to academic achievement in junior high school students in Jakarta with sleep disorders

R. Sekartini, F. Auliyanti, I. Mangunatmadja

Department of Child Health, Medical School, University of Indonesia, Indonesia

Introduction: Sleep disorders are prevalent in adolescents and may influence their academic achievement at school. However, in Indonesia, no research has ever been done regarding the academic achievement in students with sleep disorders and its related factors.

Materials and methods: This study aimed to define the relationship between factors; i.e. gender, motivation and learning strategies, IQ level, mothers' educational level, socioeconomic status, family structure, non-formal education, TV/computer set inside the bedroom, sleep duration during schooldays, bedtime-wakeup time difference; with the academic achievement in junior high school students with sleep disorders. An analytical cross-sectional study was performed between January 2013 to March 2013. Subjects were students from five junior high schools in Jakarta who fulfilled the criteria of sleep disorders based on the Sleep Disturbance Scale for Children questionnaire. Data analysis was performed with chi square and logistic regression test using SPSS 17 version.

Results: There were 111 study subjects. The prevalence of sleep disorders was 39.7%, most were difficulty in initiating and maintaining sleep (70.2%). There were 47.6% subjects that had under-average academic achievement. Factors that related with under-average academic achievement were: non-formal education (prevalence ratio 5.6, 95% confidence interval 1.36–23.18, $p = 0.017$), average IQ level (prevalence ratio 3.26, 95% confidence interval 1.38–7.71, $p = 0.007$), and male sex (prevalence ratio 2.68, 95% confidence interval 1.06–6.78, $p = 0.037$).

Conclusion: Factors that related to the under-average academic achievement are non-formal education (>2 types, non-academic), the average IQ level, and male sex.

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Prevalence and characteristics of periodic limb movements during sleep in Korean adult patients with restless leg syndrome

Jung-won Shin¹, Yong Seo Koo², Byeonguk Lee³, Won Chul Shin⁴, Sang Kun Lee³, Yong Won Cho⁵, Ki-young Jung³

¹ Department of Neurology, Cha Bundang Medical Center, Cha University, Seongnam, Republic of Korea

² Department of Neurology, Korea University Medical Center Anam Hospital, Korea University College of Medicine, Seoul, Republic of Korea

³ Department of Neurology, Seoul National University Hospital, Seoul National University College Of Medicine, Seoul, Republic Of Korea

⁴ Department of Neurology, Kyunghee University Hospital at Gangdong, Kyung Hee University College of Medicine, Seoul, Republic of Korea

⁵ Department Of Neurology, Dongsan Medical Center, Keimyung University College Of Medicine, Daegu, Republic Of Korea

Introduction: The aim of this study to investigate the prevalence and characteristics of PLMS in the Korean RLS population, the influence of PLMS on sleep quality, and the relationship between PLMS and RLS severity.

Materials and methods: Unmedicated idiopathic adult patients with RLS (N = 354) from three tertiary Hospitals who met the 2012 revised International Restless Legs Syndrome Study Group Diagnostic Criteria from July 2006 to January 2014 were included. All patients underwent polysomnography; PLMS characteristics was assessed using periodicity index. RLS severity was assessed using the International Restless Legs Scale (IRLS), and subjective sleep quality was assessed using the Pittsburgh Sleep Quality Index, Epworth Sleepiness Scale and Insomnia Severity Index. Statistical analysis was performed by unpaired Student's t-tests and Pearson's correlation coefficient.

Results: Out of 354 idiopathic patients with RLS (120 men and 234 women; mean age: 52.9 ± 12.0 years), 150 patients (42.3%) had RLS with a PLMS index greater than 15/h and 204 (57.9%) had a PLMS index greater than 5/h. PLMS positively correlated with age ($r = 0.228$; $p < 0.001$). After adjusting for age, PLMS had significant positive correlations with periodic limb movement in wakefulness index ($r = 0.455$, $p < 0.001$) and arousal index ($r = 0.174$, $p = 0.014$), but no correlation with IRLS.

Conclusion: The prevalence of PLMS in Korean patients with RLS in our study was lower than that observed in western countries. Ethnic differences or different genetic backgrounds might contribute to the different prevalence of PLMS in RLS. PLMS has no correlation with IRLS and no significant negative effect on sleep quality.

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Examining the association between self-reported sleep somnolence and cognitive decline

A. Tsapanou¹, Y. Gu², D. O'shea², T. Eich², M. Tang², N. Schupf², J. Manly², N. Scarmeas², Y. Stern²

¹ Taub Institute, Columbia University Medical Center, USA

² Columbia University Medical Center

Introduction: Sleep complaints are common in the elderly, and poor overall quality of sleep has been associated with cognitive changes. This study aimed to examine the association between different types of sleep problems and cognitive functioning across four cognitive domains (memory, language, executive functioning, and speed of processing) in older adults.

Materials and methods: Overall 1098 participants from the Washington Heights – Inwood Community Aging Project (WHICAP), aged 79.58 (SD: 6.51) years, were followed longitudinally, for an average of 3.2 (± 1.61 ; range, 1.14–14.35) years. Sleep problems were measured using the Sleep Scale from the RAND Medical Outcome Study (a self-report 12-item questionnaire). We used guidelines specified in the initial manual to create five sleep categories: sleep disturbance, snoring, sleep short of breath/with headache, sleep adequacy, and sleep somnolence. A full neuropsychological battery provided us with four cognitive composite scores, calculated for: memory, language, speed of processing, and executive function. We used Generalized Estimating Equations (GEE) with cognitive scores as the outcome, and time, sleep categories and their interactions as the main predictors. Models were initially unadjusted and then adjusted for age at the visit, gender, education, ethnicity, depression, and ApoE4 genotype. We also ran a supplementary analyses excluding the participants being demented at baseline.

Results: Increased sleep somnolence (the category including feeling drowsy/sleepy, have trouble staying awake, and taking naps during the day) was associated with faster decline in all four cognitive domains in crude analyses. However, after adjustments, it was only associated with a faster decline in speed of processing ability, both cross-sectionally ($B = -0.024$, $p = 0.009$) and longitudinally ($B = -0.003$, $p = 0.027$). The other sleep categories were not associated with any cognitive trajectory changes. After excluding the demented participants, the results remained significant ($B = -0.003$, $p = 0.021$).

Conclusion: Our findings suggest that increased sleep somnolence may be associated with the risk of subsequent cognitive decline over and above depression and clinical demographic factors. Further investigation is needed in order to pinpoint the underlying mechanisms driving the association between sleep problems and changes in cognition.

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Circadian variation of subjective sleep quality and alertness in a traumatic brain injury patient

J. Guo¹, A. Shechter², D. Boivin³

¹ Douglas Mental Health University Institute/Faculty of Medicine, McGill University, Canada

² Department of Anesthesiology, Hospital for Special Surgery, Canada

³ Douglas Mental Health University Institute/Department of Psychiatry, McGill University, Canada

Introduction: Sleep–wake cycle disturbances are among the most prevalent complaints following traumatic brain injury (TBI) and could be linked to circadian rhythm abnormalities. The objective was to characterize the circadian variation of subjective sleep quality (SSQ) and subjective alertness (SA) in a TBI patient experiencing non-24 h sleep–wake disorder.

Materials and methods: A 45-year-old woman, who suffered a TBI following a car accident 15 years earlier, participated in a 4-day study in a time isolation laboratory. She underwent a baseline nocturnal sleep period (SP1) from 18:53 to 05:00, based on her natural sleep schedule. Upon waking, she began an ultradian sleep–wake cycle procedure (USW) consisting of alternating 60-minute wake periods (<10 lux) and naps (<0.03 lux) in a semi-recumbent posture. The USW was planned to last 48 hours, but only 24 hours were completed due to the patient's withdrawal. Her data were compared with that of eight healthy women, aged 26 ± 2.67 (mean \pm SD), who

underwent a 72-h USW under the same conditions. Melatonin (patient: plasma, measured $1 \times / 2$ h; controls: salivary, $1 \times / h$), SSQ and subjective excitement ($1 \times / 2h$), and SA and subjective happiness ($1 \times / h$, at mid-wake and post-nap) were measured throughout the USW. Values were assigned a circadian degree based on melatonin peak (0° phase), averaged by 30° bins, and folded every 360° to obtain a 24-h curve. Non-linear regression analysis was used to characterize the circadian rhythm of melatonin, SSQ, and SA.

Results: The circadian rhythm of SSQ and SA was not significant in the patient, in contrast to the control group. The majority of the patient's SSQ values (77.8%) were lower than the 95% confidence interval (CI) of control data, indicating poorer sleep quality across all circadian phases. The majority of SA values (87.5% for mid-wake, 100% for post-nap) were abnormally elevated, suggesting increased vigilance throughout the circadian cycle. No other subjective mood parameter exhibited a circadian rhythm in either group, although the patient reported consistently lower happiness and greater excitement levels. The patient's plasma melatonin displayed a significant circadian rhythm, with melatonin phase occurring at clock time 22:20. This was significantly earlier than the phase of salivary melatonin in control subjects, which occurred at $03:42 \pm 1:11$ h (mean \pm SD), 95% CI [02:43, 04:41]. Melatonin phase occurred 3:27 h after the patient's natural bedtime and 6:40 h before wake time. In comparison, melatonin peaked in the control group 3:33 h after bedtime ($00:09 \pm 0:46$ h (mean \pm SD), 95% CI [23:31, 00:47]) and 4:27 h before wake time ($08:09 \pm 0:46$ h (mean \pm SD), 95% CI [07:31, 08:47]).

Conclusion: The patient reported poor sleep quality and high alertness levels throughout the day, with no significant circadian variation of SSQ and SA. Results suggest that post-TBI sleep disturbances in this patient may be influenced by disruptions in both the circadian and homeostatic regulation of the sleep–wake cycle.

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Relationship of circadian typology and Big-Five personality in patients with major depressive disorder

W. Chan, X. Li, S. Lam, Y. Wing

The Chinese University of Hong Kong, Hong Kong

Introduction: Current evidence suggests that circadian typology is associated with Big-Five personality domains, i.e. morningness is associated with agreeableness and conscientiousness, while eveningness is associated with neuroticism. This study aimed to investigate these association in a cohort of patients with major depressive disorder (MDD).

Materials and methods: Two hundred fifty-three patients with MDD were recruited in 2011. The diagnosis of MDD was ascertained by a psychiatrist using the Mini-Neuropsychiatric Inventory (MINI). All subjects have completed the Hospital Anxiety and Depression Scale (HADS), Hamilton Depression Rating Scale-17 (HAM-D-17), Morningness–Eveningness Questionnaire (MEQ), and the NEOFFI. The association was examined by person's association and ANOVA tests.

Results: MEQ score (higher score represents morningness) has significant correlation with all of the Big Five personality. Eveningness was associated with a higher score on neuroticism (N) and openness (O) while morningness was associated with higher score on extraversion (E), agreeableness (A) and conscientiousness (C). After stratifying the study sample by remission status, only conscientiousness and openness remained significantly different among the chronotypes.

Conclusion: This study replicated the association of Big-Five domains to circadian typology in a cohort of clinically depressed patients. Conscientious and openness were associated with morningness and eveningness respectively, regardless of the remission status.

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Are circadian preferences and sleep quality different according to epilepsy classification?

S. Choi¹, E. Joo², S. Hong²

¹ Department of Nursing, Sleep Center, Samsung Medical Center, Korea

² Sleep Center, Department of Neurology, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea

Introduction: Poor sleep quality due to misaligned circadian rhythm usually aggravates seizures. Circadian rhythm may differ according to ages and seizure classification. In this study, we aimed to evaluate the circadian preference and sleep quality in both patients with generalized epilepsy (GE) and partial epilepsy (PE).

Materials and methods: We enrolled the consecutive 170 patients with epilepsy (age 20–49; PE, n = 127; GE, n = 43) who were diagnosed more than 1 year before and were taking antiepileptic drugs for more than 6 months. Subjects with mentally retarded (IQ ≤ 80), serious medical and psychiatric diseases including depression, and habitual use of hypnotics (≥3 nights/w) for the last 4 weeks, short sleeper (≤5 h/day), and shift worker were excluded. All completed morningness–eveningness questionnaire (MEQ), Pittsburgh sleep quality index (PSQI), and Epworth sleepiness scale (ESS). Epilepsy history and seizure frequencies for the last 1 year were obtained from medical records.

Results: Mean age of GE was younger (30.3 years) than PE (33.9 years, p = 0.015). Except number of AEDs (PE: GE = 2.3: 1.74, p = 0.006), other epilepsy histories (age of seizure onset, seizure duration and frequency) were not different between PE and GE. The most common circadian pattern was neither type in both groups (74.0%:79.1%); however, the proportion of evening type was significantly higher in GE (20.9%, n = 9) than in PE (6.3%, n = 8, p < 0.001). GE reported more sleepy (ESS 7.5) than PE (6.0, p = 0.022). Overall sleep quality was not different between PE (PSQI = 4.97) and GE (5.56, p = 0.093). Poor sleepers (PSQI ≥ 5) of PE (n = 68, 53.5%) had higher seizure frequency and ESS than good sleepers (n = 74). Evening type showed poorer sleep quality (PSQI = 6.91, p = 0.024) than other circadian types in GE.

Conclusion: Persisting seizures and higher ESS may worsen sleep quality of PE. On the contrary, evening type of GE may worsen sleep quality. It seems that effective seizure control may help improving sleep quality of PWE.

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Assessing the daily stability of the cortisol awakening response: A controlled laboratory protocol

G. Elder¹, M. Wetherell², J. Ellis², N. Barclay²

¹ Institute of Neuroscience, Newcastle University, UK

² Northumbria Centre for Sleep Research, Northumbria University, UK

Introduction: The cortisol awakening response (CAR), where cortisol levels sharply increase upon awakening, is a useful marker of hypothalamic–pituitary–adrenal axis function. However, little

is known about the daily stability of the CAR, which might be influenced by contextual factors including sleep duration, environmental light and nocturnal awakenings, in a controlled environment.

Materials and methods: Participants (15 healthy good sleepers; 7 male, 8 female, Mage = 23.67 ± 3.49 years) completed a two-week baseline period in which habitual sleep/wake schedules were derived from sleep diaries and actigraphy. Participants slept for three consecutive weekday nights in a sleep laboratory, where sleep was measured objectively using polysomnography (PSG). Recording times were scheduled in accordance with average weekday habitual bed-times and awakening times (on the basis of baseline sleep diary sleep/wake schedules), and did not vary across the laboratory period. The CAR was measured on each subsequent weekday morning (Morning 1, Morning 2 and Morning 3). Saliva samples were obtained immediately upon awakening and at +15, +30, +45 and +60 minutes. All samples were collected in constant low-intensity ultraviolet light, of approximately one lux, to minimise the influence of light input upon the CAR. In order to maximise adherence and reduce measurement error, all saliva samples were collected in the presence of a researcher. The stability of the CAR was assessed by comparing cortisol levels, measured at each time point, and three additional CAR indices (awakening levels, the mean increase in cortisol levels (MnInc) and total cortisol secretion) between each morning of measurement.

Results: All participants were asleep, as verified using PSG, prior to the first (awakening) sample of the CAR. The CAR profile showed a typical change in cortisol levels across the measurement period, where cortisol levels peaked at +30 minutes, and there were no differences between each morning of measurement (p > 0.05). Analysis of the additional CAR indices showed that MnInc values and awakening cortisol levels were significantly different between mornings (p < 0.05). Specifically, the greatest MnInc values, and lowest awakening levels, were observed on Morning 3, although post-hoc differences were observed only in awakening cortisol levels. There were no significant differences in total cortisol secretion between each morning of measurement (p > 0.05).

Conclusion: Daily variations in awakening cortisol levels, and in the CAR magnitude, were observed despite the use of a highly-controlled CAR measurement protocol and laboratory environment. As awakening levels were lowest on the final morning of measurement, this suggests that the CAR may be affected by the anticipation of upcoming activities.

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Social jetlag in Korean population : Can it be a sequence of the weekend catch-up sleep?

H. Im, S. Baek, J. Lee, Y. Ha, C. Yun, S. Park

Department of Neurology, Seoul National University Bundang Hospital, South Korea

Introduction: There is individual difference in the preferred timing of sleep and activity called chronotype. The discrepancy between social and biological time, can be defined as ‘social jetlag’. We describe the relationship between social jetlag and the influence on the daily living and characteristics on sleep pattern in Korean population.

Materials and methods: Subjects were recruited randomly among the general population adults between 20 and 65 year old, excluded shift workers and longer sleepers when workdays. Two thousand fifty-six subjects (922 women and 1134 men) were asked to fill out the questionnaires about their sleep patterns separated by work day and free days and several scales about quality of daily life including sleep quality assessed by Pittsburgh Sleep Quality Index, Goldberg Short screening scale for anxiety and depression, the Epworth Sleepiness Scale, Insomnia Severity Index, Headache Impact Test, BMI, education. We calculated the social jetlag and divided two groups into subjects who have social jetlag exceeding 2 hours and subjects who have not. We also divide into two groups of relatively early and late chronotype.

Results: The group who has social jetlag that exceeded 2 hours (10%) has relatively longer sleep duration on average, feel insufficient sleep, and late chronotypes. And they tend to be at a younger age, higher level of education and less obese compared with the other group who do not have social jetlag which exceeds 2 (34%). There is no difference between two groups in depression, anxiety, insomnia, sleep quality, sleepiness, headache at statistical significance.

Conclusion: The social jetlag may be explained as the chance to compensate the sleep debt on freedays which is accumulated by social obligation during work day rather than the misalignment of circadian clock. That may result in positive effects like antiobesity effect on our day living.

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The relationship between road accidents and circadian rhythm

M. Moradi, Nia K., Sadeghniai O., Aminian F., Azizi
Iran

Introduction: One of the major health issues in Iran is road traffic accidents, especially on highways and freeways. Multiple factors contribute to the high rate of fatal road traffic accidents in Iran, of which, fatigue and sleepiness are amongst the most important however less evaluated ones.

Materials and methods: This study is a cross sectional study and aims to evaluate all road traffic accidents during the 3 year period from year 2006 to 2008 that has occurred in the three provinces of Tehran, Qazvin and Semnan as reported by the police. Car accidents occurred during at daily severe loss of consciousness and at most tend to sleep in the circadian rhythm (0–6 AM) compared with all other times.

Results: The risk of road traffic accidents occurring due to sleepiness which were reported by the police had a sevenfold increase (odd ratio = 7.33) during the low alertness hours of circadian rhythm (0–6 AM) as compared with other daily hours. This risk had a 0.15 fold decrease however in the hours of maximum alertness (18–22 h) of circadian rhythm. In times of sleepiness in circadian rhythm odds ratio of single vehicle crashes/other types of road accident was 2.15.

Conclusion: In times of major low alertness in circadian rhythm (0–6 AM) the rate of road accidents to transportation, single vehicle crashes, and road accidents due to sleepiness increase.

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Morningness–eveningness chronotypes, sleep quality and insomnia among medical student of Qom

A. Mozafari¹, H. Mohamadi¹, M. Tabaraie¹, S. Arsang²

¹ Department of Medical Sciences, Qom Branch, Islamic Azad University, Qom, Iran

² School of Health, Qom University of Medical Sciences, Qom, Iran

Introduction: Morningness–eveningness refers to the individual differences in diurnal inclination, sleep–wake pattern for activity, and vigilance in the morning and evening. The quality of sleep is a measure of both the quantitative and qualitative components of sleep. This paper aims to study the relationship of morningness–eveningness chronotype and sleep quality in students.

Materials and methods: This cross sectional study was performed from September 2013 to July 2014 on students. They consisted of 400 medical student subjects of the Islamic Azad University of Qom in the first to fourth year of education. The students filled out questionnaires including demographic parameters, Pittsburgh questionnaire of quality of life, insomnia severity index questionnaire and self-assessment questionnaire of morningness–eveningness. Data analysis was done in SPSS version 18 and variables compared by one way ANOVA test and p value below 0.05 was significant.

Results: Mean age of 24.01 ± 5.8 years and 41% was male. Of these, 38.5% in eveningness, 34.3% in intermediate and 27.3% were in morningness chronotype groups. There were significant relationship between morningness chronotype and insomnia and poor sleep quality ($p = 0.06$ and $p < 0.001$ respectively).

Conclusion: This study showed that morningness chronotypes have more problem in insomnia and quality of sleep.

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Relationship between metabolic rate and core body temperature during sleep in human

I. Park¹, M. Kayaba¹, K. Iwayama¹, H. Ogata², Y. Sengoku², K. Tokuyama², M. Satoh³

¹ Graduate School of Comprehensive Human Sciences, University of Tsukuba, South Korea

² Faculty of Health and Sports Sciences, University of Tsukuba, Japan

³ Faculty of Medicine, University of Tsukuba, Japan

Introduction: Energy metabolism during sleep (energy expenditure, substrate oxidation and RQ) is affected by time after sleep onset and sleep stages reflecting different physiological process. Core body temperature (CBT) also changes during sleep. The present study examined temporal relations between energy metabolism with/without adjusted for sleep stage and CBT.

Materials and methods: Healthy young adult subjects without sleep disorders participated in the study. The subjects ate dinner 5 hours before their habitual bedtime, and took 8 h sleep in a room-size metabolic chamber. Sleep was recorded polysomnographically and 30-s epochs were used to score sleep stages according to standard criteria. Energy metabolism was measured with a room-size metabolic chamber, internal volume of which is 14.49 m³. Concentrations of oxygen (O₂) and carbon dioxide (CO₂) in outgoing air were measured with high precision by online process mass spectrometry with a precision of 0.0016% and 0.0011% for O₂ and CO₂, respectively. Core body temperature was obtained using an ingestible telemetric temperature system

consisted of a commercial temperature pill, 2 cm in length × 1.2 cm diameter. Core body temperatures were recorded at intervals of at least once per 30 seconds. Sleeping metabolism was analyzed by semi-parametric regression approach, i.e. effect of sleep stage by parametrical and time after sleep onset by non-parametrical analysis. Time course of core body temperature was compared with sleep architecture, energy metabolism with/without adjusted for sleep.

Results: Energy expenditure, RQ and carbohydrate oxidation were different among sleep stages. Energy expenditure in ascending order were SWS, Stage 2, Stage 1, REM sleep and wake after sleep onset (WASO). Likewise, RQ in ascending order were SWS, Stage 2, Stage 1, REM sleep and WASO. Carbohydrate oxidation in ascending order were Stage 2, SWS, Stage 1, REM sleep and WASO. After controlling for sleep stage, RQ and carbohydrate oxidation decreased during the first half but increased during the second half of the sleep. Despite continuing fast, carbohydrate oxidation begins to increase during the second half, particularly the last hour, of sleep. Time course of core body temperature was similar to that of RQ, i.e. decreased during the first half of sleep and increased during the second half of sleep.

Conclusion: Core body temperature began to increase prior to awakening, part of which could be explained by frequent arousal and REM sleep during the second half of sleep. Alternatively, increase in core body temperature before awakening can be explained by inhibition of heat loss.

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Increased subjective sleepiness and global EEG theta power during a post-night shift drive

K. Zitting^{1,2}, W. Horrey³, Y. Liang³, G. Daniels^{1,4}, M. Shreeve^{1,4}, J. Ronda^{1,2}, B. Riedner⁵, G. Tononi⁵, C. Czeisler^{1,2}, J. Duffy^{1,2}

¹ Division of Sleep and Circadian Disorders, Departments of Medicine and Neurology, Brigham and Women's Hospital, Boston, MA, USA

² Division of Sleep Medicine, Harvard Medical School, Boston, MA, USA

³ Liberty Mutual Research Institute For Safety, Hopkinton, MA, USA

⁴ Division of Sleep Medicine, USA

⁵ Department of Psychiatry, University of Wisconsin-Madison, Madison, WI, USA

Introduction: Motor vehicle crashes (MVCs) are a leading cause of injury and death. Shiftworkers driving home after nightshifts are at high risk for a sleepiness-related MVC. We investigated sleepiness in shiftworkers and hypothesized that subjective sleepiness and global EEG theta power during driving both increase following a night shift.

Materials and methods: Ten shiftworkers (age 19–50; 7 women) were tested twice, in the morning after working a night shift ('post-shift' condition, simulating a commute home) and on a different morning after a night of sleep ('post-sleep' condition, simulating a commute to work on the day shift). Participants performed a 2-hour test drive in an instrumented car on a closed driving track. An investigator blind to driving condition was in the passenger seat with access to a brake in case the participant fell asleep. To assess subjective sleepiness, the car was stopped briefly (<2 minutes) every

30 minutes and the participants were asked to complete the Karolinska Sleepiness Scale (KSS). High-density EEG was recorded throughout the drive using a 256-channel cap connected to the amplifier and recording equipment in the rear of the car. We compared subjective sleepiness and global EEG theta power (5–9 Hz) from the beginning to the end of each drive. We compared the first pre-drive KSS score to the final end-of-drive KSS score, and the first 10 minutes of EEG to the last 10 minutes.

Results: Subjective sleepiness (KSS score) was significantly higher at the end of the drive than at the beginning of the drive (pre-drive score) in the 'post-shift' condition but not in the 'post-sleep' condition ($p = 0.006$, two way repeated measures ANOVA). Global theta power (5–9 Hz), an objective measure of sleepiness, was significantly greater during the last 10 minutes of the drive compared with the first 10 minutes in the 'post-shift' but not in the 'post-sleep' condition ($p = 0.029$, one way repeated measures ANOVA). The drive was terminated early in three of the 'post-shift' conditions (in none of the 'post-sleep' conditions) due to the subject constantly falling asleep.

Conclusion: It is known from crash data, self-reports, and simulator studies that driving after staying awake all night leads to increased crash risk. These preliminary results indicate that both subjective and objective sleepiness increase rapidly in shiftworkers who drive after a night shift, making them vulnerable to MVCs.

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Daytime sleepiness in Parkinson's disease

V. Cochen De Cock¹, S. Bayard², I. Jaussent², M. Charif², M. Grini², H. Yu², R. Lopez², C. Geny², B. Carlander², Y. Dauvilliers²

¹ Clinique Beau Soleil, France

² France

Introduction: Excessive daytime sleepiness is a frequent complaint in Parkinson's disease (PD); however the frequency and risk factors for objective sleepiness remain mostly unknown. We investigated both the frequency and determinants of self-reported and objective daytime sleepiness in patients with PD using a wide range of potential predictors.

Materials and methods: One hundred and thirty four consecutive patients with PD, without selection bias for sleep complaint, underwent a semi-structured clinical interview and a one night polysomnography followed by a multiple sleep latency test (MSLT). Demographic characteristics, medical history, PD course and severity, daytime sleepiness, depressive and insomnia symptoms, treatment intake, pain, restless legs syndrome, REM sleep behaviour disorder, and nighttime sleep measures were collected. Self-reported daytime sleepiness was defined by an Epworth Sleepiness Scale (ESS) score above 10. A mean sleep latency on MSLT below 8 minutes defined objective daytime sleepiness.

Results: Of 134 patients with PD, 46.3% had subjective and only 13.4% had objective sleepiness with a weak negative correlation between ESS and MSLT latency. A high body mass index (BMI) was associated with both ESS and MSLT, a pain complaint with ESS, and a higher apnea/hypopnea index with MSLT. However, no associations were found between both objective and subjective sleepiness, and measures of motor disability, disease onset, medication (type and dose), depression, insomnia, restless legs syndrome, REM sleep behaviour disorder and nighttime sleep evaluation.

Conclusion: We found a high frequency of self-reported EDS in PD. This finding was not confirmed by the gold standard neuro-physiological evaluation. Current treatment options for EDS in PD are very limited; decreasing pain and BMI in association with the treatment of sleep apnea syndrome might be useful.

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The relationship between excessive daytime sleepiness and depression in medical students

O. Erdinc¹, E. Unal², R. Aydin², G. Uzuner¹, S. Metintas²

¹ Eskisehir Osmangazi University Medical Faculty Department of Neurology, Turkey

² Eskisehir Osmangazi University Medical Faculty Department of Public Health, Turkey

Introduction: In the literature there are studies showing depressive symptoms as results of sleep disorders and excessive daytime sleepiness (ESS).

This study plans to evaluate the ESS and depression as well as the characteristics associated with this condition in the students of Eskişehir Osmangazi University Medical Faculty, Turkey.

Materials and methods: This study is a cross sectional study performed on the students of Eskisehir Osmangazi University Faculty of Medicine between April and May in 2014. Four hundred forty-seven students were involved in the study whom were in the first, second and third classes of the Faculty of Medicine. Survey forms were prepared according to the study aim which consisted of three parts. In the first part, socio-demographic characteristics of the students was questioned. In the second part Pittsburgh Insomnia Rating Scale (PIRS)), the Epworth Sleepiness Scale was measured for the assessment of ESS. In the third part risk of depression, the severity of depressive symptoms and the change of the severity level was measured. Beck Depression Inventory (BDI) was used to measure the intensity change. After being informed about the study and obtaining verbal consent, the students answered the survey under the supervision of researchers during day time. For statistical analysis Mann-Whitney U test was used for univariate comparisons while multivariate linear regression analysis was used for the multivariate model. Significance level was considered to be $p < 0.05$.

Results: In the study group the mean age of the 447 students was 20.3 ± 1.9 years while 224 (50.1%) were male and 223 (49.9%) of them were female. Ninety-five (21.3%) of the students were obese, 223 (49.9%) shared their room with another student, 85 (19.0%) of them smoked, while 151 (33.8%) used alcohol, 150 (33.6%) were diagnosed as at least one type of sleep disorder related illness. Four hundred eighteen (93.5%) of them thought that life was stressful and 105 (23.5%) of them expressed that their lives were inactive. The ESS scores of females were higher than men ($p < 0.001$). There was no relation between the presence of obesity, room sharing, smoking and alcohol, depression, having an illness associated with sleep disorder ($p > 0.05$) in the different classes. The median score of ESS was high as 10 (0–63). Depression was suspected in 97 (21.7%). There was a positive correlation ($p < 0.001$) after making a gender related adjustment in the results which determined the relationship between EDS and the BDI. Among the medical students EDS and depression were found to be significant health problems.

Conclusion: Among the medical students EDS and depression were found to be significant health problems. The frequency of EDS and depressive symptoms were found to be associated.

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A case of obstructive sleep apnea due to nasal tumor

D. Lee, G. Kim, S. Jeong, J. Lee

Otorhinolaryngology, Catholic University of Korea, South Korea

Introduction: We present the rare case of an adolescent boy with an antrochoanal polyp presenting with obstructive sleep apnea.

Materials and methods: A 15 year-old boy visited the Sleep Center with history of snoring for 5 years. He had complaints about loud snoring and had been witnessed to have obstructive sleep apnea by parents.

Results: The preoperative PSG study demonstrated 24.9 AHI. After the endoscopic huge mass excision, the postoperative PSG study demonstrated 0.5 AHI. The histopathology showed the ACP (antrochoanal polyp).

Conclusion: Physicians routinely need to work-up any findings in upper airway which could cause OSAS in patients presenting with sleep disorder.

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Long-term outcome of Kleine–Levin syndrome(kls): Brain image and neurocognitive findings after 5 years

S. Wu¹, Y. Huang¹, C. Guilleminault²

¹ Sleep Center and Child Psychiatry Department, Chang Gung Memorial Hospital and Chang Gung University, Taipei, Taiwan

² Stanford University Sleep Medicine Division, Stanford, CA, USA

Introduction: Kleine–Levin syndrome(KLS) is a rare periodic sleep disorder. Previous studies have shown that some patients have deficits in their cognitive functions. Prior studies revealed hypoperfusion of the thalamus at SPECT evaluation. This study investigated the long-term outcome of a large group of patients with Kleine–Levin Syndrome.

Materials and methods: Sixteen subjects diagnosed with Kleine–Levin Syndrome between age 10–15 years had regular follow-up for a minimum of 5 years. Neurocognitive tests, sleep questionnaires, SPECT study, and blood tests during periods of hypersomnic attack, and during normal status were collected overtime and the results at the 5 year follow-up period were compared with the initial findings.

Paired t-test was conducted when comparing initial and +5 years' brain image and neurocognitive findings, and correlation analysis was performed investigating the relationship between brain image and neurocognitive findings.

Results: Twenty patients were followed for at least 5 years: 16 subjects (male:female = 11:5) completed SPECT images at the 5 year follow-up. The mean age of onset was 12.87 ± 1.54 years. The mean duration of the symptomatic period was 11.17 ± 4.10 days and the average time in bed was 18.67 ± 1.93 hours. The mean frequency of hypersomnic attack was 3.63 ± 1.42 times per year. Thirteen cases had precipitating factors: The presence of upper respiratory infection before syndrome-onset occurred in 13 cases (13/16 cases) and 6 cases (6/16 cases) had fever before the hypersomnic attack. SPECT images showed initially (1) hypoperfusion during the symptomatic period over the thalamus in 11/16 cases (69%), with left thalamus hypoperfusion (7/16 cases, 46%) and right thalamus hypoperfusion

(4/16 cases, 23%). (2) Seven out of sixteen cases (46%) showed hypoperfusion during the asymptomatic period over the thalamus, including left thalamus hypoperfusion (5/16 cases, 31%) and right thalamus hypoperfusion (2/16 cases, 15%). (3) At the 5-year follow-up evaluation, there were still 8/16 cases (50%) presenting hypoperfusion over the thalamus, with left thalamus hypoperfusion (5/16 cases, 50%) and right thalamus hypoperfusion (3/16 cases, 19%).

Conclusion: At 5-year follow-up investigation, hypoperfusion over the thalamus was still observed in half of the studied subjects submitted to SPECT imaging.

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Sleep quality is in the eye of the one who experiences it

C. Fichten¹, S. Bailes², L. Creti², K. Conrod³, L. Tran³, D. Rizzo⁴, E. Libman²

¹Jewish General Hospital, Dawson College, McGill University, Montreal, Canada

²Jewish General Hospital, McGill University, Montreal, Canada

³Jewish General Hospital, Montreal, Canada

⁴Canada

Introduction: Sleep quality is widely used, measured, and employed as a therapy outcome criterion; however, its nature is poorly understood. Our goal is to investigate this construct in five groups: insomnia patients (CBT-I), community controls, and three groups of sleep apnea (OSA) patients: with or without insomnia, and noncomplaining poor sleepers.

Materials and methods: Eighty-eight primary care patients recently diagnosed with OSA (AHI/RDI of 10 or greater), 57 patients seeking cognitive-behavior therapy for insomnia (CBT-I), and 14 community participants with no insomnia or OSA (Control Group) completed a series of questionnaires, including the Sleep Study Checklist (SSC), a sleep questionnaire, and measures of depression and anxiety. Participants were divided into DIMS (difficulty initiating and maintaining sleep) and No DIMS groups based on typical research criteria (i.e., at least 31 minutes of undesired wake time at least three times per week with a problem duration of at least 1 month). Within the DIMS group, participants were further separated according to whether they had a complaint of insomnia or not. This resulted in five groups: two No DIMS groups: Control Group (n = 14), and OSA No DIMS (n = 21), as well as in three DIMS groups: OSA DIMS No Insomnia Complaint (n = 34), OSA DIMS with Insomnia Complaint (n = 30), and Insomnia-Treatment (CBT-I) (n = 57).

Results: For all groups, ratings of poor sleep quality are highly correlated with non-refreshing sleep, waking in the middle of the night and having difficulty getting back to sleep, waking up too early in the morning and sleep satisfaction. However, the pattern of correlations for other variables suggests a distinct grouping of participants into two categories; those with No DIMS (i.e., Control Group, OSA No DIMS) and DIMS groups (i.e., the remaining three groups), although the OSA DIMS No Insomnia Complaint group straddles the two categories. For those with No DIMS, ratings of poor sleep quality are most closely correlated with daytime variables (i.e., difficulty concentrating, daytime fatigue, and anxiety). For the DIMS groups correlations were generally highest for total sleep time and bodily pain. It is noteworthy that virtually none of the sleep disorder related symptoms (e.g., snoring, interruption of breathing during sleep) are related significantly to poor sleep quality for any of the OSA groups.

Conclusion: Our findings indicate that judgment of sleep quality is determined by the presence or absence of DIMS symptoms, regardless of clinical status (i.e., OSA, insomnia patient). When DIMS is present, appraisal of sleep quality is determined primarily by nocturnal events; when DIMS is absent, sleep quality relates to daytime functioning.

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Sleep experience technology introduction

G. Li, L. Hong, F. Wang, J. Zhang, F. Feng, X. Zhou, C. Wang, X. Liu, J. Xue, Q. Liang

Psychology and Sleep Department of Guang'anmen Hospital of China Academy of Chinese Medical Sciences, China

Introduction: Patients with insomnia have insomnia habits. They also have a lot of conditioned reflexes associated with insomnia that persists that make insomnia difficult to cure.

Materials and methods: Sleep experience technology is one of the main content of low resistance thought induction sleep-regulating technique (TIP3-2). It mainly includes the following aspects: First, the experience of the first time insomnia, and the second one is the experience of insomnia persists and aggravating, both can make patients comprehend insomnia related to psychology, personality and stimulate event. The third one is the experience of abnormal sleep now. It can make patients feel the doctor's understanding of patients insomnia pain, at the same time it can provoke strong desire to treatment. Fourth, the experience of normal sleep. It can help patients to establish a recent memory of a good sleep, as well as establish a new conditional reflex in the cortex, change the previous bad sleep habits and automatic thinking of sleep. Fifth, to experience normal sleep in the future, this can enhance the confidence of sleep, and prevent recurrence of insomnia. Lastly, it is needed to point out that sleep experience technology is carried out on the low resistance condition similar to hypnosis. This can get better treatment effect. And it is one of the characteristics of low resistance thought induction psychotherapy (TIP).

Results: We have verified a good curative effect of sleep experience technology in clinical and research. Chinese traditional thinking way, the Chinese implicative inside collect national character, Chinese static technology of the qigong and daoyin, as well as the western hypnosis are foundation and source for sleep experience technology. At the same time modern inflation theory support sleep experience technical theory, the imagined experience can produce real memory. Imagination in the cerebral cortex establishes new habits and conditioning that helps patients to reply a good sleep.

Conclusion: Sleep experience technology is a technology innovation for insomnia, and it has theoretical, clinical and research support.

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Drinking habit as a moderator in adjusting anxiety and sleep quality in poor sleepers

K. Chueh¹, C. Guilleminault², C. Lin³

¹ Department of Nursing, College of Medicine, Fu Jen Catholic University, Taipei, Taiwan

² Stanford University Sleep Medicine Division, Stanford, CA, USA

³ School of Medicine, Fu Jen Catholic University, Taipei, Taiwan

Introduction: The aim of the study was to explore the association between a drinking habit and anxiety among poor sleepers in northern Taiwan.

Materials and methods: A total of 84 poor sleepers (Pittsburgh Sleep Quality Index, PSQI > 5) aged 20–80 years old were recruited into this cross-sectional study. A structured questionnaire on demographics and drinking habits, level of anxiety, level of depression and perceived sleep quality was used to collect data.

Results: The poor sleepers were mostly women (72.6%) with a mean age of 41.81 (± 12.62) years old. Fifty-six percent of poor sleepers currently used sleep therapy. A 7.1% of poor sleepers had a drinking habit, with 19.0%, 13.1% and 14.3% of those having mild, moderate and severe anxiety, respectively. The poor sleepers with a drinking habit had prolonged sleep duration and often used sleeping medication. Besides, those with severe anxiety have the worst subjective sleep quality, sleep latency, use of sleeping medication, and daytime dysfunction. After adjusting factors related to the sleep quality using multiple regression analysis, both a drinking habit and anxiety are predictors of poor sleep quality. Moreover, the drinking habit had a moderating effect on the relationship between anxiety and sleep quality among poor sleepers.

Conclusion: The results revealed that a drinking habit had a moderating effect on the association between their anxiety and sleep quality.

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Insomnia affects the extent of weight loss in obese patients

N. Strueva¹, M. Poluektov², G. Melnichenko¹, L. Savelyeva¹

¹ Endocrinology Research Center, Moscow, Russia

² First Moscow State Medical University by I.M. Sechenov, Moscow, Russia

Introduction: The aim of the study was to estimate the influence of insomnia on dynamics of body weight during the treatment of obesity.

Materials and methods: Forty-three patients (18 males and 25 females, age 39.6 \pm 14.1 years, body mass index (BMI) 38.6 \pm 7.8 kg/m²) with obesity were studied. Exclusion criteria were diabetes mellitus, hypothyroidism, alcohol abuse, obstructive sleep apnea syndrome. Polysomnography was performed in all patients (according criteria of AASM, 2007). Questionnaire survey was conducted to check patients' perception of sleep quality. Minnesota Multiphasic Personality Inventory (MMPI), Hospital Anxiety and Depression Scale (HADS), SF-36 (Health Status Survey) were used for psychodiagnostic. Mental disorders were diagnosed according to ICD-10 criteria. Dynamics of body weight was estimated after 7 \pm 1 months of treatment of obesity, with the program including individual training, optimization of physical activity, diet and drug therapy (Orlistat). Weight loss of 5% or more was considered clinically significant.

Results: Patients were divided in two groups comparable by age, sex ratio and BMI. First group consisted from 19 patients with insomnia, second (controls) – 24 patients without sleep disorders. Obese patients with insomnia had greater percentage of the presence of affective disorders (dysthymia), high levels of anxiety (63.2% vs. 20.1%), depression (47.4% vs. 16.7%), high susceptibility to mental stress (tendency to somatization, pessimism, emotivity), emotional eating (68.4% vs. 33.3%), night eating syndrome (31.6% vs. 4.2%) and significant deterioration of psychological quality of life (35.4 \pm 8.4 vs. 44.7 \pm 8.9 scores) ($p < 0.05$). The extent of weight loss after combined treatment was lesser in patients with insomnia (at –2.5 kg or 3%) compared with the control group (–6.5 kg or 6.1%) ($p = 0.046$). Clinically significant weight loss (5% or more from the initial) was achieved more frequently in patients without sleep disorders (62.5%) comparing ones with insomnia (16%) ($p = 0.0023$).

Conclusion: Obese patients with insomnia have more psychopathological features and disturbances of eating behavior. This affects the extent of weight loss during course of obesity treatment.

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The prevalence of insomnia and the description of sleep hygiene in medical students, Universitas Padjadjaran, Indonesia

N. Syafriani, N. Lailiyya, T. Nurhayati

Faculty Medicine, University of Padjadjaran, Indonesia

Introduction: Insomnia is a common sleep disorder that is found in people, particularly in medical students. Improving sleep hygiene is one of insomnia managements. The purpose of this study is to know the prevalence of insomnia and the description of sleep hygiene on medical students in Universitas Padjadjaran.

Materials and methods: This is a cross sectional study. The data collection is conducted on September 2014 at Faculty of Medicine, Universitas Padjadjaran, Indonesia. A total of 288 respondents signed an informed consent form and participated in the study by filling questionnaire 'Insomnia Severity Index' and 'Sleep Hygiene Index'. A total of 288 students enrolled in the study, one person did not follow until the end of the study, one person aged ≤ 18 years and 49 people had been diagnosed to have one or more history of heart, respiratory, nerve, and gastroesophageal reflux disease. Degree of insomnia severity was studied and assessed from the quality of sleep hygiene. Several categories that are defined as sleep hygiene were the condition of bedroom, the condition of bed; such as the time of nap time, night sleep time, wake up time; sports, habit of staying in bed after waking up, activities that make someone keeps awake, other activities on bed aside of sleeping; sleeping by feeling depressed, angry, upset and thinking, planning something, or feeling restless in bed; consuming caffeine or alcohol, and smoking.

Results: 24.9% of subjects experience insomnia with sleep hygiene description that 0.8% of them always exercise in the evening, 57.8% of them do things making to stay awoken before sleep, 58.6% of them use bed for activities other than sleep.

Conclusion: The number of students who experience insomnia is relatively high and there are many who ignore sleep hygiene in several categories.

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The association of sleep quality and insomnia with dietary intake of tryptophan and niacin

J. Verster¹, A. Fernstrand¹, D. Bury¹, T. Roth², J. Garssen¹

¹ Division of Pharmacology, Utrecht University, The Netherlands

² Sleep Disorders and Research Center, Henry Ford Health System, USA

Introduction: Dietary intake of tryptophan and niacin have been related to sleep. However, the sleep-promoting effects of these nutrients are still under investigation. The aim of the current study was to examine the relationship between daily dietary intake of tryptophan and niacin and sleep.

Materials and methods: A survey on past week's dietary intake (food frequency questionnaire) was completed by N = 509 Dutch university students (20.8 years old). The SLEEP-50 questionnaire subscale on insomnia was completed, and sleep quality (0–10 score) and total sleep time (TST) were also assessed. Daily intake of tryptophan and niacin was correlated to insomnia rating, sleep quality and TST using nonparametric (Spearman) correlations. Analyses were conducted for the group as a whole, and for men (N = 143) and women (N = 366) separately.

Results: Mean [SD] scores of insomnia (14.6 [4.3]), sleep quality (7.3 [1.2]), TST (7.7 h [0.9]), and daily dietary intake of tryptophan (0.618 g [0.3]) and niacin (15.88 mg [6.7]) were within normal ranges. Insomnia scores correlated significantly with dietary intake of tryptophan ($r = -0.180$, $p = 0.0001$) and niacin ($r = -0.157$, $p = 0.001$). When controlling for total caloric intake, the partial correlation between tryptophan intake and insomnia remained significant ($r = -0.105$, $p = 0.029$). Niacin intake also correlated significantly with sleep quality ($r = .094$, $p = 0.045$). No significant correlation was found with TST. In men, insomnia scores correlated significantly with dietary intake of tryptophan ($r = -0.287$, $p = 0.002$) or niacin ($r = -0.243$, $p = 0.008$). Sleep quality scores also correlated significantly with dietary intake of tryptophan ($r = 0.205$, $p = 0.026$) and niacin ($r = -0.240$, $p = 0.008$). In women, none of the correlations were significant.

Conclusion: A modest but significant association was found between dietary intake of tryptophan and niacin and insomnia and sleep quality. The nature and causes of the observed gender differences require further investigation.

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The association between insomnia and perceived health status

A. Donners¹, D. Bury¹, A. Fernstrand¹, J. Garssen¹, T. Roth²,

J. Verster¹

¹ Division of Pharmacology, Utrecht University, The Netherlands

² Sleep Disorders and Research Center, Henry Ford Hospital, USA

Introduction: Impaired sleep can have a significant impact on perceived health status. The aim of the current study was to examine the relationship between perceived health status and sleep quality, total sleep time, and insomnia.

Materials and methods: A survey was conducted among Dutch university students. General health and perceived immune status were scored on a scale ranging from 0 (very poor) to 10 (excellent). Sleep parameters were collected with the insomnia subscale of the SLEEP-50 questionnaire. Total sleep time (TST) was recorded, and sleep quality was scored on a scale ranging from 0 (very poor) to 10 (excellent). Non-parametric correlations (Spearman) were used to examine the association between perceived health and immune status and the sleep parameters.

Results: N = 509 subjects completed the survey (N = 143 men, and N = 366 women). They were on average 20.8 (2.6) years old and reported a TST of 7.7 (0.9) hours. Mean (SD) scores were 14.6 (4.3) for insomnia, 7.3 (1.2) for sleep quality, 7.7 (1.0) for general health, and 7.8 (1.3) for perceived immune status. Perceived general health correlated significantly with scores for insomnia ($r = -0.228$, $p = 0.0001$) and sleep quality ($r = 0.235$, $p = 0.0001$), but not with TST ($r = 0.058$, $p = 0.196$). Similarly, perceived immune status correlated significantly with scores for insomnia ($r = -0.193$, $p = 0.0001$) and sleep quality ($r = 0.234$, $p = 0.0001$), but not with TST ($r = 0.051$, $p = 0.254$). A significant correlation was found between perceived health status and immune functioning ($r = 0.704$, $p = 0.0001$). Insomnia scores were highly correlated to sleep quality ($r = -0.697$, $p = 0.0001$) and to a lesser extent with TST ($r = -0.218$, $p = 0.0001$). Overall, the observed associations were stronger in men when compared with women.

Conclusion: Whereas insomnia and sleep quality were significantly related to perceived general health and immune status, this relationship was not found for total sleep time.

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Discussion on the TCM psychological mechanism of insomnia

C. Wang, G. Li, F. Wang, W. Wang, F. Feng, J. Zhang, X. Liu, X. Zhou
Psychology and Sleep Department of Guang'anmen Hospital of China Academy of Chinese Medical Sciences, China

Introduction: Insomnia, defined as both physical and mental disease, can be completely curable via psychological treatment. On the basis of TCM psychology, discussion and interpretation on mechanism and treatment of insomnia are aimed to be approached from the perspectives of primordial spirit, conscious spirit and desire spirit.

Materials and methods: The literature on TCM and the basic concepts of advanced TCM psychology are referred to. In TCM basic theories Yuan-shen means primordial spirit which represents the level of physical spirit, Yu-shen, or desire spirit, stands for people's needs and demands, Shi-shen, known as conscious spirit, indicates cognition and thinking. The original motivation of sleep lies in the physical demand of physiology, which is the demand of primordial spirit. Based on the physiological demands, the desire spirit will produce a sleepy feeling known as drowsiness. Conscious spirit expresses the cognition about concrete sleeping movement and sleep rhythm during the experience of sleep over and over again.

Results: The process of the normal sleep goes as the following pathway: primordial spirit → desire spirit → conscious spirit → sleep action, during which primordial spirit is the primary and fundamental factor. The key mechanism of insomnia is that self-consciousness's control on sleep takes place of the original motivation of physical demand; in other words, "conscious spirit" replaces "primordial spirit", controlling the body completely. The basic psychotherapy principle is regaining physical demand which means to reset the primordial spirit's control status. In detail, integrated treatment is that patients are encouraged to ease their eagerness for sleep and their fear of insomnia under low resistance via thought induction psychotherapy (TIP).

Conclusion: The basic theories of traditional Chinese medicine contain profound psychological thoughts. Further study on the basic theories can help us to put forward unique opinion on sleep and pathological mechanism of insomnia, which would advance clinical practice greatly.

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Clinical study of escitalopram monotherapy for major depressive disorder with insomnia

W. Yamadera¹, M. Morita¹, E. Osaku¹, A. Kuroda¹, K. Obuchi², H. Itoh¹, K. Nakayama²

¹ Department of Psychiatry, Katsushika Medical Center, The Jikei University School of Medicine, Japan

² Department of Psychiatry, The Jikei University School of Medicine, Japan

Introduction: We administered escitalopram for major depressive disorder with insomnia as its main symptom, assessed depression and insomnia in relation to the prevalence of as-needed zolpidem usage, and examined the relationship between zolpidem usage and improvement in quality of life (QOL).

Materials and methods: Subjects were 23 patients with depression who visited The Jikei University Katsushika Medical Center. They were prescribed antidepressant escitalopram monotherapy, with as-needed usage of zolpidem during insomnia up to three times per week. Changes in QOL, depressive symptoms, and sleep disturbances were examined using the Insomnia Severity Index (ISI), Pittsburgh Sleep Quality Index (PSQI), SF36 healthy survey questionnaire (SF36), Self-Rating Depression Scale (SDS), and Sheehan Disability Scale (SDISS) at the time of first visit and 8–12 weeks after the start of treatment.

Results: The mean age of the 23 subjects was 48.0 ± 14.1 years, with 14 cases (60.1%; referred to as the continuation group below) reaching the final assessment (mean 9.4 ± 1.8 weeks). The continuation group's ISI, PSQI, SDS, SDISS, and SF36 scores showed improvement after treatment with escitalopram. The PSQI score before escitalopram administration in the zolpidem as-needed usage group was 12.2 ± 1.6 ; after administration, their PSQI score was 7.7 ± 3.1 (p value = 0.046). The PSQI score before escitalopram administration in the zolpidem non-usage group was 10.0 ± 1.8 ; after administration, their PSQI score was 7.0 ± 1.2 (p value = 0.011). Insomnia symptoms improved in both the zolpidem as-needed usage group and non-usage group; however, improvement in QOL showed close association with zolpidem as-needed usage. When we investigated whether the improved QOL in the continuation group was because of mitigation of depression or of insomnia, we found that the improvement in the depression scales, but not the insomnia scales, were positively correlated with improvement in QOL.

Conclusion: Escitalopram monotherapy produced an improvement in insomnia regardless of the as-needed usage of hypnotics. An improvement in QOL was associated with zolpidem as-needed usage. Improvement in QOL was associated with an improvement in depression, but not in insomnia.

Acknowledgements: Escitalopram monotherapy produced an improvement in insomnia regardless of zolpidem usage. However, only as-needed usage of zolpidem was positively correlated with improvement in QOL.

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Prevalence of insomnia in a large sample of adults who underwent a general medical examination in China

J. Yuan, Z. Yang, L. Huang, F. Xu, H. Guan

Guangdong Provincial Academy of Chinese Medical Sciences, China

Introduction: Epidemiological data on insomnia in Chinese populations were scarce. These studies focused on Hong Kong, Taiwan, while seldom in Mainland China. We reported the results of a multi-center epidemiological survey to estimate the prevalence of self-reported sleep problems of examination population in Mainland China.

Materials and methods: An epidemiological questionnaire survey was carried out in Medical Examination Center in seven cities: Beijing (northern part of Mainland China); Shanghai (eastern part of Mainland China); Guangzhou (southern part of Mainland China); Chengdu (southwestern part of Mainland China); Chongqing (southwestern part of Mainland China); Nanjing (southeastern part of Mainland China); Hangzhou (southeastern part of Mainland China). A total of 8627 adults between the ages of 18 and 60 years comprising 4467 males and 4160 female. The participants completed a self-administered questionnaire regarding demographic characteristics, standardized clinical interview questionnaire about insomnia symptom (according to the definition of insomnia on the International Statistical Classification of Disease and Related Health Problems, 10th version), Short Form Health Survey (SF-36), Self-reporting Inventory (SCL-90), lifestyles.

Results: Among 8627 people, there 1245 (12.45%) people had difficulty falling asleep, 2292 (26.57%) people had difficulty maintaining sleep, 2517 (29.18%) people had poor quality of sleep. There were total 4185 (48.51%) people had at least one symptom, but there were only 1270 people who complained these symptoms. Among the 1270 people, there were 536 (42.1%) people with sleep disturbance that occurred at least three times per week for at least 1 month. Over all, we found the number of insomniacs was 536 in 8627 respondents, which was 6.21%. Among 536 insomniacs, 231 (43.1%) had difficulty falling asleep, 405 (75.6%) had difficulty maintaining sleep, 313 (58.4%) had poor quality of sleep. Sixty-eight (12.7%) people had insomnia 1–3 months (including 1 month, excluding 3 months), 116 (21.6%) people had insomnia 3–6 months (including 3 month, excluding 6 month), 352 (65.7%) people had insomnia above 6 months. Insomniacs had significantly lower scores in each dimension of SF-36 to non-insomniacs. Insomniacs had significantly higher scores in each dimension of SCL-90. Non-insomniacs significantly more frequently have regular exercise and regular rest rules than insomniacs. Insomniacs were also more partial to sweet, hot peppers, sour, hot than insomniacs.

Conclusion: Insomniacs who were consistent with the diagnostic criteria were only 6.21% in this study. However, there were 14.72% people who complained of insomnia while the duration time was less than 1 month; if their symptoms persisted, they would turn to insomniacs. It is worth researching in future studies.

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The relationship between the clinical features of narcolepsy and the 2009/2010 H1N1 pandemic in China

Y. Hu, X. Dong, F. Han, J. Li, H. Yan, Y. Li, P. An, L. Zhao, Q. Li, Z. Gao
Department of Respiratory and Critical Care Medicine, People's Hospital, Peking University, Beijing, China

Introduction: Narcolepsy onset increased dramatically after the 2009 H1N1 winter influenza pandemic. This study aimed to compare

the differences in clinical manifestations among the narcoleptic patients before and after the influenza pandemic.

Materials and methods: The study is a retrospective analysis of narcolepsy onset in subjects diagnosed in Beijing, China (August 1998–December 2012). The 2010 H1N1 flu epidemic was set as a cutoff point, patients whose onset time was within 1 year were divided into before flu group, with-flu group and after flu group. The clinical features of three groups of narcoleptic patients were compared.

Results: There are 206, 238 and 112 cases recruited in before-flu group (onset between 1998 and 2009, diagnosis delayed by 4.7 ± 0.3 months), with-flu group (onset in 2010, diagnosis delayed by 4.4 ± 0.2 months) and after-flu group (onset between 2011 and 2012, diagnosis delayed by 4.6 ± 0.4 months), respectively. The average onset age of with-flu group was younger but the difference was not statistically significant (8.9 ± 6.7 years old in flu group, 9.8 ± 9.1 in before-flu group and 10.3 ± 10.9 in after-flu group, $p = 0.346$); The numbers of sleep-onset rapid eye movement periods (SOREMPs) in MSLT in with-flu group was more than the other two groups (4.60 ± 0.72 times, 4.40 ± 0.87 times and 4.15 ± 1.13 , respectively, $p = 0.000$); The mean latency of SOREMPs was shorter in with-flu group than in the other two groups (1.34 ± 0.79 minutes, 1.91 ± 1.34 minutes, and 2.12 ± 1.59 minutes, respectively, $p = 0.000$).

Conclusion: There was no significant difference in clinical features between with-flu group and the other two groups of narcoleptic patients. However the numbers of SOREMPs were higher and the mean SOREMP latency was shorter than those of the other two groups.

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Utility of nocturnal SOREMP for diagnosing narcolepsy in children

Q. Li¹, B. Wang², X. Li³, X. Tang⁴, X. Dong¹, J. Li¹, P. An¹, L. Zhao¹, X. Zhang¹, F. Han¹

¹ Department of Pulmonary Medicine, Peking University People's Hospital, China

² Department of Pulmonary and Critical Care Medicine, Fujian University First Hospital, China

³ Department of Pulmonary Medicine, Bin Zhou Medical University, China

⁴ Sleep Medicine Center, Mental Health Center, Translational Neuroscience Center, West China Hospital, Sichuan University, China

Introduction: Nocturnal sleep onset REM sleep period (nSOREMP) is highly specific for diagnosing narcolepsy in adult. However, there are only few studies about the utility of nSOREMP for diagnosing narcolepsy in children. Our study is to explore the utility of nSOREMP for diagnosing narcolepsy in children.

Materials and methods: Total of 822 subjects (including 529 narcolepsy-cataplexy [NC] patients, 20 KLS patients, 17 narcolepsy patients without cataplexy and 256 controls, age < 18 years) were recruited. All patients were selected from Peking University People's Hospital and some controls were recruited from West China Hospital, Sichuan University. We further divided NC patients and controls into prepuberty (351 NC patients, 138 controls; female < 10 years, male < 11 years) and postpuberty groups (178 NC patients, 118 controls; female $10 \leq \text{age} < 18$, male $11 \leq \text{age} < 18$). In addition, we recruited 225 NC patients, 21 narcolepsy patients without cataplexy, 133 idiopathic hypersomnia patients and 482 controls in adult group. Diagnosis was made according to the International Classification of Sleep Disorders 2nd Edition (ICSD-2).

Results: In children, nSOREMP had a high specificity in both prepuberty and postpuberty patients (99.28% [95% CI: 95.4–99.96%] and 98.31% [95% CI: 93.40–99.71%], respectively). The sensitivity of nSOREMP

in prepuberty group was 52.71% (95% CI: 47.34–58.01%) and 60.34% (95% CI: 52.74–67.48%) in postpuberty group. In narcolepsy without cataplexy group, the sensitivity was 35.29% (95% CI: 15.26–61.38%) and the specificity was 41.27% (95% CI: 37.82–44.82%). In KLS, eight patients underwent an overnight polysomnography during episodes and five of them had an nSOREMP. During remissions, none of the KLS patients had a nSOREMP. Compared with adult group (45.78%), the sensitivity was higher in children. The specificity of nSOREMP in our adult group was similar to previous report.

Conclusion: Our study suggests that nSOREMP is highly specific for diagnosing narcolepsy-cataplexy in children. When differentiating KLS and narcolepsy, further test will be needed due to the high probability of nSOREMP in KLS patients during episodes.

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Relationship between brain image and neurocognitive functions in patients with narcolepsy-cataplexy

C. Lin¹, Y. Huang¹, C. Guillemainault²

¹ Sleep Center and Child Psychiatry Department, Chang Gung Memorial Hospital and Chang Gung University, Taipei, Taiwan

² Sleep Medicine Division, Stanford University, Stanford, CA, USA

Introduction: Previous studies showed hypometabolism of the hypothalamus–thalamus–orbitofrontal pathway and early loss of hypothalamus neurons in narcolepsy. However, we do not know if the abnormalities of brain image findings are related to the symptoms of narcolepsy and neurocognitive function impairment. The study analyzed the relationship between brain image and neurocognitive function.

Materials and methods: Fifty two with narcolepsy-cataplexy, diagnosed based on ICSD-2 criteria and 11 age and sex matched control are involved in the study. All subjects had comprehensive clinical investigation with (1) clinical interview based on ICSD-2 and Stanford narcolepsy questionnaire, (2) sleep-wake evaluation questionnaires, (3) study of sleep/wake with actigraphy, polysomnography (PSG) and MSLT, (4) blood tests (with HLA typing). All subjects underwent a PET study with CPT and WCST test on the same day. PET data were analyzed using SPM8 software. The data were analyzed with SPSS, version-18. The demographic data was compared by Student's t test, and the correlation between PET result and other questionnaires and tests was compared by Pearson correlation and calculation of correlation coefficient.

Results: The fifty two narcolepsy patients had a mean age of 20.39 years and 37 were men (71.2%), and the 11 controls had a mean age of 17.89 and 6 were men (54.55%). CPT test: the results of clinical confidence index, omission, Hit RT Std Error, Total Error, Perseverative-Res_T, Perseverative-Errors_T and P_Conceptual-Level-Res_T were all significantly different between narcolepsy patients and normal controls ($p < 0.05$). PET study: Compared with normal controls, narcoleptic-cataplectic patients presented hypometabolism in the frontal lobe, posterior cingulum and parietal lobe ($p < 0.05$); there was also significant hypermetabolism in the amygdala, striatum, substantia nigra, basal ganglia and thalamus ($p < 0.05$). A hypometabolism trend was noted in the hippocampus. After the analysis of the correlation between PET results and the symptom data, we found that the metabolic activity of the thalamus and striatum area was negatively correlated with result of MSLT ($p < 0.05$). Also the metabolic activity of frontal area was negatively correlated to the ESS and VAS ($p < 0.05$); the metabolic activities of striatum and thalamus was positively correlated to ESS, PDSS, VAS onset and CI in CPT ($p < 0.05$); the metabolic activities of stratum and thalamus was partially correlated to worse performance in CPT.

Conclusion: Significant differences were found between PET brain image, MSLT and neuro-cognitive parameters in narcolepsy patients compared with normal controls, and changes in brain metabolic activity in narcoleptics can be correlated to results of sleepiness scales and to test performance.

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Attention deficit hyperactivity disorder and narcolepsy in child

S. Qu, L. Xu

Peking University People's Hospital, China

Introduction: To explore the co-occurrence of narcolepsy and attention deficit hyperactivity disorder (ADHD) symptoms and compare the damage of cognitive function and improvement after treatment of methylphenidate hydrochloride for 8–16 weeks between narcolepsy with and without ADHD.

Materials and methods: Three hundred eight child narcolepsy patients (232 males and 76 females, with a range between 5 and 17 years old) were selected from outpatients at the People's Hospital, Peking University, from February 2011 to July 2013. All of them underwent polysomnography (PSG) followed by the multiple sleep latency test (MSLT). Epworth Sleepiness Scale (ESS) was completed. All patients were interviewed by a psychiatrist according to DSM-IV diagnostic criteria through Mini International Neuropsychiatric Interview for children and adolescents (MINI Kid). Meanwhile, we compared ecological executive function between narcolepsy with and without ADHD through Behavior Rating Inventory of Executive Function – Parents Version (BRIEF-P). Narcolepsy with ADHD symptoms were treated with 9–18 mg methylphenidate hydrochloride for 16 weeks and completed ADHD rating scale (ADHD-RS) and ESS.

Results: Narcolepsy with ADHD symptoms was 27.92% (86/308). Subtype: ADHD-I: 94% (81/86), ADHD-C: 6% (5/86), ADHD-H: 0% (0/86). It was much higher than the prevalence of ADHD in Mainland China (3.1–7.8%). There were no difference between narcolepsy with and without ADHD in performance in MSLT and the number of SOREM. In ecological executive function, BRIEF-P after Bonferroni testing correction, narcolepsy with ADHD had a higher score than without ADHD in total scale, Behavioral Regulation Index and Metacognition Index, as well as all eight factors of inhibition, shift, emotion control, initiation, work memory, plan, self monitoring and organization ($p < 0.05$). Fifty-six of 86 (65%) insisted methylphenidate hydrochloride for 16 weeks. After treatment, score of ESS was lower (13 ± 2) than before (17 ± 2) ($t: 7.951, p < 0.001$) but no change before and after therapy in ADHD-RS ($p > 0.05$).

Conclusion: ADHD is very common in children with narcolepsy, and the overlap of two disorders, results in more severe deterioration in executive function. Treatment strategies need to be adjusted for narcolepsy with ADHD.

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Rituximab treatment in a narcolepsy patient: Temporary relief of symptoms

T. Sarkanen¹, R. Alén¹, M. Partinen²

¹ Central Finland Central Hospital, Finland

² Helsinki Sleep Clinic, Vitalmed Research Centre, Finland

Introduction: Type 1 narcolepsy is a central disorder of hypersomnolence, likely with an autoimmune background. Immunomodulatory therapy has given little benefit in narcolepsy so far, but we report a remarkable but short-lasting effect with monoclonal CD20+ antibody rituximab in a 12-year-old narcoleptic boy with treatment resistant narcolepsy and severe psychiatric symptoms.

Materials and methods: Our patient started to suffer from excessive daytime sleepiness (EDS) and cataplexy (CPL) in February 2010 2 months after Pandemrix-vaccination. Diagnosis of narcolepsy was made 45 days from the onset. CSF hypocretin-1 was 0 pg/mL. Brain MRI and EEG were normal and screening for neuronal autoantibodies was negative. He received intravenous immunoglobulin 1g/kg for 2 days immediately after the diagnosis without effect. Because of adverse effects treatment was discontinued. Methylphenidate, clomipramine, fluoxetine, venlafaxine and sodium oxybate were tried without effect. He started to suffer from escalating behavioral problems and got hospitalized in a psychiatric ward. He had hallucinations difficult to discriminate from psychotic symptoms. EDS, CPL treatments did not alleviate symptoms and the symptoms presented also without medication. Benzodiazepines and antipsychotics were tried without any positive effect. There were no new changes in laboratory examinations except for high levels of antibodies against the H1N1 vaccine components. After careful discussion with the parents, rituximab (RXB) treatment was initiated. He received two 1 g/kg intravenous infusions of RXB after high-dose (1 g) intravenous methylprednisolone in the beginning of 2012.

Results: His condition improved remarkably after the treatment; EDS and CPL were much milder, he was happy and optimistic and could engage in normal conversation, which had been impossible before. He was able to return to home-school. Cataplectic attacks and hypnagogic hallucinations disappeared almost completely and also the night sleep was ameliorated. He told about previous imperative voices in a dream-like state that had now disappeared. Unfortunately, effect of the treatment lasted only for 2 months. After that, the symptoms (EDS, CPL, symptoms of RBD, psychiatric symptoms) reappeared. Second attempt with half a dose (because of low IgG levels) 6 months later did not alleviate symptoms. A third course of RXB was given during summer 2013, now five infusions of 1 g/kg with 1-week interval without response. He spends most of time in bed and does not talk almost at all.

Conclusion: Finding of beneficial effect of RXB in narcolepsy is intriguing since it could imply that there is still ongoing B-cell mediated immune reaction and possibly antibody formation. However, risk of adverse effects (infectious complications) restrict large-scale use of RXB.

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Dynamics of sleep–wake transitions in sleep diseases

X. Zhang¹, J. Kantelhardt², J. Li³, L. Zhao³, X. Dong³, M. Glos⁴, T. Penzel⁴, F. Han³

¹ Peking University International Hospital, China

² Martin-Luther-Universität Halle-Wittenberg, Germany

³ Peking University People's Hospital, China

⁴ Charité Universitätsmedizin Berlin, Germany

Introduction: The aim was to examine sleep and wakefulness dynamics of narcolepsy and SAHS patients and try to study the regulation of sleep and wake during night of narcolepsy and SAHS patients.

Materials and methods: The subjects consist of 85 Chinese narcolepsy patients with cataplexy, 46 moderate SAHS patients, 49 severe SAHS patients, 66 Chinese healthy controls, and 197 healthy controls from European SIESTA database. All the subjects underwent one night of polysomnographic recording in sleep medicine lab, and narcolepsy patients underwent MSLT tests in the following day of study. Sleep study was scored according to the 2007 AASM manual. We calculated the cumulative probability of wakefulness and sleep state durations, then plotted the distributions of wake and sleep state durations. Kolmogorov–Smirnov test was used to check if a power law and an exponential fit significantly deviation from the data.

Results: For sleep stage duration distributions, exponential decays with decay times in European controls were close to 22.3 minutes, but Chinese healthy controls (96.1 min), moderate SAHS (71.9 min), severe SAHS (69.9 min), and narcolepsy (50.2 min). No sleep duration distribution is consistent with a power-law fit. Wake duration distributions are consistent with power-law fits for durations above 3–6 minutes, exception: narcolepsy group – no consistent power-law fit possible. Wake duration distributions are also consistent with exponential fits for durations above 7–13 minutes; exception: Europe healthy group – no consistent exponential fit possible. Sleep duration distributions are consistent with exponential fits for durations larger than 10–25 minutes; exception: severe SAHS group – no consistent fit.

Conclusion: The ethnic variations between Chinese and European subjects influence dynamics of sleep–wake transition during nocturnal sleep. Narcolepsy affects mainly wake control during nocturnal sleep, and also affects sleep control. The deficiency of hypocretin in narcolepsy with cataplexy may be the main reason.

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The sleep–wake cycle and motor activity are disrupted in mice genetically depleted of dystrophin

Goto Y., K. Aritake, Y. Urade

International Institute for Integrative Sleep Medicine (WPI-IIIIS), University of Tsukuba, Japan

Introduction: Duchenne muscular dystrophy (DMD) is a neuromuscular disorder characterized by muscle degeneration, cognitive impairments and also associated with disturbed sleep caused by dystrophin gene deficiency. The mdx mouse, which lacks dystrophin gene, also displays cognitive and behavioral deficits. On the other hands, sleep–wake properties of mdx mice still remain unknown.

Materials and methods: In this study, we examine the sleep–wake behavior by monitoring electroencephalogram in mdx mice. Male mdx mice and C57BL/6 mice (25–30 g, 11–13 weeks) were housed in an insulated and soundproof recording room. The locomotor activity in individual mice was detected with a passive infrared sensor. The mice were chronically implanted with electroencephalogram (EEG) and electromyogram (EMG) electrodes for polysomnographic recordings. The EEG/EMG signals were amplified, filtered (EEG, 0.5–30 Hz; EMG, 20–200 Hz), then digitized at a sampling rate of 128 Hz, and recorded by using data acquisition program SleepSign Ver. 3.0 software (Kissei Comtec, Nagano, Japan). Vigilance states were automatically classified into three stages, wakefulness, non-REM sleep, and REM sleep, and the EEG power density during non-REM sleep was also determined by the SleepSign software.

Results: The total amount of locomotor activity in mdx mice during the dark period was significantly lowered to 80% as compared with those of control (C57BL/6) mice. The total time of non-REM sleep during a 6-h period from 20:00 to 2:00 and also a 6-h

period from 2:00 to 8:00 in mdx mice were significantly longer by 190% and 120%, respectively as compared with those of control mice. In contrast, the amount of wake during the dark period was significantly lowered to 90% in mdx mice. There was no significant difference in time spent of REM sleep between mdx mice and control mice. We determined the number of non-REM sleep and wake bouts, mean episode duration, and stage transition number in mdx mice and control mice. During a 6-h period from 20:00 to 2:00, the number of wake duration over 240 s was significantly decreased in mdx. The number of stage transition from wakefulness to non-REM sleep and from non-REM sleep to wakefulness in mdx was increased by 185% and 210%, respectively compared with the control mice. There was no significant difference in EEG power density of non-REM sleep between mdx mice and control mice.

Conclusion: These findings indicate that non-REM sleep during dark period in dystrophin depleted mdx mice is significantly increased and alterations in locomotor activities during the dark period are affected by the reduction of skeletal muscle strength and also by the reduction of wakefulness.

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Morphological changes of REM-activating pedunculopontine nucleus in patients with epilepsy of sleep-predominant seizures

K. Cho¹, M. Lee², B. Lee¹, Y. Cho¹, K. Heo¹

¹ Department of Neurology, Yonsei University College of Medicine, South Korea

² Department of Neurology, University of Ulsan College of Medicine, Gangeung Asan Hospital, South Korea

Introduction: Non-rapid eye movement (NREM) sleep increases the interictal epileptiform discharges and the frequency of seizure, whereas REM sleep suppresses them. REM-on structure such as pedunculopontine nucleus (PPN) is postulated to have potent antiepileptogenic role. We questioned if volume of PPN differs between sleep-related epilepsy patients and not sleep-related epilepsy.

Materials and methods: Subjects were identified who had visited Dr. K. Heo at the outpatient epilepsy clinic of Severance Hospital, were diagnosed with epilepsy of unknown causes based on clinical and electroencephalography findings, and whose conventional MRI were negative for focal structural lesion. Based on clinical data, two groups were compared for our hypothesis; (1) 33 subjects with more than 80% of seizures occurred during sleep, (2) 45 subjects who had no seizures during sleep and registered between year 2009 and 2012. 3D T1 MR scans were acquired and analyzed with voxel based morphometry-based, automated region of interest generation method. Total intracranial volume was also measured using a software package. PPN volumes were measured in each region of contrast and compared between the two groups after controlling for age, sex and total intracranial volume as covariates.

Results: The two groups did not differ in mean age at registration, proportion of male gender, age of disease onset, total count of seizures and total intracranial volume. PPN volume was statistically smaller in sleep-related epilepsy patients than non-sleep related epilepsy (Student's t test, $p = 0.012$). Multivariate analysis revealed a significant of PPN volume difference between the two groups after controlling for age, sex and intracranial volume (ANCOVA, $F(1,74) = 6.63$, $p = 0.012$).

Conclusion: This is the first study which discovered structural change of PPN associated with predominant timing of seizure across

the wake–sleep cycle. The structure is considered to be a modulator of both REM sleep and epilepsy. Our finding might help understand interventional pathomechanism that lies between human sleep cycle and epilepsy.

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Three patients with posterior quadrant epilepsy showing focal ictal EEG onset during NREM sleep, but not during wakefulness

I. Itabashi, K. Jin, M. Iwasaki, Y. Kitazawa, K. Kato, Y. Kakisaka, N. Nakasato
Japan

Introduction: The influence of sleep on interictal epileptiform discharges is well known, yet its impact on ictal EEG changes is not fully investigated. We report three patients with posterior quadrant epilepsy showing focal ictal EEG onset during NREM sleep, but not during wakefulness.

Materials and methods: Three patients with posterior quadrant epilepsy (three men; 25, 41, and 44 years) were included in the present study. They underwent 4-day video-EEG monitoring in our epilepsy monitoring unit. Scalp EEG was performed using the 10–20 system with additional anterior temporal electrodes. Sleep stages were scored based on the American Academy of Sleep Medicine criteria. Habitual seizures were recorded both during wakefulness and sleep. Ictal EEG recordings and neuroimaging studies (i.e., MR imaging and FDG-PET) were reviewed.

Results: All three patients were diagnosed as neocortical epilepsy arising from temporo-parieto-occipital lobe. In patient 1 (25 year-old right-handed male), complex partial seizures with automatism were recorded. Ictal EEG changes started with rhythmic beta activity in the left posterior temporal region during NREM sleep, but not during wakefulness. MRI showed focal cerebral defect after the resection of traumatic lesion in the left parietal lobe. In patient 2 (41 year-old right-handed male), complex partial seizures were recorded. Ictal EEG changes started with rhythmic beta activity in the left temporo-occipital region during NREM sleep, but not during wakefulness. Neither MRI nor FDG-PET showed abnormalities. In patient 3 (44 year-old right-handed male), complex partial seizures with vocalization were recorded. Ictal EEG changes started with rhythmic beta activity in the left temporo-occipital region during NREM sleep, but not during wakefulness. MRI showed focal atrophic lesion in the left parieto-occipital lobe.

Conclusion: Ictal EEG findings of neocortical epilepsy arising from temporo-parieto-occipital lobe may be susceptible to sleep. Seizures during NREM sleep can elicit focal EEG onset and have higher detectability and localization accuracy than those during wakefulness.

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Three patients with extra-temporal lobe epilepsy having seizures during REM sleep

K. Jin, M. Nakamura, K. Kato, Y. Kitazawa, Y. Kakisaka, M. Iwasaki, N. Nakasato
Japan

Introduction: Epileptic seizures rarely occur during REM sleep, which account for only about 1% of focal seizures. Temporal seizures can occur associated with REM sleep. However, the relationship

between extra-temporal seizures and REM sleep has not been investigated. We report three patients with extra-temporal lobe epilepsy having seizures during REM sleep.

Materials and methods: Three patients with extra-temporal epilepsy (2 men; 18, 28, and 47 years) were included in the present study. They underwent 4-day video-EEG monitoring in our epilepsy monitoring unit. Scalp EEG was performed using the 10–20 system with additional anterior temporal electrodes, simultaneous with submental EMG. Sleep stages were scored based on the American Academy of Sleep Medicine criteria. Some of their habitual seizures were recorded during REM sleep. Ictal EEG recordings and neuroimaging studies (i.e., MR imaging and FDG-PET) were reviewed.

Results: In patient 1 (28 year-old right-handed female), a complex partial seizure with oral automatism and vocalization was recorded. Ictal EEG changes started with polyspike in the right frontal region 13 minutes after the REM sleep onset. Neither MRI nor FDG-PET showed abnormalities. In patient 2 (18 year-old right-handed male), a hypermotor seizure with vocalization was recorded. Ictal EEG changes started with repetitive spikes in the left anterior temporal region 5 minutes after the REM sleep onset. MRI showed no abnormalities. FDG-PET revealed hypometabolism in the left orbitofrontal cortex. The patient was subsequently evaluated with intracranial and scalp EEG recording, which detected three seizures arising from the left orbitofrontal cortex during REM sleep. In patient 3 (47 year-old right-handed male), a simple partial seizure of somatosensory aura in right head and arm were recorded. Ictal EEG changes started with low amplitude fast activities in the left parietal region 8 minutes after the REM sleep onset. MRI showed focal cortical dysplasia in the bottom of left central sulcus.

Conclusion: Extra-temporal seizures can occur during REM sleep, whereas temporal seizures occur in transitional phase between REM and NREM sleep. In patient 2, seizures may be induced by activation of orbitofrontal cortex, which was reported to occur during REM sleep.

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Risk of stroke following uvulopalatopharyngoplasty: A nationwide retrospective cohort study

C. Liao, T. Chen
Department of Anesthesiology, Taipei Medical University Hospital, Taipei, Taiwan

Introduction: The increased risk of stroke in patients with obstructive sleep apnea (OSA) was reported, however, the risk of stroke after patients with OSA receiving uvulopalatopharyngoplasty (UPPP) remains unknown. The objective of this study is to investigate the risk of stroke following UPPP.

Materials and methods: Using the claims data from the Taiwan's National Health Insurance, we identified 9105 patients with new-diagnosed OSA between 2004 and 2009. The one-year incidence of stroke was compared between patients had OSA with and without receiving UPPP. The multivariate Poisson regression analysis was used to calculate adjusted rate ratio (RR) and 95% confidence interval of stroke associated with UPPP.

Results: The one-year incidence of stroke for patients had OSA with and without UPPP were 5.19% and 1.15%, respectively. Patients with OSA receiving UPPP had lower risk of stroke compared with those without UPPP (RR 0.44, 95% CI 0.31–0.60). The decreased risk of stroke following UPPP was observed in both sexes and patients with OSA aged 20–59 years. In the stratified analysis

of medical conditions, the RR of stroke associated with UPPP for patients with no, one and more than two medical conditions were 0.39 (95% CI 0.20–0.78), 0.48 (95% CI 0.27–0.86), and 0.43 (95% CI 0.27–0.69), respectively.

Conclusion: In a cohort of people aged 20 years and older with a diagnosis of OSA, patients who had UPPP had lower risk of stroke within 1 year after surgery compared with patients who had not undergone UPPP.

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New approach to the development of animal model of depression characterized by super-sensitivity of brain muscarinic cholinergic system

N. Nachkebia, E. Chkhartishvili, O. McHedlidze, S. Dzadzamia, N. Maglakelidze, M. Babilodze, E. Chijavadze

Laboratory of Neurobiology of Sleep-Wakefulness Cycle, I. Beritashvili Center of Experimental Biomedicine, Georgia

Introduction: Animal model of depression was developed by new methodical approach inducing malfunctioning of muscarinic cholinergic system (MChS) in rat pups during early postnatal period and its lasting super-sensitivity in adult age. Character of sleep disturbances and the rate of M2/M4 muscarinic cholinergic receptors in neocortex and hippocampus were studied.

Materials and methods: Rat pups (n = 30) received subcutaneously atropine (Atr) and/or scopolamine (Scop) 15 mg/kg two times daily during 2 weeks as follows: Atr injection starting at postnatal day 7 (P7) until P21; Scop injection starting at P7 until P21. After drug discontinuation rat pups were maintained in home cages under special care. Rat pups receiving distilled water (15 mg/kg) two times daily during 2 weeks (from P7 to P21) served as control animals in adult age. Surgery and implantation of stainless screws for EEG registration was made 8–12 weeks after the end of the treatment of rat pups by anti-muscarinic drugs and/or distilled water. EEG registration of sleep–wakefulness cycle was started 5–7 days after surgery and continued for 10 hours daily during 7 consecutive days both in control and experimental animals. Density of M2/M4 muscarinic cholinergic receptors in synaptic membranes of hippocampus and neocortex was measured in adult animal models and controls by Western blotting by means of specific antibodies. Statistical processing was made by Student's t-test.

Results: Sleep–wakefulness cycle was significantly disturbed in all modeled animals. Both light and deep slow wave sleep became fragmented and superficial. Number of awakenings from slow wave sleep was raised considerably. Incidence for delta waves at the frequencies of 1–1.5 c/s became very low. REM latency was found four times shorter than in the control rats. Sleep was sometimes started by REM episodes. REM incidence was three times more frequent compared with the same indices of control rats. Mean duration of REM sleep episodes was shortened because of frequent awakening from this phase. REM total time was increased for two times due to increased REM sleep incidence. The rate of M2/M4 subtypes of muscarinic cholinergic receptors appeared significantly higher in neocortical and hippocampal plasma membranes in rats with postnatal exposure to muscarinic antagonists.

Conclusion: Early postnatal malfunctioning of MChS leads to its adult super-sensitivity accompanied by sleep disturbances like those characteristic for major depressive disorder and significant up-regulation of M2/M4 cholinergic receptors. Results certify the significance

of early postnatal malfunctioning and consequent adult super-sensitivity of MChS for the development of depression-like disturbances in animals.

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Cataplexy and sleep disorders in Niemann–Pick disease type C

S. Nevsimalova¹, V. Malinova²

¹ Department of Neurology, Charles University, 1st Faculty of Medicine and General Teaching Hospital, Prague, Czech Republic

² Department of Pediatrics and Adolescent Medicine, Charles University, 1st Faculty of Medicine and General Teaching Hospital, Prague, Czech Republic

Introduction: Niemann–Pick disease type C (NP-C) is a rare and progressive autosomal recessive disease leading to disabling neurological manifestation and premature death. NP-C is characterized by visceral, neurological and psychiatric manifestation. Although cataplexy can be one of its characteristic symptoms, sleep disturbances are described only exceptionally.

Materials and methods: Twenty-two NP-C patients have been followed in the Czech Republic in the past 20 years, NPC1 mutations were found in all of them. The most frequent forms were juvenile (seven cases), adult (seven cases) and late infantile (six cases); in two patients infantile NP-C type was diagnosed. Splenomegaly, supranuclear gaze palsy, intellectual deficit, dysarthria, dysphagia, and cerebellar ataxia accompanied by spasticity belong to the main neurological symptoms. Epilepsy was present in six cases and cataplexy – as an isolated narcoleptic symptom – in five patients. In three cases (mostly of adult form) there were manifestations of psychiatric disorders. Nine patients have died, 13 are still alive.

Results: The mean age at onset of cataplexy was 7.5 ± 3.8 years (age range from 2.5 to 12 years). In two cases cataplexy continues over the whole followed-up period for 1 and 4 years respectively. One child, who died at the age of 6 years, had cataplexy from the onset of NP-C clinical symptoms at the age of 2.5 years until his death. In the last two patients cataplectic attacks were observed for only a limited period of the disease (for 2 and 5 years respectively) and disappeared when neurological disability accompanied by intellectual deterioration and emotional regress had increased. The frequency of attacks varied from a sporadic occurrence up to several attacks within 1 day (documented by video recording). Cataplexy was most frequently seen in the late infantile form – in three out of six patients, and in two out of seven cases with juvenile form. No case of cataplexy was observed in the infantile or adult form. Mildly increased daytime sleepiness (without cataplexy) was seen only in one patient (who suffered also from a mild sleep breathing disorder), while six patients frequently complained of restless and disturbed sleep.

Conclusion: Cataplexy appeared predominantly in preschool and school children, and one of our cases with the infantile form belongs to the youngest patients ever described in the literature. A severe clinical course of the disease is probably the reason why sleep problems, except for cataplexy, are overlooked and underdiagnosed.

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Crocin, a carotenoid pigment of saffron, promotes non-rapid eye movement sleep

K. Aritake, N. Ito, Y. Shoyama, Y. Urade

International Institute for Integrative Sleep Medicine (WPI-IIIIS), University of Tsukuba, Japan

Introduction: Saffron has been traditionally used for the treatment of insomnia. Crocin is a major carotenoid pigment of saffron and a number of pharmacological studies have demonstrated that crocin have a wide range of neuroprotective activities. On the other hand, the effects of crocin and on sleep still remain unknown.

Materials and methods: In this study, we examined the sleep-promoting activity of crocin and crocetin by monitoring the locomotor activity and electroencephalogram after administration of these components to mice. Male C57BL/6 mice (23–27g, 11–13 weeks) were housed in an insulated and soundproof recording room. The locomotor activity in individual mice was detected with a passive infrared sensor. Mice were chronically implanted with electroencephalogram (EEG) and electromyogram (EMG) electrodes for polysomnographic recordings. The EEG/EMG signals were amplified, filtered (EEG, 0.5–30 Hz; EMG, 20–200 Hz), digitized at a sampling rate of 128 Hz, and recorded by using data acquisition program SleepSign Ver. 3.0 software (Kissei Comtec, Nagano, Japan). Vigilance states were automatically classified into three stages, wakefulness, non-REM sleep, and REM sleep, and the EEG power density during non-REM sleep was also determined by the SleepSign software. Highly purified crocin from saffron, crocetin or vehicle (physiological saline) was administered into mice at 20:00, a light-off time, for the study of locomotor activity and sleep analysis. As crocin is poorly water-soluble, it was enzymatically transglycosylated to improve the solubility and absorption properties. Transglycosylated crocin was also administered to analyze the locomotor activity and sleep.

Results: Orally administered crocin (80 and 160 mg/kg of body weight) significantly suppressed the total amount of locomotor activity during 12 h by 33% and 20%, respectively, as compared with the vehicle control. Crocin (30 and 100 mg/kg of body weight) increased the total time of non-REM sleep by 60% and 170%, respectively, during a 4-h period from 20:00 to 24:00 after its intraperitoneal administration at a lights-off time of 20:00. Crocetin (100 mg/kg) also increased the total time of non-REM sleep by 50% after the administration. Compared with the vehicle-treated control, the number of non-REM sleep bouts increased by 2.2-fold and also those of wake bouts by 2.0-fold for 4 h after the crocin treatment. Crocin increased the number of stage transitions from wakefulness to non-REM sleep and from non-REM sleep to wakefulness by 110% and 190%, respectively. There was no significant difference in EEG power density of non-REM sleep between the crocin treatment and the vehicle control, indicating that crocin did not affect the EEG power density of NREM sleep. Highly glycosylated crocin showed 5–10 fold improvement in the absorption than crocin after oral administration and showed photo stabilities depend on the length of sugar chains.

Conclusion: We conclude that crocin is considered to induce non-REM sleep that is very similar to physiological sleep, suggesting its potential use for the treatment of insomnia.

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Central apnea like events and iron deficiency

S. Aydinöz, M. Kendirli

Gulhane Military Medical Academy, Haydarpasa Teaching Hospital, Turkey

Introduction: Central sleep apnea is a sleep-related disorder in which the event is associated with absent inspiratory effort that lasts more than 20 seconds or at least the duration of two breaths with an arousal or a $\geq 3\%$ arterial oxygen desaturation.

Materials and methods: Breath-holding spells is a benign, non-epileptic condition usually seen in children from 6 months to 6 years. An association between breath-holding spells and iron deficiency has been proposed as a pathophysiologic mechanism and it may be associated with maturational delay in myelination of brain stem.

Results: Here we report a case of a 7-year-old previously healthy girl with witnessed apneas during her sleep detected by her mother. A full night polysomnogram has performed in our sleep laboratory and it was in normal limits with a central apnea index of 0.2 and no obstructive event was detected. She also had several central apnea like events which are not fulfilling the criteria. In blood tests, her ferritin level was 15 ng/ml and her serum iron was 44.1 mg/dl. Oral iron supplementation was started to correct the iron deficiency.

Conclusion: Regarding the presence of central apnea like events and iron deficiency in a patient with a history of witnessed apneas indicate that low iron levels may have a role in central apnea like breath-holding spells in children.

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Zinc promotes non-rapid eye movement sleep in mice

Y. Cherasse, H. Saitou, Y. Urade

International Institute for Integrative Sleep Medicine (WPI-IIIIS), University of Tsukuba, Japan

Introduction: Several important roles for zinc, a cofactor for more than 300 enzymes and 1000 transcription factors, have been discovered. In this study we have found that oral ingestion of zinc-containing yeast promotes non-rapid eye movement (NREM) sleep in mice. This effect was further enhanced by the combination with astaxanthin.

Materials and methods: Animal: C57BL/6 mice, 8–12 weeks of age, were acclimated to the light-dark cycle of 12 hours for 10 days before experiments. Amount of locomotor activity: Zinc, iron, copper, and manganese-containing yeast were diluted into distilled water and administered orally just before dark phase (active phase) at a dose of 10 ml/kg. The locomotor activity of control group (water administration) was measured by using infrared locomotor sensors (Biotex Co. Ltd.). EEG: After administering the control and test diets, electro-encephalogram (EEG), electro-myogram (EMG) as well as spontaneous locomotor activity were analyzed. The sleep-wake profile was determined by using SleepSign software (Kissei Comtec Co., Ltd.). Absorption: After dilution in distilled water, zinc-containing yeast supplemented or not with astaxanthin nano-emulsion was orally administered at a dose of 10 ml/kg. Blood was taken each hour and centrifuged. Zinc concentration in the serum was measured by atomic absorption spectrometry.

Results: Only zinc-containing yeast exhibited a sedative effect on mice after oral administration. Sleep induction was enhanced by the combination of astaxanthin nano-emulsion with zinc-containing yeast. The increased effect was at least in part due to an increase of zinc absorption into the blood stream.

Conclusion: We concluded that zinc absorption can increase non-REM sleep in mice in a dose-dependent manner, but do not modify the amount of REM sleep. Furthermore, astaxanthin can enhance the bio-availability of zinc and improves its sleep-inducing effect.

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Risk of myocardial infarction in male population aged 25–64 years with sleep disturbances: WHO program MONICA-psycho-social

V. Gafarov¹, E. Gromova², I. Gagulin¹, A. Gafarova¹, D. Panov²

¹ Collaborative Laboratory of Cardiovascular Diseases Epidemiology SB RAMS, Novosibirsk, Russia

² FSBI Institute of Internal and Preventive Medicine SB RAMS, Novosibirsk, Russia

Introduction: We decided to examine the relationship between sleep disturbances (SD) and the risk development of myocardial infarction (MI) among men ages 25–64 years.

Materials and methods: Within the framework of program, WHO MONICA-psycho-social was examined with representative sample of men 25–64 years old (1994 year). Total sample was 657 persons. SD were measured at baseline with the use of the Jenkins' questionnaire. Incidence of new cases of MI was revealed at 14-year follow-up. Cox-proportional regression model was used for an estimation of hazard ratio (HR).

Results: Only 1/3 of the 25 to 64-year old male subjects with the first MI referred to their sleep as "good", whereas 2/3 had SD (63.1%). The risk of development of MI within 5 years at group of men with SD was 2.43 (95% CI 1.27–8.59) times higher than without it. For the following 10 years, risk of development of MI was 2.6 (95% CI 1.35–9.41) times higher in men with SD. Within 14 years HR = 2.3 (95% CI 1.1–4.6); ($p < 0.05$). MI most frequently occurred in men with SD and higher negative psychosocial factors, i.e. widowers, divorced, those with primary and not-completed secondary school education and those engaged in hard and moderate manual labor and head, with low index social network.

Conclusion: The results demonstrate that SD present a social problem and contribute greatly to the risk of MI in men. The highest frequency of MI occurred in men with SD and negative social gradient.

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The impact of nocturnal hypoglycaemia on sleep in subjects with type 2 diabetes

P. Jennum¹, N. Jørgensen², R. Rabøl³, P. Chu⁴, K. Stender-Petersen³, S. Madsbad⁵

¹ Danish Center for Sleep Medicine, Copenhagen University Hospital Glostrup, Glostrup, Denmark

² Department of Diagnostics, Copenhagen University Hospital Glostrup, Glostrup, Denmark

³ Novo Nordisk A/S, Søborg, Denmark

⁴ Novo Nordisk Inc, Plainsboro, USA

⁵ Department of Endocrinology, Hvidovre Hospital, Hvidovre, Denmark

Introduction: Nocturnal hypoglycaemia is a major barrier in achieving optimal glycaemic control in patients with diabetes. Knowledge about the consequences of nocturnal hypoglycaemia on sleep is limited. The aim of the present trial was to investigate the impact of nocturnal hypoglycaemia on sleep pattern.

Materials and methods: In this randomised, single-blinded, two-period, cross-over trial, 26 subjects with type 2 diabetes attended two experimental night visits (one normoglycaemic and one hypoglycaemic) in randomised order to assess the impact of nocturnal hypoglycaemia on sleep (using polysomnography) and on hormonal responses. Plasma glucose (PG) levels were controlled on the experimental nights by hyperinsulinaemic glucose clamping. On the hypoglycaemic night, hypoglycaemia was induced when subjects had reached sleep stage N2 or deeper by turning off the glucose infusion (PG target: 2.7–2.8 mmol/l) for approximately 15 min, after which subjects were brought back to normoglycaemia. On the normoglycaemic night, PG was maintained at 5–7 mmol/l throughout the night.

Results: There was no difference between the hypoglycaemic night and the normoglycaemic night, in either the number of EEG-identified arousals or awakenings in the first 4 hours of sleep (0–4 h after reaching sleep stage N2). During the last 4 hours (4–8 h) and during the entire night (0–8 h), the number of awakenings was significantly lower ($p < 0.05$) on the hypoglycaemic night than on the normoglycaemic night (observed geometric means 4–8 h: 10 vs. 14 awakenings and 0–8 h: 25 vs. 30 awakenings). Total sleep time tended to be longer on the hypoglycaemic night (observed means: 366 vs. 349 min, $p = \text{NS}$). Statistically significantly higher hormonal counter-regulatory responses (adrenaline, growth hormone and cortisol) to hypoglycaemia were observed as compared with normoglycaemic night.

Conclusion: Nocturnal hypoglycaemia in patients with type 2 diabetes caused a decrease in awakening response following the event. These findings underscore the risks associated with nocturnal hypoglycaemia since these events potentially affect the subject's ability to wake up and respond adequately to hypoglycaemia.

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Associations between sleep characteristics and dietary intake patterns in 10-year old Canadian children

A. Leblanc, M. Tremblay, C. Boyer, M. Borghese, G. Leduc, J. Chaput
Children's Hospital of Eastern Ontario Research Institute, Canada

Introduction: Evidence associates short sleep duration with increased food intake and obesity; however, whether poor sleep quality or late bedtimes are associated with poor dietary patterns is unknown. The objective was to examine the associations between sleep characteristics (duration, efficiency, bedtime) and dietary intake patterns in a sample of Canadian children.

Materials and methods: Data for this study were obtained from the International Study of Childhood Obesity, Lifestyle and the Environment (ISCOLE). This analysis includes data on children aged 9–11 years from Ottawa, Canada ($n = 507$, 41.2% boys). Sleep duration (hours/day), sleep efficiency (%) and bedtime (h:min) were assessed over 7 days using actigraphy. Dietary intake was assessed using a food frequency questionnaire, asking participants how often they consumed 23 food items in a usual week. Principal component analyses were conducted to create two dietary scores: "unhealthy diet" (e.g. hamburgers, soft drinks, fried food), and "healthy diet" (e.g. vegetables and fruits). Multivariable linear regression was used to investigate the

associations between sleep characteristics and dietary intake patterns of children.

Results: Children averaged 9.1 hours of sleep per night with 96.2% sleep efficiency and a mean bedtime of 21:35. In unadjusted models, poor sleep efficiency was associated with a worse score for unhealthy diet ($r = -0.17$, $p < 0.01$) and later bedtime was associated with a worse score for healthy diet ($r = -0.15$, $p < 0.01$). After adjusting for age, sex, ethnicity, annual household income, body mass index z-score and physical activity level, relationships between sleep efficiency and unhealthy diet ($r = -0.11$, $p = 0.02$), and bedtime and healthy diet ($r = -0.11$, $p = 0.02$) remained significant. No associations were found with the other variables.

Conclusion: Later bedtimes and poor sleep efficiency, but not sleep duration, were associated with poor dietary patterns in our sample. Future work should focus on various characteristics of sleep, not just sleep duration. Widespread use of actigraphy can facilitate the examination of bedtime and sleep efficiency in field based settings.

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Sleep disorders in Mongoloid and European races in Eastern Siberia

I. Madaeva, L. Kolesnikova, T. Bairova, O. Ablamskaya, S. Kolesnikov, N. Semenova, O. V. Berdina
Scientific Centre of Family Health and Human Reproduction Problems, Russia

Introduction: The aim of this study is to assess the ethnic and gender aspects of sleep disorders in European and Mongoloid races living in Eastern Siberia.

Materials and methods: Four hundred nine respondents who were divided into two groups: Europeans (Russian) (49.63%) and Mongoloid (Buryats) (50.37%) aged 20–60 years living in the Irkutsk region and the Buryat Republic were examined. Gender structure: 270 females (66.9%) and 125 males (33.1%). Questioning was conducted with using standard questionnaire of Stanford Sleep Research Center (USA). The PSGs were recorded on a GRASS-Telefactor Twin (Comet) with amplifier As-40 with integrated module for sleep SPM-1 (USA). The study was conducted in accordance with ethical standards of Helsinki Declaration (2008). All participants provided written, informed consent.

Results: It was shown that 25.1% of Buryats and 38.3% of Russian respondents ($p < 0.05$) have had “light” sleep problems. Moreover “moderate” sleep disorders have been identified in 87% Buryats and 31% Russian ($p < 0.05$) and “severe” sleep disorders in 53% and 22% respectively ($p < 0.05$). “Severe” sleep disorders often have been identified in Buryat women (72%) as compared with Russian ones (18%) ($p < 0.05$). Men have had significantly higher prevalence of “severe” sleep disorders than women (238% in the Buryats and Russian 146% ($p < 0.05$)). According to the results of the PSG study Buryats males had higher incidence of “moderate” (282%) and “severe” (201%) obstructive sleep apnea (OSA) than Russian ($p < 0.05$).

Conclusion: Our results demonstrate relationship between ethnic and severe sleep disorders (including OSA). However, certain anatomical features for the formation of OSA in Mongoloids have not been found.

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A study on the meteorological analysis of nocturnal falls during sleep in hospital

C. Magota¹, S. Ando², M. Nishizaka², K. Horikoshi³, K. Tanaka³, M. Miyazono⁴, N. Hashiguchi¹, T. Ohkusa⁵, A. Chishaki¹

¹ Department Health Sciences, Kyushu University Graduate School of Medical Sciences, Japan

² Sleep Apnea Center, Kyushu University Hospital, Japan

³ Saiseikai Futsukaichi Hospital, Japan

⁴ School of Nursing, Fukuoka Prefectural University, Japan

⁵ Kirameki Projects Career Support Center, Kyushu University Hospital, Japan

Introduction: Nocturnal falls of in-hospital patients occurs by various factors and not only deteriorate patients' quality of life but also cause serious mental and physical stress on medical staff. The aim of this study was, thus, to clarify the effects of meteorological factors of in-hospital nocturnal falls to reduce the incidence.

Materials and methods: We performed a retrospective study on fall-incident reports (April 2010 to March 2014) in a medium sized hospital with 260 beds in the southern part of Japan. We collected all fall-incident data excluding those that occurred in the intensive care unit and emergency room and evaluated patient characteristics, frequency of the falls, and activities associated with falls. We also analyzed the relationship between the frequency of nocturnal falls and several meteorological factors including the length of night or season. For data analysis, chi-square test and regression analysis were used.

Results: In this hospital, light is turn on at 6:00 and off at 21:00 irrespective of the season. We reviewed total 201 nocturnal fall-incident reports for 4 years. The mean age of the patients was 76 ± 10 years old, and 121 were male (61%). One hundred thirty-seven falls (68.1%) were associated with excretion activity. During 4 years, the mean number of nocturnal falls per hour was 22 ± 6 times, and the frequency per hour was significantly altered according to the time of night; the frequency was significantly increased at 22:00–23:00, 02:00–03:00, 04:00–05:00, and 05:00–06:00 compared with that of 21:00–22:00, and mean frequency during 22:00–06:00 was 1.5–2.5 times higher than that during 21:00–22:00 ($P < 0.05$). Furthermore, the frequency of fall at 02:00–03:00 was significantly increased ($\times 2.3$, $p < 0.05$) during October–March, so-called fall/winter seasons, compared with that of April–September (spring/summer seasons). Additionally, we examined correlation between the length of night-time and frequency of falls to further investigate the factor of seasonal variation in frequency of nocturnal falls and found a significant positive correlation between them ($R^2 = 0.72$, $p < 0.001$; the mean number of nocturnal falls per month was 17 ± 4 times during 21:00–06:00).

Conclusion: Since many incidences of nocturnal falls of in-hospital patients were related to excretion activity in dark period, we should pay more attention to meteorological factors, especially to the darkness in the early morning of the season with a long night-time in order to decrease the fall incidence.

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Implication of basal forebrain neurons in arousal through different projecting pathways to sensory primary cortical areas in the rat

M. Rodrigo-Angulo, I. Chaves-Coira, Á. Núñez
Universidad Autónoma de Madrid. Facultad de Medicina, Spain

Introduction: The basal forebrain neurons are implicated in attention processes playing an important role in cortical activation

during wakefulness and arousal through sensory cortices connections. Present work goal is to determine if basal forebrain cortical projections are segregated in different neuronal populations for specific sensory modalities related to role in arousal.

Materials and methods: The anatomical pathways linking the basal forebrain neurons with somatosensory (S1), auditory (A1) and visual (V1) cortical areas were studied in 21 adult Sprague–Dawley rats. All animal procedures were approved by the Ethical Committee of the Autonomous University of Madrid, in accordance with Council Directive 2010/63/UE of the European Community. Efforts were made to minimize animal suffering as well as to reduce the number of animals used. After appropriated craniotomy, animals received injections of the neuronal fluorescent retrograde tracer Fluoro-Gold (FG) in S1 and deposits of fluorescent retrograde tracer Fast Blue (FB) in either the visual-or-auditory cerebral primary cortices. After 7 days animals were sacrificed and brains processed for visualizing the location of retrograde labelled neurons by means of confocal microscopy and processed for acetylcholine immunocytochemistry. Quantitative studies have been also made and the number of labelled neurons found in basal forebrain has been referred in percentages from the total labelled ones.

Results: Preliminary results show that counting basal forebrain neurons in animals receiving injections in S1 and A1 cortices averaged 98% of neurons labelled for FG and 2% of neurons labelled for FB in the Broca diagonal band (HDB). No double-labelled neurons were found in this region; that means that the scarce projection to auditory cortex from HDB is independent of the somatosensory one. In basal magnocellular nucleus (B), percentages of labelled neurons in these animals were 52% of FG-labelled, 13% of FB-labelled and 35% of double-labelled neurons indicating a shared projection to S1 and A1 from B. Animals receiving injections in S1 and V1 showed 60% of FG-labelled neurons, 12% of FB-labelled neurons and 28% of double-labelled neurons in HDB; in B 39% of total labelled neurons were FG-labelled, 18% FB-labelled and 42% double-labelled neurons. This indicates that both HDB and B display a common projections pathway to S1 and V1. Cholinergic neurons were also detected in both HDB and B nuclei intermingled with fluorescent labelled neurons.

Conclusion: Our results show that HDB modulation to S1 and A1 cortices runs separately and shared to S1 and V1, while modulation exerted from B to S1, A1 and V1 cortices displays shared pathways. We hypothesize that activation of sensory cortices in arousal is highly influenced by de cholinergic B neurons.

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The impact of having a 15-minute break with and without consuming an energy drink on prolonged simulated highway driving

A. Van De Loo¹, A. Bervoets¹, L. Mooren¹, J. Garssen¹, T. Roth², J. Verster¹

¹ Division of Pharmacology, Utrecht University, The Netherlands

² Sleep Disorders and Research Center, Henry Ford Health System, USA

Introduction: Driving a car may be negatively affected by driver sleepiness. This is especially seen under monotonous conditions such as prolonged highway driving. This study examined the effects of energy drink (ED) on simulated highway driving.

Materials and methods: In a double blind crossover study, N = 21 healthy volunteers performed a 4-hour driving test in the STISIM driving simulator. After 2 hours driving, a 15-minute break

was scheduled in two of the three conditions. During the break subjects consumed either 250 ml ED (Red Bull) or a placebo drink (Red Bull without caffeine (80 mg), glucuronolactone, taurine and B-vitamins). Subjects were instructed to drive with a steady lateral position while maintaining a constant speed of 95 km/h. The primary outcome measure was the number of lapses. A lapse is considered to be a short period of inattention and is defined by a deviation from the mean lateral position for >100 cm for 8 seconds or more.

Results: No significant differences were observed between the ED, placebo, and continuous driving (9.2, 9.9, 12.5 lapses) in hour 2. In hour 3, significantly fewer lapses were observed after consuming ED versus continued driving (4.3 versus 9.5 lapses, $p = 0.020$), and having a break and a placebo drink produced a non-significant reduction in the number of lapses (7.4 lapses, $p = 0.365$). In hour 4 after consuming ED, again significantly fewer lapses were observed when compared with continued driving (6.2 versus 9.4 lapses, $p = 0.014$). After placebo, the number of lapses in the 4th hour were similar to those observed in the 2nd hour of driving (9.9 versus 9.9 lapses, $p = 0.456$). In hour 3, the improvement by consuming ED relative to placebo did not reach significance ($p = 0.097$). In hour 4, consuming ED was significantly more effective in reducing the number of lapses than having a break only ($p = 0.034$).

Conclusion: A 15-minute break in combination with consuming an energy drink significantly reduces the number of lapses during prolonged simulated highway driving.

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Effect of quetiapine on sleep profile in treatment of opioid abuse patients: A polysomnographic evaluation study in an Egyptian sample

T. Asaad, S. El Ghoneimy, H. El Rassas
Psychiatry, Egypt

Introduction: Sleep disturbance is quite common in opioid abuse patients, representing a major obstacle to treatment success, being associated with a high relapse rate. The aim of the present study was to evaluate the role of quetiapine “in addressing the sleep pattern of such patients”.

Materials and methods: The study included 46 opioid-dependent male patients, who were admitted to the substance abuse treatment unit at the Institute of Psychiatry, Ain Shams University, assessed 2 weeks after admission (to allow for resolution of most of the withdrawal symptoms). After initial assessment using Addiction Severity Index, Beck Depression Inventory, Standardized Sleep Questionnaire and all-night polysomnography (PSG), patients were divided into two equal age-matched groups: (a) Group I (23 patients): maintained on “Quetiapine IR” in the dose range from 100 to 200 mg according to patient’s tolerability and response given as a single dose 1 hour before bed time. (b) Group II (23 patients): receiving only psychotherapeutic and behavioral interventions with no drug treatment except for “Naltrexone” in some patients in preparation for discharge. A second assessment using the same previous tools was considered 4 weeks following the initial one.

Results: The initial assessment of sleep showed reports of sleep complaints in nearly all patients (insomnia, increased sleep latency, reduced sleep time and hypersomnolence). PSG main findings included prolonged sleep latency, decreased sleep efficiency, increased arousal index, increased stages N1 and N2 with decreased SWS. In the second assessment significant differences had been observed

between the two groups regarding both subjective and objective assessments. Patients on “Quetiapine” had better sleep profile with more sleep efficiency and duration, decreased arousal index, decreased sleep latency and more SWS. At the same time the “Quetiapine” group showed significantly less depression scores though not correlated with the PSG findings.

Conclusion: Quetiapine is a well-tolerated medication in opioid abuse patients with a positive effect on both sleep “quantity” and “quality” as well as the accompanying depressive symptoms.

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Sleep and cognitive problems in patients with attention-deficit hyperactivity disorder

J. Jeong, N. Kim, T. Kim, H. Lim, S. Hong, J. Han

Department of Psychiatry, St. Vincent Hospital, College of Medicine, The Catholic University of Korea, South Korea

Introduction: Attention-deficit hyperactivity disorder (ADHD) is characterised by inattentive and impulsive behaviour. Many ADHD patients reportedly have cognitive dysfunction and sleep problems, including longer sleep latency, lower sleep efficiency and shorter total sleep time. This study was to examine nocturnal sleep parameters in patients with ADHD using an actigraphy.

Materials and methods: Subjects included 37 male patients with ADHD and 32 controls (7–12 years of age). For each participant, we determined intelligence quotient (IQ) and administered the Matching Familiar Figures Test (MFFT) and 72-h actigraphy. The relationships between sleep parameters and cognitive functions were assessed.

Results: ADHD patients significantly differed from controls in several cognitive functions and sleep variables. In the MFFT, response error rate ($p < 0.001$) and error counts ($p = 0.003$) were significantly increased in ADHD patients compared with control children. MFFT response latency was significantly shorter in ADHD patients than in controls ($p < 0.001$). In addition, sleep latency ($p = 0.01$), wake after sleep onset (WASO) ($p < 0.001$), and fragmentation index ($p < 0.001$) were evaluated by actigraphy and found to be significantly increased in patients with ADHD compared with controls. However, no significant differences in total sleep time or sleep efficiency were observed. WASO and response error rates were positively correlated in patients with ADHD ($\rho = 0.52$, $p = 0.012$). Furthermore, fragmentation index sleep variables were significantly positively correlated with response error ($\rho = 0.44$, $p = 0.008$) and response latency rates ($\rho = 0.4$, $p = 0.018$) in the MFFT. Reaction error rate was significantly associated with the fragmentation index ($\beta = 0.94$, $p = 0.024$).

Conclusion: Patients with ADHD had more sleep problems, including significantly increased sleep latency, WASO and fragmentation index, and poorer cognitive function, compared with controls. Some of these sleep problems, including WASO and the fragmentation index, were positively correlated with impulsivity illustrated by the cognitive function tests in patients with ADHD.

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Methylphenidate effects on sleep after 5-months treatment in children with attention-deficit/hyperactivity disorder. a pilot study

F. Liboni¹, L. Palagini², G. D'Acquinto¹, F. Lenzi¹, A. Tacchi¹, F. Ricci¹, C. Pfanner¹, A. Manfredi¹, M. Mauri², G. Masi¹

¹IRCCS Stella Maris Scientific Institute of Child Neurology and Psychiatry, Calambrone, Pisa, Italy

²Sleep Disorder Clinic, Department of Clinical Experimental Medicine, Psychiatric Unit II, University of Pisa, Italy

Introduction: Sleep problems are frequently reported in children with attention-deficit/hyperactivity disorder (ADHD) with or without methylphenidate (MPH) treatment. The aim of the study is to evaluate sleep consistency in children with ADHD and to look for a correlation between sleep characteristics, ADHD symptom severity and general functioning.

Materials and methods: We selected 15 ADHD patients, according to DSM-IV TR criteria, using K-SADS-PL interview with children and their parent and administering specific questionnaires (Conner's Parent Rating Scale e ADHD-RS). Age range was 6–12 years; we excluded comorbid conditions with known effect on sleep pattern and sleep major disorders (restless leg syndrome, obstructive sleep apnea). Patients were evaluated at T0 (drug naive) and at T1 (after 5 months of MPH treatment; 0.5 mg/kg/die bid). Sleep characterization was made using the Children Sleep and Habits Questionnaire (CSHQ): a parent-report sleep screening survey specifically designed for school-aged children. Clinical Global Impression for Severity (CGI-S) and Improvement scales (CGI-I) and Children's Global Assessment Scale (CGAS) were administered at T0 and T1.

Results: Our population included 13 ADHD children combined type, 2 inattentive type; 14 male and 1 girl; mean age 8.3 ± 1.4 years; comorbidity with oppositional defiant disorder was elevated, being present in 9 out of 15 patients. At T0 11 out of 15 patients showed sleep disorder (CSHQ total score ≥ 41 , mean value $44.6 \pm ds 1.44$). In 12 children parasomnias subscale was positive. Elevated score in CSHQ subdomain such as bed time resistance, sleep anxiety and daytime sleepiness were found. At T1 a reduction of CSHQ mean total value ($=42.8 \pm ds 4.4$) has been registered; 10 out of 15 patients showed CSHQ total score ≥ 41 . The CSHQ' subscales profile was comparable with that observed at T0. CGI-S, CGI-I and CGAS score did not correlate with sleep characteristics ($p = ns$) at T0 and neither at T1.

Conclusion: These preliminary data confirm the hypothesis that ADHD itself is strictly connected with alteration of sleep indeed clinically significant sleep problems are present in drug naive patients. Treatment with MPH does not seem to negatively affect the quality of sleep, according to the most recent scientific literature.

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Relations of sleep disturbances with psychosocial factors in female population aged 25–64 years in Russia: MONICA-psychosocial epidemiological study

V. Gafarov¹, D. Panov², E. Gromova², I. Gagulin¹, A. Gafarova¹

¹ Collaborative Laboratory of Cardiovascular Diseases Epidemiology SB RAMS, Novosibirsk, Russia

² FSBI Institute of Internal and Preventive Medicine SB RAMS, Novosibirsk, Russia

Introduction: To study the prevalence of sleep disturbances (SD) and its relation with other psychosocial factors in female population aged of 25–64 years in Russia/Siberia.

Materials and methods: Under the third screening of the WHO MONICA-psychosocial program random representative sample of women aged 25–64 years ($n = 870$) were surveyed in Novosibirsk. The response rate was 72.5%. Estimation of sleep was assessed by the Jenkins questionnaire. Chi-square test (χ^2) was used to assess the statistical significance.

Results: The prevalence of SD in the female population aged 25–64 years was 65.3%. Poor sleep associates with high personal anxiety more frequently (93.8%) than good sleep ($p < 0.01$). The rate of major depression was fourfold higher in women with poor sleep ($p < 0.001$). Prevalence of high vital exhaustion as well as low close contacts index grows linearly with deteriorating quality of sleep ($p < 0.001$). Changes in marital status are twofold higher and conflicts in family are also increased in women with SD ($p < 0.05$). Those women rarely have the opportunity to relax at home ($p < 0.05$). With regard to job stress poor sleep is associated with stopping or reducing the additional work in two-times higher. Women with SD are three-times more likely to report decline in their working capacity and responsibility at work ($p < 0.001$).

Conclusion: The prevalence of SD in female population aged 25–64 years in Russia is high. SD are often related to high personal anxiety and vital exhaustion, major depression, high job and family stress.

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The role of insomnia in memory complaint among compulsive checkers

M. Wong, C. Leung, E. Lau

Sleep Laboratory, The University of Hong Kong, Hong Kong

Introduction: Compulsive checking behavior has been connected with memory complaints but the mechanism between them was unclear. We previously showed that insomnia symptoms mediated the relationship between checking behaviors and anxiety. Here, we investigated the role of sleep in the checking-memory link with both subjective and objective memory measures.

Materials and methods: We have a cross-sectional design, with a community young adult sample ($n = 100$, mean age = 20.08, female = 60.7%), who completed measures of insomnia (Insomnia Severity Index, ISI), sleep characteristics (sleep timing questionnaire), compulsive checking behavior (Obsessive-compulsive Inventory – Revised checking subscale, OCI-R-checking), subjective complaint on memory (Cognitive Failure Questionnaire Memory subscale, CFQ-memory) and objective measure on memory (Modified Rey Complex Figure Test, RCFT, in which participants were asked to explicitly memorize the figure with the accuracy and reaction time as outcome measures). All experiments were conducted at 1–2 PM to control for circadian effect on cognitive performance. Participants did not have caffeine or alcohol intake 24 hours before the experiment. All participants were screened and did not have acute medical conditions, history of traumatic brain injury, neurological or cognitive dysfunctions, or use of any medication in 2 weeks' time before the study. We hypothesized that checking behavior would be correlated with subjective but not objective measures of memory (by Pearson's r) and insomnia symptoms would mediate the relationship between checking behaviors and subjective memory complaints. Mediation analyses and Sobel test would be used to test this hypothesis. Statistical significance was determined by an alpha value of 0.05.

Results: The sample reported to have 7.37 (standard deviation, SD: 1.17) hours of sleep in weekday and 8.94 (SD: 1.28) hours in weekend. Correlational analyses showed that OCI-R-checking was correlated with CFQ-Memory, $r = 0.283$, $p = 0.010$, but not with the accuracy, $r = -0.012$, $p = 0.314$, or reaction time, $r = 0.033$, $p = 0.542$ of the RCFT. For the mediating role of insomnia on OCIR-checking and CFQ-memory, regression analyses showed that OCI-R-checking significantly predicted CFQ-memory, unstandardized regression coefficient, $B = 0.604$, standard error, $SE = 0.230$, $p = 0.010$. OCI-R-

checking also significantly predicted ISI, $B = 0.475$, $SE = 0.153$, $p = 0.003$. Hierarchical regression analyses (first step with OCI-R-checking and second step with ISI) showed that after controlling for the effect of OCI-R-checking, ISI remained to be a significant predictor of CFQ-memory, $B = 0.552$, $SE = 0.165$, $p = 0.001$. Result from Sobel test showed that ISI significantly mediated the relationship between OCI-R-checking with CFQ-memory, Sobel test = 2.912, $SE = 0.534$, $p = 0.004$.

Conclusion: From a non-clinical sample, checking behavior correlated with subjective but not objective memory measure. Importantly, insomnia symptoms mediated the relationship between checking behaviors and subjective memory complaints. Future studies (E.g. with longitudinal/experimental-design/clinical sample) could study the causal relationship among sleep, memory and anxiety in obsessive-compulsive disorder.

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Does weight influence REM sleep?

A. Gonfalone

European Space Agency (Ex), France

Introduction: Most terrestrial animals, mammals and birds, show a varying amount of REM sleep periods during sleep. Aquatic and semi aquatic animals have a different sleep pattern with reduced or inexistent REM sleep. The weight of the species may be an indication of the duration of REM sleep.

Materials and methods: The search for evidence of weight influence on the REM sleep periods is based on previous results published either in books or on papers on the Internet. Many studies report values of the sleep duration in animals and the REM sleep percentage and the weight of the different species have been listed a long time ago. Values extracted from an extensive survey of the literature have been compiled in a table and a graph showing the trend has been obtained. Mean values are used when indications are too inaccurate.

Results: The total duration sleep of mammals shows a clear dependence on weight. The REM sleep duration has a more subtle relation to weight and a few species are not following the general trend (armadillos, opossums). It is noted that when mammals do have REM sleep they have to lie down like do the horses and the elephants. It is suggested that REM sleep cannot occur if the sensation of weight is present. Fishes in neutral buoyancy have no apparent weight in the water. Semi aquatic animals show an intermediate level of REM sleep.

Conclusion: Data consistently show that REM sleep can occur when the feeling of weight is reduced or compensated and that the body is completely relaxed and disconnected from external influences even the influence of gravity which is a universal and permanent phenomena.

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Sleep stability and transitions in patients with idiopathic REM sleep behavior disorder and patients with Parkinson's disease

J. Christensen^{1,2}, H. Koch¹, R. Frandsen², M. Zoetmulder², L. Arvastson³, S. Christensen³, H. Sorensen¹, P. Jennum^{2,4}

¹ Department of Electrical Engineering, Technical University of Denmark, Denmark

² Danish Center for Sleep Medicine, Department of Clinical Neurophysiology, Glostrup Hospital, Denmark

³ H. Lundbeck A/S, Denmark

⁴ Center for Healthy Aging, University of Copenhagen, Denmark

Introduction: Patients with idiopathic REM sleep behavior disorder (iRBD) are at high risk of developing Parkinson's disease (PD). As wake/sleep-regulation is thought to involve neurons located in the brainstem and hypothalamic areas, we hypothesize that neurodegeneration in iRBD/PD is likely to affect wake/sleep and REM/NREM transitions.

Materials and methods: We determined the frequency of wake/sleep and REM/NREM sleep transitions and the stability of wake (W), REM and NREM sleep as measured by polysomnography (PSG) in 36 patients with PD (52–78 years, 12F/24M), 31 patients with iRBD (45–76 years, 5F/26M), 25 patients with periodic leg movement (PLM) (37–77 years, 12F/13M) and 23 controls (40–73 years, 16F/7M). Measures were computed based on automatic data-driven labeled sleep staging.

Results: Patients with PD showed significantly lower REM sleep stability than controls and patients with PLM and iRBD. Patients with PD also had significantly lower NREM sleep stability and significantly more transitions between REM and NREM sleep than controls, but not compared with patients with iRBD or PLM. Patients with iRBD had significantly lower REM sleep stability compared with patients with PLM and controls.

Conclusion: We conclude that W, NREM and REM sleep stability and transitions are progressively affected in iRBD and PD, probably reflecting the successive involvement of brain stem areas from early on in the disease.

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Olfactory dysfunction in patients with Parkinson's disease complicated REM sleep behavior disorder

T. Nomura ¹, Y. Inoue ², M. Kishi ¹, K. Nakashima ¹

¹ Tottori University, Japan

² Tokyo Medical University

Introduction: Olfactory dysfunction and REM sleep behavior disorder (RBD) frequently occurred in patients with Parkinson's disease (PD). These symptoms were paid attention to not only premotor symptoms of PD but also risk factor to dementia in PD. We evaluated the association between these symptoms in PD.

Materials and methods: Thirty eight patients with PD were examined olfactory examination (Odor Stick Identification Test for Japanese: OSIT-J) and polysomnogram (PSG). We divided these patients into PD with clinical RBD, PD with subclinical RBD, and PD with normal REM sleep. These three groups were compared on the proportion of subjective olfactory dysfunction, each category of OSIT-J, and total scores of OSIT-J by chi square test and a one-way analysis of variance.

Results: Nineteen were categorized as PD with clinical RBD, 7 as PD with subclinical RBD, and 12 as PD with normal REM sleep. There were no significant differences of clinical backgrounds. However, PD with clinical RBD had more patients with subjective olfactory dysfunction than the other groups. There were significant difference of total OSIT-J score among three groups (PD with clinical RBD: 3.4 ± 2.3 ,

PD with subclinical RBD: 4.6 ± 2.0 , PD with normal REM sleep: 6.2 ± 3.1 , $p = 0.014$). A post hoc test revealed that PD group with clinical RBD had significant lower than that with normal REM sleep ($p = 0.011$). PD patients with normal REM sleep had more patients with correct of rose, gas, and perfume than those with clinical RBD.

Conclusion: Olfactory dysfunction was associated with RBD findings. Both these symptoms were important for premotor symptoms and development of risk in patients with PD.

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Increased motor activity during REM sleep is linked with dopamine-function in idiopathic REM sleep behaviour disorder and Parkinson's disease

M. Zoetmulder ^{1,2}, M. Nikolic ³, H. Biernat ², L. Korbo ², L. Friberg ⁴, P. Jennum ⁵

¹ Danish Center for Sleep Medicine, Glostrup Hospital, Denmark

² Department of Neurology, Bispebjerg Hospital, Denmark

³ Department of Clinical Neurophysiology, Glostrup Hospital, Denmark

⁴ Department of Clinical Physiology and Nuclear Medicine, Bispebjerg Hospital, Denmark

⁵ Danish Center for Sleep Medicine, Department of Clinical Neurophysiology, Glostrup Hospital, Denmark

Introduction: Idiopathic rapid eye movement sleep behavior disorder (iRBD) is characterized by impaired motor inhibition and dream-enacting behavior during REM sleep. Longitudinal studies have shown that iRBD-patients have increased risk of developing an α -synucleinopathy. We investigated the relationship between the nigrostriatal-dopamine-system and muscle activity during sleep in iRBD and Parkinson's.

Materials and methods: Ten iRBD patients, 10 PD patients with PD, 10 PD patients without RBD, and 10 healthy controls were included and assessed with 123I-FP-CIT SPECT, neurological examination, and polysomnography.

Results: iRBD patients and PD patients with RBD had increased phasic EMG-activity compared with healthy controls. 123I-FP-CIT uptake in the putamen-region was highest in controls, followed by iRBD patients, and lowest in PD patients. In iRBD patients EMG-activity in the mentalis muscle was correlated to 123I-FP-CIT uptake in the putamen. In PD patients EMG-activity was correlated to anti-Parkinson medication.

Conclusion: Our results support the hypothesis that increased EMG-activity during REM sleep is at least partly linked to the nigrostriatal dopamine system in iRBD, and with dopaminergic medication in PD.

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Sensorimotor gating deficits in multiple system atrophy: Comparison with Parkinson's disease and idiopathic REM sleep behavior disorder

M. Zoetmulder ^{1,2}, H. Biernat ², M. Nikolic ³, L. Korbo ², P. Jennum ⁴

¹ Danish Center for Sleep Medicine, Glostrup Hospital, Denmark

² Department of Neurology, Bispebjerg Hospital, Denmark

³ Department of Clinical Neurophysiology, Glostrup Hospital, Denmark

⁴ Danish Center for Sleep Medicine, Department of Clinical Neurophysiology, Glostrup Hospital, Denmark

Introduction: Prepulse inhibition (PPI) is a measure of sensorimotor gating. PPI has never been studied in patients with multiple system atrophy (MSA), although sensorimotor deficits are frequently associated with synucleinopathies. We investigated PPI in MSA, Parkinson's disease (PD), idiopathic rapid eye movement sleep behavior disorder (iRBD) and healthy controls.

Materials and methods: Ten patients with MSA, 12 patients with iRBD, 40 patients with PD, and 20 healthy controls completed the study. A passive acoustic prepulse inhibition paradigm was applied with prepulses 5 and 15 dB above background noise at 30-, 60-, 120- and 300-ms intervals.

Results: Non-parametric analyses showed that MSA patients had significantly lower prepulse inhibition, as measured with maximum amplitude, than PD patients and iRBD patients on the 60 ms–85 dB and 120 ms–85 dB inter stimulus intervals. The same relation was found when using area under the curve. No differences were found between groups for the 30 ms–85 dB and 300 ms–85 dB. Furthermore, blink reflex characteristics such as habituation did not differ between patients and controls.

Conclusion: We showed that PPI is markedly reduced in MSA, which may be due to brainstem dysfunction, as well as the degeneration of other structures related to the PPI modulating pathways in MSA. PPI may be a non-invasive neurophysiological measure that can aid in the differential diagnosis between PD and MSA.

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Willis–Ekblom disease (WED) and sleep problems in children with Down syndrome (DS)

M. Chan ¹, N. Beyzaei ¹, S. Stockler ², O. Ipsiroglu ¹

¹ Sleep/Wake Behaviours Clinic & Research Lab, BCCH, UBC (Vancouver), Canada

² Division of Biochemical Diseases, BCCH, UBC (Vancouver), Canada

Introduction: Sleep problems are described to start at an early age in children with DS. We hypothesize that patients with DS may experience WED-associated symptoms, such as insomnia and restless sleep, in addition to sleep disordered breathing, a known contributor of daytime sleepiness and hyperactive-like behaviours.

Materials and methods: Sixteen patients (children, youth, and adults) with DS were assessed at the Sleep/Wake Behaviour Clinic with qualitative methodology, utilizing narrative schema and therapeutic employment. Familial WED was diagnosed clinically with: (a) an extended clinical history, which included a sleep/wake behavior assessment of the parents, and (b) a modified version of the lab-based 'Suggested Immobilization Test', called the 'Suggested Clinical Immobilization Test' (SCIT). During the SCIT, implemented since 2011, patients and their parents were asked to sit barefoot in a relaxed position, remain motionless, and describe sensorimotor symptoms. The formal SCIT was conducted when patients could participate actively; otherwise, the physician's observations and parents' descriptions were summarized as an informal SCIT. Data were collected based on (a) patients' descriptions, (b) clinician's observations of sitting position, and (c) of toe, feet, and leg movements. Clinical

presentations and symptoms were (a) captured in reports using the descriptions as the foundation of the clinical diagnoses, (b) quality controlled by parents and therapists, who worked with the patient, and (c) recorded retrospectively in a clinical phenotyping database.

Results: (A) 100% of patients had restless sleep; 88% seemed to experience non-restorative sleep; 81% experienced daytime fatigue, sleepiness, and presented with challenging/disruptive daytime behaviours. (B) Familial sleep history revealed that 81% of parents presented with WED-associated symptoms. (C) One hundred percent of the patients presented with WED-associated symptoms: 75% experienced insomnia (50% falling asleep and 75% sleep maintenance challenges), 19% also experienced secondary behavioural insomnia, and 56% had suspected or confirmed periodic limb movements. (D) Since the introduction of the SCIT, all patients received a professional/parent observation/description based informal SCIT, with 42% demonstrating a positive result; none of the patients with DS could be assessed with a formal SCIT. However, the professionals' observations and descriptions cued additional parental descriptions (e.g. 'sits in yogi positions', 'loves to dance on her tiptoes'). (E) Ninety-four percent presented with sleep disordered breathing: mouth breathing 75%, snoring 63%, witnessed apnea/hypopnea (either currently or historically) 44%, and an atypical head position/reclined head during sleep 31%.

Conclusion: We investigated clinical presentations of patients with DS and sleep problems. Our current understanding is that, in addition to sleep disordered breathing, WED plays an important role; however, due to non-restorative sleep and chronic sleep deprivation, the typical falling asleep symptoms may not be evident. Further structured investigations are necessary.

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Suggested clinical immobilization test (SCIT) for diagnosis of Willis–Ekblom disease in clinical practice

N. Beyzaei ¹, A. Wagner ², M. Berger ¹, R. Milner ³, S. Stockler ⁴, O. Ipsiroglu ¹

¹ Sleep/Wake Behaviours Clinic and Research Lab, BCCH, UBC (Vancouver), Canada

² Sleep/Wake Behaviours Clinic and Research Lab, BCCH, UBC (Vancouver), Austria

³ BC Children's Hospital, Vancouver, Canada

⁴ Division of Biochemical Diseases, BC Children's Hospital, Department of Paediatrics, University of British Columbia, Vancouver, Canada

Introduction: In children/youth/adults with neurodevelopmental conditions we rely on supportive criteria, such as family history, to diagnose WED. We hypothesize that a structured office-based test will improve diagnostic investigations by incorporating subjective symptoms with (objective) behavioural observations.

Materials and methods: Twenty-seven mothers, with history of WED and iron deficiency, were assessed together with their children who had been previously diagnosed with various neurodevelopmental disabilities and also suffered from chronic insomnia. Maternal WED was diagnosed clinically by: (a) clinical history; (b) descriptions of experienced symptoms, and (c) an office-based suggested clinical immobilization test (SCIT), a modified version of the lab-based suggested immobilization test. The SCIT was divided into two components: (a) Formal SCIT: A structured test where clients got up, shook out, sat barefoot in a relaxed position, and remained motionless while they

described any sensorimotor symptoms they experienced. The clinician observed their movement patterns during the test. (b) Informal SCIT: clients described any sensorimotor symptoms they experience during rest on a regular basis, while the clinician observed movement patterns throughout the clinical encounter. Clinical presentations and symptoms were (a) captured in reports, using descriptions and observations as the foundation of clinical diagnosis; (b) shared during the clinical encounter and discussed (clinical employment); (c) distributed to parents in a medical report for quality control; and (d) recorded retrospectively in a phenotyping data-base developed from these records.

Results: Formal SCIT: Of the 27 mothers, 26 participated in the test. One mother could not participate in the formal SCIT due to cultural reasons. All 26 mothers received a positive result based on: sensorimotor sensations (SS) and clinical observations (CO). SS: 100% described difficulties in sitting still and the urge to move, 42% described further leg sensations, 15% described feet/toe sensations, and the remaining could not specify. CO: 63% displayed movement patterns of toes, feet, or legs; 37% were able to stay still but with increased tension in their limbs/body. Informal SCIT: Data were available from all 27 mothers. SS: 96% (26/27) did not specify the sensorimotor sensations in their clinical history. CO: 92% (25/27) of mothers received a positive result based on CO of movement patterns during the clinical encounter (before the formalized test was conducted); 41% (11/27) had constant toe/feet/leg and/or stretching movements; 30% (8/27) increased tension in their legs by raising their heels.

Conclusion: The formal SCIT captures descriptions of sensations and observations in a structured way, while the informal test does not explore SS in a structured way, but focuses on movement patterns. The combined results support the development of a shared language with clients for the diagnosis of familial WED.

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Sleep disturbances in patients with idiopathic restless leg syndrome: Clinical, mood, and polysomnographic comparisons with other sleep disorders

H. Jang, E. Joo, S. Yun, S. Choi, S. Hong

Samsung Medical Center, Sungkyunkwan University School of Medicine, Korea

Introduction: Patients with restless leg syndrome (RLS) suffer from difficulty falling asleep at night due to urge to move and abnormal sensations in the limbs. Sleep of untreated RLS patients would be no better than other sleep disorders, however, there is no comparative study based on clinical and polysomnography data.

Materials and methods: We consecutively enrolled 319 patients with idiopathic RLS, 138 patients with primary insomnia (PI), and 248 patients with obstructive sleep apnea syndrome (OSA). They were all treatment-naïve patients. We compared their clinical, mood, and PSG data.

Results: Mean age of RLS patients was 56.1 years and 57.7% were female. RLS patients exhibited shorter sleep time than OSA, but similar to PI. Mean sleep latency of RLS patients significantly prolonged than OSA, while shorter than PI. Sleep efficiency was the lowest in PI patients and the second lowest was RLS patients. Sleep fragmentation (increased N1 and N2 sleep and decreased N3 sleep) and preserved REM sleep % were found across three sleep disorders. Substantial RLS patients were accompanied with OSA (AHI \geq 5/h, $n = 138$, 43.3%); AHI \geq 15/h, $n = 81$, 25.4%) or periodic leg movement disorder (PLMD) (PLMS index \geq 15/h, $n = 154$, 48.3%). It resulted in

a significant difference of arousal index between patients with RLS ($23.3 \pm 1.3/h$) and with PI ($16.5 \pm 0.7/h$, $p < 0.001$). Mean arousal index was much higher in OSA patients than RLS or PI patients, yet time of wakefulness after sleep onset was significantly higher in RLS or PI patients than OSA patients. RLS or PI patients have significantly higher scores in depressive and anxious mood scales than OSA though the degree of daytime sleepiness was the highest in OSA patients than two other groups.

Conclusion: Nocturnal sleep and mood of RLS patients are markedly disturbed, comparable with PI patients. Coexisting OSA may further deteriorate sleep of RLS patients compared with PI patients, which suggests the necessity of thorough assessment of sleep in RLS patients who seldom complain of sleep-disordered breathing.

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Analysis of BTBD9 conditional knockout mice as models of restless legs syndrome

Y. Li¹, M. Deandrade², F. Yokoi¹

¹ University of Florida, USA

² Harvard Medical School, USA

Introduction: Restless legs syndrome (RLS) or Willis-Ekbom disease is a sensory-motor neurological disorder. No neurodegeneration has been observed in RLS patients, but functional alterations have been reported in the cortex, striatum, cerebellum, and thalamus of the brain. How these different brain regions contribute to the pathophysiology of RLS is not known.

Materials and methods: Genome-wide association studies have led to strong evidence of a genetic contribution in RLS, particularly, an involvement of BTBD9. The function of BTBD9 has not been elucidated, but has been suggested to be involved in iron homeostasis and protein ubiquitination. BTBD9 is expressed almost ubiquitously during development and adulthood. To understand the function of BTBD9 and its potential role in RLS, we generated a line of Btbd9 knockout mice. Using this line of mice we have demonstrated the important role of Btbd9 in regulating synaptic plasticity in the hippocampus. Furthermore, our behavioral analysis of the Btbd9 mutant mice demonstrated several phenotypes directly relatable to RLS, including hyperactivity, sensory deficits, and altered iron homeostasis. Here, we imported a line Btbd9 loxP mutant mice that have loxP sites inserted inside the introns of the Btbd9 gene that will allow us to do conditional knockout of the gene. We crossed this line of mice with Rgs9-cre mice and generated striatum-specific conditional Btbd9 knockout (sKO) mice to determine how different brain regions contribute to the pathophysiology of RLS. We used wheel running, hot plate, and tail flick tests to determine whether the sKO mice show changes in voluntary activity and sensory system.

Results: We generated a cohort of sKO mice for preliminary behavior characterization and analyzed the Btbd9 sKO mice for alterations in wheel running activity. The Btbd9 sKO mice had a strong trend of an increase in voluntary activity during the rest phase ($p = 0.06$), but no change in activity during the active phase ($p > 0.05$). This is particularly relevant to RLS, as symptoms in patients predominantly appear during rest or sleep. We also examined the Btbd9 sKO mice for alterations in sensation to hot stimuli. Previously, we have shown that the Btbd9 KO mice have an increased sensitivity to hot stimuli. Using two standard tests, we measured the latency to respond to a hot stimuli applied to plantar surface of the paw (hot plate) and to the tail (tail flick). We found that the Btbd9 sKO mice had an increase in sensitivity to both these test ($p < 0.05$), suggesting alterations in striatal modulation of the spinal cord reflexes.

Conclusion: Taken together, our results strongly suggest that the central nervous system, and in particular the basal ganglia, are important in the symptoms seen in the Btd9 KO mice, and perhaps RLS symptomatology.

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The prevalence and risk factor of augmentation in Japanese patients with restless legs syndrome receiving pramipexole treatment

M. Takahashi¹, S. Nishida¹, M. Nakamura¹, M. Kobayashi¹, K. Matsui², E. Ito¹, A. Usui², Y. Inoue¹

¹ Department of Somnology, Tokyo Medical University, Tokyo, Japan

² Japan Somnology Center, Neuropsychiatric Research Institute, Tokyo, Japan

Introduction: We conducted a retrospective study to investigate the prevalence and risk factor of restless legs syndrome (RLS) augmentation in Japanese patients under long-term pramipexole (PPX) treatment in clinical settings.

Materials and methods: We analyzed 231 outpatients of our sleep disorder center (40.7% male/59.3% female) who had met the NIH/IRLSSG criteria for the diagnosis of RLS and had been receiving PPX treatment for more than 1 month. The mean PPX treatment duration was 48.5 ± 26.4 months and age at the start of PPX treatment was 60.6 ± 14.9 years. The augmentation was judged by the attending physicians using Max Planck Institute (MPI) criteria for the augmentation. The clinical descriptive variables were compared between patients with augmentation (augmentation group) and those without augmentation (no augmentation group). The factors associated with augmentation were also examined using multiple logistic regression analysis. The receiver operating characteristic (ROC) curve was used to determine the cut-off value for the dose of PPX predicting the occurrence of augmentation.

Results: The augmentation was recognized in 9.1% of the patients. Augmentation Severity Rating Scale total score (ASRS) was 9.4 ± 3.0 points. The mean daily dose of PPX in the augmentation group was significantly higher than that in the no augmentation group (0.419 mg/day vs 0.248 mg/day, $p < 0.001$). However, differences in sex, age, body mass index and of total score of International Restless Legs Syndrome Study Group rating scale (IRLS) were not observed between the groups. A multiple logistic regression analysis revealed that daily PPX dose was only the factor associated with the presence of augmentation ($p < 0.001$). The ROC curve revealed that the cut-off value of daily dose of PPX for predicting the occurrence of the augmentation was 0.375 mg/day (area under the curve = 0.811 , sensitivity = 0.714 , specificity = 0.757 , positive predictive value = 0.227 , negative predictive value = 0.964 , positive likelihood ratio = 2.94 , negative likelihood ratio = 0.377).

Conclusion: Our study showed that RLS augmentation under long-term PPX treatment was not rare in Japanese patients. The daily dose of PPX was the only risk factor associated with RLS augmentation, suggesting the importance of keeping patients on low doses of PPX so as to prevent from causing the augmentation.

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The increase of leg motor activities in Parkinson's disease accompanied with sleep apnea

K. Xiong, Y. Shen, C. Liu, J. Huang

Department of Neurology, Second Affiliated Hospital of Soochow University, Suzhou, Jiangsu 215004, China

Introduction: Parkinson's disease (PD) not only manifests typical motor symptoms, but also exhibits upper airway dysfunction. Restless legs syndrome (RLS) and periodic limb movements in sleep (PLMS) are common in PD. The interaction between RLS/PLMS and obstructive sleep apnea (OSA) in PD remains unclear.

Materials and methods: One hundred twenty-six PD patients were recruited in this study. All participants underwent comprehensive clinical investigation and video-polysomnography (vPSG). Clinical issues are evaluated, including cognitive function, depression, hypersomnia, blood pressure before and after sleep and severity of RLS. Sleep architecture, sleep apnea parameters, and the index of PLMS (PLMSI) were assessed.

Results: The PD subjects were split to two subgroups according to apnea-hypopnea index (AHI). PD with OSA ($n = 39$) was defined as AHI equal to or greater than 15, PD without OSA was determined as AHI less than 5 ($n = 32$). PD with OSA had higher prevalence of RLS (%) and PLMSI than PD without OSA (27.3% vs 19.1% and 39.5 ± 21.1 vs 21.7 ± 18.6 , all $p < 0.05$). Increased PLMI in PD patients with OSA ($AHI \geq 5$, $n = 94$) was significantly associated with more awakenings ($r = 0.179$, $p < 0.05$), more PLM related arousals ($r = 0.239$, $p < 0.05$), higher systolic pressure after sleep ($r = 0.198$, $p < 0.05$), but not lower Montreal Cognitive Assessment (MOCA) scores ($r = 0.148$, $p = 0.082$). Also, compared with PD without OSA, PD with OSA had significantly higher oxygen desaturation index (ODI) (9.42 ± 4.34 vs 3.50 ± 1.42 , $p < 0.05$) and lower nadir SaO₂ (88.49 ± 11.34 vs 91.30 ± 8.04 , $p < 0.05$), whereas worse sleep efficiency (%) (51.36 ± 27.04 vs 67.06 ± 16.60 , $p < 0.001$), and higher Epworth Sleepiness Scale (ESS) score (7.49 ± 2.34 vs 5.90 ± 4.25 , $p < 0.05$), but no significant change on MOCA scores (23.49 ± 5.34 vs 25.10 ± 4.36 , $p = 0.056$).

Conclusion: This study demonstrated that leg motor activities obviously increase in PD patients accompanied with OSA. Sleep fragmentation and daytime sleepiness are affected either by PLM or OSA in PD. Cognitive impairment is mostly caused by other, non-leg motor or apneic mechanisms in PD.

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Sleep quality in sleep bruxism patients using oral appliances: A retrospective analysis of two studies

S. Abe¹, N. Huynh², P. Rompré², A. Landry-Schönbeck², M. Landry², P. De Grandmont², F. Kawano¹, G. Lavigne²

¹ University of Tokushima, Japan

² Université De Montréal, Canada

Introduction: Oral appliances are used to prevent tooth damage and pain caused by sleep bruxism (SB). The objective of the present study was to assess sleep quality in patients using two types of oral appliances.

Materials and methods: A retrospective analysis of 21 sleep bruxism subjects (25.7 ± 1.0 years) was done on data previously collected in our sleep laboratory. The inclusion criteria were: frequent tooth-grinding sound reported by a sleep partner or family member occurring as least three times a week over previous 6 months, tooth grinding-sleep bruxism confirmed by polygraphic recordings with audio/video monitoring. We compared night of sleep without oral appliance vs. sleep with occlusal splint (OS) or mandibular

advancement appliances (MAA) at the 75% advancement position. Sleep with appliance was tested after a period of 7 nights of habituation. Sleep quality and oral appliance comfort was assessed on morning using 100 mm VAS. Rhythmic masticatory muscle activity (RMMA), a biomarker of SB was scored from jaw electromyographic recordings during sleep using published criteria. RMMA index (# event/h) and sleep variables were compared between the baseline night (no appliance) and the ones with the two kinds of appliances using ANOVA or Friedman test. Questionnaire data were compared between OS and MAA nights with the Wilcoxon signed rank test. Statistical significance was set at $p < 0.05$.

Results: Total sleep time of each experiment night was divided into three sections from sleep onset. There was no interaction between conditions and three night sections ($p = 0.66$). However, there were significant difference among conditions in second part of night ($p = 0.01$): during the OS and MAA nights the index of RMMA/SB episode/h of sleep was lower than during the baseline night ($p = 0.01$ and $p < 0.001$, respectively). Index of RMMA bursts and episodes with noise during night showed the same trend. Moreover, OS nights showed a significant reduction of index of phasic and mixed episodes than baseline night ($p = 0.04$ and $p = 0.05$, respectively) However, for tonic episodes, no significantly difference among baseline night, OS, and MAA was observed. During OS night sleep efficiency and percent of Stage N2 (light sleep) period were significantly higher than during baseline ($p < 0.01$ and $p = 0.04$, respectively). There was a reduction of N3 (deep sleep) and of awakening index during the OS night in comparison with the baseline night ($p = 0.05$ and $p < 0.001$, respectively). No effect was observed between MAA and baseline night for sleep variables. Subjects evaluated the OS as providing better sleep quality (median OS = 82.8, MAA = 57.5, $p = 0.05$) and comfort (median OS = 79.3, MAA = 16.5, $p < 0.001$) than MAA.

Conclusion: The RMMA index of SB was reduced using either OS or MAA. Only OS seem to improve overall sleep quality and comfort; MAA was not better than OS. Use of smaller and more comfortable MAA for SB subjects with snoring and/or sleep apnea is to be tested.

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Effect of coronary artery bypass grafting surgery on sleep apnea in Omani patients

M. Al Hooti
SQU, Oman

Introduction: Coronary artery bypass grafting surgery (CABG) is an effective way of treating coronary artery disease (CAD). Prevalence of obstructive sleep apnea (OSA) causing hypoxic stress is higher in patients with CAD. This study is aimed at evaluating effect of CABG on sleep apnea in Omani patients undergoing CABG.

Materials and methods: Patients with severe ischemic heart disease posted for CABG were recruited for the study. Portable sleep study was performed in the in-patient ward 1 day before the surgery, and sleep study was repeated on 6th and the 30th day of the surgery. All patients underwent on-pump CABG. Patients who had blood pressure of more than 200/120 and post prandial glucose more than 10 mmol were rejected.

Results: Thirty-two patients volunteered to participate in the study (28 males; 4 females; age 62.6 ± 9.6 years). Twenty patients

completed all three sleep studies. Pre-CABG study indicated that all patients had sleep apnea (AHI: 37.05 ± 4.95) which persisted on day 6 and day 30. The baseline desaturation index was 21.38 ± 3.27 . There was no significant difference in obstructive sleeps apneas, hypopneas, apnea-hypopnea index, mean saturation index, maximum saturation index and desaturation index amongst pre CABG study and day 6 and day 30 of CABG ($p > 0.05$). Central sleep apnea (CSA) was found to be reduced on day 6 post-surgery but increased again on day 30 (Pre CABG: 12 ± 17 ; Day 6: 6 ± 12 ; Day 30: 27 ± 66 ; $p > 0.05$).

Conclusion: All patients undergoing CABG had moderate to severe obstructive sleep apnea-hypopnea syndrome. The CABG did not change the sleep apnea parameters.

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Compliance to CPAP therapy in patients with severe obstructive sleep apnea

A. Aladab¹, A. H², I. A², A. A², A. A², M. A², A. O²

¹ College of Medicine, King Saud University, Riyadh, Saudi Arabia
² Saudi Arabia

Introduction: Positive airway pressure (PAP) therapy is considered the gold standard treatment for obstructive sleep apnea. Compliance with treatment is a major obstacle for the success of treatment. Compliance among Saudi patients has not been documented objectively before. This prospective study to objectively determine compliance, and to identify predictors of compliance.

Materials and methods: The main objective was to determine the specific reasons that could help patients to compliance with their adherence to CPAP, and improve their comorbid illness. The selected patients who were >18 years old and suspected to have OSA during the two year period between December 2010 to January 2012, had undergone type 1 PSG (polysomnography), have had AHI of more than 10 events/h. Objective assessment by full night diagnostic PSG and subsequent laboratory titration studies had been performed after first 2 h of recording according to study protocol was used. Exclusion criteria include any patients who had chronic pulmonary disease, daytime hypercapnia, congestive heart failure, neuromuscular disease, and was on home oxygen therapy. In the first 2 weeks of CPAP therapy patient underwent three training session on (day 1, day 7, day 14). Then a follow up in the clinic was done at 2 and 4 weeks after CPAP therapy. During each follow-up visit, patients complete data entry form and received training on their devices. Compliance with CPAP was determined at each visit subjectively and filling a questionnaire at each visit assessed the patients' concerns. Good compliance was defined as using CPAP for >4 h/night for $>70\%$ of the recorded period.

Results: Total of 156 patients recruited in the study period with a mean age of 52.6 ± 12.8 years, BMI of 38.1 ± 8.8 kg/m², Epworth Sleepiness Scale (ESS) of 10.0 ± 5.8 and an apnea-hypopnea index (AHI) of 66.1 ± 34.6 /h. During CPAP device titration in the sleep disorders center (SDC) 94.9% accepted titration with good objective improvement in sleep quality and respiratory events. All CPAP devices were provided with heated humidifiers. At 1 month, 56% met the criteria of good compliance. By the end of 10 months there was no difference in compliance between males and females (56.9% vs. 54.2%) and between patients who used conventional CPAP or auto-titrating CPAP (44.4% vs. 42.3%). However, patients who purchased their CPAP devices had better compliance compared with patients who obtained it free from the hospital (59.7% vs. 47.2%). There were no differences regarding demographics data, symptoms, comorbidities, PSG parameters, AHI or type of mask used. Most

common adverse effects were mask discomfort (35.4%), mouth and nose dryness (35.4%) and eye irritation (7.1%). Since there was no universal definition of compliance, it was defined by mean hours of daily use, which was over 4 hours as shown in our data. During follow up visit, ESS scores were improved and there was decrease in sleepiness.

Conclusion: CPAP compliance among Saudi OSA patients is relatively low. Close follow up, proper training and encouragement on CPAP therapy improve adherence, but there was no difference between compliant and non-compliant of similar gender and age. University Sleep Disorder Centre (USDC) had its own strategies to improve compliance, by education and intervention.

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Assessment of fatigue in obstructive sleep apnea by using salivary human herpes virus (HHV)-6 and HHV-7 reactivation as a biomarker

R. Aoki, N. Kobayashi, W. Yamadera, M. Iwashita, K. Kondo, H. Itoh, K. Nakayama

The Jikei University School of Medicine, Japan

Introduction: Complaints of fatigue are frequent in patients with obstructive sleep apnea (OSA). However, medical studies relating to “fatigue” have only been fragmentarily conducted, and hardly any studies have been done on decisive means or quantitative standards for quantitatively and objectively expressing “fatigue”, which is a subjective symptom.

Materials and methods: Viruses belonging to the herpes virus family can lie dormant in the body for long periods and are known to be reactivated by fatigue. Human herpesvirus (HHV)-6 and HHV-7 are the causative agent of exanthema subitum and establish latency in almost all individuals. These viruses reactivate frequently and are shed in saliva, and have a potential to be a useful biomarker for physical fatigue. Fifty-five patients with diagnosed OSA were enrolled in this study. Sixty-five control subjects were also recruited. Subjective fatigue was measured with Profile of Mood State-Short form Fatigue subscale (POMS-F), and depressive mood was measured with Beck depression inventory (BDI). The study was approved by the Ethics Committees of The Jikei University School of Medicine. Written informed consent was obtained from each subject. A sample of saliva was collected from all participants. Viral DNA was extracted from 400 µl samples of saliva by automatic isolation with the BioRobot EZ1 workstation and EZ1 virus mini kit v2.0 (QIAGEN). Copies of HHV-6 and HHV-7 DNA in the saliva samples were quantified by real-time PCR.

Results: There were no significant differences between OSA and healthy control on the self-rated fatigue POMS-F and HHV-6 DNA copy numbers. HHV-7 DNA copy numbers are significantly decreased in OSA than controls. In the OSA patients, POMS-F scores are not correlated with HHV DNA copy numbers. On the other hand, POMS-F scores are correlated with BDI scores.

Conclusion: HHV-6 and HHV-7 are biomarkers for physical fatigue. However, reactivation of HHV-6 and HHV-7 is not observed in patients with OSA. Depressive symptoms have association with fatigue in OSA; therefore, the fatigue in OSA is a mental symptom.

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Neuro-cognitive assessment in obstructive sleep apnea syndrome (OSAS) versus primary insomnia patients: A comparative study in an Egyptian sample

T. Asaad¹, A. Said²

¹ Psychiatry, Egypt

² Neurology, Egypt

Introduction: Cognitive impairment is a common complaint in both OSAS and primary insomnia, hypothesized to be possibly related to the attentional capacity impairment. The aim of the present study was to objectively evaluate the cognitive profile, mainly executive functions, in OSAS patients, compared with patients with primary insomnia.

Materials and methods: The study included 20 patients with OSAS (moderate to severe), diagnosed depending on both clinical and PSG criteria, in addition to 20 age and sex-matched patients, diagnosed as primary insomnia (PSG-guided), as well as 20 matched healthy subjects. Exclusion criteria included subjects above 45 years (to exclude the mere effect of age on cognitive testing), and the presence of either psychiatric or major medical comorbidity, including the use of psychotropics as sleep aids in the past 2 weeks prior to assessment. All subjects were assessed using the following neuropsychological tests: Trail Making Test (TMT), parts A and B, Digit Span Test, Digit Symbol Substitution Test (DSST), Wisconsin Card Sorting Test (WCST), and Go/No Go Test for Recognition Reaction Time Measurement. Both OSAS and primary insomnia patients were further assessed by Epworth Sleepiness Scale, as a measure of severity of daytime sleepiness.

Results: Patients with OSAS showed significantly more impairment in all cognitive tasks considered ($p < 0.05$), compared with both healthy controls and patients with primary insomnia. On the other hand, patients with primary insomnia differed significantly from controls in only Recognition Reaction Time Test, more impairment being correlated with the severity of daytime sleepiness in Epworth Scale.

Conclusion: Executive dysfunction in OSAS was not similarly shown in patients with primary insomnia, hence, it could not be entirely attributed to the mere presence of attentional capacity decrement, but other factors do play a role, like the detrimental effect of chronic hypoxia on brain functioning, especially PFC.

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Familial aggregation of obstructive sleep apnoea in children without tonsillar hypertrophy

C. Au¹, J. Zhang², Y. Wing², A. Li¹

¹ Department of Paediatrics, The Chinese University of Hong Kong, Hong Kong

² Department of Psychiatry, The Chinese University of Hong Kong, Hong Kong

Introduction: Adenotonsillar hypertrophy is the major cause of childhood obstructive sleep apnoea (OSA). It is unclear whether the

presence of OSA in parents affects the occurrence of OSA in children. This study aimed to investigate if OSA in either parent is a risk factor for childhood OSA independent of tonsillar size.

Materials and methods: A total of 124 trios with a child/adolescent aged 6–18 years was recruited. All cases and their parents underwent in-hospital and home nocturnal polysomnography respectively. Tonsillar size of the index subjects was assessed with the standard Brodsky grading system. Significant interaction was observed by tonsillar size of index subjects and family history of OSA ($p = 0.015$); therefore index cases who had minimal (grade I) or no tonsils (grade 0) and those with prominent tonsils (grade II–IV) were analyzed separately.

Results: Within the group of minimal or no tonsils, 23 out of a total of 46 index subjects had at least one parent with moderate-to-severe OSA (defined as an obstructive apnoea–hypopnoea index (OAH) of 15/h or more). Compared with those without a parent having moderate-to-severe OSA, subjects whose parent had the disease had a significantly higher OAH [0.4/h (0–0.8), c.f. 1.2/h (0.3–3.4), $p = 0.036$] as well as a higher prevalence of OSA (defined as an OAH $> 1/h$, 21.7%, c.f. 52.2%, $p = 0.032$), while the two groups had similar age, body size and sex ratio. These findings were not seen in subjects with prominent tonsils.

Conclusion: Tonsillar hypertrophy was the major cause of childhood OSA that if present, the effect of family history may be masked. In contrast, the presence of OSA in parents may indicate a higher risk for OSA in children without tonsillar hypertrophy. These children should be identified for early investigation.

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Familial aggregation of obstructive sleep apnoea using children probands – Obesity makes the difference

C. Au¹, J. Zhang², Y. Wing², A. Li¹

¹ Department of Paediatrics, The Chinese University of Hong Kong, Hong Kong

² Department of Psychiatry, The Chinese University of Hong Kong, Hong Kong

Introduction: There are only very few studies investigating the familial aggregation of obstructive sleep apnoea (OSA) based on paediatric subjects. This study aimed to examine familial aggregation of OSA using paediatric probands. We hypothesized that first-degree relatives of children with OSA have more severe OSA than those of children without OSA.

Materials and methods: Children aged between 6 and 18 years who attended our paediatric sleep disorder clinic with symptoms suggestive of OSA were invited to undergo nocturnal polysomnography (PSG). Children with obstructive apnoea hypopnoea index (OAH) between 1 and 5/h were defined as having mild OSA, while those with OAH $\geq 5/h$ had moderate-to-severe OSA. Control subjects without habitual snoring were recruited from a concurrent population-based epidemiological study. Parents and siblings of both cases and controls were also invited to undergo nocturnal PSG. Data analysis was performed to examine if first degree relatives of children with OSA had higher OAH than those of children without OSA using generalized estimating equations. Subgroup analyses were performed to see if childhood OSA had significant association specifically with OSA in fathers, mothers or siblings. Separate analyses were also performed for families of overweight and normal weight children.

Results: Two hundred and twenty-two children were recruited, of whom 32 had moderate-to-severe OSA, 67 had mild OSA and 123 were controls. A total of 398 first-degree relatives participated, of whom 59 were of children with moderate-to-severe OSA, 120 were of children with mild disease and 219 were of healthy controls. We found that OAH of first-degree relatives of children with moderate-to-severe or mild OSA did not differ significantly to those of controls after adjustment for age and gender ($p > 0.25$). Separate analyses for fathers ($p > 0.65$), mothers ($p > 0.06$) and siblings ($p > 0.3$) all showed negative findings. Subgroup analysis for families of normal weight children also revealed similar negative result ($p > 0.7$). Nevertheless, for families of overweight children, first-degree relatives of children with moderate-to-severe OSA had significantly higher log-transformed OAH than those of children with milder disease even after adjustment for age, gender and body mass index (adjusted mean OAH = 4.1/h, c.f. 2.2/h, $p = 0.047$).

Conclusion: First-degree relatives of overweight children with moderate-to-severe OSA had significantly higher OAH than those of children with milder disease. Similar results could not be obtained from families of normal weight children. This suggests that significant familial aggregation of OSA may only exist in families of overweight children.

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Familial aggregation of habitual snoring using children probands

C. Au, A. Li

Department of Paediatrics, The Chinese University of Hong Kong, Hong Kong

Introduction: Family studies of habitual snoring (HS) using paediatric probands are lacking in the current scientific literature. This study aimed to examine familial aggregation of habitual snoring using paediatric probands, and we hypothesized that first-degree relatives of children with HS were more likely to have HS.

Materials and methods: Children aged between 6 and 18 years were recruited from attendants to the sleep disorder clinic. Parents were asked to complete a validated sleep symptoms questionnaire. Children reported to snore for at least three nights per week in the past 12 months were considered as having HS. Control subjects without HS were recruited from a concurrent population-based epidemiological study. Parents and siblings of both cases and controls were also invited to complete a self-reported and a parent-reported questionnaire, respectively, to determine whether they had HS. Data analysis was performed using generalized estimating equations to examine if first degree relatives of children with HS had higher odds of having HS when compared with controls. Separate analyses were performed for families of overweight and normal weight children.

Results: A total of 62 children with HS and 74 children without HS were recruited. A total of 295 first-degree relatives participated, of whom 133 (including 59 fathers, 62 mothers and 12 siblings) were of children with HS and 162 (including 70 fathers, 68 mothers and 24 siblings) were of controls. The results showed that first-degree relatives of children with HS had significantly higher odds of having HS [OR adjusted for age, gender and body size = 1.9 (95% CI: 1.1–3.4), $p = 0.022$]. Subgroup analysis revealed that the odds ratio was only significant in family members of normal weight children [adjusted OR = 2.4 (95% CI: 1.2–4.8), $p = 0.011$] but not in those of overweight children [adjusted OR = 1.6 (95% CI: 0.6–4.1), $p = 0.31$].

Conclusion: Heritability of HS was demonstrated only in families with normal weight child proband. Obesity is a known risk factor for development of snoring, and it may mask the familial aggregation pattern of HS.

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Long-term CPAP therapy follow-up: Reasons for patients' contacts with the sleep unit

H. Avellan-hietanen, A. Bachour, P. Brander

Sleep Department Helsinki University Hospital, Finland

Introduction: Continuous positive airway pressure (CPAP) is the gold standard therapy for obstructive sleep apnea (OSA). There is no consensus about the modality or the frequency of long-term follow-up. In our Sleep Unit, CPAP treated patients are routinely followed up by regular contacts at 12–24 months intervals.

Materials and methods: All CPAP patients (N = 2575) followed up in our Sleep Unit longer than 12 months were included. The patients were divided into two groups: those with a contact at the routine date, i.e. scheduled (S) contacts only, and those with non-scheduled (N-S) contacts as well, i.e. occurring before the scheduled contact. The patients' characteristics and CPAP therapy results in the S and N-S groups were analyzed.

Results: Up to October 2014, data from 580 patients (160 women), age (mean \pm SD) 61 ± 11 years, body mass index (BMI) 33 ± 7 kg/m² and CPAP duration 82 ± 97 months, were collected. Of these patients, 479 (83%) belonged to the S group and 101 (17%) to the N-S group. During the scheduled contact in the S group, 437 patients (91%) had no problems; 23 (5%) had symptoms (mainly sleepiness and nasal stuffiness), 5 (1%) had problems with the CPAP mask/device, 4 (1%) had non-CPAP related problems, and 10 (2%) patients showed abnormal CPAP-report findings. These 10 had an age-related Charlson comorbidity index significantly ($p = 0.011$) higher (2.60 ± 2.99) than the other S patients (0.96 ± 1.99). All 101 patients in the N-S group had problems, 16 patients showed symptoms, 34 mask/device related problems, 44 non-CPAP related problems, and 7 patients had abnormal CPAP-report findings.

Conclusion: One fourth of long-term CPAP patients presented problems during the follow-up contact and one fifth contacted us before their scheduled contact mainly for problems not related to the CPAP mask or CPAP device.

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Oral appliance (OA) vs. CPAP in the treatment of mild obstructive sleep apnea (OSA): Are they equally effective in short term health outcomes?

L. Bittencourt

Universidade Federal de São Paulo, Brazil

Introduction: If patients with only mild OSA needs be treat and what is the better treatment is not well established. The aim of this study was to evaluate the effectiveness of CPAP versus OA in mild OSA patients.

Materials and methods: OSA patients of both genders, $18 \leq \text{Age} \leq 65$ years, $\text{BMI} \leq 35$ kg/m², $5 \leq \text{AHI} \leq 15$ events/h were selected. In total sample of 60 volunteers, 38 individuals were evaluated after 6 months,

distributed as: Control group (n = 12); OA group (n = 13); CPAP group (n = 13). Assessment of: mood (Anxiety and Depression Beck Inventory-BAI and BDI); quality of life (Functional Outcomes of Sleep Questionnaire – FOSQ); clinical examination, full overnight polysomnography, blood tests, Ambulatory Blood Pressure Monitoring (ABPM), peripheral arterial tone (EndoPAT) and Psychomotor vigilance task (PVT) performance were realized. The comparison of the variation of health outcomes among groups was performed using the General Linear Model (GLM) (post-hoc Sidak). Considered $\alpha \leq 0.05$.

Results: CPAP was better at improving polysomnographic parameters (delta changes): arousal index (OA: -1.48 ± 4.78 , control: 1.62 ± 4.02 , CPAP: -7.93 ± 8.22 , $p = 0.001$); AHI (OA: 4.29 ± 2.98 ; control: 0.03 ± 6.17 , CPAP: -9.03 ± 2.72 , $p < 0.001$); index of desaturation in REM (OA: -7.40 ± 12.62 , control: -0.09 ± 13.49 , CPAP: -29.26 ± 14.54 , $p < 0.001$), index of desaturation in NREM (OA: -3.62 ± 4.99 , control: -3.02 ± 5.16 , CPAP: -10.03 ± 10.45 , $p = 0.04$). CPAP decreased more lapses (OA: 1.61 ± 8.95 , control: -3.33 ± 9.34 , CPAP: -8.36 ± 11.12). The OA was better to improve (delta change) the average diastolic value vigil (OA: -3.75 ± 5.70 , control: -0.90 ± 6.61 , CPAP: 2.58 ± 3.09 , $p = 0.02$) and the quality of life (general average, OA: -0.21 ± 2.46 , control: 0.65 ± 1.21 , CPAP: 2.24 ± 2.34 , $p = 0.01$; and social outcomes, OA: -0.15 ± 0.31 , control: 0.12 ± 0.43 , CPAP: 0.50 ± 0.73 , $p = 0.01$).

Conclusion: In 6 months of treatment CPAP was the better treatment than OA considering sleep parameters and attention, while OA was the better treatment in quality of life and cardiovascular parameters of patients with mild OSA.

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Improvements in sleep apnea endpoints and quality of life are related to the degree of weight loss: Results from the randomized, double-blind scale sleep apnea trial

A. Blackman¹, G. Foster², R. Rosenberg³, L. Aronne⁴, T. Wadden⁵, B. Claudius⁶, C. Jensen⁶, G. Zammit⁷

¹ Toronto Sleep Institute, MedSleep, Toronto, ON, Canada

² School of Medicine, Temple University, Philadelphia, PA, USA

³ Neurotrials Research, Atlanta, GA, USA

⁴ Weill Cornell Medical College, New York, NY, USA

⁵ Perelman School of Medicine, University of Pennsylvania, PA, USA

⁶ Novo Nordisk, Soeborg, Denmark

⁷ Clinilabs Sleep Disorders Institute, New York, NY, USA

Introduction: The relationship between weight loss and endpoints related to sleep apnea and quality of life in the SCALE Sleep Apnea trial was examined post hoc.

Materials and methods: Obese adults (72% male, mean age 49 years, apnea-hypopnea index [AHI] 49.2 events/h, body weight 117.6 kg) with moderate or severe obstructive sleep apnea (OSA) and unable or unwilling to use continuous positive airway pressure therapy were treated with liraglutide 3.0 mg (n = 180) or placebo (n = 179), both as adjunct to diet and exercise counseling, for 32 weeks. Pre-specified ANCOVA model included treatment, country and gender as fixed effects and baseline age, BMI, parameter value as covariates. Post hoc analyses also included % weight change covariate and examined its interactions with other effects (Clinicaltrials.gov ID: NCT01557166).

Results: Liraglutide 3.0 mg reduced AHI (-12.2 vs. -6.1 events/h, $p = 0.015$) and body weight (-5.7 vs. -1.6% , $p < 0.0001$) vs. placebo after 32 weeks. AHI reduction was significantly associated with weight loss, irrespective of treatment. The reduction in AHI per % weight loss depended on baseline AHI, with reductions

of 0.7, 1.4, 2.8 events/h for baseline AHI cohorts <30, 30–59 and ≥60 events/h (both groups, $p < 0.0001$). Greater weight loss was also significantly associated with greater improvements in oxygen saturation, sleep architecture and quality of life endpoints ($p < 0.01$, all).

Conclusion: Greater improvements in sleep apnea endpoints and quality of life were significantly associated with greater weight loss, irrespective of treatment. Greater weight loss was more likely with liraglutide. The liraglutide 3.0 mg safety profile was generally consistent with that seen with liraglutide in type 2 diabetes.

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Clinical observation on effect of auto-CPAP on blood pressure in OSAHS patients

Y. Chang¹, Y. Ma², S. Sun¹

¹ Guang'anmen Hospital, China Academy of Chinese Medical Sciences, China

² Eye Hospital, China Academy of Chinese Medical Sciences, China

Introduction: As a safe approach for obstructive sleep apnea–hypopnea syndrome (OSAHS) caused hypertension, efficacy of CPAP on blood pressure has been proven to be affirmative, mild, and variable. The purpose of this study was to observe the blood pressure changes with time with abnormal blood pressure after auto-CPAP treatment.

Materials and methods: According to the latest AASM standard, 20 subjects diagnosed as OSAHS with abnormal blood pressure were included based on polysomnography (PSG) diagnosis, mean age (46.3 ± 11.1) years old, mean BMI (28.9 ± 2.9) kg/m², 17 male, all had no other complications. Auto CPAP (RESmartG II, BMC Medical Co.Ltd.) was used for 1 week standard treatment, with no less than 6 hours each night. Treatment of 30% subjects has been extended to 2 weeks. Twenty-four hour ambulatory blood pressure (24 h ABP) was monitored at baseline, first week and second week. Routine medication was recommended during the treatment. Epworth sleepiness scale (ESS) was used at each visit.

Results: After 1 week treatment, daytime SBP and DBP decreased 7.1 and 4.1 mmHg respectively, while nighttime SBP and DBP did not show significant changes. No significant difference was observed between group with routine antihypertensives ($n = 8$) and group with non-medications ($n = 12$). At daytime, the decrease of DBP was negatively correlated with baseline ESS score ($r = -0.593$, $p < 0.01$) and BMI ($r = -0.975$, $p < 0.05$). Age and the severity of AHI and LSaO₂ do not indicate any association with the efficacy of CPAP on blood pressure. In the group of extended treatment, no difference was found in the second week, compared with the first week.

Conclusion: Because auto-CPAP on blood pressure showed its effects mainly in the first week, we suggested that 24 h ABP of first week CPAP should be a reference to OSAHS patients with hypertension, which may indicate their further medication or intervention. Future studies are needed with longer treatment and large sample size.

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Prevalence of obstructive sleep apnea in an ambulatory colonoscopy clinic

S. Chien¹, S. O'Connell-Goff¹, S. Tang², K. Chien², S. Ho²

¹ Trillium Sleep Center, Canada

² Canada

Introduction: Obstructive sleep apnea (OSA) is associated with perioperative complications requiring sedation. There has been an increased frequency of outpatient endoscopic procedures. The prevalence of OSA in this setting is not known. The objective of this study is to estimate the prevalence of OSA in an ambulatory colonoscopy clinic.

Materials and methods: A prospective observational study was conducted in an ambulatory colonoscopy clinic between January and June 2014. Adults (age > 30) referred to the clinic for colonoscopy were screened for OSA based on three criteria: (1) The STOP-Bang questionnaire (>2); (2) BMI > 30; and (3) perioperative desaturation. Patients were considered positive if they met two of the three criteria. They were interviewed and advised to undergo a polysomnographic (PSG) study.

Results: During the study period, 1671 patients had colonoscopy performed. All were screened, with 171 (10.3%) screening positive. Of the 171 who screened positive, 62 consented to undergo a sleep study. Among the 62 patients who had the sleep study, 55 had OSA based on the scoring criteria with RDI (respiratory disturbance index) > 5, with a positive predictive value (PPV) of 89% (confidence interval of $\pm 1\%$). The prevalence of OSA in the clinic is estimated at 8.9–9.2%. Eighteen patients (29%) had moderate OSA (RDI 15–30) and 31 patients (50%) had severe OSA (RDI >30). Seventy percent of patients (10/14) with BMI > 30 and STOP-Bang score >2 had severe OSA. The study is limited by the fact that 2/3 of screened positive patients declined PSG study, which may lead to selection bias.

Conclusion: OSA is common in this outpatient colonoscopy clinic. It is estimated that 9% of the patients had OSA. Furthermore, majority of the patients with STOP-Bang score > 2 and BMI > 30 had severe OSA. These patients require close monitoring for perioperative complications.

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Undiagnosed obstructive sleep apnea and post-operative outcomes: A prospective observational study from tertiary care center

U. Devaraj¹, S. Rajagopala², A. Kumar¹, P. Ramachandran¹, G. D'Souza¹, P. Devereaux³

¹ St. John's Medical College and Hospital, India

² Jawaharlal Nehru Institute of Postgraduate Medical Education & Research, India

³ McMaster University, Hamilton, ON, Canada

Introduction: The prevalence of undiagnosed obstructive sleep apnoea–hypopnea syndrome (OSAHS) during preoperative evaluation and the best method to screen for OSAHS and its association with postoperative complications (PCs) remains unclear.

Materials and methods: This study was conducted in a large tertiary care hospital in South India between July 2011 and February 2013. All patients undergoing non-cardiac surgery were identified by the pre-operative surgical list obtained from the department of surgery a day prior to the surgery. From this master-list of patients, elective non-cardiac surgeries in adults under general anaesthesia were identified. Exclusion criteria included

a prior diagnosis of OSAHS, preoperative pneumonia, obstructive lung disease, chronic respiratory failure, day-care surgeries, concurrent administration of sedatives and lack of consent by physician or patient. The STOP-BANG questionnaire was administered on all. A prospective cohort of 245 patients with ≥ 2 risk factors for OSAHS was formed. One hundred eighty-two out of two hundred forty-five (74.2%) patients underwent pre-operative level III sleep study. OSAHS was defined by an apnoea–hypopnoea index (AHI > 5). All enrolled patients underwent continuous pulse oximetry monitoring for 24 hours following the surgery and a chest radiograph at 72 hours. Patients were followed until discharge and telephonically on day 30 after surgery for development of defined PCs. These were defined as the development of any of the combined respiratory PCs (pneumonia OR sepsis OR respiratory failure), combined cardiovascular PCs (myocardial infarction OR congestive cardiac failure OR stroke), arrhythmias and postoperative desaturation.

Results: Seventy out of one hundred eighty-two (38.5%) of patients that underwent pre-operative sleep study had a new diagnosis of OSAHS, including 11/182 (6%) with moderate-severe OSAHS (AHI > 15). The mean age of the OSAHS cohort was 52.7 ± 11.5 years; using an age > 50 years as a nominal cut-off, 51/70 (72.8%) vs 45/112 (40.2%) had a diagnosis of OSAHS [OR 4, 95% C.I. 1.9–8, $p < 0.001$]. Using a mean neck circumference of > 40 cm, 13/70 (18.6%) vs 5/107 (4.7%) were classified as having OSAHS [O.R 4.8, 95% C.I. 1.5–16.6, $p < 0.002$]; with a BMI > 35 kg/m², 5/70 (7.1%) vs 3/112 (2.7%) had a diagnosis of OSAHS [OR 2.79, $p = 0.26$]; Weight, neck circumference and a STOP-BANG score ≥ 3 were significantly different in patients with OSAHS as compared with patients without OSAHS. PCs, as defined by the presence of any complications by day 7, and post-operative desaturation was significantly higher in patients with any OSAHS. There was a higher prevalence of every pre-defined PCs and hospital length of stay in patients with severe OSAHS. On logistic regression, however, the presence of OSAHS was not independently associated with PCs. STOP-BANG questionnaire did not identify 12/70 (17%) of patients with diagnosed OSAHS and misclassified 28% of the cohort.

Conclusion: Unrecognized OSAHS is common during preoperative evaluation of a surgical patient. The independent effect of OSAHS on PCs needs to be studied in larger prospective multicentric studies. Level III sleep study can supplement STOP-BANG to reliably exclude OSAHS during preoperative evaluation.

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Treatment effects with short-term continuous positive airway pressure on blood glucose control in type 2 diabetic patients with obstructive sleep apnea syndrome

X. Dong¹, C. Wei², Z. He³, H. Yan¹, J. Li¹, P. An¹, L. Zhao¹, Z. Gao¹, F. Han¹

¹ Department of Respiratory and Critical Care Medicine, People's Hospital, Peking University, China

² Department of Endocrine Medicine, First Affiliated Hospital, Baotou Medical College, China

³ Department of Respiratory and Critical Care Medicine, Central Hospital, Karamay City, Xinjiang Uygur [Uighur] Autonomous Region, China

Introduction: Obstructive sleep apnea syndrome (OSAS) is often associated with impaired glucose metabolism. Data on the effects of OSAS treatment with CPAP on blood glucose and insulin resistance are conflicting. The study aimed at assessing the short-term

effect of CPAP on glucose control measured with a continuous glucose monitoring system (CGMS).

Materials and methods: Twenty-four T2DM patients with OSAS (mean age 55.0 ± 9.0 years; body mass index 29.5 ± 5.2 kg/m²) underwent two overnight polysomnographic examinations: a diagnostic study and one with CPAP titration. Then they were treated by CPAP during sleep for the following three nights. CGMS was applied over the all 5 days. Glucose metabolism was assessed with plasma insulin and homeostatic model assessment of insulin resistance (HOMA-IR) index.

Results: The mean (\pm SD) apnoea–hypopnea index (AHI) at diagnostic polysomnography was 51.2 ± 22.4 (range 10–88) events/h. CPAP treatment in the subjects with OSAS resulted that all of the major saturation parameters improved significantly on CPAP. CGMS showed mean nocturnal and whole-day glucose values significantly lower after CPAP treatment than at baseline (7.67 ± 2.58 mmol/l vs 6.97 ± 1.90 mmol/l, $p = 0.008$; and 8.52 ± 2.76 mmol/l vs 7.66 ± 1.84 mmol/l, $p = 0.027$). Fasting plasma insulin levels and HOMA-IR were also decreased significantly after CPAP treatment (13.0 ± 7.5 μ U/ml vs 10.8 ± 5.4 μ U/ml, $p = 0.044$; and 4.2 ± 2.2 vs 3.1 ± 1.7 , $p = 0.003$, respectively).

For the 14 treat-naïve diabetic patients with OSA, short term CPAP treatment caused significant decreases of blood glucose level during night (7.24 ± 1.51 vs 6.77 ± 1.65 , $p = 0.017$), during daytime (8.53 ± 2.58 vs 7.51 ± 1.42 , $p = 0.018$), and even the whole 24 h (7.97 ± 1.31 vs 7.52 ± 0.94 , $p = 0.033$). The SD and MAGE of 24 h glucose significantly decreased after CPAP treatment (1.91 ± 1.10 vs 1.61 ± 1.20 , $p = 0.014$; 1.26 ± 1.13 vs 1.01 ± 0.98 , $p = 0.008$). It also induced a significant decrease of HOMA-IR (3.65 ± 1.93 vs 2.79 ± 1.68 , $p = 0.047$).

Conclusion: CPAP treatment in OSAS with type 2 diabetic patients may decrease the blood glucose level, glucose variability and insulin sensitivity.

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Obstructive sleep apnea: Impact on daytime functioning and quality of life

S. ElGhonemy

Neuropsychiatry Department, Ain Shams University, Egypt

Introduction: Shallow, fragmented sleep that is caused by arousals in patients suffering from obstructive sleep apnea (OSA) is not restorative and contributes to excessive daytime sleepiness with impact on overall functioning. This will negatively impact the overall individual's functioning and his/her quality of life.

Materials and methods: Ongoing study investigating the impact of OSAS and its severity on individuals' function and their quality of life.

Results: The study is designed as a case–control cross-sectional study, in which 20 adult patients with recently diagnosed OSA were eligible for the study. Diagnostic criteria for OSA included: (1) an apnea–hypopnoea index ≥ 15 (an apneic event being defined as a cessation of the oronasal flow for at least 10 s, and hypopnea, as a 50% decrease in the nasal pressure signal associated with a desaturation $> 3\%$, and/or arousal will be recruited from the outpatient sleep psychiatric clinic of the Institute of Psychiatry, Ain Shams University. The patient group will be compared with a control group including 10 healthy volunteers matched for age, sex, and social standard selected from among employees of the Institute of Psychiatry, Ain Shams University. Both groups will be subjected to GHQ and generic form of QoL questionnaire before undergoing an overnight PSG.

Conclusion: Statistical analysis of the data will be carried out and the final results will be presented at a time.

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Insomnia–sleepiness relationship: A cross-sectional study of 3808 polysomnographies

C. Fiori^{1,2}, E. Martins^{1,2}, R. Da Silva^{1,2}, C. Montanari^{2,3}, B. Peukert^{2,3}, M. Fagundes^{1,2}, M. Pedroso^{1,2}, L. Sezerá², D. Martinez^{1,2,3}

¹ Graduate Program in Cardiology and Cardiovascular Sciences, Universidade Federal do Rio Grande do Sul (UFRGS)

² Cardiology Unit, Hospital de Clínicas de Porto Alegre (HCPA – UFRGS), Brazil

³ Graduate Program in Medical Sciences, Universidade Federal do Rio Grande do Sul (UFRGS)

Introduction: Sleep apnea with insomnia has been described as a syndrome. The aim of the present study was to evaluate whether it is possible to predict the need of polysomnography to exclude sleep apnea in patients with a complaint of subjective insomnia.

Materials and methods: We used a database of 3808 patients over 18 years, of both genders, who underwent baseline polysomnography in a sleep clinic. They were grouped according with excessive daytime sleepiness. The criterion for excessive daytime sleepiness was a score higher than 10 in the Epworth Sleepiness Scale. The criteria for insomnia were: (1) a chief complaint of insomnia; (2) reporting difficulty to initiate or maintain sleep, early awakening, or non-restorative sleep; (3) answering to a question on how much suffering difficulty in initiating or maintaining sleep had caused in the past 7 days. Depression scores were evaluated although questions from the “National Institutes of Health Patient Reported Outcomes Measurement Information System” (NIH-PROMIS) calibrated item banks on depression. To keep the practicality of the questionnaire, 10 questions from each bank were selected beforehand by a psychologist, to form scales of depression. In brief, the questionnaire asks: “In the past seven days. . .” and lists several symptoms. For each question the patient could respond: never (1), rarely (2), sometimes (3), often (4), always (5). The summed scores of depression ranged from 10 to 50 each.

Results: In the total sample of 3808 patients, 63% were men, the mean age was 45 ± 14 years, and the mean body mass index was 29.6 ± 5.9 kg/m². The Epworth Sleepiness Scale > 10 was seen in 56% (95% CI: 54.4–57.6). The obstructive sleep apnea (apnea–hypopnea index > 5) was shown in 74% of the sample. Only 13.2% (95% CI: 12.1–14.3) had insomnia as chief complaint, but 43.2% (41.6–44.8) had difficulty to initiate sleep, 44.2% (42.6–45.8) to maintain sleep, 46.8% (45.2–48.4) early awakening, and 66.8% (65.3–68.3) non-restorative sleep. All these complete criteria for insomnia diagnosis were present in 37.7% (36.2–39.2) of the total sample. Logistic binary model was performed to predict excessive daytime sleepiness. The variables that remained significant in the model were: age > 40 years (OR = 0.65; 95% CI = 0.49–0.86), AHI > 15 (OR = 1.51; 95% CI = 1.13–2.01), depression scores (OR = 1.83; 95% CI = 1.45–2.32), tiredness on waking (OR = 2.09; 95% CI = 1.71–2.56), and insomnia (OR = 0.55; 95% CI = 0.45–0.67). These variables explain 11% of the sleepiness (Nagelkerke R² = 0.11).

Conclusion: The present study showed that the variables sleep apnea, depression scores, and tiredness on waking, were more related to excessive daytime sleepiness, in accordance with previous studies. Therefore, subjects with complaint of subjective insomnia should be investigated for sleep apnea.

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Polysomnographic, demographic, and clinic differences between male and female obstructive sleep apnea patients

M. Erdemir Isık, B. Gulbay, T. Acican, F. Çiftçi
Department of Chest Disease, Ankara University School of Medicine, Turkey

Introduction: OSAS is more frequently diagnosed in male patients than females. Gender difference’s effect on OSAS is not widely studied. Aim of this study is to find the effects of gender differences in the symptoms, demographic and polysomnographic parameters in OSAS patients.

Materials and methods: Total of 216 (100 female and 116 male) patients diagnosed with OSAS (AHI ≥ 5/sa) in our Sleep Laboratory between the years 2011 and 2014 are included in this study. Demographic properties including age and gender, body mass index (BMI), symptoms related to OSAS, and ESS results of patients are recorded. PSG data of all patients were evaluated in the study.

Results: The average age of female patients (57.2 ± 9.1) was significantly higher than male patients (50.9 ± 11.8) (p < 0.05). Additionally, the average BMI value of female patient group (35.4 ± 9.2) was higher than male patients (32.5 ± 6.7) (p < 0.05). However no statistically significant difference is found between the two groups in terms of symptoms related to the OSAS and coincidental diseases (p > 0.05). The average number of obstructive apnea (56 ± 129) as well as the average duration of obstructive apnea (17 ± 5.8) was higher in male patients (p < 0.05 for both domain). Apnea–hypopnea index (AHI) was statistically higher in men compared with women (p < 0.05). Despite AHI NREM was higher in male patients and AHI REM was higher in female patients, the difference was not statistically significant (p > 0.05 for both domain). While mild and moderate OSAS were observed more frequently in female patients, severe OSAS was more frequent in male cases (p < 0.05 for both domain).

Conclusion: Female OSAS patients were older, more obese and had lower AHI values. Despite lower AHI values, female OSAS patients have similar symptoms and PSG findings with males, which must be remembered during the evaluation by the clinician.

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Compliance improvement to use CPAP for patients with obstructive sleep apnea diagnosed by portable device

S. Ha¹, D. Lee¹, V. Abdullah¹, C. Van Hasselt²

¹ Ear, Nose & Throat Department, United Christian Hospital, Hong Kong

² Department of Otolaryngology, Head and Neck Surgery, The Chinese University of Hong Kong, Hong Kong

Introduction: Patients with obstructive sleep apnea diagnosed by polysomnography or portable sleep test were shown to have same adherence to continuous positive airway pressure. A portable sleep test can advance the continuous positive airway pressure treatment. We would like to try to improve the compliance for this group of patient.

Materials and methods: Subjects without using continuous positive airway pressure and with a positive result in a questionnaire call STOP-BANG were recruited to our study in Ear, Nose and Throat Department in the United Christian Hospital. They were arranged to conduct a diagnostic test, Watch-PAT, and a home polysomnography simultaneously. If the result of Watch-PAT respiratory disturbance index is higher than or equal to 20/hour, they will be randomly allocated into either the supportive arm or the non-supportive arm. In the supportive arm, subjects received an information sheet and watched a video about obstructive sleep apnea and continuous positive airway pressure and received a phone call weekly to encourage the subjects to use the continuous positive airway pressure and helped them solve the problem they faced when using it. They could take all of the four masks and the auto-titration machine home and tried the four masks randomly by their preference for 6 weeks. In the non-supportive arm, they selected one of the four masks in the hospital by their preference and took the selected mask and the auto-titration machine home and used it for 6 weeks.

Results: Fifteen subjects met the criteria and were recruited to our study. Eleven out of 15 subjects had Watch-PAT respiratory disturbance index higher than or equal to 20/hour. For the 11 subjects, the mean age is 52.09 and seven of them are males. Five subjects were randomized into supportive arm and six subjects were randomized in non-supportive arm. Among the five subjects randomized into supportive arm, four (80%) of them reported they would continue to use continuous positive airway pressure for treatment. Among the six subjects randomized into non-supportive arm, two (33.33%) of them reported they would continue to use continuous positive airway pressure for treatment. Comparing between the two arms, the reported average time used were 5.52 and 5.28 hours respectively between supportive arm and non-supportive arm. The recorded average time used were 4.60 and 4.07 hours respectively between supportive arm and non-supportive arm. The reported daily used were 28.20 and 20.50 days respectively between supportive arm and non-supportive arm. The recorded daily used were 27.00 and 10.67 days respectively between supportive arm and non-supportive arm.

Conclusion: It showed that the subjects were more willing to use continuous positive airway pressure with the support from the hospital, including telling the subjects the consequences of obstructive sleep apnea and giving them different masks to use at night. All subjects exaggerated the reported usage of continuous positive airway pressure.

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Obstructive sleep apnoea in indigenous and non-indigenous population

S. Heraganahally, A. Kruavit
Royal Darwin Hospital, Australia

Introduction: Prevalence of obstructive sleep apnoea (OSA) in general population is well known. However there is scarce data regarding the prevalence of OSA in Australia, in particular, among its Indigenous population in comparison with the Non-Indigenous population. We aimed to evaluate the presence of OSA in Indigenous and Non-Indigenous Australians.

Materials and methods: This is a 2-year observational study, comparing the Non-Indigenous and Indigenous populations who were referred for a sleep study with a clinical suspicion of OSA between 2011 and 2012. Demographic data were analysed. Each sleep study was performed either as a full monitored or as an ambulatory study. Respiratory event scoring was performed in accordance with the American Academy of Sleep Medicine's Manual (2007).

Results: There were a total of 395 Non-Indigenous patients and 124 Indigenous patients. Although BMI showed similar cohorts, the Indigenous cohort showed a higher proportion (75% vs 65%) of those in the obese range. The Indigenous cohort had a higher prevalence of hypertension (56% vs 31%), heart disease (40% vs 15%) and diabetes (43% vs 8%). Both the overall AHI and REM AHI were also significantly higher within the Indigenous population ($p < 0.001$ and $p < 0.001$ respectively). The overall AHI for the Indigenous and the Non-Indigenous groups were 32.5 ± 28.4 per hour and 26.0 ± 26.8 per hour respectively. The Indigenous cohort had a higher percentage of patients with severe SDB (AHI > 30/h) (43.1% vs 28.5%). The overall prevalence of OSA in this study for mild, moderate and severe OSA were 83.8%, 53.3% and 31.5% respectively.

Conclusion: This study demonstrated that severe OSA and other cardiovascular co-morbidities are highly prevalent overall, but more so among the Indigenous patients. Early recognition of suspected OSA is essential, as prompt treatment improves health outcomes.

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Continuous positive airway pressure treatment and liver enzymes in sleep apnea patients

M. Hobzova¹, O. Ludka², R. Stepanova³, E. Sovova⁴

¹ Department of Respiratory Medicine, Faculty of Medicine and Dentistry, Palacky University Olomouc, Czech Republic

² Department of Internal Medicine and Cardiology, University Hospital, Brno, Czech Republic

³ International Clinical Research Center, St. Anne's University Hospital, Brno, Czech Republic

⁴ Department of Internal Medicine Cardiology, Faculty of Medicine and Dentistry, Palacky University Olomouc, Czech Republic

Introduction: Obstructive sleep apnea (OSA) has been suggested to be an independent risk factor for liver disease, possibly via intermittent hypoxemia. In observational studies, OSA has been associated with elevated levels of liver enzymes. The effect of continuous positive airway pressure (CPAP) on liver enzymes has not been sufficiently studied.

Materials and methods: We prospectively studied 179 consecutive patients (89% men, age 53 + 10 years) with moderate to severe OSA who were indicated for the treatment with CPAP. All subjects underwent sleep evaluations using a polysomnography or polygraphy. Plasma levels of aspartate-aminotransferase (AST), alanine-aminotransferase (ALT), gamma-glutamyl transferase (GGT) and alkaline phosphatase (ALP) were measured before treatment and after 1 month and 1 year of CPAP treatment to determine if 1 month and 1 year of CPAP treatment influence AST, ALT, GGT and ALP plasma levels.

Results: AST levels decreased from $0.56 + 0.31$ to $0.54 + 0.26$ (after 1 month) and $0.51 + 0.28$ ukat/l (after 1 year) ($p = 0.301, 0.018$), ALT from $0.74 + 0.48$ to $0.67 + 0.36$ and $0.65 + 0.39$ ukat/l ($p = 0.013, 0.038$), GGT from $0.87 + 0.61$ to $0.90 + 0.99$ and $0.79 + 0.62$ ukat/l ($p = 0.750, 0.140$) and ALP from $1.41 + 0.39$ to $1.40 + 0.41$ and $1.29 + 0.40$ ukat/l

($p = 0.970, < 0.001$). AHI decreased from $58.61 + 23.91$ to $8.38 + 13.23$ and $5.89 + 6.21$ events per hour ($p < 0.001, < 0.001$).

Conclusion: One month and 1 year of CPAP treatment has positive effect on liver enzymes in patients with moderate to severe OSA. There was a significant difference between pre and post treatment levels of AST, ALT and ALP. It may suggest a liver-protective role of CPAP treatment.

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Upper airway anatomy can affect compliance with continuous positive airway pressure

S. Hong, H. Kim, G. Ryu

Department of Otorhinolaryngology – Head and Neck Surgery, Samsung Medical Center, Sungkyunkwan University School of Medicine, Korea

Introduction: Compliance with continuous positive airway pressure (CPAP) treatment remains a primary concern for improving treatment outcomes of obstructive sleep apnea (OSA). There are few studies that have considered the role of upper airway anatomy in compliance with CPAP. We hypothesized that upper airway anatomy would influence CPAP compliance.

Materials and methods: Retrospective review of prospectively collected data from sequential case series. One hundred fifty adult OSA patients (136 male and 14 female, mean age = 50.6 ± 10.4 years, mean body mass index [BMI] = 26.8 ± 4.0 kg/m², mean apnea–hypopnea index [AHI] = 47.9 ± 22.7 episodes/h) who decided to start CPAP were enrolled. Compliance was calculated as the average daily CPAP use time. The correlations between average daily CPAP use time and diverse variables such as demographics, polysomnographic parameters, and upper airway anatomy including physical examination and cephalometric parameters were evaluated.

Results: In multivariate analyses, non-smoker, less alcohol consumption, a longer distance between the mandibular plane and the most anterosuperior point of the hyoid (MP-H), and a shorter posterior airway space (PAS) were independent predictors of daily CPAP use time.

Conclusion: The findings suggest that upper airway anatomical parameters, in particular, narrower oro- and hypopharyngeal airway may be important factors in determining the CPAP compliance.

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Association between metabolic syndrome, non-alcoholic fatty liver disease and obstructive sleep apnea syndrome in Korean adults

S. Hong¹, C. Kim², R. Chae¹, I. Park³, S. Lee³, K. Lee¹

¹ Department of Otorhinolaryngology – Head and Neck Surgery, Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, South Korea

² Workplace Wellness Design Institute, Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, South Korea

³ Department of Otorhinolaryngology – Head and Neck Surgery, Korea University College of Medicine, South Korea

Introduction: Obstructive sleep apnea syndrome (OSAS) is associated with cardiovascular risk factors and some factors which are components of metabolic syndrome (MS). OSAS and non-alcoholic fatty liver disease (NAFLD) are frequently encountered in obese patients. The purpose of this study was to investigate the association between OSAS and MS, NAFLD.

Materials and methods: The subjects included in this cross-sectional study comprised 172 adults (mean age 47.9 ± 8.5 years) who participated in a comprehensive health checkup program. All subjects had undergone portable polysomnography (Watch PAT) and abdominal ultrasound examination. Blood samples were collected from the antecubital vein after overnight fasting and fasting blood glucose (FBS), total cholesterol (TC), triglycerides (TG), low-density lipoprotein cholesterol (LDL-C), high density lipoprotein cholesterol (HDL-C) were measured. Fatty liver index (FLI) was calculated to quantify liver steatosis. Two groups were defined according to apnea–hypopnea index (AHI): AHI < 15 (normal to mild) and $15 \leq$ AHI (moderate to severe).

Results: According to AHI, 94 subjects (54.7%) are AHI < 15, and 78 (45.3%) had moderate to severe OSA ($15 \leq$ AHI). A significant increase was observed in TG, body weight, BMI, blood pressure levels, and a decrease in HDL-C levels was observed with an increase in OSA severity ($p < 0.001$). After analysis of abdominal ultrasonographic findings and fatty liver index according to OSA severity, moderate to severe OSA (AHI ≥ 15) patients have significant correlation with the presence of NAFLD ($p < 0.05$).

Conclusion: Our results showed that metabolic components were independently correlated with the severity of OSA. Our study revealed that moderate to severe OSA patients are highly associated with NAFLD.

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Inflammatory cytokines in pediatric obstructive sleep apnea

C. Cheng¹, Y. Huang¹, C. Guillemainault²

¹ Sleep Center and Child Psychiatry Department, Chang Gung Memorial Hospital and University, Taipei, Taiwan

² Stanford University Sleep Medicine Division, Stanford, CA, USA

Introduction: Empirical studies have showed that systemic chronic inflammation is associated with pediatric OSA. This study aims at investigating pro-inflammatory cytokines, particularly IL-17, a pleiotropic cytokine produced largely by a unique CD4+ Th-helper (Th) subset called Th17 cells, and IL 23.

Materials and methods: Eighty-two children, 3–12 years participated in the study. Inclusion criteria are based on polysomnogram (PSG) findings and clinical symptoms. (1) Individuals without snoring, and obstructive apnea index (AHI) < 1 are the non-OSA group; (2) OSA subjects had symptoms and AHI > 1. Exclusion criteria: adenotonsillectomy, neurological and severe psychiatric diseases, heart disease, seizure, thyroid dysfunction and severe obesity. Participants had overnight PSG followed by blood withdrawal and neurocognitive and psychological function evaluations the following morning. Parents filled questionnaires evaluating quality of life and clinical pediatric sleep symptoms. Plasma samples were analyzed for: high sensitivity-C reactive protein (HS-CRP), tumor necrosis factor alpha (TNF- α), interleukins 1 (IL-1), 6 (IL-6), 10 (IL-10), 17 (IL-17) and 23 (IL-23). Results were compared with clinical symptoms, PSG findings, neurocognitive functions results.

Results: Eighty-five non-obese children (F:M = 32:53, mean age = 7.86 ± 3.10 years, with boys: 8.12 ± 2.96 versus girls: 7.14 ± 3.43 years; body mass index [BMI] = 18.26 ± 4.86 kg/m², BMI z score = 0.45 ± 1.31) were enrolled that included 30 healthy control

children (F:M = 12:21, mean age = 7.98 ± 2.68 years, with boys: 8.05 ± 2.76 versus girls: 7.60 ± 2.59 years; [BMI] = 17.91 ± 2.10 kg/m², BMI z score = 0.28 ± 1.00) without symptoms and AHI less than 1/hour (mean AHI = 0.54 ± 0.47 /hour). There were 52 OSA children (F:M = 20:32, mean age = 8.05 ± 3.33 years, with boys: 8.17 ± 3.14 versus girls: 7.01 ± 3.70 years; [BMI] = 19.03 ± 5.26 kg/m², BMI z score = 0.68 ± 1.32) with clinical symptoms and mean AHI = 10.35 ± 13.80 /hour at PSG. Serum analyses (controls versus OSA): HS-CRP (mg/l): 0.40 ± 0.20 and 1.88 ± 3.26 p = 0.002* and IL17 (pg/ml): 8.93 ± 5.35 and 14.08 ± 9.09 , p = 0.029* were the only significant results. IL23 had a non-significant trend: 12.14 ± 3.90 and 14.37 ± 4.56 , p = 0.056.

Conclusion: Th17 is a subset of T helper cells playing a role in development of auto-immunity and allergic reactions and its high expression level may contribute to complications of pediatric OSA.

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Comparison of curative effects of 112 cases of children with OSAHS before and after intervention

J. Huang, Y. Lin, K. Xiao, X. Sun, T. Zhang

The EENT Hospital of Fudan University, China

Introduction: We compare curative effects of 112 cases of children with OSAHS before and after intervention to supply the evidences for clinical treatment.

Materials and methods: We selected 112 children with severe OSAHS (boys: 85, 3–13years old) who came to the EENT Hospital of Fudan University by using PSG and Urumqi draft diagnosis (AHI > 20/h) during 2/2008 to 6/2011. Meanwhile we evaluate them by using disease-specific quality of life for children with obstructive sleep apnea 18 items survey (OSA-18) before and after the intervention; the duration of follow-up is 6–48 months.

Results: In our study, 66.3% (55/83) children chose surgery for treatment, and the rate of notable improvement is 81.8%. 14.5% (12/83) children chose medication including intranasal steroids, antiallergic agent and traditional Chinese medicine for treatment, and the rate of notable improvement is 58.4%. Interestingly, we found there are no significant differences between the notable improvement of surgery, medication and no therapy. Data were statistically assessed using chi-square test (p > 0.05).

Conclusion: For this specific population of children, we cannot ignore the medications treatment and regular follow-up effect. Surgery is the main treatment for children with severe OSAHS, but not the only means, carefully grasp the indications and timing of operation in children with OSAHS.

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Analysis of sleep quality after uvulopalatopharyngoplasty in patients with obstructive sleep apnea based on cardiopulmonary coupling analysis

H. Lee¹, K. Lee¹, H. Kim², S. Jung², E. Joo²

¹ Yonsei University, South Korea

² Samsung Medical Center, Sungkyunkwan University School of Medicine, South Korea

Introduction: Uvulopalatopharyngoplasty (UPPP) is the most common surgical procedure performed for the treatment of obstructive sleep apnea (OSA) which may contribute to decline a quality

of life. We evaluate the changes of sleep quality based on cardiopulmonary coupling (CPC) analysis in patients with OSA in treatment with UPPP.

Materials and methods: We enrolled 51 OSA patients who underwent UPPP and had no cardiovascular abnormalities. CPC analysis induced from a single-channel electrocardiogram (ECG) was employed to evaluate changes of sleep quality before and after UPPP surgery. ECG signal was measured during full-night sleep and sampled at 200 Hz with 16-bit resolution using a recording system (N7000, Embla System Inc., USA). Paired t-test was performed to determine the significance of differences of CPC parameters (high-frequency coupling, HFC, 0.1–0.4 Hz; low-frequency coupling, LFC, 0.01–0.1 Hz; very low-frequency coupling, VLFC, 0.001–0.01 Hz; and elevated low-frequency coupling, e-LFC, a subset of LFC) before and after UPPP surgery. Correlation analysis was conducted to determine the significance of differences of CPC parameters with polysomnographic (PSG) indices (time in bed, TIB; total sleep time, TST; sleep latency, SL; REM sleep latency, REM L; sleep efficiency, SE; apnea–hypopnea index, AHI; respiratory disturbance index, RDI; arousal index, AI; wakefulness after sleep onset, WASO, min and %; N1%; N2%; N3%; REM %; and lowest oxygen saturation, SpO₂).

Results: In PSG indices after UPPP surgery, AHI, RDI, AI, and N1% were significantly decreased (AHI: 28.2 to 19.8, p = 0.032; RDI: 33.5 to 24.5, p = 0.019; AI: 29.1 to 22.6, p = 0.036; and N1%: 20.9 to 15.7, p = 0.012). No statistically significant differences were found in CPC parameters after UPPP compared with before one (HFC: 44.4 to 50.8, p = 0.103; LFC: 42.9 to 37.1, p = 0.130; VLFC: 12.3 to 11.7, p = 0.715; e-LFC: 24.1 to 24.0, p = 0.298). Differences of AHI, RDI, AI and N1% were significantly correlated with those of each HFC, LFC and e-LFC (vs AHI: –0.46, 0.53, and 0.56; vs RDI: –0.45, 0.53, and 0.53; vs AI: –0.45, 0.54 and 0.59; and vs N1%: –0.40, 0.47, and 0.45; p < 0.001 in all cases). AHI, RDI, AI and N1% before UPPP were significantly correlated with changes of each HFC, LFC, and e-LFC (vs AHI: .42, –0.4, and –0.41; vs RDI: 0.46, –0.46, and –0.42; vs AI: 0.49, –0.50, and –0.52; and vs N1%: 0.37, –0.41, and –0.31; p < 0.05 in all cases). However, none of the PSG indices after UPPP were significantly correlated with changes of any CPC parameters.

Conclusion: Paired t-test results revealed that the UPPP significantly improve sleep quality in terms of PSG indices and CPC parameters. Correlation results suggest that CPC parameters may be sensitive tools to determine sleep quality for patients with OSA treated with UPPP.

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Is sleep disturbances in men with obstructive sleep apnea syndrome related to libido?

J. Mun, E. Joo, S. Yun, S. Choi, S. Hong

School of Medicine, Samsung Medical Center, Sungkyunkwan University, South Korea

Introduction: Hyposexuality is defined as diminished sexual drive or libido. Yet, there has been little research into the sexuality in patients with obstructive sleep apnea syndrome (OSA) who are suffering from sleep disturbances. The aim of this study was to investigate the prevalence of hyposexuality libido and the relating factors for reduced libido in OSA men.

Materials and methods: We enrolled consecutive 198 male (mean age 48.3 years, 18–81) were enrolled who were newly diagnosed with OSA through polysomnography. All completed Symptom checklist-90 (SCL-90), Epworth sleepiness scale (ESS), Beck depression inventory (BDI), and Beck anxiety inventory (BAI). Subjects answered to the question number 5 in SCL-90 “Loss of sexual interest or pleasure” with 0 (not at all) to 4 (extremely). Subjects were divided into normal (score 0) and hyposexuality (score 1–4) groups.

Results: One hundred ten of 198 subjects (55.6%) answered feeling hyposexuality (score 1). Significant correlations were found between scores of hyposexuality and following factors; age ($\rho = 0.248$), BDI ($\rho = 0.450$), BAI ($\rho = 0.410$), and ESS ($\rho = 0.221$). The percentage of N3 sleep was negatively correlated with scores of hyposexuality ($\rho = -0.184$). Apnea–hypopnea index (AHI) of subjects was significantly correlated with ESS ($r = 0.230$), the N1 sleep % ($r = 0.596$), N2 sleep % ($r = -0.540$) and N3 sleep % ($r = -0.195$), and lowest oxygen saturation ($r = -0.641$). The number of nocturia was positively correlation with AHI ($\rho = 0.320$). Compared with normal group, subjects with hyposexuality showed significantly lowered total sleep time (380.2 min vs. 359.1 min), and sleep efficiency (83% vs. 76%). The scores of hyposexuality was significantly correlated with BDI ($\rho = 0.330$), BAI ($\rho = 0.253$), and N3 % ($\rho = -0.215$) in subjects with hyposexuality.

Conclusion: About half of untreated OSA men reported diminished sexual drive. Age, daytime sleepiness, and depressive mood increase, the severity of hyposexuality increases. Total sleep time as well as sleep efficiency may affect libido in untreated men.

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Correlation of optimal CPAP pressure with Epworth sleepiness score, body mass index, collar size and apnoea–hypopnoea index obtained by polysomnography in patients with obstructive sleep apnoea in a tertiary health care centre

A. D. K

Kerala Institute of Medical Sciences, India

Introduction: Treatment of choice for OSA is CPAP therapy. CPAP with an optimal pressure effectively abolishes sleep disordered breathing. Our study is to determine the possible correlation of optimal CPAP pressure obtained from titration studies to ESS, BMI, collar size and AHI of patients with OSA.

Materials and methods: This was an observational study conducted among patients presented to respiratory medicine OPD with clinical features suggestive of OSA during 1 year period from August 2013 to July 2014. During the period of study 150 patients were subjected to PSG and CPAP titration. Basic data of patients along with ESS, BMI and collar size were collected before subjecting the patients to Level 1 polysomnography in Sleep Lab. AHI and optimal CPAP pressure were obtained from the sleep study and CPAP titration study. The correlation between different parameters with optimal CPAP pressure was assessed using appropriate statistical tools.

Results: Statistical analysis showed that there was a positive correlation of CPAP titration pressure with ESS, BMI, collar size and AHI. Those having higher values were requiring higher pressures for abolishing the obstructive events. But the correlation with only AHI and ESS were statistically significant.

Conclusion: ESS and AHI had statistically significant correlation with CPAP pressure required. The optimal CPAP pressure can be predicted from ESS and AHI using an appropriate formula derived from these data. This may be useful in situations where facilities for CPAP titration are limited.

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Effects of modafinil in patients with obstructive sleep apnea: A systematic review and meta-analysis

Y. Kuan, Y. Huang

Department of Neurology, Taiwan

Introduction: Obstructive sleep apnea (OSA) is a condition marked by upper airway obstruction during sleep and continuous positive airway pressure is the first-line treatment. However, some patients still have problems on daily function and residual daytime sleepiness. Modafinil is a wakefulness promoting agent known to be effective in ameliorating sleepiness.

Materials and methods: We performed a systematic review and meta-analysis of published randomized controlled trials (RCTs) that evaluated the efficacy and safety of modafinil in patients with OSA. Electronic databases, including PubMed, EMBASE, and the Cochrane Central Register of Controlled Trials, were searched for articles on OSA published before November 2014.

Results: We identified 11 RCTs of modafinil involving 880 patients with OSA. The meta-analysis showed significant improvement of Epworth Sleepiness Scale where the weighted mean difference (WMD) of modafinil was -2.96 (95% confidence interval [CI]: -3.73 to -2.19) compared with the placebo. The sleep latency of maintenance of wakefulness test was also significantly prolonged under modafinil with WMD of 2.51 (95% CI 1.5–3.52). The patients also gain significant improvement of global cognition and daily functioning from modafinil than the placebo. However, more adverse effects such as headache, anxiety or nausea also develop in the modafinil group.

Conclusion: The present review indicated that modafinil significantly improved subjective and objective daytime sleepiness, cognition and daily function. Thus, modafinil may be recommended to patients with OSA, especially those with EDS.

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Positive airway pressure therapy in OSA children at Ramathibodi Hospital

A. Leejakpai¹, V. Hongtong¹, T. Kuptanon¹, A. Preutthipan², H. Kamalaporn¹

¹ Ramathibodi Hospital Sleep Disorder Center, Department of Pediatrics, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok 10400, Thailand

² Division of Pediatric Pulmonology, Ramathibodi Hospital Sleep Disorder Center, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok 10400, Thailand

Introduction: Long term noninvasive ventilation has been increasingly considered as a treatment option for children with OSA when adenotonsillectomy has failed or is contraindicated.

Materials and methods: This was a retrospective hospital record review and telephone interview of 86 children with OSA being on home CPAP or BPAP under the care of Pediatric Pulmonary Division, Ramathibodi Hospital between 1995 and 2014. Two patients were loss to follow-up

and excluded. Demographic and clinical data were collected on the underlying diagnosis, ventilator related issues and outcome.

Results: Of 86 patients, 64 (74%) were male, age at starting CPAP and BPAP ranged from 1.7 to 15.8 years. Eleven (16%) were under 5 years of age, 24 (35%) were under 10 years of age. The most common comorbidity was obesity (BMI > 95 percentile for age) in 84 (97%) patients. Sixteen (19%) patients had Prader–Willi syndrome, 10 (12%) had cor pulmonale and 8 (9%) had hypertension and/or DM. Twelve (17.4%) stopped CPAP or BPAP due to clinical improvement. Five (6%) were changed from nasal mask to oronasal mask due to obesity. Three (3%) were changed from CPAP to AutoPAP due to obesity. Fifteen (22%) were non-compliant. Four (5.8%) patients died from respiratory failure. The maximum duration of CPAP or BPAP was 11 years. The only reported complication was minor facial injury in 11 (13%) patients.

Conclusion: CPAP and BPAP are well tolerated with minimal complications by most Thai children with OSA.

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Effects of cyclical intermittent hypoxia on the blood–brain barrier

D. Lim¹, D. Brady², R. Soans³, E. Kim², L. Valverde⁴, W. Kim⁵, M. Park⁵, B. Keenan², J. Shackelford³, A. Pack¹

¹ Division of Sleep Medicine, Department of Medicine, University of Pennsylvania, USA

² Center for Sleep and Circadian Neurobiology, University of Pennsylvania, USA

³ Department of Electrical and Computer Engineering, Drexel University, USA

⁴ Superior School of Health Sciences, Brasilia, Brazil

⁵ Korea University, Seoul, Korea

Introduction: Associations between obstructive sleep apnea, specifically cyclical intermittent hypoxia (CIH), and cognitive impairment are reported. Physiological effects of CIH on the blood–brain barrier (BBB) may be one mechanism of cognitive impairment. We questioned whether different severities of CIH in a mouse model affect angiogenesis and GLUT1 at the BBB.

Materials and methods: First, in a clinical cohort of 47 patients, we identified oxygenation characteristics by measuring desaturation and resaturation time as we observed that desaturation tended to be slower, resaturation faster. Second, we developed a system for CIH to incorporate the oxygenation characteristics we measured in OSA patients. We also assessed, in mice, whether a shorter resaturation time, which better mirrors OSA patients, altered oxidative stress levels when compared with a longer resaturation time, not uncommonly used by many investigators, by measuring urinary 8,12-iso-iPF2 α -VI levels. Third, we exposed C57Bl/6 male mice, 4 months old, to one of four conditions for 12 hours per day for 2 weeks: (1) Sham of continuous air, FiO₂ = 0.21, (2) Moderate CIH, FiO₂ 0.21 to 0.125 (CIH12.5), (3) Severe CIH, FiO₂ 0.21 to 0.10 (CIH10), and (4) Very Severe CIH, FiO₂ 0.21 to 0.05 (CIH5). We used immunohistochemistry to stain hippocampal brain tissue for CD31 and GLUT1. Neurostereology using CD31 was used to quantitate the length of blood vessels, a measurement of angiogenesis. GLUT1 expression in blood vessels at the BBB was quantitated using Immunohistochemistry Quantification (IQ) algorithms.

Results: First, our findings from patients with OSA reveal that a cycle of intermittent hypoxia is not sinusoidal; specifically, desaturation time increases in an almost linear relationship to the degree of hypoxia (nadir), whereas resaturation time is fast and somewhat constant (approximately 15 seconds), independent of the nadir. Second, we modified the Hycon mouse model of CIH to

accommodate a 15 second resaturation time to allow a more rapid resaturation as seen in OSA patients. When we compared a short resaturation with a longer resaturation schedule we found that a more rapid resaturation leads to increased oxidative stress as assessed by urinary 8,12-iso-iPF2 α -VI levels. Third, we show that there is significantly more angiogenesis in the CIH5 condition compared with all other conditions ($p < 0.05$), as well as strong evidence for a linear dose response to CIH severity ($p = 0.002$). Using IQ we identified a total of 564,714 vessels and quantified GLUT1 expression to be significantly increased at the CIH5 compared with the other conditions ($p < 0.05$), but no significant dose response increase in GLUT1 within the other CIH conditions. Thus, only very severe CIH levels increased expression of transporters.

Conclusion: Increasing severity of CIH induces angiogenesis at the BBB in a linear response. However, GLUT1 increased only at very severe CIH. Thus, homeostatic mechanisms are likely to be activated during moderate and severe CIH, but at very severe CIH there may be a breakdown in homeostasis.

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A scientometric approach to the advances in obesity-related sleep apnea research in childhood

M. Milkov, V. Iotova, P. T. D. C. Nedev, T. Avramov, D. Tomov, L. Matev, A. Pomakova

Medical University, Varna, Bulgaria

Introduction: Modern scientometrics enables the timely identification of the essential peculiarities of dynamic science stratification and advances of research in ‘hot topics’.

Materials and methods: In November, 2014, a retrospective problem-oriented search devoted to the association between childhood obesity and sleep apnea was performed in Web of Science (WoS) for the period from 2004 to 2013. The following scientometric parameters were comparatively studied: number of abstracted publications; names and countries of authors; languages and types of primary documents; titles of journals and number of articles in them, and nominations and countries of authors’ institutions. Citation analysis in WoS was performed, too. Data were processed by means of descriptive statistics.

Results: In WoS, there were 646 items by authors from 45 countries. There were 479 original articles, 109 reviews, 51 conference publications in 37 scientific meetings, 18 book chapters, 16 editorials and 11 letters in seven languages. D. Gozal, L. Kheiranish-Gozal and R. Bhattacharjee as well as the scientists at the University of Louisville and the University of Chicago were most productive. USA authors dominated followed by those from China, Australia, Italy, Canada, etc. The ‘core’ journals were Sleep, Chest, International Journal of Pediatric Otorhinolaryngology and Pediatric Pulmonology. The most significant WOS categories were ‘pediatrics’ and ‘respiratory medicine’. Research advances focused on comprehensive diagnosis and modern therapeutic methods of sleep apnea as well as on prevention of obesity. The papers abstracted in WoS received 13,607 citations of which, 11,050 were without self-citations. There were 8366 citing articles, of which 7895 were without self-citations. Average citations per item were 21.062, average citations per year were 1237.00, and h-index was 56. Some 533 papers were cited at least once during this 11-year period.

Conclusion: Purposeful usage of these abstracts and full-text papers could promote the further improvement of the collaboration between Bulgarian scientists and their colleagues from important scientific schools worldwide.

Acknowledgements: Citation analysis in WoS was performed, too. Data were processed by means of descriptive statistics.

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Obstructive sleep apnea as a risk factor in coronary artery disease

A. Mozaffari¹, S. Hejazi², Z. Afrakhteh², F. Shakeri², S. Mohebi³, H. Zamanian⁴

¹ Department of Medical Sciences, Qom Branch, Islamic Azad University, Qom, Iran

² Department of Medical Sciences, Qom University Medical Sciences, Qom, Iran

³ Department of Public Health, School of Health, Qom University Medical Sciences, Qom, Iran

⁴ Department of Public Health, School of Health, Tehran University of Medical Sciences, Tehran, Iran

Introduction: Obstructive sleep apnea (OSA) is frequent and affects about 25% of adult in some degree. In most studies, OSA is associated with a significantly increased risk of CAD and acute myocardial infarction in both men and women. This study was aim to assess relationship between risk of OSA and CAD.

Materials and methods: This case-control study was performed on 184 patients with history of coronary angiography in two catheter lab in Qom hospitals. Patients were divided to two groups, half of them in control group with normal or minimal coronary stenosis (<50%) and the others remain in case group with one, two or three coronary vessel diseases. All of patients completed demographic and Berlin questionnaire and then data were analyzed in SPSS version 16 and p value below 0.05 was considered significant.

Results: Mean age 55.36 ± 10 and 119 (61.4%) patients were female. This study showed significant difference between risk of OSA with and without CAD ($p = 0.008$, OR = 1.25, CI: 1.22–4.13), HTN and NIDDM ($p = 0.001$ OR = 10.4, CI: 4.99–20.22, and $p = 0.023$ OR = 2.12, CI: 1.10–4.07, respectively), But there were no correlation with ejection fraction <45% ($p = 0.582$).

Conclusion: According this study, OSA is one of the important risk factors for coronary artery disease.

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Retropharyngeal airway has no change in volume, but that morphological findings manifest change after uvulopalatopharyngoplasty

Y. Nishimura¹, N. Fujii², S. Nakata¹, T. Yamamoto³, M. Hirata⁴, N. Iwata¹, S. Moral⁵, W. Ahmed⁶, M. Hamed⁶, K. Suzuki⁷

¹ Department of Otorhinolaryngology, Second Hospital, Fujita Health University School of Medicine, Japan

² Department of Radiology, Second Hospital, Fujita Health University School of Medicine, Japan

³ Department of Mechanical Engineering, Gifu National College of Technology, Japan

⁴ Department of Examination, Second Hospital, Fujita Health University School of Medicine, Japan

⁵ Department of Otolaryngology – Head and Neck Surgery, The Philippine Medical City Hospital, Philippines

⁶ Department of Otorhinolaryngology, Faculty of Medicine, Sohag University, Egypt

⁷ Department of Otorhinolaryngology, Fujita Health University School of Medicine, Japan

Introduction: Recently, imaging study in obstructive sleep apnea syndrome (OSAS) has been improving on detection of severity and its classification. Some researchers focused on imaging study that describe pharyngeal morphology in patients with OSAS.

Materials and methods: We report on the changes of upper airway volume in patient with OSAS before and after uvulopalatopharyngoplasty (UPPP) with the use of three-dimensional computed tomography (3D-CT). Multi-planar reformation (MPR) and 3D-CT image reconstructions were carried out at an image workstation (Ziostation2, Ziosoft®), which enable us to measure diameter and volume of the airway before and after UPPP.

Results: We compared the morphology and volume changes of the retropharyngeal airway. After UPPP, at the level of soft palate, narrowing of retropharyngeal airway enlarged transversely, A-P respectively. At the level of tongue base, transverse diameter enlarged; however A-P diameter became narrower. Many morphological changes were shown after UPPP compared with those of before UPPP. Nevertheless total air volume between before and after UPPP was not changed as much as we expected before our examination. Volume changes between them were negligible.

Conclusion: We studied morphological and retropharyngeal air volume changes after UPPP in a patient with OSAS. We demonstrated by 3D-CT that the retropharyngeal airway was not changed in volume, but that morphological findings did change after UPPP.

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The additional value of CAP measures in the detection of flow limitation events in OSAS patients: A comparison with AASM arousals

G. Milioli¹, M. Bosi², S. Riccardi¹, M. Puligheddu³, V. Poletti², P. Cortelli⁴, M. Terzano¹, L. Parrino¹

¹ University of Parma, Italy

² Forli Hospital

³ University of Cagliari

⁴ University of Bologna

Introduction: The scoring of American Academy of Sleep Medicine (AASM) arousal is mandatory for the definition of respiratory event-related arousal (RERA). However, there are other, generally underrated, EEG activation phenomena, such as A phases of cyclic alternating pattern (CAP) which are associated with respiratory events in NREM sleep.

Materials and methods: The present study aims at exploring whether CAP allows, compared with ASSM arousals, a more accurate detection of subtle respiratory events in patients with OSAS (obstructive sleep apnea syndrome). Analysis was carried out on polysomnographic recordings of 19 OSAS patients divided in two severity groups: a mild group composed of patients with $5/h < AHI < 15/h$, and a moderate-severe group with $AHI > 15/h$. Apneas and hypopneas were defined according to the AASM rules. A flow limitation (FL) event was defined as a sequence of breaths,

not meeting criteria for apnea or hypopnea lasting at least 10 seconds, characterized by increasing respiratory effort (assessed by inductance plethysmography) and/or by flattening of the inspiratory portion of the nasal flow trace. Scoring was focused on the temporal relation between FL events and EEG responses (time range of 4 seconds before and 4 seconds after respiratory recovery of FL). When a CAP A phase occurred in this time interval, FL was considered as associated with CAP (FLCAP). When the EEG activation met the criteria for the definition of an AASM EEG arousal, FL was counted also as RERA. The FL events that were not associated with an EEG activation were classified as non-EEG correlated FL.

Results: There were no age differences between the two OSAS groups. The mild group (AHI: 8 ± 3) was composed of eight patients, while the moderate-severe group (AHI: 44 ± 21) included 11 patients. Among all the sleep measures, only CAP time and CAP rate allowed significant discrimination between the two OSAS groups. A total of 5113 respiratory events were detected in NREM sleep (FL events: 1651). FL events represented the most frequent features in the mild OSAS group. In NREM sleep, 1246 FL events (75.4%) were associated with an A phase of CAP, without significant differences between the two severity groups. In contrast, only 41.1% of FL events analyzed in NREM sleep met the AASM criteria for the RERA definition. The non-EEG correlated FL were 406, with no significant differences between the two OSAS groups. Throughout total sleep time, FL events were significantly more abundant than RERA in both OSAS groups. During NREM sleep, FL events and FLCAP were significantly more numerous than RERA only for mild OSAS. Most FLCAP (69.1%) terminated with a CAP phase A3 subtype, but also the slower EEG features of CAP A phases (subtypes A1 and A2) were widely represented (30.9%).

Conclusion: These data suggest that the RERA scoring underestimates the disruptive influences of subtle respiratory events on sleep consolidation. The extended framework of arousal based on the activation properties of CAP A phases provides more information than AASM criteria for evaluating the cerebral impact of FL events during NREM sleep.

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The effect of surgical maxillomandibular advancement on sleep apnea

T. Peltomäki¹, J. Kurimo², J. Järnstedt³, A. Miettinen², S. Himanen⁴

¹ Oral and Maxillofacial Unit, Tampere University Hospital and School of Medicine, University of Tampere, Finland

² Oral and Maxillofacial Unit, Tampere University Hospital, Finland

³ Medical Imaging Center, Tampere University Hospital, Finland

⁴ Department of Clinical Neurophysiology, Tampere University Hospital, Finland

Introduction: The aims of the study were to study the effect of surgical maxillomandibular advancement (MMA) on upper airway dimensions and polysomnography in obstructive sleep apnea (OSA) patients.

Materials and methods: Study sample consisted of 16 OSA patients (12 males, 4 females, mean age 46.4 years, range 28–55 years). All patients were treated in Tampere University Hospital, Finland with MMA, i.e. sagittal split and LeFort I osteotomy. Mandibular advancement was an average of 10 mm, and maxillary advancement 4–6 mm. Pre and postsurgical polysomnography was performed and apnea–hypopnea index (AHI, total and supine), oxygen desaturation index (ODI), body mass index (BMI) and Epworth sleepiness scale (ESS) were registered. Cone-beam computed tomography was taken

in natural head position prior to and after the surgery. A three-dimensional model of the upper airway extending from the level of the lower margin of the third cervical vertebrae to the level of the highest point of the nasopharyngeal cavity was segmented and volume calculated. In addition the minimum cross-sectional dimension of the airway was measured.

Results: Following MMA upper airway volume increased in all patients, an average by 35%. The minimum sagittal dimension increased also in every patient. Total AHI decreased from median 11.3 to 2.5, and supine from 35.7 to 3.3. Corresponding reduction of median ODI was from 5 to 3.7. ESS showed also an average decrease from presurgical 8 to postsurgical 4; however, in some patients the influence of MMA was weak to ESS.

Conclusion: MMA is a successful surgical therapy for OSA. MMA increases airway volume and cross sectional area in most constricted area of the upper airway. Tendency to collapsibility of the upper airway is prevented even at sleep when the muscles are relaxed, which contributes to the reduction of obstructive events.

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Intensive nighttime ambulatory blood pressure monitoring during polysomnography: Effect of wakefulness, non-REM, and REM sleep on dipping

B. Peukert¹, C. Fiori², E. Martins², M. Pedroso², M. Fagundes², R. Da Silva², C. Montanari³, D. Ribeiro⁴, D. Martinez^{1,5}

¹ Graduate Program in Medical Sciences, Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, RS, Brazil

² Graduate Program in Cardiology and Cardiovascular Sciences, UFRGS, Porto Alegre, RS, Brazil

³ Graduate Program in Medical Sciences, UFRGS, Brazil

⁴ Cardiology Unit, Hospital de Clínicas de Porto Alegre (HCPA), Porto Alegre, RS, Brazil

⁵ Graduate Program in Medical Sciences, Hospital de Clínicas de Porto Alegre (HCPA – UFRGS), Brazil

Introduction: It has been shown that sleep–wake status determines a 5-mmHg difference in nocturnal blood pressure. However, performing measurements at 30-minute intervals obtained insufficient data during REM sleep. In this study, nocturnal measurements were made at 10-minute intervals to research the effects of wakefulness and REM sleep stage on blood pressure.

Materials and methods: Patients who underwent diagnostic polysomnography were invited to use the pressure monitor set to make measurements at 10-minute intervals during the sleep study. A microphone recorded the monitor activity so that the sleep stage at which blood pressure measurements were made could be determined in the polysomnography. Questionnaires were used to assess the disruption provoked by the monitor.

Results: Sixteen patients were included, 13 men, mean (\pm SD) age 38 ± 11 years, and body mass index of 32 ± 8 kg/m². They underwent 93 \pm 9 measurements, 45 \pm 3 during sleep, 5 \pm 3 in REM, with 0–11 measurement-related awakenings. Sleep quality in the ABPM group was similar to that of matched controls that underwent polysomnography. Nocturnal systolic blood pressures measured during waking, non-REM, and REM sleep were, respectively, 146 ± 17 , 139 ± 20 , and 145 ± 20 mmHg ($p = 0.001$). Patients with apnea–hypopnea index greater than 15 events per hour had significantly higher BP levels during non-REM and REM sleep.

Conclusion: The participants tolerated intensive monitoring. Differences in systolic blood pressure as large as 7 mmHg among sleep stages may have implications in the evaluation of dipping and nocturnal hypertension.

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Prevalence and risk factors of obstructive sleep apnea in a rural population in India

A. Pinto, U. Devaraj, P. Ramachandran, B. Joseph, G. D'Souza
St. John's Medical College and Hospital, India

Introduction: Obstructive sleep apnea (OSA) is abnormal collapse of the pharyngeal airway during sleep, causing repetitive arousals. OSA is associated with hypertension, arrhythmias, stroke and myocardial infarction. Scant literature is available on OSA in rural India. OSA is largely undiagnosed in rural India, as well as in rural populations worldwide.

Materials and methods: Prospective, observational, cross sectional study was undertaken. All residents aged 18 years or older in the selected systematic stratified random sample (every seventh person selected from a locality) in a rural population located in Mugalur, near Bangalore, Karnataka, India, who fulfilled the inclusion and exclusion criteria, were interviewed using a pre-defined proforma. Population from seven villages in Mugalur comprising Mugalur village, Deshpande, Guttahalli, Shegnayakahalli, Kugur, Rajiv Gandhi Nagar, Madappannahalli and Banahalli were studied. The project started after obtaining approval from ethics committee. The investigators collected the details in the pre-defined proforma after obtaining written informed consent from the subject. The principal investigator travelled to rural center during weekends and college holidays to conduct interviews. Data regarding the demographics, smoking history, alcohol use and co-morbid illness were collected. Data regarding sleep was obtained using Berlin Questionnaire and Epworth Sleepiness Score (ESS). Subjects who are in high risk category (2 or more checked categories in Berlin questionnaire) according to the sleep questionnaire were subjected to a level 3 sleep study. Subjects who are positive for OSA (apnea-hypopnea index $\geq 5/h$) were offered further management. Data collected was analyzed with SPSS version 17.

Results: Total adult population in seven villages in rural Mugalur was 2247. Three hundred and twenty one subjects were selected by stratified random sampling with a sampling interval of 7. The mean age of the population was 39.43 ± 15.6 years (range 18–90 years) with the male: female ratio of 0.98:1. The mean BMI in the high risk category (27.9 kg/m^2) was significantly higher than in the low risk category (23.7 kg/m^2). Prevalence of risk of OSA by Berlin questionnaire was 8.72% (95% CI 5.63, 11.81) in total population, 7.4% in males and 11.7% in females. OSA risk was higher in females, but not statistically significant. Older age (OR 3.97; CI 1.63, 9.6), hypertension (OR 11; CI 4.3, 28.2), obesity (OR 2.35; CI 1, 5.5) and higher Mallampati score (OR 3.78; CI 1.7, 8.4) were significantly associated with high risk of OSA (p value = 0.0001–0.04). Other parameters such as smoking, alcohol use, diabetes mellitus and neck circumference measured were similar in both risk groups. Twenty eight subjects were in high risk category, of whom 22 underwent level 3 sleep study. Three studies were unsatisfactory. OSA was diagnosed in 10 out of the 19. The mean AHI of this group was 9.7/h. One outlier had an AHI of 53.2/h and was not included in statistical analysis. The prevalence of OSA by AHI criteria was 3.11%.

Conclusion: The prevalence of OSA by AHI criteria in rural India is 3.11%. When extrapolating this data to the total rural population of India – i.e., 833.5 million – the prevalence of OSA amounts to 25.92 million individuals. This condition is under-diagnosed in rural and in urban settings, although risk factors are present.

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Prevalence of patients at high risk of obstructive sleep apnea among individuals admitted for myocardial infarction

K. Sadeghniaat-Haghighi¹, A. Khajeh-Mehrizi¹,
A. Rahimi-Golkhandan¹, M. Sedaghat²

¹ Occupational Sleep Research Center, Tehran University of Medical Sciences, Iran

² Department of Community Medicine, Tehran University of Medical Sciences, Iran

Introduction: Obstructive sleep apnea (OSA) is the most common respiratory disorder during sleep which is a risk factor for myocardial ischemia. In this study we evaluated the proportion of subjects at high risk for OSA and prevalence of its predictors among patients admitted for acute myocardial infarction (MI).

Materials and methods: A total of 210 patients with MI admitted at the cardiac care unit of Baharloo hospital, Tehran, Iran were enrolled in this study. The STOP-BANG questionnaire was used for diagnosing high-risk patients of OSA. Anthropometric and demographic characteristics, family and personal history, biochemical tests' data of patients and the time of the onset of MI were recorded.

Results: Based on the STOP-BANG questionnaire, 112 patients (53.3%) were at high risk for OSA. The level of fasting blood sugar (FBS) was significantly higher in high-risk patients for OSA. FBS could be a predictor of OSA in patients with MI (p value: 0.005). From midnight to 5:59, the frequency of the onset of MI was significantly higher in patients at high risk for OSA compared with those at low risk (42% vs. 16.3%, p value < 0.001).

Conclusion: OSA is a prevalent disorder in patients with MI. Looking for signs and symptoms of OSA should be considered in clinical assessment of patients with MI.

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Accumulated nocturnal hypoxemia was a better predicting factor in vascular endothelial dysfunction in patients with chronic heart failure and sleep disordered breathing

H. Sawatari¹, S. Ando², M. Nishizaka^{2,3}, M. Miyazono⁴,
T. Sakamoto³, H. Chishaki⁵, T. Ohkusa⁶, C. Magota¹,
K. Sunagawa³, A. Chishaki¹

¹ Department of Health Sciences, Kyushu University Graduate School of Medical Sciences, Japan

² Sleep Apnea Center, Kyushu University Hospital, Japan

³ Department of Cardiovascular Medicine, Kyushu University Graduate School of Medical Sciences, Japan

⁴ School of Nursing, Fukuoka Prefectural University, Japan

⁵ Department of Healthcare Management, College of Healthcare Management, Japan

⁶ Kirameki Projects Career Support Center, Kyushu University Hospital, Japan

Introduction: Sleep-disordered breathing (SDB) prevails in patients with chronic heart failure (CHF). The resultant hypoxia by SDB might impair arterial endothelial function, which would strongly affect prognosis of those patients. We assessed the relationships

between SDB related indices, including index of hypoxic insult, and endothelial function in patients with CHF.

Materials and methods: We measured flow mediated vasodilation (%FMD) using ultrasound as the index of arterial endothelial function in 17 in-patients with CHF (age: 59 ± 11 years, male: 14, NYHA: II-III). We also underwent overnight polysomnography, and calculated traditional sleep parameters, such as apnea-hypopnea index (AHI), 3% oxygen desaturation index (3%ODI), minimum percutaneous oxygen saturation (min SpO₂), and mean percutaneous oxygen saturation (mean SpO₂). Other than these traditional indices, we developed a new index, time desaturation summation index ($TDS = (100\% - \text{averaged SpO}_2) \times \text{total sleep time}$) to represent accumulated hypoxemia during sleep. We excluded the patients with diagnosed pulmonary disease and/or left ventricular assist devices. We assessed the relationships between the various indices of SDB (i.e. traditional indices such as AHI, 3%ODI, min SpO₂, and mean SpO₂ and newly developed indices; TDS) and %FMD using Pearson's correlation coefficient or Spearman's rank correlation.

Results: The most common underlying heart disease was dilated cardiomyopathy (35%). The patients with CHF had severe left ventricular dysfunction. The mean left ventricular ejection fraction by echocardiography and plasma brain natriuretic peptide level were $26.5 \pm 7.3\%$ and 457 ± 348 pg/ml, respectively (data shown as mean \pm SD). Regarding sleep related parameters, total sleep time, AHI, 3% ODI, min SpO₂, and TDS were 6.0 ± 0.9 hour, 17.4 ± 16.4 /hour, 13.5 ± 15.3 hour, $85.2 \pm 7.8\%$ /hour, and $30.3 \pm 11.9\%$ /hour, respectively. The patients with CHF had impaired arterial endothelial function (%FMD: $5.1 \pm 2.4\%$). The single regression analysis showed no significant relationships between traditional sleep indices (AHI ($r = -0.10$, $p = 0.69$), 3%ODI ($r = -0.39$, $p = 0.12$), min SpO₂ ($r = 0.42$, $p = 0.09$), and mean SpO₂ ($r = 0.34$, $p = 0.19$)) and %FMD. In contrast, TDS, the index representing accumulated hypoxemia, was significantly related to %FMD ($r = -0.49$, $p < 0.05$).

Conclusion: The accumulated hypoxemia (i.e. TDS), rather than the frequency of hypoxemia caused by SDB, might be a greater contributing factor causing endothelial dysfunction in patients with CHF. We should target reducing the accumulation of hypoxia to improve vascular function and prognosis of the patients with CHF.

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Predictors of perioperative complications in higher risk children after adenotonsillectomy for obstructive sleepapnea: A prospective study

A. Thongyam¹, C. Marcus¹, J. Lockmann², M. Cornaglia¹, A. Caroff³, P. Gallagher⁴, J. Shults⁴, J. Traylor¹, M. Rizzi³, L. Elden³

¹ Sleep Center, The Children's Hospital of Philadelphia and The University of Pennsylvania Perelman School of Medicine, Philadelphia, PA, USA

² Anesthesia and Critical Care Medicine Department, The Children's Hospital of Philadelphia and The University of Pennsylvania Perelman School of Medicine, Philadelphia, PA, USA

³ Division of Otolaryngology, The Children's Hospital of Philadelphia and The University of Pennsylvania Perelman School of Medicine, Philadelphia, PA, USA

⁴ Clinical and Translational Research Center, The Children's Hospital of Philadelphia and The University of Pennsylvania Perelman School of Medicine, Philadelphia, PA, USA

Introduction: Retrospective studies have limitations in predicting perioperative risk following adenotonsillectomy in children with obstructive sleep apnea syndrome (OSAS). Few prospective studies

exist. We hypothesized that demographic and polysomnographic (PSG) variables would predict respiratory and general perioperative complications.

Materials and methods: Consecutive children <18 years of age who underwent adenotonsillectomy for OSAS at Children's Hospital of Philadelphia within 12 months of PSG were followed prospectively and intra-operative and post-operative complications were recorded. Finally, caregivers were called 2 weeks after discharge to ascertain late complications. Data were analyzed using two-sample t-tests, Mann-Whitney tests or point-biserial correlations.

Results: There were 329 subjects, with 27% <3 years old, 24% obese, 16% preterm, and 29% with comorbidities. In this higher risk population, 28% had respiratory complications (major and/or minor), and 33% had nonrespiratory complications. Significant associations were found between PSG parameters and respiratory complications as follows: apnea-hypopnea index (rank-biserial correlation coefficient [r] = 0.174, $p = 0.017$), SpO₂ nadir ($r = -0.332$, $p < 0.0005$), sleep time with SpO₂ < 90% ($r = 0.298$, $p < .0005$), peak end-tidal CO₂ ($r = 0.354$, $p < 0.0005$), and sleep time with end-tidal CO₂ >50 mmHg ($r = 0.199$, $p = 0.006$). Associations were also found between respiratory complications and age <3 years ($r = -0.174$, $p = 0.003$) or black race ($r = 0.123$, $P = .039$). No significant associations existed between PSG parameters and nonrespiratory complications. A model using age <3 years, SpO₂ nadir, and peak CO₂ predicted respiratory complications better than the American Academy of Pediatrics or American Academy of Otolaryngology – Head and Neck Surgery Foundation guidelines but was imperfect (area under the curve = 0.72).

Conclusion: Thus, PSG predicted perioperative respiratory, but not nonrespiratory, complications in children with OSAS. Age <3 years or black race are high-risk factors. Present guidelines have limitations in determining the need for postoperative admission.

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Continuous positive airway pressure (cPAP) improved performance of judo player (Judoka) with Sleep Disordered Breathing (SDB)

H. Wada, K. Nagata, R. Shirahama, S. Furuya, Y. Suzuki, T. Sekiyama, A. Ikeda, T. Tanigawa
Juntendo University, Japan

Introduction: Sleep disorders cause not only day-time sleepiness, but also attention and performance in everyday life. The aim of this study was to elucidate whether or not cPAP potentiate to improve the performance of Judo players, who suffer sleep disordered breathing (SDB).

Materials and methods: Heavy-weight Judo players of a university team, as defined either with body weight being 100 kg or over, or with BMI 30 or over, as well as those who wanted to join the study, were enrolled and initially screened with a home-based over-night polygraph and pulse oxymetry. SDB, defined as respiratory disturbance index (RDI), was 5/h or more. Those who were diagnosed as SDB were prescribed with cPAP, based on their consent. Questionnaires of Epworth sleepiness scale (ESS) and SF-8 were also conducted.

Results: Twenty Judo players of the team were firstly enrolled to this study, and 8 of them were diagnosed with SDB because their RDI were slightly increased ($7.8 + / - 1.3$), and thus underwent cPAP therapy. There was no difference in body size, ESS, SF-8 between

those who were prescribed with cPAP and those who were not. Those on cPAP therapy also claimed that their day-time sleepiness, fatigue, attention and exercise were improved, in parallel with their ESS with statistical significance ($p = 0.03$), but not SF-8, after introduction of cPAP. The preferable effect of cPAP were reported only on limited sports players, such as golfers or Sumo wrestlers. Our study added new evidence for heavyweight Judo players, but with slight SDB, supporting that cPAP may improve their performance.

Conclusion: To the best of our knowledge, this is the first report that cPAP improved SDB in judo players, and subsequently their performance. Thus, awareness of sleep apnea in young Judo players may improve their performance by introduction of proper treatment for their SDB.

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Augmented cardiovascular responses to episodes of repetitive respiratory events compared with isolated events in preschool children with sleep disordered breathing

L. Walter¹, S. Biggs¹, L. Nisbet¹, A. Weichard¹, M. Muntinga², M. Davey³, V. Anderson⁴, G. Nixon³, R. Horne⁵

¹ The Ritchie Centre, Monash University, Australia

² Maastricht University, The Netherlands

³ Melbourne Children's Sleep Centre, Monash Health, Australia

⁴ Murdoch Children's Research Institute, Australia

⁵ The Ritchie Centre, Monash University, Australia

Introduction: In adults and children with sleep disordered breathing (SDB), there is a significant surge in heart rate (HR) and blood pressure (BP) at respiratory event termination. We aimed to compare the acute cardiovascular effects of respiratory events that occur in isolation or as episodes of repetitive events.

Materials and methods: Forty-five children (3–5 years) diagnosed with SDB underwent overnight polysomnography. Analysis was performed on data from 28 children who exhibited both episodes of repetitive respiratory events and isolated events. Repetitive respiratory events were defined as two or more consecutive obstructive or central events with less than 25 s between events. A ratio of the number of repetitive to isolated events was calculated. Each event was divided into an early-event (first half) and late-event (second half) period, allowing comparison of data between events of differing durations. The change in HR and BP for isolated respiratory events was calculated as the % change in HR and pulse transit time (PTT), an inverse surrogate measure of BP change, from the mean of the late-event period to the mean of the three consecutive beats at HR peak or PTT trough during the 15 s following the event (post-event). For episodes of repetitive respiratory events, the % change in HR and PTT was calculated from the late-event period to the period between successive events (between-events) and also to the 15s following the end of the episode of repetitive events (post-episode). Student's *t*-tests were used to compare the HR and PTT change between isolated and repetitive events.

Results: Three hundred forty-two episodes of repetitive respiratory events were analysed (median 12 episodes/child; range 1–35), consisting of 918 individual events (median 26 events/episode; range 2–59). 539 isolated events were analysed (median, 21 isolated events/child; range, 3–55). Eight out of twenty-eight (29%) had a repetitive events/isolated events ratio < 1.0, indicating more isolated than repetitive events; one child had a ratio of 1.0, indicating equal number of isolated and repetitive events. 19/28 (69%) had a ratio > 1.0, indicating more repetitive than isolated events. Obstructive events were the predominant event type within repetitive episodes compared

with central apneas (68% and 31% respectively). In episodes of repetitive events, % change in HR from late- to between-events ($27\% \pm 1\%$) and from late-event to post-episode ($25\% \pm 1\%$) were significantly higher compared with the % change in HR from late- to post-event in isolated respiratory events ($17\% \pm 1\%$; $p < 0.001$ for both). The % change in PTT from late-event to post-episode was significantly greater (indicating a greater change in BP) for repetitive episodes ($-8\% \pm 2\%$) when compared with the % change from late- to post-events in isolated respiratory events ($-2\% \pm 2\%$; $p < 0.05$). There was no difference between % change in PTT from late- to between-events in repetitive episodes compared with % change from late- to post-events in isolated respiratory events.

Conclusion: Repetitive respiratory events evoke a greater acute cardiovascular response, than isolated events. As repetitive respiratory events predominate over isolated events in preschool children, these repetitive fluctuations are likely implicated in the adverse cardiovascular sequelae of SDB, supporting consideration of the temporal nature of respiratory events when clinically assessing SDB severity.

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Sleep disorders breathing in post polio syndrome

M. Wang¹, X. Li¹, J. Wang¹, C. Lv¹, X. Wang¹, T. Sun¹, Y. Sun¹, K. Strohl¹, F. Han²

¹ Department of Pulmonary Medicine, Binzhou Medical University, Shan Dong Province, China

² Department of Pulmonary Medicine, Peking University Pepples' Hospital, Beijing, China

Introduction: To evaluate the prevalence of sleep disorder breathing (SDB), its respiratory event pattern and treatment in patients with poliomyelitis.

Materials and methods: Three hundred eight subjects (200 males, 108 females, age 46.8 ± 6.9 years) were recruited from two community. One hundred fifty-one of them from the south part of China and 157 from the north part of China. All of them underwent questionnaires, routine blood test, spirometry, chest X-ray, arterial blood gas, and overnight oximetry. Fifty subjects who were at high risk of SDB (oxygen desaturation index, ODI4 ≥ 5 /h) from south China were selected to undergo polysomnography (PSG) and positive airway pressure treatment (PAP) if needed.

Results: Among them, 36% subjects had ODI4 ≥ 5 and 9% subjects had ODI4 ≥ 15 . The Pearson correlation between ODI4 and body mass index (BMI) was 0.535 ($p < 0.01$). Subjects with BMI ≥ 28 kg/m² had a higher ODI4 index than those whose BMI < 28 kg/m² (17.20 ± 17.95 versus 4.11 ± 3.59 , $p < 0.01$). Hyperglycemia and hypercholesterolemia were found more common in the subjects whose ODI4 ≥ 15 than those whose ODI4 ≤ 15 (28% and 40% versus 12.5% and 21.8%, $p < 0.05$). We analyzed subjects' PSG and found that apnea-hypopnea index (AHI) was 20.33 ± 4.4 /h with a higher AHI in REM sleep (50.67 ± 6.20 /h) and a lower AHI in non-REM sleep (11.2 ± 4.23 /h). Obstructive apnea was the predominant respiratory event. PAP treatment was an effective way to improve subjects' ODI4 from 20.3 ± 4.33 to 2.7 ± 0.59 . ($p < 0.01$).

Conclusion: SDB has a high prevalence among patients with post polio syndrome (PPS), possibly due to muscle weakness. The

high prevalence of hyperglycemia and hypercholesterolemia was unclear. Nasal PAP is an effective treatment for SDB in patients with PPS.

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Serum tumor necrosis factor- α and interleukin-6 in overweight and obese patients with obstructive sleep apnea–hypopnea syndrome

X. Xu, H. Yi, S. Yin

Affiliated Sixth People's Hospital, and Institute of Otolaryngology, Shanghai Jiao Tong University, China

Introduction: Obstructive sleep apnea–hypopnea syndrome (OSAHS) is associated with increased serum tumor necrosis factor- α (TNF- α) and interleukin-6 (IL-6) levels. The relationship between these two cytokines and OSAHS severity remains unclear. We aim to identify the relationships between OSAHS severity and serum concentrations of TNF- α and IL-6.

Materials and methods: A total of 163 patients with OSAHS were divided into subgroups by apnea-hypopnea index (AHI) ($5 \leq \text{AHI} \leq 15$, $n = 51$; $15 < \text{AHI} \leq 30$, $n = 48$; $30 < \text{AHI} \leq 55$, $n = 36$; $\text{AHI} > 55$, $n = 28$), and 57 controls were enrolled in this study. All subjects were overweight or obese, but no high blood pressure, diabetes, or heart disease was detected. Serum TNF- α and IL-6 concentrations were compared among the groups. Serum TNF- α and IL-6 levels were determined by enzyme-linked immunosorbent assays.

Results: No significant differences in age, body mass index (BMI), systolic blood pressure, or diastolic blood pressure were found among the groups. A significant difference was detected in TNF- α levels among the groups ($p = 0.039$). Moreover, the $15 < \text{AHI} \leq 30$ OSAHS group had significantly higher serum TNF- α levels than did the other groups. However, no significant increase in IL-6 level was observed among the groups. TNF- α and IL-6 were not linearly correlated with AHI, BMI, oxygen desaturation index, or minimal pulse oxygen saturation in patients with OSAHS.

Conclusion: Our results suggest that AHI severity had no linear correlation with TNF- α or IL-6 levels. Compensatory processes may be responsible for OSAHS.

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Catathrenia: Is it a sleep related breathing disorder?

L. Xu¹, Z. Hao², X. Lan³, P. An¹, L. Zhao¹, X. Zhang¹, X. Dong¹, X. Gao¹, F. Han¹

¹ Department of Pulmonary Medicine, Peking University People's Hospital, China

² Department of Orthodontics, Peking University School and Hospital of Stomatology, China

³ Department of Pulmonary Medicine, Aerospace Central Hospital, China

Introduction: Catathrenia has been described as an isolated symptoms and normal variants, belong to sleep related breathing disorder (SRBD) according to ICSD-3 but classified as parasomnia in ICSD-2. The goal of our study is to investigate the clinical feature the

response to continuous positive airway pressure (CPAP) or oral appliance treatment.

Materials and methods: Thirty-nine patients with catathrenia visited our sleep center from December 2009 to October 2014. The patients underwent clinical evaluation, physical examination, questionnaires, and maxillofacial check. All of the patients underwent a overnight polysomnography (PSG) and synchronous sound recording. Twenty-four patients underwent a trial of CPAP. Twenty-five patients underwent a trial of oral appliance. Twenty patients underwent both CPAP and oral appliance trial. Groaning index (the numbers of the groaning per hour) was used to evaluate the degree of catathrenia.

Results: Among 39 patients (27 female and 12 male, range from 16 to 64 years old, mean age 30.56 ± 10.37), we noticed that the patients had normal BMI (21.71 ± 2.71). Catathrenia patients have normal occlusion in terms of craniofacial structures. We found that the average onset age of the patients was 20.16 ± 8.56 . Their average ESS was 8.97 ± 3.84 and 30.77% of the patients' ESS was ≥ 11 . Among these patients, 54% patients complained of disturbed noise at night. Their average AHI was 2.16 ± 2.79 , ranging from 0 to 13.82, and 10.26% of the patients' AHI was ≥ 5 . The groaning index in REM and NREM sleep stage was 30.75 ± 5.23 and 5.39 ± 5.89 respectively ($p < 0.01$). After the therapy of CPAP, the groaning index decreased from 11.2 ± 12.3 to 6.07 ± 7.24 ($p < 0.01$). While after oral appliance treatment, the groaning index (8.25 ± 8.45) did not reduce significantly ($p = 0.1$).

Conclusion: Our study found that catathrenia mainly occur in young people with normal BMI. It is also more common in females. Catathrenia is a REM related breathing disorder and respond well to CPAP treatment.

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Long-term non-invasive ventilation at home in children: Beijing experience

Z. Xu, B. Li, Y. Zhang, K. Shen

Beijing Children's Hospital, China

Introduction: This study aimed to identify the number, categories and outcome of children receiving long-term home non-invasive ventilation (NIV) at a tertiary paediatric hospital in Beijing.

Materials and methods: Data were collected prospectively from patients commencing NIV in Beijing Children's Hospital over 8 years using a NIV chart. Children aged 18 years or younger receiving long-term NIV at home between 1 January 2005 and 31 December 2013 were recruited. The NIV chart included clinical data, polysomnography results and ventilation parameters. This chart was filled out at the commencement of NIV and each follow-up visit. Patients were required to follow up every 3–12 months depending on their disease condition.

Results: Twenty children were identified as receiving long-term home NIV. The underlying conditions included obstructive sleep apnea syndrome associated with cerebral palsy, laryngomalacia, obesity, craniofacial anomalies and syndromes, congenital or acquired central hypoventilation syndrome and bronchiolitis obliterans following severe pneumonia. Fifty percent (10/20) of the patients remained on home NIV. The median duration of ventilation was 3.1 ± 2.4 years. Four patients discontinued NIV when their symptoms improved. The overall survival in children requiring home ventilation was 90% (18/20).

Conclusion: NIV is an emerging treatment in children in China. It is currently carried out in Beijing Children's Hospital for the domiciliary management of children with various conditions. But it

is still performed on a small scale, and combined with the heterogeneity of the patient population.

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Prevalence of sleep disordered breathing in patients with hypertrophic cardiomyopathy

D. Zemanek¹, J. Veselka¹, M. Belehrad², V. Somers³, T. Kara²

¹ Department of Cardiology, Second Medical School of Charles University and University Hospital Motol, Prague, Czech Republic

² International Clinical Research Center Brno, Czech Republic

³ Division of Cardiovascular Diseases, Mayo Clinic, Rochester, USA

Introduction: The prevalence of sleep disordered breathing (SDB) in patients with hypertrophic cardiomyopathy (HCM) is unusually high according to previously published data (from 40% to 70%). However, reliability of data from these studies is limited because the majority of studies were using less accurate methods for SDB screening, such as pulse oxymetry or polygraphy.

Materials and methods: Fifty-two consecutive patients with HCM (age: 51.8 ± 12.7 years, male 73%, body mass index 27.9 ± 4.3 kg/m², left ventricle end-diastolic diameter 43.6 ± 6.4 mm, maximal wall thickness 20.3 ± 3.4 mm, left ventricle ejection fraction $72.8 \pm 6.4\%$) underwent full polysomnography in-hospital (sleep study – as the most accurate methods for SDB) and echocardiography. The polysomnography signals were recorded and scored with the American Academy of Sleep Medicine Criteria. Patients with an apnea-hypopnea-index (AHI) ≥ 15 events/hour of sleep were considered to have significant OSA.

Results: Average AHI was 11.6 ± 11.6 events/hour of sleep. Sixteen patients of 52 (30.8%) had clinically significant SDB with dominance of obstructive sleep apnea. Mild SDB (AHI 5 – 14 events/hour) was present in further 17 patients (32.7%).

Conclusion: By using full polysomnography and an AHI of 15 as the cut-off limit, the prevalence of moderate to severe SDB in HCM patients remains high, affecting up to one third of patients.

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The effect of different elevation on sleep apnea

H. Zhongming¹, H. Fang², L. Qingsheng³

¹ Department of Pulmonary Medicine, Karamay Central Hospital, Karamay, Xinjiang, China

² Department of Pulmonary Medicine, The People's Hospital, Peking University, China

³ Department of Pulmonary Medicine, Kelamayi Central Hospital, Kelamayi, Xinjiang, China

Introduction: To explore the effect of different elevation of sleep apnea-hypopnea syndrome.

Materials and methods: Five subjects underwent respiration and pulse oximeter tests. Apnea-hypopnea index (AHI), hypopnea index (HI), mean SaO₂ (MSaO₂), the lowest SaO₂ (LSaO₂), the time spent at SaO₂ below 90%, the number of desaturations $\geq 4\%$ per hour (ODI4) and blood pressure were calculated at different altitude (include Karamay (altitude 500 m), Kuche (1000 m), Geermu (altitude 2261 m), Xining (altitude 2800 m), Lasha (altitude 3650 m) and Yu shu

(altitude 4200 m). Selected 114 cases of SAHS from Karamay city (altitude 500 m) and 174 cases of SAHS from Kunming city (altitude 1890 m). The two groups were matched for age, sex.

Results: The apnea-hypopnea index, hypopnea index, oxygen desaturation index, MSaO₂%, nadir arterial oxygen saturation, systolic pressure and diastolic pressure were significantly different among five different altitude groups ($p < 0.01$). The AHI risen from 11.0 ± 5.4 to 28.6 ± 11.3 /h, the HI risen from 7.6 ± 3.4 to 19.6 ± 9.0 /h. ODI4 risen from 11.2 ± 5.2 to 29.8 ± 11.0 /h. As altitude increases from 500m to 4200 m. The body mass [(27.1 \pm 4.1) kg/m² vs. (29.6 \pm 4.5) kg/m²], neck circumference [(39.0 \pm 3.5) cm vs. (41.0 \pm 2.9) cm], abdominal circumference [(87.1 \pm 9.5) cm vs. (98.0 \pm 11.6) cm], oxygen desaturation index [(32.3 \pm 21.5)/h vs. (51.1 \pm 29.4)/h], the mean arterial oxygen saturation [(87.2 \pm 7.8) % vs. (90.5 \pm 4.1) %], the nadir arterial oxygen saturation [(72.9 \pm 11.7) % vs. (82.7 \pm 7.4) %], apnea index [(49.2 \pm 28.5)/h vs. (33.1 \pm 21.5)/h]. The Arterial oxygen partial pressure (PaO₂) [(63.2 \pm 10.6) mmHg vs. (80.9 \pm 13.40) mmHg] and Arterial carbon dioxide partial pressure (PaCO₂) [(33.3 \pm 5.6) mmHg vs. (41.4 \pm 3.7) mmHg] were significantly different between Kunming and Karamay's SAHS groups ($p < 0.01$).

Conclusion: Central apneas and hypopneas rose in number from low altitude (500 m) to high (4200 m). The degree of SAHS becomes more serious in the higher altitude area, in particular to SAHS patient. This is can be paid more attention.

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Quality of sleep in 45- to 69-year-old population in Russia

V. Gafarov¹, I. Gagulin¹, E. Gromova², D. Panov², A. Gafarova¹

¹ Collaborative Laboratory of Cardiovascular Diseases Epidemiology SB RAMS, Novosibirsk, Russia

² FSBI Institute of Internal and Preventive Medicine SB RAMS, Novosibirsk, Russia

Introduction: Purpose of our study was to elucidate the characteristics of the quality of sleep in 45- to 69-year-old male population of the city of Novosibirsk (Siberia, Russia).

Materials and methods: A study included a randomized representative sample of 45- to 69-year-old male population ($n = 556$). The sleep disturbances were studied via test designed by Jenkins et al. by using the four-item Jenkins Sleep Questionnaire (JSQ). Respondents were asked to answer the questions of the test: questions 1–4 were designed to evaluate the quality of sleep; question 5 was designed to assess the duration of sleep.

Results: The sleep quality in the study population showed that males stated that they did not have or rarely had anxious thoughts while falling asleep (59% in men); they did not have any disturbing dreams or had them for less than three nights per month (68% in men); they had sound sleep (47% in men); and they were able to get a good night's rest via the regular sleep (63% in men). Overall, individual men had the following problems during 15 and more nights per month: anxious thoughts while falling sleep (10%); interrupted sleep defined as two and more episodes of waking up during the night (20%); and dissatisfaction with the regular sleep (10%).

Conclusion: In 45- to 69-year-old male population in Russia, high prevalence of sleep disturbances in the categories of sleep quality was associated with high prevalence of psychosocial factors.

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The effect of sleep modification on the association between fat mass and obesity associated gene (FTO) Rs9939609 and dietary pattern

Y. Jiang¹, L. Yu², L. Yin², Y. Wang¹, W. Sun¹, Y. Song¹, Z. Wang², F. Jiang¹

¹ Shanghai Children's Medical Center, China

² East China Normal University, Shanghai, China

Introduction: The fat mass and obesity associated gene (FTO) rs9939609 is a well replicated gene locus of obesity, mainly driven by increased energy intake. Besides, the mechanism between sleep and obesity is also mainly through energy intake. Our study aimed to investigate whether sleep modified the association FTO and dietary pattern.

Materials and methods: A stratified, randomly clustered sampling design was used to select fifth grade students from 10 primary schools in Shanghai, China. Children's sleep duration were assessed with FTO rs9939609 genotyped from whole blood, and dietary patterns were surveyed self-report questionnaires.

Results: The final sample included 1506 children with a mean age of 10.82 ± 0.40 years, boys accounted for 52% (783/1506). The frequency of risk alleles of FTO rs9939609 (AT&AA) was 23.7%. Children slept on average 9.46 ± 0.59 hours. Results showed that compared with children who slept ≥ 10 h, the proportion of higher intake of fast food and snack was higher in children who slept < 9 h among AA & AT group both before and after adjusted for confounding factors, but not for TT children.

Conclusion: The final sample included 1506 children with a mean age of 10.82 ± 0.40 years, boys accounted for 52% (783/1506). The frequency of risk alleles of FTO rs9939609 (AT&AA) was 23.7%. Children slept on average 9.46 ± 0.59 hours. Results showed that compared to children who slept ≥ 10 h, the proportion of higher intake of fast food and snack was higher in children who slept < 9 h among AA & AT group both before and after adjusted for confounding factors, but not for TT children.

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Waking state resists REM sleep onset: Experimental evidences

L. Maisuradze¹, N. Lortkipanidze², M. Eliozishvili², N. Oniani²

¹ Iv. Beritashvili Center of Experimental Biomedicine, Ilia State University, Georgia

² Ilia State University, Georgia

Introduction: According to our previous studies, REM sleep need does not accrue during wakefulness. In purpose to assess possible way to prevent developing of REM sleep or even its onset in the sleep–wakefulness cycle (SWC), this report presents results of different experimental strategies for non-chemical sleep deprivation through waking state provoking.

Materials and methods: The experiments were carried out on the mature cats ($n = 8$) chronically implanted with electrodes in different brain structures. Following 6–7 days of rehabilitation from surgery, habituation to the SWC recording environment and 3–4 days of baseline SWC recordings, four cats underwent 24-hour REM sleep deprivation through the electrical stimulation of the mesencephalic reticular formation (MRF) at the appearance of REM sleep signs and maintenance of waking episodes 8–10 min in duration (D1 session). Another four cats were awakened following each slow-wave sleep (SWS) stage not available falling asleep during 8–10 min

by using posterior hypothalamus stimulation (D2 session); the length of D2 experiments was also 24 hours. The parameters of electrical stimulation of different brain structures were changed depending on the receiving of behavioral awakening effect from REM sleep or SWS with further maintenance of wakefulness episodes during one or another deprivation manipulation. Each deprivation experiment, D1 or D2, was followed by the 24-hour corresponding recovery recordings, RD1 or RD2. The time of the individual sleep stages, their latency, as well as total amount and percent ratio of SWC phases were identified from D1-, D2-, RD1- and RD2-protocols; the calculated data were compared with corresponding baseline data.

Results: Total amount or percent of waking state increased in both, D1 and D2, sessions. In contrast to the well-known REM sleep deprivation instrumental techniques, D1 session was not accompanied by the decrease in REM sleep latency. If awakening was followed by active wakefulness, REM sleep onset was delayed. No signs of REM sleep (ponto-geniculo-occipital waves or rapid eye movements) were registered during wakefulness in D1 recordings: REM sleep onset was found only following SWS like baseline. Neither REM sleep rebound nor increase of REM sleep signs was found in the RD1. The timing of individual REM sleep episodes did not change significantly in comparison with the baseline. D1 did not cause disturbance in the course of normal alternation of different SWC phases. The occurrence of REM sleep episodes or signs was not registered in the course of D2 session: there was complete lack of REM sleep. SWS increased in quantity and quality following the cessation of D2 procedures, particularly during the first hours of RD2 where the diminution of REM sleep latency was not observed. Transition time from SWS to REM sleep was dependent on the length and level (active or passive) of waking episode prior SWS.

Conclusion: Supposedly, results would be interesting for basic and clinical sleep research to avoid REM sleep quantitative or qualitative augmentation. We suggest the replacement of REM sleep by waking to be effective for prevention of sleep disturbances due to increased REM sleep propensity leading to mood worsening in depressive individuals.

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Suicidal feelings are related to sleep phase, sleep quality, and sleep quantity: A study on the relationship between sleep and suicide prevention by using 3DSS (3 Dimensional Sleep Scale)

Y. Matsumoto¹, N. Uchimura², T. Ishida², K. Toyomasu³, N. Kushino¹, M. Mori¹, Y. Morimatsu¹, M. Hoshiko¹, T. Ishitake¹

¹ Department of Environmental Medicine, Kurume University School of Medicine, Japan

² Department of Neuropsychiatry, Kurume University School of Medicine, Japan

³ Institute of Health and Sports Science, Kurume University, Japan

Introduction: We investigated the relationship between three elements of sleep and suicidal feelings. Suicide often starts with suicidal feelings and ends with actions aimed at fulfilling suicidal desires. Therefore, it is important for suicide prevention to take measures to address suicidal feelings, which comprise the first stage of suicide processes.

Materials and methods: The 3DSS (3 Dimensional Sleep Scale), which measures three elements of sleep (phase, quality, and quantity), was used to assess subjects' sleep conditions. It can classify subjects into eight sleep types based on the scores of its three elements. Participants in the study were 635 Japanese day workers

(461 men and 174 women) who were engaged in the manufacturing or service industries. Their average age was 40.5 ± 8.6 years. We assessed the participants' suicidal feelings by using the corresponding item (No. 19) on the SDS (Self-rating Depression Scale). They were judged to have no suicidal feelings when they chose "1 (=never)" for question No. 19. If they chose "2 (=sometimes)", "3 (=often)", or "4 (=always)" for this question, we considered them to have suicidal feelings. We selected an unpaired t-test and ANCOVA for comparative assessment and multiple logistic regressions to calculate an odds ratio.

Results: There were significant differences between the subjects who had suicidal feelings and those who did not. All 3DSS scores (phase, quality, and quantity) of the former group were lower than those of the latter. The participants were then compared by the strength of their suicidal feelings. A significant negative correlation was found between the strength of suicidal feelings and the quality and quantity 3DSS scores; the stronger the suicidal feelings, the lower the 3DSS scores of quality and quantity. The phase 3DSS score, however, tended to increase in the subjects who had the strongest suicidal feelings. We also classified the subjects into three groups based on their SDS score (under 39, 40–49, and over 50). There were significant differences for all comparisons when the 3DSS scores of these were compared. The normal group (SDS score under 39) had the highest 3DSS scores among the three groups, and the moderate depression group (SDS over 50) had the lowest. The odds ratios for the suicidal feelings of each participant's sleep type, based on 3DSS scores, were also calculated. The risk of suicidal feelings increased significantly in the case that all or two of three elements (phase, quality, and quantity) were poor.

Conclusion: Analyzing total sleep conditions is required for suicide prevention because all sleep elements (phase, quality, and quantity) are related to suicidal feelings. In particular, it is necessary to improve sleep conditions actively when all or two elements are poor because of the risk of increased suicidal feelings and, eventually, actions.

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Time recovering from chronic partial sleep deprivation due to watchkeeping

R. Naeck¹, E. Bouazizi², M. Mateo³, D. D'amore⁴, A. Rabat⁵, J. Ginoux⁶

¹ Clinical Research Unit, Hôpital Ste Musse, Toulon, France

² Tunis University, Ensit, Tunisia

³ CESNES, Hôpital Ste Musse, Toulon, France

⁴ Pneumology Unit, Hôpital Ste Musse, Toulon, France

⁵ Alertness Unit, Department of Operational Environments, Armed Forces Biomedical Research Institute, Brétigny Sur Orge, France

⁶ ISITV, Toulon University, LSIS, UMR CNRS 7296, France

Introduction: Chronic partial sleep deprivation for watchkeepers induces many ill-fated effects such as sleep fragmentation which provoke significant daytime sleepiness, risk of accident. The knowledge of the time necessary for recovering from such sleep deprivation is important. The aim of this work is to provide an assessment of such time recovering.

Materials and methods: Thirty-two healthy subjects (mariners on warships: 8 women and 24 men) aged 19–50 years underwent the same chronic partial sleep deprivation due to watchkeeping during the same test period. A baseline polysomnography (PSG) was

performed for all subjects and their latency to sleep [Multiple Sleep Latency Test (MSLT) scores] was evaluated just before the beginning of the test at Di while their follow-up (PSG) and (MSLT) was done with a certain delay after the end of the test at Df. Main indicators of sleep fragmentation such as the sleep fragmentation index and the sleep diversity index were then computed.

Results: The diagnosis of sleep fragmentation produced by clinicians confirms that mariners' sleep is much fragmented after their mission on the warship relative to the reference night. Comparison of different criteria for the PSG, the MSLT and the indicators of fragmentation index (sleep fragmentation index, sleep diversity index and stage N1 latency) can show that the time required to recover from the partial chronic sleep deprivation is 3 days for sleep architecture and 5 days for sleep fragmentation.

Conclusion: These results have to be compared with an assessment of the cognitive performance. Then we may introduce a minimum rest period during missions in order to increase alertness and responsiveness of the sailors.

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Individual variability to biological, hormonal and psychological responses to sleep deprivation

C. Reis¹, A. Domingues², C. Mestre¹, J. Ribeiro², J. Sanches², T. Paiva¹

¹ CENC – Sleep Medicine Center, Lisbon, Portugal

² Institute for Systems and Robotics, Instituto Superior Técnico, University of Lisbon, Portugal

Introduction: Most sleep deprivation (SD) studies are conducted either with animal models or in young adults and occur in highly controlled conditions. Studies in middle age adults in their regular living and working conditions are however lacking. Individual variability to SD is currently recognized but data explaining it are scarce.

Materials and methods: Ten healthy male individuals with age between 35 and 45 performed saliva and blood collections, after a normal sleep night and after a 24 h sleep deprivation. In each subject 11 saliva collections by themselves, were done at specific times between 7:00 and 02:00, and one blood collection at 12:00. Subjective measures for sleepiness, vigilance and fatigue, as well as reaction times (KSS, SFC, PVT), were measured for each timeline. In order not to disturb subjects' daily activities, a mini-freezer was provided to store saliva samples (2–8 °C), thus maintaining their properties. Samples were stored at –80 °C until analysis. Melatonin and cortisol were measured for all saliva collection times, and testosterone at 08:00. Serotonin and IL-6 were measured from blood and saliva at 12:00. All analyses were performed with commercial enzyme immunoassays. A wrist actigraph was worn by each volunteer during 7 straight days, comprising 2 days of collections (after a normal sleep night and after sleep deprivation), 2 days before and 2 days after collections. This permitted the monitoring of the volunteers' daily activities and to ensure that they had the 24 h sleep deprivation prior to collections. Data analysis was carried with non-parametric tests (Mann–Whitney and Spearman's correlation coefficient), using SPSS Statistics.

Results: Comparison between the two groups (baseline and sleep deprivation) showed that serotonin levels, reaction times (PVT) and

sleep (KSS) and fatigue (SFC) subjective measures increased after sleep deprivation, with the latter presenting significant differences ($p < 0.05$). On the other hand, testosterone, IL-6, melatonin and cortisol levels have decreased after sleep deprivation. All results except for cortisol were according to literature. Significant correlations were found between some variables in both timelines. For baseline collections, strong correlations were found between serotonin and KSS ($R = 0.780$, $p < 0.05$), cortisol and melatonin ($R = 0.782$, $p < 0.01$) and SFC and KSS ($R = 0.908$, $p < 0.01$). Regarding collections after sleep deprivation, significant differences were found between testosterone levels and total sleep hours before collection ($R = 0.738$, $p < 0.05$), IL-6 and both testosterone levels ($R = 0.638$, $p < 0.05$) and SFC ($R = -0.685$, $p < 0.05$) and finally between PVT and SFC ($R = 0.738$, $p < 0.05$). Furthermore individual differences were observed with two patterns of response to SD emerging: Some subjects had an increase in cortisol while in others this was not observed. Such differences were associated with the remaining variables evaluated.

Conclusion: Individual patterns of response to SD were observed. Results indicate that despite individual variability response to SD (some results were the opposite of what was expected), it is possible to analyse individuals in their daily activities. This may open the possibility of analysing potential biomarkers for fatigue in occupational settings.

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The management experience of sleep monitoring center for children

W. Zhinan

Wuhan Children's Hospital, China

Introduction: To explore the methods and experience in the center for children's sleep disorders.

Materials and methods: A center for children's sleep disorders was set up to provide high-quality nursing service through creating good environment and scientific nursing management.

Results: This practice achieved both social and economic benefits, facilitated the cooperation among various departments, updated ideas, ensured the quality of nursing and increased patients' satisfaction.

Conclusion: It is suggested to improve the nursing management in the center for sleep disorders by setting up nursing quality control system, making full use of team function, expanding high-quality services and practicing humanity management.

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Sensor for apnea classification and detection

G. Baffet, C. Montaron, J. Boissinot, C. Freycenon, J. Pinguet
CIDELEC Research, France

Introduction: We are proposing an evolution of a sensor for apnea detection and classification. This sensor perceives pressure variations through the skin that indicate the presence or absence of respiratory effort during apneas. Moreover, the sensor detect apnea

from respiratory sounds from tracheal sounds in the frequency band 200–2000 Hz.

Materials and methods: The sensor is a significant evolution of a sensor studied in Meslier, (2002) (PNEAVOX Technology). The former sensor was made with electrets used in CID102 (CIDELEC, France), in the frequency band 0.1–10 Hz and gave a good specificity 93.6% and sensitivity 99.4% to classify apnea as obstructive, mixed or central. This method induced a delay in the signal that reduced the potential for apnea classification especially for children. To reduced the delay, we used a specific pressure sensor for respiratory effort detection and signal is filtered in the frequency band 0.02–20 Hz. We present a mechanical model of two dimensions and three degrees of freedom with thoracic, abdomen and neck to represent dynamic of sensor signal. PneaVox measurements were performed in polysomnograph CID102L8D and CIDLX (CIDELEC, France) to evaluate the initial results in patients.

Results: First tests shows good potential for apnea classification and detection. Introduction of the specific pressure sensor removes signal delay and so improves the technology dynamic for short event detection (children diagnosing). Moreover, examples show that the method indicates respiratory efforts when belts are flat during obstructive apneas (Boudewyns, 1997), and so potentially resolves the lack of belt sensitivity. Mechanical modelling explains interactions between respiratory efforts and actions around the neck (muscles, etc.).

Conclusion: PneaVox technology is an interesting solution for sleep diagnostic, for adults and also for children as it perceives respiratory efforts and breathing sounds with a good dynamic and without sensors placed on patient's face.

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The accuracy of BPAP determined apnea–hypopnea index

H. Uluçoban Dede, A. Çilli

Introduction: Bilevel positive airway pressure (BPAP) devices do not only titrate BPAP pressures but also measure residual respiratory event. The aim of this study was to determine the accuracy of BPAP derived residual apnea–hypopnea index (AHI).

Materials and methods: We studied 100 patients who underwent in laboratory overnight PSG (polysomnography) using BPAP. Exclusion criterias are patients with central sleep apnea and complex central apnea syndrome. Age, sex, body mass index (BMI), neck circumference, Epworth Sleepiness Scale (ESS), and comorbidity were recorded at the time of diagnostic PSG for each patient. Residual AHI obtained from BPAP (BPAP-AHI) was compared simultaneously with AHI from an overnight PSG on BPAP (PSG-AHI) using Bland–Altman analysis and Wilcoxon signed-rank test.

Results: BPAP markedly suppressed the respiratory event during the titration (PSG-AHI = 3.5 event per hour). On the other hand BPAP-AHI was 5.6 event per hour. There was statistically significant difference between residual AHI obtained from BPAP and AHI from overnight PSG on BPAP ($p < 0.001$). Residual AHI obtained from BPAP was significantly higher than AHI from PSG on BPAP. Bland–Altman analysis showed that there is no agreement between BPAP-AHI and PSG-AHI (AHI mean difference of 3.60) and the limits of agreement for the AHI were from 2.40 to 4.79).

Conclusion: The accuracy of measuring residual respiratory events for BPAP device has not been extensively evaluated and compared

with the gold standard method, in-laboratory PSG-based measurements. In this study, BPAP was not able to identify residual respiratory events equivalent to the use of PSG.

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Scoring criteria for portable monitor recordings: A comparison of four hypopnea definitions in a population based cohort

S. Vat, J. Haba-rubio, N. Tobback, D. Andries, M. Tafti, R. Heinzer
Center for Investigation and Research in Sleep (CIRS), University Hospital of Lausanne (CHUV), Switzerland

Introduction: There is currently no recommendations for the scoring of limited-channel-portable-monitors (PM) recordings to diagnose obstructive-sleep-apnea (OSA). We aimed to investigate the performance of four different hypopnea scoring criteria, using 3% or 4% oxygen desaturation levels and including or not PWA drops as surrogates for EEG-arousals, with polysomnography (PSG) as gold-standard.

Materials and methods: Subjects from a population-based cohort (HypnoLaus) underwent a complete home PSG. The PSG recordings were then rescored using only the parameters available on type 3PM with lights off and "lights on" based on patients' report instead of EEG. The AHI of the four different PM scoring criteria were then compared with the PSG-based AHI.

Results: Three hundred twelve subjects were included. Overall, PM-AHIs showed a good correlation with PSG-AHI although it tended to slightly underestimated it. The PM-AHI using 3% desaturation without PWA criteria showed the best diagnostic accuracy for AHI thresholds of >5/h and >15/h (correctly classifying 94.6% and 93.3% of subjects respectively). For AHI >30/h however, the inclusion of PWA drops showed better accuracy (classifying correctly 94.2% subjects).

Conclusion: Interpretation of PM recordings using hypopnea criteria which include 3% desaturation without PWA drops showed the best correlation and diagnosis accuracy for mild and moderate OSA. Using PWA drops as surrogates for microarousals adds accuracy for the detection of severe OSA.

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Time-frequency representations of the time-varying, nonstationary signals: A comparison study based on Hilbert-Huang and Fourier transforms

C. Lin¹, M. Lo¹, C. Guilleminault²

¹ Research Center for Adaptive Data Analysis & Center for Dynamical Biomarkers and Translational Medicine, National Central University, Taiwan

² Stanford University Sleep Medicine Division, Stanford University, USA

Introduction: Signal analysis plays an important role not only in automated sleep staging but also in extracting critical features related to specific sleep events such as sleep hypopnea/apnea. Analysis methods with high time-resolution can be crucial to probe the underlying mechanisms during sleep disorder events.

Materials and methods: Hilbert-Huang transform (HHT) attracted more attention recently in biological and medical areas. HHT can give better representations of instantaneous changes of

amplitudes and phases (frequency) compared with traditional Fourier transform. On one hand, the resolution of different frequency bands is not limited by the temporal window size and thus it is able to probe the time-varying signals better. On the other hand, the nonstationarity of biological signals such as trends or missing data can be easily removed or constrained the influence locally. To understand the limitation of the analysis methods, we applied Fourier-based analysis and HHT to two different simulation signals: (1) two sinusoidal cycles with different frequency stitching together; and (2) continuous wavelets mixing with alternative frequencies with arbitrary trends.

Results: We designed a signal with only two wave cycles (8 and 5 Hz) with different amplitudes. It is difficult to construct a time-frequency spectrum by Fourier transform with limited wave cycles while HHT spectrogram presents the instantaneous frequencies accurately over time except for boundaries. In addition, the result of Fourier spectrum was also distorted by power leakages but the marginal spectrum calculated from HHT can reconstruct two peaks at 8 and 5 Hz perfectly. For the signal with continuous alternating frequencies and arbitrary trends, we preprocessed the signal with polynomial curve fitting to remove the trends and applied the Fourier-based analysis. The frequency representation of Gabor spectrogram smeared up and even if we applied the Fourier transform to each cycle of wave, the spectrum of each cycle was still deviated from the real answer. On the contrary, the HHT spectrogram can extract the instantaneous frequency changes with high temporal resolution under the influences of random trends.

Conclusion: The physiological signals recorded during sleep inevitably encountered many transient influences such as arousal, breathing events, and body movements. HHT enables the researchers to extract the underlying changes during sleep events with better time and frequency resolution.

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Communication error analysis of sleep/wake-behaviour assessments: The need for optimizing communication and data gathering with new technologies

G. McAllister¹, D. Elbe², N. De Pietro³, E. Portales-casamar⁴, D. Lin⁵, T. Rosenfeld⁶, D. Penn⁷, S. Stockler⁷, D. Mount⁸, O. Ipsiroglu¹

¹ Sleep/Wake Behaviours Clinic & Research Lab, Division of Pediatrics, Department of Pediatrics, Faculty of Medicine, University of British Columbia, Canada

² Child and Adolescent Mental Health, BC Children's Hospital, Department of Pediatrics, Department of Psychiatry, Faculty of Medicine, University of British Columbia, Canada

³ National Core for Neuroethics, NeuroDevNet, Neuroethics Core, Canada

⁴ Child And Family Research Institute, BC Children's Hospital, Canada

⁵ Neurodevnet Neuroinformatics Core, Canada

⁶ Engage Data Corporation, Canada

⁷ Treatable Intellectual Disability Endeavour – British Columbia (TIDE-BC), Division of Biochemical Diseases, Department of Pediatrics, Faculty of Medicine, University of British Columbia, Canada

⁸ N2N-Research Cluster at Child Family Research Institute, BC Children's Hospital, Canada

Introduction: In complex chronic-care, patients' functional comorbidities such as sleep problems and effects of medications on

sleep problems often remain unreported/unrecognized. Frequently, documentation lacks overview accessible to patients/stakeholders. We are investigating and developing concepts facilitating overview and presenting complex patient data to show condition history and document treatment progress.

Materials and methods: Research Question 1: What information is required to provide overview of patient history? Communication pathways of five complex chronic care pediatric patients referred to a sleep/wake behaviour clinic and needing at least five interventions by multi-professional teams were analyzed and visualized (Mayer, BA Thesis 2012, University of British Columbia; Mayer et. al. Sleep 2013, abstracted). In addition, we interviewed representatives of five service providing non-governmental organizations (NGOs) to elucidate the main causes of sleep/wake-behaviour related communication errors. Research Question 2: How to facilitate prospective quality control in data gathering? Current data gathering options and pitfalls in the communication of categorical/functional diagnoses were analyzed using case studies of four complex-care paediatric patients (Ipsiroglu et. al. in Di Pietro/Illes Elsevier 2015, in press) and results were discussed with representatives of NGOs in a public session (Sleep2Treat Meeting, September 2013, UBC-Robson Square). Research Question 3: How to achieve overview of inter-physician communication and patient information? The visualized results were presented to patients' parents and representatives of NGOs and further developed/refined based on their feedback (ongoing research).

Results: Research Question 1: The communication pathways revealed systemic communication errors. All interviewees agreed that patient information should be shared with patients and their caregivers so they can comprehend it and contribute additional information. Furthermore, patient ownership of gathered data is expected to reduce communication errors. Research Question 2: Sleep/Wake-Behaviour-Lab, software engineers, and designers of Shift Health Paradigms Inc. have created the sleep/wake-behaviour-app (SWAPP) utilizing the broadened BEARS concept (Ipsiroglu et al. NOFAS 2012) with a medication module listing all Canadian sleep and psychotropic medications. The SWAPP is built on the TickIT® platform using graphics and simple text to improve accessibility for patient-entered data. The results, printed off as a PDF-file, facilitate immediate quality control by patient/families and professionals. This avoids monopolization of medical data by a single clinic/professional, and allows patients/families to share data for a second opinion or new assessment. Research Question 3: We have created a "Life-Trajectory Graph" concept, which summarizes information gathered from the medical records into a timeline. Life-Trajectory graphs, initially created for case studies, were developed further toward an app automatically generating graphs using SWAPP as the "front-end" for patient information, at the 2014 eHealth Vancouver Hackathon conference in collaboration with Engage Data Corporation.

Conclusion: Modern technology can enable bi-directional communication between professionals and patient families; data ownership-related challenges are the subject of ongoing research. Currently, we suggest a model where all data are owned by patient families, who can provide consent for professionals to use these data for clinical and research purposes.

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Mathematical modeling of sleep fragmentation diagnosis

R. Naeck¹, A. Elias², D. D'amore³, M. Mateo⁴, J. Suppini¹, C. Rabec⁵, X. Drouot⁶, J. Meurice⁷, J. Paquereau⁸, J. Ginoux⁹

¹ Clinical Research Unit, Hôpital Ste Musse, Toulon, France

² Vacular Unit, Hôpital Ste Musse, Toulon, France

³ Pneumology Unit, Hôpital Ste Musse, Toulon, France

⁴ CESNES, Hôpital Ste Musse, Toulon, France

⁵ Pneumology Unit, Chu Dijon, France

⁶ Clinical Neurophysiology Unit, CHU Poitiers, France

⁷ Pneumology Unit, CHU Poitiers, France

⁸ Centre Régional des Pathologies du Sommeil, CHU Poitiers, France

⁹ ISITV, Toulon University, LSIS, UMR CNRS 7296, France

Introduction: Polysomnography (PSG) is the recording during sleep of physiological parameters enabling the diagnosis of sleep disorders and the characterization of sleep fragmentation. In this work we propose to build a mathematical model of sleep fragmentation diagnosis based on three main sleep characteristics each having its own threshold and weight values for each clinician.

Materials and methods: From PSG several sleep characteristics such as the number of sleep stages shifts (SSS), the micro arousal rate (MAR) and the number of intra sleep awakenings (ISA) can be deduced each having its own fragmentation threshold value and each being more or less important (weight) in the clinician's diagnosis according to his specialization (pulmonologist or neurophysiologist). We use a decision algorithm which consists in assigning the value 1 if a patient's sleep is considered as fragmented and the value 0 if it is not. This allows representing by an index, on the one hand each clinician's diagnosis.

Results: Thus, from a database of 111 PSG consisting of 55 healthy adults and 56 adult patients with a suspicion of obstructive sleep apnoea syndrome (OSAS), we show that a measurement of the agreement between each clinician's diagnosis (CDI) and each corresponding mathematical model (MDI) is substantial.

Conclusion: It follows from this result that each of our predictive mathematical model MDI of sleep fragmentation diagnosis is a posteriori validated for each clinician.

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Artificial neural network for sleep fragmentation diagnosis

E. Bouazizi¹, R. Naeck², D. D'amore³, M. Mateo⁴, P. Arlotto⁵, M. Grimaldi⁵, M. Bouchouicha¹, F. Fnaiech¹, N. Fnaiech¹, J. Ginoux⁶

¹ ENSIT, Tunis University, Tunisia

² Clinical Research Unit, Hôpital Ste Musse, Toulon, France

³ Pneumology Unit, Hôpital Ste Musse, Toulon, France

⁴ CESNES, Hôpital Ste Musse, Toulon, France

⁵ Protee Laboratory, EA3819, Toulon University, France

⁶ ISITV, Toulon University, LSIS, UMR CNRS 7296, France

Introduction: Polysomnography (PSG) is the recording during sleep of physiological parameters enabling to diagnose sleep disorders and to characterize sleep fragmentation. We build a computational model of sleep fragmentation diagnosis while using an Artificial Neural Network and based on three main sleep characteristics each having its own threshold and weight values.

Materials and methods: From PSG several sleep characteristics such as the number of sleep stages shifts (SSS), the micro arousal

rate (MAR) and the number of intra sleep awakenings (ISA) can be deduced each having its own fragmentation threshold value and each being more or less important (weight) in the clinician's diagnosis according to his specialization (pulmonologist or neuro-physiologist). In this work we propose to build a computational model of sleep fragmentation diagnosis while using an Artificial Neural Network (ANN) and based on these three main sleep characteristics (MAR, SSS, ISA) each having its own threshold and weight values. To this aim we use a decision algorithm which consists of assigning the value 1 if a patient's sleep is considered as fragmented and the value 0 if it is not. This allows representing by an index, on the one hand the clinician's diagnosis that we call Clinician's Diagnosis Index (CDI) and, on the other hand the computational model of this diagnosis that we call ANN's Diagnosis Index (ADI) since it is based on the use of an Artificial Neural Network.

Results: Then, from a database of 150 adult PSG consisting of 84 healthy subjects and 66 patients with a suspicion of obstructive sleep apnoea syndrome (OSAS), we will show that the agreement between our ADI and each clinician's diagnosis is substantial.

Conclusion: It follows from this result that Artificial Neural Networks enable modelling each clinician's diagnosis, taking into account their own specialization and the intrinsic features of the database analyzed.

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Automatic classification of sleep-disordered breathing using cardiopulmonary coupling analysis

J. Park, U. Erdenebayar, P. Jeong, K. Lee
Yonsei University, South Korea

Introduction: This study proposed a method of automatically classifying sleep-disordered breathing (SDB) events based on cardiopulmonary coupling (CPC) analysis induced from a single-channel electrocardiogram (ECG).

Materials and methods: Nocturnal polysomnography (PSG) recordings were obtained during the sleep of 12 subjects (9 men) at Samsung Medical Center (Seoul, Republic of Korea). PSG recordings were evaluated by sleep expert. This study consists of the following steps: (1) preprocessing of the ECG signal obtained from the nocturnal PSG, (2) extraction of the normal-to-normal sinus interval series and the electrocardiogram-derived respiration (EDR) signal, (3) calculating the CPC through the product of the cross-power and the coherence of two signals, (4) extraction of CPC parameters each 10-seconds epoch; low frequency coupling (0.01–0.1 Hz band, LFC), high frequency coupling (0.1–0.5 Hz band, HFC), (5) classification of SDB based on support vector machines (SVMs), (6) evaluation of classification performance using leave-one-out (LOO) cross validation.

Results: The classification performance showed sensitivity and positivity predictive values of 77.8% and 86.4% for SDB, respectively.

Conclusion: The CPC analysis is feasible for a system to classify automatically SDB in a home environment without any other physiological signals.

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Fast and secure access to medicine of different consistencies and different forms through universal devices

K. Serik¹, Y. Yelzhas², K. Omarova³

¹ Torekhanuly, Kazakhstan

² Bekserikuly, Kazakhstan

³ Kazakhstan

Introduction: The problem of the modern world is that medicine often poisons people. Scientists analyzed year 2011 and made the following conclusions: 10.392 cases of medicine poisoning were revealed; the most common cause of poisoning is a medication overdose.

Materials and methods: What are they capable of, these smart devices? At first, it measures blood pressure, pulse, weight and height of the individual. Second, it advises and recommends medication in appropriate doses. Third, at the choice of medicine the machine provides complete information about the medicine. Fourth, if you cannot find a medicine available at the pharmacy, using our machine you can find the network of pharmacies that sells the medicine that you were looking for. Fifth, the machine only gives the medicine in single doses by measuring your weight and height. Sixth, for the sake of safety we set the LED for recognition of PIN of the document or passport. We conducted a survey to determine whether the population needs this machine. We conducted a survey at the airport, train station and shopping malls. Two hundred fifty residents and guests of the Almaty city attended the survey.

Results: The answers were as follows:

1. Do you feel discomfort while walking?
Fifty-six people said never, 32 people said rare, 98 people said sometimes, 54 people said often.
2. What are your actions if while walking you feel unwell?
I will do nothing, said 135 people
I will start self-treatment, I will purchase medicine in pharmacy, said 79 people
I will go to the hospital and cancel all my deals, said 36 people
3. Would you agree if a special device would advise you something in connection with your illness?
Yes, said 238 people
No, said 12 people
4. Would you buy a single dose of medicine from a special apparatus with drugs located in the street at affordable prices?
Yes, said 198 people.
No, said 52 people.

Conclusion: Questioning revealed that such machines selling the medicine would be popular and useful to society. After questioning, we found out that the machine with the medicines would become more reliable and safe way to first aid.

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Effect of music therapy on sleep, stress and anxiety level in patients undergoing overnight polysomnography: A randomized-controlled trial

W. Suwansathit¹, V. Tantrakul², J. Pengjam¹,

N. Amornputhisathaporn³

¹ Ramathibodi Hospital Sleep Disorder Center, Mahidol University, Bangkok, Thailand

² Ramathibodi Hospital Sleep Disorder Center, Division of Pulmonary and Critical Care, Medicine Department, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand

³ Division of Pulmonary and Critical Care, Medicine Department, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand

Introduction: Music therapy has been used in various types of clinical settings to improve sleep quality and reduce stress and anxiety. This study aims to determine the effect of music therapy on sleep and stress level in subjects who undergo standard overnight polysomnography (PSG).

Materials and methods: A randomized-controlled trial was conducted at Ramathibodi Hospital Sleep Center, Bangkok, Thailand during June 2014 to July 2014. One hundred and forty subjects scheduled for standard overnight PSG for the first time were enrolled (70 subjects each in music and control groups). While the control group received only standard care, 30 minutes of Thai light music was given to the experimental group during hook-up time prior to initiation of PSG. Recording and scoring sleep technologists were blinded to the randomized conditions. Comparisons of sleep quality were measured with sleep parameters from PSG and Pittsburgh Sleep Quality Index (PSQI). Stress and anxiety levels were compared using State-Trait questionnaires prior to intervention and the morning after PSG.

Results: Compared with controls, the music group were similar with regards to age (53.7 ± 15.1 versus 52.8 ± 15.1 years), gender (male 49% vs 50%), apnea–hypopnea index (41.0 ± 31.1 versus 36.4 ± 27.9 events/hour), respiratory disturbance index (46.3 ± 28.8 versus 41.4 ± 26.3 events/hour) with exception of higher body mass index (29.1 ± 5.8 versus 26.9 ± 5.8 kg/m², $p = 0.02$). Baseline State trait (48.3 ± 6.1 versus 46.4 ± 8.4), PSQI (7.6 ± 3.1 versus 7.5 ± 3.2) and Epworth Sleepiness Scale (11.4 ± 5.3 versus 10.8 ± 5.5) were similar. Stress and anxiety level after PSG was significantly lower in the music group compared with controls as shown in post-intervention State Trait questionnaire (35.6 ± 10.8 versus 47.6 ± 6.1 , $p < 0.001$) and difference of pre-and-post PSG State Trait score (-12.4 ± 12.8 versus 0.52 ± 7.7 , $p < 0.001$). However objective sleep parameters were not different in terms of total sleep time (228.2 ± 118.2 versus 231.2 ± 120.4 minutes), sleep latency (8.2 ± 10.2 versus 8.7 ± 11.7 minutes), sleep efficiency (84.5 ± 13.1 versus $83.8 \pm 15.3\%$), arousal index (45.3 ± 27.3 versus 41.7 ± 24.8 /hour), and WASO (34.1 ± 44.5 versus 36.8 ± 45.5 minutes). Sleep architecture was similar as measured by percentages of sleep stages N1 (21.7 ± 13.3 versus $25.0 \pm 18.8\%$), N2 (47.9 ± 13.2 versus $45.1 \pm 15.3\%$), N3 (18.5 ± 13.2 versus $17.1 \pm 12.6\%$), and REM (18.5 ± 13.2 versus $17.1 \pm 12.6\%$).

Conclusion: Music therapy substantially reduced stress and anxiety related with overnight polysomnography. Thus it could be offered to patients prior to initiation of the sleep test for relaxation. However there was no alteration in sleep architecture and other sleep quality indices associated with music therapy.

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What are the differences in sleep skills between insomnia patients with and without need of hypnotics?

Hoo Rim Song, Se Hoon Shim, Hwa Young Lee, Young Joon Kwon
Department Of Psychiatry, College Of Medicine, Soonchunhyang University, Cheonan, Korea

Introduction: We checked ordinary sleep skills of insomnia patients and changes of sleep skills after sleep CBT, and evaluated the difference in changes of sleep skills between patients with and without need of hypnotics.

Materials and methods: Sleep disturbance of 131 primary insomnia patients assessed by 1–100 visual analogue scales. They received 9 sessions of sleep CBT about sleep hygiene and sleep stimulus-control guidelines and were prescribed hypnotics for prn use during 3 months. Sleep hygiene guidelines were Limit the amount of time spent in bed (SH1), Get regular moderate exercise (SH2), Avoid exposure to bright light at night (SH3), Avoid heavy meals or drinking within 3 hours of bedtime (SH4), bedroom is quiet, dark, and comfortable (SH5), Avoid caffeine, alcohol, and nicotine before bed (SH6), Practice a relaxing bedtime routine (SH7), Have a light bedtime snack (SH8), Remove the bedroom clock (SH9). Sleep stimulus-control guidelines were Go to bed only when sleepy (SSC1), Use the bedroom only for sleeping or sex (SSC2), Get out of bed when unable to sleep (SSC3), Get up at the same time every morning (SSC4), Avoid daytime napping (SSC5). The degree of each sleep skill state was evaluated by 1–5 Likert scale, and they were compared between before and after CBT. After 3 months of CBT, patients were divided into two groups: still need of hypnotics and no need of hypnotics. Two groups were compared in changes of sleep skills.

Results: All the sleep hygiene, sleep stimulus-control skills and sleep VAS were statistically improved after CBT (all, $p < 0.001$). Forty-six (35.1%) patients replied they needed not hypnotics any more, but 85 (64.9%) patients replied they still needed hypnotics after CBT. Sleep VAS (25.26 ± 8.52 vs. 32.64 ± 8.95 , $p < 0.001$), SH2 (3.67 ± 0.92 vs. 2.76 ± 1.06 , $p = 0.030$), SH7 (4.08 ± 0.55 vs. 2.76 ± 0.76 , $p < 0.001$) were different in two groups.

Conclusion: Sleep CBT is efficacious for the treatment of insomnia. Among several CBT skills, regular moderate exercise in daytime and a relaxing bedtime routine seem to be key components. For reducing chronic use of hypnotics and better outcome of CBT, clinicians should focus on the two components more.

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Can indices of body fat distribution be used as indicators of paediatric obstructive sleep apnoea severity?

Lauren Nisbet, Lisa Walter, Gillian Nixon, Margot Davey, Rosemary Horne
Mimr-phi Institute of Medical Research, Australia

Introduction: Obesity is a major cause of obstructive sleep apnoea (OSA) in older children and adolescents. Neck circumference (NC) percentiles have recently been proposed as a screening tool for OSA in Canadian children aged 6–17 years (Katz et al, 2015). However the relationship between anthropometric variables and OSA severity has not been investigated in preschool age children, when OSA is most prevalent and is largely due to adenotonsillar hypertrophy. This study aimed to characterise such a relationship in Australian children over a wider age range of 3–18 years.

Materials and methods: 199 preschool children (3–5 y), 163 school-age children (6–11 y) and 58 adolescents (12–18 y) underwent overnight polysomnography plus height, weight, NC, hip (HC) and waist circumference (WC) measurements. Subjects were grouped according to OSA severity (Controls, no snoring, obstructive apnoea hypopnoea index (OAHI) ≤ 1 event/h; Primary Snoring (PS), OAHI ≤ 1 ; Mild OSA, OAHI $> 1-5$; Moderate-Severe (MS) OSA, OAHI > 5). Body mass index (BMI) z-scores were calculated, in addition to waist-to-hip ratio (WHR), neck-to-waist ratio (NWR) and waist-to-height ratio (WHtR) as indices of body fat distribution. NC and WC percentiles were calculated for age and sex based on established norms (>6 years) or cohort percentiles (<6 years; no established norms available). Proportions of subjects >90 th percentile within

each severity group at each age were compared using chi-square analysis.

Results: The median BMI z-score was 0.66 (range -2.45 to 4.41). BMI z-score was similar between severity groups in pre-school, school-age and adolescent cohorts. In preschool children, OAH1 was not significantly correlated with NC, WC, HC or any indices of body fat distribution. Preschool children with mild OSA had a significantly higher WC and HC than control or PS children ($p < 0.05$ for both). NC was significantly smaller in preschool children with PS than mild or MS OSA groups ($p < 0.05$ for both). There were no preschool group differences in indices of body fat distribution. School-age and adolescent cohorts showed no severity group differences in NC, WC or HC. However, school-age children with mild OSA had a significantly higher WHR than controls ($p < 0.01$). In school age children, OAH1 correlated with NC, WC, HC and WHtR ($p < 0.01$ for all, $r = 0.42$, $r = 0.3$, $r = 0.3$, $r = 0.36$ respectively). Adolescents with MS OSA had a significantly higher WHR, NWR and WHtR than controls ($p < 0.05$ for all). In adolescents, OAH1 correlated with NC, WC, HC, WHtR, WHR and NWR ($p < 0.05$ for all, $r = 0.29$, $r = 0.4$, $r = 0.3$, $r = 0.41$, $r = 0.39$, $r = -0.32$ respectively). The proportion of preschool children with NC > 90 th percentile in each severity group was significantly different ($p < 0.05$), however proportions in each severity group were similar at the school-age and adolescent age. There were no severity group differences in proportions of subjects with WC > 90 th percentile at any age.

Conclusion: In a heterogeneous population of healthy, overweight and obese children, indices of body fat distribution relate to OSA severity in school-aged and adolescent years, however less so at the preschool age. These findings are largely underpinned by the contrasting causes of OSA in each age group. The use of NC and WC as a screening tool for OSA is likely to be age dependent.

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Sleep quality and fatigue are associated with cognitive function in adults living with human immunodeficiency virus/acquired immunodeficiency syndrome

E. Byun, C. Gay, K. Lee

Department of Family Health Care Nursing, University of California at San Francisco, USA

Introduction: Up to 50% of persons with human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) have some neurocognitive impairment. The purpose of this study was to examine associations of objectively and subjectively measured sleep and fatigue with cognitive function in adults living with HIV/AIDS.

Materials and methods: A cross sectional descriptive study was conducted with a convenience sample of 268 adults (179 men, 67 women, and 22 transgender, mean age 45 ± 8.5) living with HIV/AIDS recruited from HIV clinics and community sites in the San Francisco Bay Area. A wrist actigraph was worn for 72 hours to assess total sleep time (TST) and percent of TST spent awake after sleep onset (WASO%). The Pittsburgh Sleep Quality Index was used to measure subjective sleep quality (range: 0–21, higher scores = poorer sleep quality). The Fatigue Severity Scale was used to measure fatigue (range: 1–7, higher scores = greater fatigue). Cognitive function was assessed by the Medical Outcome Study Cognitive Functioning Scale (range: 6–36, higher scores = better cognition) that includes six cognitive aspects (reasoning, concentration and thinking, confusion, memory, attention and psychomotor). Poor cognitive function was defined as scoring > 1 standard deviation below the mean on the

scale. Multivariate regression was used to examine associations between cognition and TST, WASO%, subjective sleep quality and fatigue, with adjustment for age, gender, race, education, CD4+ T-cell count, and HIV viral load log.

Results: The mean TST (hours) was 6.21 ± 1.64 (SD) and mean WASO (%) was 20.46 ± 14.69 (SD). The mean Pittsburgh Sleep Quality Index score was 7.25 ± 3.35 (SD) and 63% of adults with HIV/AIDS had poor sleep quality using a cutoff point of 5. The mean score for the Fatigue Severity Scale was 4.78 ± 2.03 (SD). The mean Medical Outcome Study Cognitive Functioning Scale score was 27.23 ± 7.22 and 19% of the adults with HIV/AIDS had poor cognitive function. Poorer subjective sleep quality was correlated with greater fatigue ($r = 0.43$, $p < 0.001$), but the relationships between subjective sleep quality scores and actigraphy values for TST ($r = -0.115$, $p = 0.059$) and WASO ($r = -0.118$, $p = 0.053$) were weak. Poorer cognitive function was associated with being female or transgender (vs. male, $p = 0.025$), higher CD4+ T-cell count ($p < 0.001$) and higher HIV viral load ($p = 0.013$). Poorer subjective sleep quality ($p < 0.001$) and greater fatigue ($p < 0.001$) were associated with poorer cognitive function, even after controlling for socio-demographic and clinical variables.

Conclusion: Adults with HIV/AIDS who experience poorer sleep quality and greater fatigue are more likely to have poorer cognitive function, regardless of CD4+ cell count and viral load. Assessing and treating both sleep problems and fatigue may have greater impact on improving cognitive function, and suggests potential areas for intervention.

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Promoting sleep among undergraduate nursing students in Hong Kong

J. Chan, S. Lam, M. Cheung, K. Lee, J. Lee

The Chinese University of Hong Kong, Hong Kong

Introduction: There is little research on the sleep knowledge and quality of nursing students. This study aims to compare the sleep knowledge, sleep quality and sleep parameters prior to, and after, a sleep education programme for nursing students.

Materials and methods: A single group pre-test and post-test quasi-experimental design is used in this study. We aim to recruit 57 undergraduate nursing students in Hong Kong. The program consists of about 30-minute oral presentation with utilization of sleep education PowerPoint and sleep education handout. The educational contents include importance of good sleep, impact of shift work on sleep, negative consequences of poor sleep, sleep hygiene and practice guidelines, stimulus control instructions and information about substances with caffeine. Pittsburgh Sleep Quality Index (PSQI), Sleep Beliefs Scale (SBS) and client satisfaction survey are used as instruments to measure the outcomes which include students' sleep quality, sleep parameters, sleep knowledge and their satisfaction toward the program respectively. The participants will be assessed over three time points which are pre-program, post-program and 6-week follow up. Prior to the program, students will answer questions about demographics, PSQI and SBS; right after the program, they will complete SBS and client satisfaction questionnaire. Six weeks after the program, they will complete PSQI. An email with the PSQI will be sent to them and they will have to return the

questionnaire in person. Hardcopies of the questionnaires will also be available.

Results: The sleep promotion program will take place in January 2015 and the results will be ready for report in the conference.

Conclusion: Pending.

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Waking threats and the temporal references of dream threat simulations

A. Lafrenière, R. Robidoux, A. Dale, J. De Koninck
School of Psychology, University of Ottawa, Canada

Introduction: This study aimed to test the hypothesis of the Threat Simulation Theory (TST, Revonsuo, 2000) according to which, in the absence of a recent experience with severely threatening events, simulated threats in the dream should reflect elements of past experiences encoded in long-term autobiographical memory.

Materials and methods: The study included two groups of participants ($n = 119$), aged between 18 and 24 years old, who did not experience severe threatening events in the year preceding their dream. The first group ($n = 60$) had reported a dream with at least one threatening event and the second group ($n = 59$) had reported a dream without any threats. In their dream questionnaires, the participants indicated if the various dream components referred to past experiences and if so, at what point in time. This was determined in accordance with a temporal references scale including 13 time points, ranging from “last night” to “20 to 29 years ago”. The dream threats were identified by two independent judges using a subset of the Dream Threat Scale.

Results: There were no statistically significant differences for the temporal references between the two groups for the time categories referring to the year preceding the dreams. However, participants who reported threat in their dream had significantly more temporal references for the time categories “One year ago” ($F(1; 117) = 9.01$, $p < 0.05$).

Conclusion: From 2 to 4 years ago” ($F(1; 117) = 11.57$, $p < 0.05$) and “From 5 to 9 years ago” ($F(1; 117) = 10.86$, $p < 0.05$) confirm that the dreams of these participants incorporated threats related to their remote past (beyond a year). In support of the TST, it seems that in the absence of recent highly negative emotional experiences, the dream production system selects memory traces from the remote past. Research is required to evaluate the potential impact of dream threat incorporations on waking adaptation.

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Dream mood and morning mood differentiates emotionally impactful versus mundane dreams for negative but not for positive valence

R. Robidoux, D. Allyson, A. Lafrenière, A. Nixon, J. De Koninck
School of Psychology, University of Ottawa, Canada

Introduction: The goal of this study was to validate the classification of dreams as emotionally impactful or mundane as defined by Kuiken and collaborators by confirming that in the former, the dreamer would report consistency between dream mood and morning mood dimensions but not in the case of the latter.

Materials and methods: Participants were 52 young adults (18–24 years old) who wrote down two dreams in the morning as part of a normative study of the dreams of Canadians. They had reported one emotionally impactful dream (EID) (“that had an impact on their morning mood”) and one mundane dream (MD). Participants had also rated on a four point scale their level of sadness, happiness, fear, and anger, in their dream, and again in the morning.

Results: Correlational analyses showed that all self-rated mood dimensions in EIDs were significantly positively correlated with morning mood (sadness, $r = 0.76$, $p < 0.001$; happiness, $r = 0.61$, $p < 0.001$; anger, $r = 0.584$, $p < 0.05$; and fear, $r = 0.41$, $p < 0.05$). In the case of MDs the only significant correlation was for happiness levels ($r = 0.50$, $p < 0.05$).

Conclusion: These results support the notion that mood in EIDs is associated with morning mood. They provide support for the identification of EIDs in studies of the function of dreams in adaptation. Positive correlations for happiness associated with MD are consistent with the benefits of sleep with unperturbed dreams.

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Sleep duration and weight

A. A. Gonfalone
School of Psychology, University of Ottawa, Canada

Introduction: The function of sleep has not been understood yet. A popular belief, proposes that sleep is there for the body and the brain to rest. This paper shows that there is a correlation between sleep and weight among the mammals and an explanation based on Earth environment is proposed.

Materials and methods: The paper is essentially based on experiments performed by Michel Jouviet, Lyon, and results collected by Sushil K. Jha, New Delhi. The conclusions reached by Jerome M. Siegel, Los Angeles, in “Clues to the functions of mammalian sleep” follow our result but the interpretation given here is more general and applies to all species. A further extensive and attentive review of the existing literature has been used to make a correlation between the total sleep time and the weight of more than 100 mammalian species. When the values for the weight of an animal species are different a mean value has been taken, and the same applies for the sleep duration. It is expected that for life sciences, results do show a trend and do not adhere to a mathematical law. Sleep of the human species follows the general finding. Theories proposed to explain the duration of sleep in mammals based on arguments like predator fear, gestation time, length of hindguts, parasitological protection, have been examined.

Results: The Total Sleep Time has been plotted against weight value for the 100 species. The tendency curve obtained shows a clear variation of the total sleep time with the weight. The heavier animals sleeping less than the light animals. This finding was already noted by a few authors, and in particular by Siegel who sees different slopes in the curves, depending on whether the mammal is vegetarian, carnivore or omnivore. Here the interpretation given for this trend, is that the level of adaptation to the environment and the conditions of life on earth, and the permanent presence of gravity can be the explanation. This adaptation to gravity, is analysed for the elephant and the little brown bat at the two ends of the scale. If gravity plays a role in sleep duration, then the sleep of fishes can be easily interpreted, the weight of the fishes in water is null because of the Archimedes’ force. A straightforward conclusion do not apply to the sleep of reptiles, amphibians. For birds, the trend also

indicates that heavy birds sleep less than light birds, but the scattering of the points is so large that this result has to be taken with precaution.

Conclusion: Gravity is a price to pay for life on Earth. For the first time, a possible explanation of the duration of sleep in mammals is found. The weight is a sign of a good adaptation to gravity and the heavier animals sleep less.

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Clues to the functions of seals' sleep

A. Gonfalone

European Space Agency, France

Introduction: On land fur seals usually sleep like terrestrial mammals, with bilateral EEG synchrony and REM sleep. However, in water they show asymmetrical slow-wave sleep, and no REM sleep. REM sleep rebound is not always seen when they return.

Materials and methods: This paper is based on numerous results obtained by a large community of scientists both from the sleep domain and the seal study domain. Like many other wild mammals, seals sleep in short bursts of time rather than spending a single daily period of hours sleeping like humans do. How long seals sleep depends on many factors, such as whether they are looking after pups and how many predators inhabit the area. A careful examination of the sleep features of the seals has convinced us that the environment in which the seal sleeps has a fundamental importance. Simple laws of physics have been used to obtain a possible explanation on the strange behavior of seals during their sleep periods.

Results: The effect of gravity in the ocean is compensated by the Archimedes force, the seal does not show REM sleep. All terrestrial animals showing REM sleep lie on the ground. The seal shows again REM sleep when it returns to land. There is no rebound as the REM sleep was not necessary in the water. Flying and terrestrial animals should spend energy to move while supporting their weight against gravity. On the other hand, supported by buoyancy, aquatic animals can minimize the energy cost for supporting their body weight and neutral buoyancy has been considered advantageous for aquatic animals. To maintain depth some seals control buoyancy by the amount of air in their lungs. When seals sleep in water, they sleep in a position known as bottling. This is a position in which their bodies float but remain completely underwater except for their snouts, which remain above water at all times. Some species can sleep at moderate depths on the bottom of the sea.

Conclusion: REM sleep is associated with gravity, and this explains perfectly the unexpected sleep of seal: no gravity, no REM sleep; gravity, REM sleep.

The buoyancy of the seal in the water, can be compared with the buoyancy of fishes which hardly show signs of SWS sleep or REM sleep.

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The effect of daytime sleep opportunity on risky decision-making

Y. Lee, P. Hung, M. Wong, E. Lau

Sleep Laboratory, The University of Hong Kong, Hong Kong

Introduction: Sleep duration has been reported to predict risky decision-making by sleep deprivation literature. Yet, the ecological

validity of the findings is constrained by the manipulation of participants' nighttime sleep duration. This study aimed to investigate the effect of daytime napping, which is more of everyday life significance, on risky decision-making.

Materials and methods: Ninety-six young adults (aged 19–24) completed a 5-day sleep diary. Fifty (52.1%) of them were randomized to the "nap group" with a 90-minute daytime sleep opportunity, while 46 (47.9%) of them were randomized to the "wake group" following their usual routine in the laboratory for 90 minutes on the sixth day. All participants completed the Psychomotor Vigilance Test (PVT) and Risky-Gains-Task before and after the nap/wake condition. Both their reaction time (RT) and the frequencies of risky vs. safe choices were taken as the indication of their decision-making behaviors.

Results: Group differences on age, gender and body-mass-index were non-significant ($p > 0.01$). A $2(\text{time}) \times 2(\text{condition})$ factorial ANOVA revealed a significant interaction effect between daytime napping and pre-post-condition on the RT in choosing the risky options ($F(1,94) = 8.512, p = 0.004$). No other significant relationships were observed ($p > 0.01$). Post-hoc paired-sample t-test analysis revealed significantly faster RT in selecting the risky options in post-condition when compared with pre-condition only among individuals in the wake group ($t(95) = 3.048, p = 0.004$), while there were no significant changes after nap among individuals in the nap group ($p > 0.01$). A $2(\text{time}) \times 2(\text{condition})$ factorial ANOVA also revealed a significant interaction effect between daytime napping and pre-post condition on the PVT performance ($F(1,94) = 30.587, p < 0.001$). Post-hoc paired-sample t-test analysis also showed that in the PVT task, the nap group had improved performance in the post-condition ($t(95) = -5.249, p < 0.001$), while the wake group performed significantly worse in the post-condition than the pre-condition ($t(95) = 2.913, p = 0.008$).

Conclusion: Across the day, one's vigilance deteriorated and risky decision-making behaviors changed while napping was found to improve one's vigilance and maintain the risky decision-making tendency and RT. Our study supported that role of sleep in risky decision-making by using a daytime napping paradigm, which is more commonly experienced.

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The impact of sleep quality on cognitive function in idiopathic Parkinson's disease: Quantitative EEG study

J. Seo

School of Medicine, Department of Neurology, Kyungpook National University, South Korea

Introduction: Relatively poor sleep has been associated with lower global cognitive function and poorer performance on a test of executive function, attention, and working memory. The purpose of this study was to evaluate the impact of sleep quality on cognitive function in idiopathic Parkinson's disease (IPD) using quantitative EEG (qEEG).

Materials and methods: We enrolled IPD patients who had visited our clinic. IPD was diagnosed by UK Parkinson's Disease Society brain bank clinical diagnostic criteria. Sixty-nine subjects constituted the final group for analysis. Subjects underwent the Pittsburgh Sleep Quality Index (PSQI) and neuropsychological tests. Poor sleep quality was defined by PSQI score 6 or above. The resting EEG was recorded and relative powers were computed for seven frequency bands.

Results: Poor sleepers had more cognitive dysfunction than good sleepers in neuropsychological test. In qEEG analysis, poor

sleepers, when compared with good sleepers, showed a statistically significant decrease in theta2 band power at the frontal (FP1, F3, Fz, F4) regions and increased beta band power at the parietal (P3, Pz, P4) and occipital (O1, O2) regions. Lower theta2 band power in the parietal (P3, Pz) and occipital (O2) regions significantly correlated with sleep quality. In addition, higher delta1 band power in central (Cz) and higher theta2 band power in central (C3, Cz) and occipital (O1, O2) regions significantly correlated with cognitive performance.

Conclusion: This study demonstrated that sleep quality in IPD could influence cognitive function and our findings may encourage further research using qEEG to evaluate cognitive function in various neurological disorders.

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Poor sleep quality associated with obesity in men

W. Sun

Tulane University, USA

Introduction: To examine the association between sleep quality and obesity status.

Materials and methods: A cross-sectional study of 3225 Chinese participants aged 16–65 years was conducted in Beijing. Body mass index (BMI) was classified according to the Working Group on Obesity in China, and sleep quality was assessed by the Pittsburg Sleep Quality Index questionnaire. Logistic regression models were applied to estimate the odds ratios and 95% CIs of obesity by sleep quality adjusted for potential confounders. Two sets of potential confounders were used in the adjusted models. Model 1 was adjusted for sex and age. Model 2 was further adjusted for education level, occupation, marriage status, smoking, drinking, body pain, and health status.

Results: Poor sleep quality was associated with overweight/obesity in men but not in women. Additional adjustment for education level, occupation, marriage status, smoking, drinking, body pain, and health status did not attenuate the association (OR = 1.41 with 95% CI: 1.03–1.93; $p < 0.05$) among men. The adjusted OR per sleep quality score hour was 1.07 (1.01–1.14) for overweight/obesity, suggesting that for one score increase in sleep quality, obesity/overweight risk increased by 7% in men.

Conclusion: Sleep quality was negatively associated with overweight/obesity in Chinese men but not women.

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Clinical characteristics of restless legs syndrome after acute cerebral infarction

D. Yongmin

Department of Neurology, The Second Affiliated Hospital of Nanchang University, Nanchang, China

Materials and methods: All of admission of acute cerebral infarction were screening in accordance with IRLSSG (International

Restless Legs Syndrome Study Group). The patients without RLS were as matched group in similar with age, gender, location of lesion. We analyzed the clinical characteristics of the patients with and without RLS.

Results: Two hundred seventy-five of patients with acute cerebral infarction were studied. Twenty-two cases met the diagnostic criteria for RLS. Nineteen out of 275 (6.91%) cases were diagnosed with new RLS. In RLS group, cortical lesion of cerebral infarction is 21.05% (4/19), subcortical lesion is 78.95% (15/19), the basal ganglia lesion in subcortical cerebral infarction is 47.37% (9/19), but the right basal ganglia lesion is 6/9 (66.67%). The prevalence of periodic limb movement and obstructive sleep apnea (OSA) in RLS group were 73.68% (14/19) and 78.9% (15/19) separately. The sleep quality and neurological function in RLS group were worse in comparison with no RLS group. 42.11% of symptoms of RLS in RLS group had resolution of symptoms after 180 days.

Conclusion: The prospective study demonstrates acute cerebral infarction resulting in new RLS. The subcortical lesion of cerebral infarction may be the risk factor of post-stroke RLS, in particular basal ganglia lesion. The prognosis and sleep quality of patients with RLS are worse.

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Insomnia and depression among post ischemic stroke patients

Z. Afif, B. Munir

Medical Faculty Brawijaya University – Saiful Anwar General Hospital, Indonesia

Introduction: The incidences of sleep disorders and depression among post stroke patients are considerably high. Post stroke patients with sleep disorders often complain of fatigue, depression, memory and attention deficit. This study is conducted to determine the incidence and correlation of insomnia and depression among post ischemic stroke patients.

Materials and methods: Analytic descriptive study that been conducted at Neurology Outpatient Clinic of Dr. Saiful Anwar Hospital Malang between June and September 2014. Age, sex, onset of stroke, type of insomnia, and Hamilton Depression Rating Scale (HDRS) were recorded and analyzed.

Results: There were 44 patients included in this study, consisting of 19 males (43.2%) and 25 females (56.8%). Based on the age of patients, there were 25 patients (56.8%) over 60 years and 19 patients (43.2%) under 60 years. Based on the onset of stroke, 12 patients (27.3%) experienced the attack < 6 month and 32 patients (72.7%) > 6 month. There were no significant correlations between age, sex, and onset of stroke with the depression level ($p > 0.05$). There were 36 patients (82%) who experienced insomnia. Among them, 6 patients (17%) had early insomnia, 2 patients (6%) experienced the maintenance insomnia, and 10 patients (28%) experienced late insomnia. There were significant correlations between maintenance insomnia and late insomnia with the depression level ($p = 0.005$). Hamilton Depression Rating Scale (HDRS) evaluation revealed that 15 patients (34.1%) experienced severe depression and 23 patients (52.3%) had mild depression.

Conclusion: There were associations between insomnia and the depression level, especially maintenance and late insomnia. There was also high tendency to experience depression among post ischemic stroke patients.

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Prevalence of insomnia and associated factors in community-dwelling Korean elderly

S. Ahn, J. Kim

Chungnam National University Hospital, Korea

Introduction: Insomnia is a common sleep disturbance in the elderly. We are to examine prevalence of insomnia and associated factors in community-dwelling Korean elderly.

Materials and methods: A cross-sectional survey was conducted in a total of 1500 older individuals aged 65 and older of an urban community of Korean, including 615 men and 885 women.

Results: We found that the overall prevalence of insomnia during the preceding month was 43.1%, including difficulty initiating sleep (DIS: 27%) and difficulty maintaining sleep or early morning awakening (DMS or EMA: 37.9%). Of the sample, 23.2% had insomnia with daytime consequences, and 4.1% were dissatisfied with sleep quality. Multiple logistic regression analysis showed that chronic disease (OR 2.42, 95% CI 1.59–3.71), depression (OR 1.86, 95% CI 1.31–2.63), female (OR 1.63, 95% CI 1.27–2.10), suicidal ideation (OR 1.60, 95% CI 1.05–2.45), poor perceived health (OR 1.57, 95% CI 1.14–2.17), unemployment (OR 1.51, 95% CI 1.13–2.03) are associated with an increased prevalence of insomnia. The prevalence of insomnia was higher as the subjects perceive that the quality of sleep is bad ($\chi^2 = 360.81$, $p = 0.000$). Hypnotic use during past month was reported by 13.1% of the sample; women were more likely than men to use hypnotics (male 10.7%, female 14.8%, $\chi^2 = 5.270$, $p = 0.022$).

Conclusion: The prevalence of insomnia in community-dwelling Korean elderly is as common as among Western elderly, and that insomnia is associated with multiple psychosocial factors. We should consider underlying chronic disease and depression for patients with insomnia.

Acknowledgements: This study is part of an elderly mental-health survey conducted by the Daejeon Welfare Foundation between June 9 and July 18, 2014.

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Validation of the French version of the Ford insomnia response to stress test and the association between sleep reactivity and hyperarousal

I. Chen, D. Jarrin, A. Rochefort, M. Lamy, H. Ivers, C. Morin

École de Psychologie, Université Laval, Canada

Introduction: The Ford Insomnia Response to Stress Test (FIRST) assesses sleep reactivity, a vulnerability to experience sleep disturbances under stressful conditions. Sleep reactivity is associated with insomnia and with hyperarousal. The aim of this study was to validate the FIRST in French and explore the association between sleep reactivity and hyperarousal.

Materials and methods: Participants were 45 healthy adults (25.0 ± 5.0 years; 71.1% women) without prior and current insomnia complaints. Participants completed the French version of FIRST (F-FIRST) at baseline and 3 weeks later. A subsample of participants ($n = 14$; 26.2 ± 4.0 years; 57.1% women) underwent one night of polysomnography (PSG) recordings in the laboratory. Subjective estimations of sleep onset latency, total sleep time, and nocturnal wake time were also obtained for the same night. The Pre-Sleep Arousal Scale (PSAS) was completed on the following morning to assess subjective somatic and cognitive arousal. Indices of physiological hyperarousal, including blood pressure and heart rate, were recorded throughout a 2-hour period preceding bedtime. Spearman correlation coefficients were calculated to assess the

strength of the association of sleep reactivity (FIRST scores) with subjective and objective sleep parameters, and with hyperarousal measures.

Results: The F-FIRST was found to have high internal consistency (Cronbach's $\alpha = 0.81$) and acceptable test-retest reliability after 3 weeks ($r = 0.75$). Correlational analyses revealed significant associations between sleep reactivity and sleep parameters. Heightened sleep reactivity was significantly associated with lower PSG sleep efficiency ($r_s = -0.53$, $p = 0.049$), longer PSG sleep onset latency ($r_s = 0.54$, $p = 0.047$) and total wake time ($r_s = 0.61$, $p = 0.021$), and longer subjective sleep onset latency ($r_s = 0.71$, $p = 0.003$). Additionally, correlational analyses between sleep reactivity and hyperarousal measures revealed that heightened sleep reactivity was significantly associated with higher somatic arousal on the PSAS ($r_s = 0.61$, $p = 0.007$) and with elevated heart rate ($r = 0.47$, $p = 0.049$). However, sleep reactivity correlated neither with the cognitive arousal on the PSAS nor with blood pressure.

Conclusion: Preliminary findings suggest that the F-FIRST demonstrates adequate psychometrics. Heightened sleep reactivity is associated with greater stress-related sleep disturbances (i.e., first laboratory night) and with hyperarousal. Identification of premorbid individual differences in sleep reactivity is important, as it may provide insights into potential prevention of incident insomnia.

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The respiratory regulation effect of autonomic nervous system

Y. Chung, P. Tsai, S. Lou

Chung Yuan Christian University, Taiwan

Introduction: Breathing with given patterns known as respiratory regulation is considered as a type of external stimulation to the body. Autonomic nervous system controls involuntary organs in responses to stimulations, such as heart beat, digestion, so on. This work studies how respiratory regulation affects heart beat in particular heart rate variability.

Materials and methods: Fifteen subjects, 10 males and 5 females who average 22 years old, were included. Each subject performed a 27-min breathing session, which is equally divided into nine periods. These periods consist of five resting periods (noted as Rest A, B, C, D, and E) and four designated breathing periods (noted as Modes 1, 2, 3, and 4) with resting and breathing alternated. Each breathing period includes many respiration cycles with each cycle having four durations in order as: inhaled (2 s), held (3 s), exhaled and short rest (3 s). The time durations of the exhaled in Modes 1, 2, and 3 were 3, 6 and 9 s, respectively. Mode 4 is a mixture of Modes 1, 2, and 3.

Prior to each breathing session, the subjects were guided to follow a respiratory regulation coach, Relaxkit (DailyCare) to conduct each breathing mode. ECGs (and thus R-R intervals) of the subjects were recorded by an Actiheart monitor (Camntech) throughout the 27-min session. HRV was then analyzed by an Actiheart4 software (Camntech) to obtain parameters of HF, LF, LF/HF, LFnu and HFnu. Student's t-test was used to determine statistical significance. A p -value < 0.05 is considered statistically significant.

Results: The result of HRV analysis shows that HFnu at the resting periods significantly increased ($p < 0.05$) compared with that of the breathing periods. This indicates that parasympathetic nervous system (PNS) is more active in the resting period right after each respiratory regulation course. This is particularly prominent from Rest B (HFnu = 0.24) to Rest C (HFnu = 0.32). In addition, HF from

Mode 2 to Rest C shows significant increase (from 335.5 to 576.4 ms^2 , p -value = 0.018). Such an increase could be attributed from the effect of Mode 2 as it turns out to have the highest LF/HF ratio (28.6 ms^2 , $p < 0.05$). Our interpretation is that among the four breathing patterns Mode 2 is the best approach to activate ANS regulation leading to the subjects' relaxation. It is worth to note that HFnu is low for the periods of Rest B, C, D, and E (0.24, 0.32, 0.30 and 0.32%, respectively) compared with that of Rest A (0.43%). Furthermore, the LF/HF ratios (5.23, 4.14, 5.28 and 4.63) of those resting periods are all higher than that of the Rest-A period (1.69). The explanation of these results is likely due to the physical conditions of subjects, whose health is so good that the ANS effect was quickly balanced back right after each respiratory regulation period.

Conclusion: We have demonstrated that PNS can be activated by respiratory regulation. Particularly, the breathing cycle noted as Mode 2 here for 3 minutes can make human body relax. Comprehensive studies of using Mode 2 to investigate the effect on patients who have sleeping disorders and stress issues are in progress.

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Sleep disorders increase the risk of venous thromboembolism in individuals without sleep apnea: A nationwide population-based cohort study

W. Chung¹, Y. Chen², C. Lin³, C. Kao⁴

¹ Department of Internal Medicine, Taichung Hospital, Ministry of Health and Welfare, Taichung, Taiwan

² Department of Healthcare Administration, Central Taiwan University of Science and Technology, Taichung, Taiwan

³ Management Office for Health Data, China Medical University Hospital, Taichung, Taiwan

⁴ Graduate Institute of Clinical Medical Science and School of Medicine, College of Medicine, China Medical University, Taichung, Taiwan

Introduction: Studies investigating the relationship between sleep disorders (SDs) and the risk of venous thromboembolism (VTE) are scarce. This study evaluated whether the risk of VTE was associated with SDs other than sleep apnea in Taiwan.

Materials and methods: This study included 46,371 patients with SDs and a total of 92,742 controls without SDs between 1998 and 2001 by using National Health Insurance Research Database in Taiwan. The date of first diagnosis of SD was defined as the index date. For each corresponding SD patient, four controls without SD as a comparison cohort were selected using a systematic random-sampling method, and frequency matched by age, sex, and index year. The follow-up period began from the date of entering the study cohort to the date of a VTE event, censoring, or December 31, 2011. We conducted Cox proportional hazard regression analysis to estimate the effects of SDs on VTE risk.

Results: The SD cohort had a 1.79-fold adjusted hazard ratio (HR) of subsequent VTE, compared with the cohort without SD (95% confidence interval (CI) = 1.49–2.16). The incidence of VTE increased as age increased for both cohorts and was higher for the patients in the SD cohort. However, the adjusted HRs of VTE were significantly higher for SD patients aged ≤ 49 years (HR = 3.29, 95% CI = 2.12–5.12) and 50–64 years (HR = 2.43, 95% CI = 1.76–3.35), but nonsignificant for the oldest group (HR = 1.11, 95% CI = 0.84–1.47), compared with the controls. The multiplicative increased risk of VTE was significant for the SD patients with any comorbidity.

Conclusion: The current study determined that patients with nonapnea SD were at a higher risk of developing VTE. Because

patients with non-apnea SD are progressively increasing, to enhance sleep problem management may be important for decreasing VTE events.

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Are you asking what time did your patients take sleeping pills?: Sleeping pill taking time and patient satisfaction

S. Chung, S. Youn, K. Yi, B. Park, S. Lee

Department of Psychiatry, Asan Medical Center, University of Ulsan College of Medicine, Korea

Introduction: Taking hypnotics 30 minutes before bedtime is the usual guidance, but some patients report dissatisfaction with their sleeping pills. We investigated whether the timing of when sleeping pills are taken influences patient satisfaction with these drugs.

Materials and methods: Eighty-eight primary insomnia patients currently taking hypnotics were selected. The time to take their sleeping pills, bedtime, sleep onset time, and wake up time were obtained from their medical records. Subjects were also categorized into satisfied or dissatisfied groups.

Results: The time at which hypnotics were taken ($p < 0.001$) and bedtime ($p < 0.001$), but not the sleep onset time or wake up time, occurred later in the night in the satisfied group. The duration from taking pills to sleep onset (31.8 ± 21.3 minutes) and to wake up time (7.1 ± 1.2 hours) were significantly shorter in the satisfied group (142.9 ± 72.2 minutes vs. 9.4 ± 1.3 hours). Patients in both groups took hypnotics within 30 minutes before bedtime, despite a significant difference in duration from pills to bedtime ($p < 0.001$). Logistic regression analysis revealed that patient satisfaction with hypnotics could be predicted by a short duration from taking pills to sleep onset (odds ratio = 0.01; 95% confidence interval [0.001–0.19]) and a short duration from taking pills to wake up time (0.36; [0.15–0.88], $F = 33.80$, $p < 0.001$).

Conclusion: Taking sleeping pills at a later time and a shorter interval between taking pills and wake up time may increase a patient's satisfaction with hypnotics. We propose that physicians advise patients to take sleeping pills roughly 7 hours before their usual wake up time rather than 30 minutes before bedtime.

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The prevalence of depression and insomnia among patients; results from Health Insurance and Review and Assessment Service – National Patient Sample

B. Park, K. Yi, J. Lee, S. Chung

Department of Psychiatry, Asan Medical Center, University of Ulsan College of Medicine, Korea

Introduction: The aim of this study is to explore the prevalence of depression and insomnia among patients with the top 10th most common cancers in South Korea.

Materials and methods: We analyzed data from the 2011 Health Insurance and Review and Assessment Service – National Patient Sample (HIRA-NPS) of South Korea. It consisted of records for medical care and medications of 1,375,842 (3% of total records)

patients from January 2011 to December 2011. We explored the proportions of patients who had been diagnosed with the top 10th most common cancers in S. Korea using the ICD-10 codes. Then, we examined the prevalence of major depressive disorder (F32 and F33) and primary insomnia order (F51) among those patients. In case of insomnia, since many patients routinely take classical hypnotics without diagnosis, we included those who prescribed any of hypnotic drugs (zolpidem and triazolam) into insomnia patient population.

Results: Among the 1,375,842 patients sampled, thyroid cancer (N = 6688, 0.49%) was the most common cancer; colorectal (0.42%), liver (0.40%), stomach (0.37%), prostate (0.29%), breast (0.26%), lung (0.21%), cervix (0.09%), bladder (0.08%), and non-Hodgkin lymphoma (0.05%). The prevalence of major depressive disorder was 3.64% among total patients sampled, but the prevalence was higher (10.05%) among patients with any of the top 10 cancers. Major depressive disorder was most prevalent in lung cancer (14.6%) and prevalence was lowest in thyroid cancer (7.0%); prostate (13.2%), bladder (12.2%), non-hodgkin lymphoma (11.0%), colorectal (10.9%), liver (10.5%), stomach (10.0%), breast (9.3%), and cervix (9.3%). Insomnia prevalence rate was 2.37% among total population and higher (9.08%) in the top 10 cancer population. Among the 10 cancers, same as depression, lung cancer had highest prevalence rate (18.0%) and thyroid cancer had lowest rate (5.7%); non Hodgkin lymphoma (11.0%), bladder (10.6%), liver (10.4%), colorectal (10.2%), prostate (9.9%), stomach (9.4%), breast (8.0%), and cervix (8.0%).

Conclusion: In this study of a nationwide population-based data, the prevalence of depression and insomnia varied among patients with different cancer types. In particular, lung cancer had highest prevalence rate for both depression and insomnia.

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Is mirtazapine really effective in the treatment of Korean elderly depressed patients with insomnia after previous antidepressant failure?: An open-label, multicenter study

S. Chung¹, J. Park¹, M. Choi², J. Yang¹, T. Park¹, M. Kim³, N. Lee⁴, S. Moon⁵

¹ Chonbuk National University Medical School, Korea

² Hur Hospital, Korea

³ Chonbuk National University Hospital, Korea

⁴ Jeonju Welfare Hospital for the Elderly, Korea

⁵ Jeongeup Geriatric Hospital, Korea

Introduction: Insomnia is one of the predictable indicators of depression and may even worsen the prognosis of these patients. An antidepressant medication with good sleep effect profiles may be of significant therapeutic value in elderly depressed patients with insomnia.

Materials and methods: This study was performed to evaluate the antidepressant efficacy and the sleep effect profile of mirtazapine in elderly depressed patients with insomnia.

Methods: Patients with major depressive disorder with comorbid insomnia at least over 65-years-old were eligible. Patients entered an 6-week open-label multicenter study. Patients were rated using Hamilton Rating Scale for Depression (HAM-D-17), Clinical Global Impression Scale (CGI), and Pittsburgh Sleep Quality Index (PSQI) at baseline and after 6 weeks.

Results: Of the 54 patients (17 men, 37 women, mean age 69.7 years) enrolled at seven sites, 41 patients completed 6-week trial. The mean daily dose of mirtazapine was 17.1 mg. The mean HAM-D-17 score was decreased from 27.1 at baseline to 12.9 at the endpoint ($p < 0.001$). The mean CGI score declined from 5.1 to

2.9 ($p < 0.001$). The mean PSQI score was decreased from 14.5 to 7.7 ($p < 0.05$). Significant improvement in PSQI component scales, such as sleep quality, sleep satisfaction, sleep disturbance, and daytime functioning between baseline and the endpoint were observed.

Conclusion: This study suggests that mirtazapine may be an effective antidepressant in elderly depressed patients with insomnia after previous antidepressant failure.

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How do new mothers experience sleep?

L. Creti¹, D. Tran², D. Rizzo², P. Zekowitz¹, E. Libman¹

¹ Jewish General Hospital, McGill University, Canada

² Jewish General Hospital, Université de Montréal, Canada

Introduction: It has been shown that the basis for how people judge good and poor sleep quality is remarkably stable across varying types of intrinsically caused sleep disruption. This study examines daytime and nighttime factors involved in the appraisal of sleep quality in healthy new mothers at 2 months postpartum.

Materials and methods: First time mothers were recruited from the postpartum unit at the Jewish General Hospital. Data collection took place in the consenting participants' homes at 2 months after birth. Only mothers, living with their partners, who had a healthy, normal birth weight infant, following an uncomplicated vaginal delivery, were selected for this study. Forty-five mothers (mean age = 30.13; SD = 5.62) completed a battery of questionnaires including the Edinburgh Postnatal Depression Scale (EPDS – Cox, Holden, & Sagovsky, 1987) which is one of the most widely used measure of perinatal depressive symptomatology, the Generalized Anxiety Disorder Scale (GAD-7 scale, Kroenke, Spitzer, Williams, Monahan, & Lowe, 2007) which is a seven-item questionnaire that asks about symptoms of anxiety in the past 2 weeks and has been shown to be an effective screening tool for anxiety disorders., the Sleep Symptom Checklist (SSC, Bailes et al., 2008), which is a 21-item survey of a broad range of symptoms that are related to sleep disorders, the Insomnia Severity Index (ISI, Morin et al., 2011) which is a seven-item measure frequently used to detect insomnia, and one week of Sleep Diaries.

Results: Pearson correlations were carried out between the sleep quality item in the SSC and each other individual item of the SSC, as well as the ISI, the EPDS, GAD total scores, total nighttime sleep (TST) and number of nighttime sleep episodes, derived from the sleep diary. The average nighttime TST was 6 hours while the mean number of nighttime sleep episodes was 2.45 (indicating that night time sleep was fragmented). Poor sleep quality was significantly correlated with the following nocturnal variables: complaint of insomnia, difficulty falling asleep and getting back to sleep, and TST. Poor sleep quality also correlated with the following daytime variables: non-refreshing sleep, daytime sleepiness and lack of vitality. Depression, anxiety and insomnia severity were also significantly correlated with sleep quality. However, the mean scores were all within the normal range and only 16% and 22% of the mothers scored in the moderate range on these variables.

Conclusion: In this sample of healthy mothers, poor sleep quality is defined by sleep disruption, feeling unrefreshed in the morning, daytime sleepiness and lack of vitality. These are the same sleep quality components endorsed by other groups, both with and without sleep disruption, reinforcing that varying circumstances make little difference.

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Feasibility of delivering CBT-I in chronic fatigue syndrome (CFS)

Z. Gotts¹, J. Newton², V. Deary³, J. Ellis³

¹ Northumbria University at Newcastle, UK

² Newcastle University, UK

³ Northumbria University, UK

Introduction: The effectiveness of cognitive behavioural therapy for insomnia (CBT-I) has not been explored in chronic fatigue syndrome (CFS), a disabling condition where disturbed sleep is a cardinal symptom. This study reports on the feasibility, acceptability and initial effectiveness of CBT-I in a clinical sample of CFS patients.

Materials and methods: Fifteen individuals meeting the CDC criteria for CFS received face-to-face CBT-I in a specialist CFS treatment clinic. Treatment was delivered by a health researcher trained in CBT-I and comprised six individual weekly sessions. The treatment included sleep education, sleep efficiency training, individualised sleep scheduling and completion of weekly sleep diaries with an overarching aim to establish regularity in patients' sleep and wake patterns. Patients completed self-report questionnaires (fatigue, pain, mood, sleep preoccupation, insomnia severity, and dysfunctional beliefs about sleep) pre- and post-treatment, and a weekly sleep diary and Epworth Sleepiness Scale. The primary outcome measure of acceptability of CBT-I was assessed by examining barriers and facilitators to treatment via reflective note-taking by the researcher.

Results: This initial feasibility study showed that treatment was not acceptable for all patients with CFS. CFS patients who presented with circadian rhythm disorders require additional sleep interventions and, practically, it was not feasible for all patients to attend consecutive, weekly sessions for CBT-I, within a clinic setting. Attendance to weekly sessions was affected by the disabling CFS symptoms, which have a direct bearing on mobility. Barriers to treatment adherence included increased symptom focus and the perpetuation of symptoms in some patients, due to weekly attendance to the clinic. CBT-I did have beneficial effects for CFS patients with insomnia-related sleep symptoms, on self-reported sleep parameters (diary measures of sleep onset latency, awakenings during the night and sleep efficiency), and improved scores on insomnia, dysfunctional beliefs about sleep and sleep preoccupation, following treatment.

Conclusion: CBT-I is an acceptable non-pharmacological approach to treat sleep disturbances in some CFS patients. However, future studies should consider integrating less frequent telephone or online sessions for this patient group, who often have high levels of disability and symptom burden. Tailoring sleep treatments for different sleep complaints is also warranted.

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Psychological inflexibility as a potential explanation of the neuroticism–insomnia link

L. Ho

Sleep Laboratory, Department of Psychology, The University of Hong Kong, Hong Kong

Introduction: Insomnia is strongly associated with neuroticism among the Big Five personality traits but the mechanisms of the relationship are unknown. Psychological inflexibility, a core concept in metacognitive therapies for insomnia (MCTI) using acceptance-based approaches, is a potentially viable explanation of the link. The present study aimed at investigating this mediation.

Materials and methods: Seventy-nine Chinese full-time university students (30 males, 49 females) aged between 18 and 24 (mean = 20.31) whose primary language is Cantonese were recruited. Exclusion criteria included (1) preexisting diagnosis of medical and psychological disorders other than insomnia, and (2) use of medication that was known to treat insomnia or affect sleep quality and patterns within 2 weeks of the study. Participants were invited to the Sleep Laboratory of the University of Hong Kong. After completion of written informed consent and a health interview, participants filled out a set of questionnaires, including (1) International Personality Item Pool (IPIP) assessing personality traits based on the Big Five domains, (2) Acceptance and Action Questionnaire (AAQ-II) assessing psychological inflexibility, (3) Insomnia Severity Index (ISI) assessing insomnia severity, and (4) Sleep Timing Questionnaire (STQ) assessing sleep duration of the participants. Participants were debriefed after the study. Logistic regression analysis was conducted, with neuroticism set as the predictor, psychological inflexibility as the mediator, and insomnia severity as a binary outcome variable using a cutoff score of 7/8 on the ISI. The Sobel test was conducted to test the significance of the mediation.

Results: Regarding the sleep characteristics, the participants reported a mean daily sleep duration (weekday) of 7.50 hours of (SD = 1.23) and a mean of 9.05 hours at weekends (SD = 1.29). Logistic regression analysis showed that neuroticism predicted insomnia severity as a binary outcome variable, with significant unstandardized regression coefficient ($B = 0.140$, $SE = 0.055$, $p = 0.010$). Neuroticism also predicted psychological inflexibility significantly ($B = 0.759$, $SE = 0.106$, $t(77) = 7.140$, $p < 0.001$). Psychological inflexibility significantly predicted insomnia severity above and beyond neuroticism ($B = 0.108$, $SE = 0.054$, $p = 0.045$). Results from Sobel test showed that psychological inflexibility was found to marginally mediate the effect of neuroticism on insomnia severity ($z = 1.926$, $p = 0.054$).

Conclusion: Our results showed that psychological inflexibility marginally mediated the effect of neuroticism on insomnia. It laid foundation for further longitudinal or experimental studies to explore the causal relationship among neuroticism, psychological inflexibility and insomnia. Individuals with insomnia symptoms and neurotic personality trait might benefit from treatment targeting on psychological inflexibility.

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The effectiveness of mindfulness meditation with cognitive behavioral therapy in patients with chronic insomnia

S. Hong¹, T. Kim¹, S. Kim², J. Jeong¹, J. Han¹

¹ St. Vincent's Hospital, College of Medicine, The Catholic University of Korea, South Korea

² Department of Psychology, Duksung Women's University, South Korea

Introduction: The aim of this study is to investigate the effectiveness of mindfulness meditation on pre-sleep arousal and dysfunctional

belief by comparing the patients who received mindfulness meditation and cognitive behavioral therapy for insomnia with the patients who received only cognitive behavioral therapy for insomnia.

Materials and methods: Twenty patients with chronic insomnia were recruited at the Sleep Center of St. Vincent's Hospital. The patients were allocated to the cognitive behavior therapy (CBTi) group and mindfulness meditation and cognitive behavioral therapy (MCBTi) group. CBTi group received total of four sessions of cognitive behavior therapy for insomnia once a week and MCBTi group received six sessions of mindfulness meditation program additional to the four sessions of CBTi program once a week. We used Insomnia Severity Index, Sleep Diary, Pre-Sleep Arousal Scale, Dysfunctional Belief and Attitudes about Sleep Scale, Kentucky Inventory of Mindfulness Skills.

Results: Results indicated that both physical arousal and cognitive arousal of pre-sleep arousal score of MCBTi group significantly decreased compared with CBTi group. Insomnia Severity Index of MCBTi group showed significantly greater decrease compared with CBTi group. There were no significant differences between groups in dysfunctional beliefs related to sleep.

Conclusion: MCBTi group showed significant decrease in pre-sleep arousal score and Insomnia Severity Index, although there were no significant differences between groups in dysfunctional beliefs related to sleep. Mindfulness meditation has additional therapeutic effects on arousal and insomnia severity.

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Identification of somnogenic component of ashwagandha (*Withania somnifera*) leaf

M. Kaushik¹, S. Kaul², R. Wadhwa², Y. Urade¹

¹ International Institute for Integrative Sleep Medicine (WPI-IIMS), University of Tsukuba, Tsukuba, Ibaraki, Japan

² National Institute of Advanced Industrial Science & Technology (AIST), Tsukuba, Ibaraki, Japan

Introduction: Insomnia is a persistent disorder with difficulty falling asleep and maintaining it. Currently available drugs (benzodiazepines) develop dependency. Natural therapies hence become an alternative choice of treatment. The root or whole plant extract of ashwagandha has sleep inducing effects. However, the active component for somnogenic activity is not yet known.

Materials and methods: In current study, we investigated the effect of various components of Ashwagandha leaf extract on amount and quality of sleep. Wild-type (CL57BL/6J) mice were chronically implanted with electroencephalogram (EEG) and electromyogram (EMG) electrodes for assessing sleep-wake behavior. After recovery from surgical trauma and habituation, various doses alcoholic (iEx-P2), water extract (cd-WEX-P2 and WEX-P2) and purified water based component (WEX-T) of Ashwagandha leaf were administered orally at the onset of dark period. Sleep-wake was recorded and quantified, statistically.

Results: Result showed that alcoholic leaf extract iEx-P2 (with high ration of Withanone to Withaferin A) or water extract cd-WEX-P2 (contains Withaferin A and Withanone), were ineffective to induce sleep in mice. However, water extract WEX-P2 and purified component (WEX-T) induced significant amount of NREM sleep, dose dependently, after oral administration in mice. Further, WEX-P2 and WEX-T significantly increased total amount of REM sleep during next day.

Conclusion: Our data clearly showed that WEX-T (which is purified triethylene glycol), is the active component for sleep induction.

The mechanism of its action and its neural targets are still under investigation.

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Effects of physical exercise on sleep, quality of life and mood in community-dwelling adults

S. Kim¹, J. Lee², Y. Lim², J. Bang², M. Lee², J. Lee²

¹ Department of Psychiatry, Naeane Hospital, South Korea

² Department of Psychiatry, Kangwon National University Hospital, South Korea

Introduction: Physical exercise is known to be a non-photic circadian time cue for sleep. A study reported that physical activity improved the sleep quality, mood, and quality of life in older insomniacs. This study was to evaluate the effect of exercise on sleep, quality of life and mood in community-dwelling adults.

Materials and methods: Participants included the exercise group (EG) of 64 subjects doing physical exercise (age: 56.8 ± 12.3 years) and non-exercise group (NEG) of 55 subjects (age: 56.9 ± 14.5 years). The subjects who were being treated for sleep disorders or those with shiftwork were excluded. Questionnaires including the Korean version of MEQ (MEQ-K), the Korean version of ESS (KESS), the Pittsburgh Sleep Quality Index (PSQI), Short Form-12 (SF-12) and the Korean version of Beck Depression Inventory (BDI) were administered. The actigraphy recording for 7 days was conducted at home for each subject. Insomnia was defined as a complaint of difficulty initiating sleep, difficulty maintaining sleep or non-restorative sleep (NRS) three or more times per week. The two summary scores (physical component summary, PCS; mental component summary, MCS) were yielded from SF-12. Sleep variables including PSQI scores and objective measures via actigraphy, PCS, MCS, and BDI scores were compared by independent t-test between the EG and NEG. In addition, the same analysis was done from a subset of EG (23 morning exercise vs. 19 evening exercise) and a subset of insomnia (37 subjects with NRS vs. 25 subjects without NRS). Bivariate correlations were conducted between sleep variables, PCS, MCS, BDI scores and exercise duration.

Results: (1) The PSQI scores and sleep efficiency were not significantly different between the EG and NEG. Compared with the NEG, the EG showed significantly higher PCS scores and no significantly different BDI scores. (2) In the EG, there were no significant differences in the PSQI scores between the subjects engaging in morning exercise (ME subjects) and those engaging in evening exercise (EE subjects), but ME subjects showed significantly earlier bedtimes and shorter sleep onsets than EE subjects. There were no significant differences in the PCS, MCS and BDI scores between ME subjects and EE subjects. (3) The exercise duration was correlated with the PCS scores ($p < 0.05$), and was negatively correlated with the MCS scores ($p < 0.01$). (4) The insomniacs with NRS complaint had significantly later wake-times and lower MCS scores than those without NRS complaint.

Conclusion: Our study suggested that community-dwelling adults doing physical exercise were more likely to report being in a better physical health-related quality of life. However, their sleep quality and mood might not be associated with taking exercise, exercise time and exercise duration.

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More stable emotional perception after daytime nap in individuals with insomnia

K. Lau, D. Cheng, C. Tseng, E. Lau
The University of Hong Kong, Hong Kong

Introduction: Previous studies showed that both people with lifetime depression and individuals with insomnia would have altered intensity ratings of emotional expressions. This preliminary study aimed to investigate how emotional processing in individuals with insomnia with and without history of depression would change across the day after a period wakefulness or nap.

Materials and methods: Thirty-two young adults (mean age = 18.97, SD = 3.82, 62% female) were recruited from the university and assessed by the Brief Insomnia Questionnaire, and all of them fulfilled the diagnostic criteria of Insomnia. They were also assessed by Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition [DSM IV]. 43.75% of them had history of Major Depressive Disorder (MDD) and the remaining had no lifetime history of psychiatric disorders. Depression Anxiety Stress Scale (DASS-21) was used to assess participant's current depressive symptoms. On the experimental day, participants completed a facial expression recognition task, to rate the intensity of different emotional expressions. Participants were first presented with faces of a male and a female that expressed increasing degrees of emotional intensity, slowly changing from neutral to a full-intensity happy, sad, fearful, and angry expression. The faces then appeared again in random order and participants were instructed to judge the intensity of the facial expressions. Both groups with and without a history of MDD were randomly assigned to either the Nap or the Wake Condition for 90 min. Afterwards, participants completed the ERT again to assess the changes in intensity judgment of emotional faces.

Results: Two-way analysis of covariance with Group (with and without History of MDD) and Condition (nap and wake) as between group variables and current depressive symptoms as covariate was conducted to investigate the changes in intensity rating. For the 60% happy face, significant main effect of Condition was found, $F(1,27) = 5.47$, $p = 0.027$, with the wake group rating significantly more negative than the nap group in post-test. For neutral face (0% happy face), Group*Condition interaction was significant, $F(1,27) = 9.87$, $p = 0.004$. For the group with history of MDD, they rated the neutral faces significantly less happy across wakefulness whereas intensity rating did not change significantly after nap. No changes after wakefulness or nap were found in the group without history of MDD. For 60% sad face, significant Group*Condition interaction was found, $F(1,27) = 5$, $p = 0.034$. While the insomnia individuals with history of MDD rated the sad expression less intense and those without history of MDD had more intense rating across wakefulness, both groups did not change their intensity ratings after nap. Current depressive symptoms were not a significant covariate for all the analyses.

Conclusion: While insomniac individuals with and without history of MDD had either amplified or reduced emotional intensity ratings toward happy, neutral and sad faces across wakefulness, napping was found to preserve such ratings. This study provided the first evidence on the potential stabilizing effects of napping on emotional perception in insomnia.

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Interactive effect of depressive symptoms and nap on valence judgment in individuals with insomnia

K. Yee, K. Lau, C. Tseng, E. Lau
The University of Hong Kong, Hong Kong

Introduction: While previous studies showed that napping would affect emotional processing in healthy populations, such effect in people with insomnia and depressive symptoms has yet to be explored. This study aimed to investigate the interactive effect of depressive symptoms and nap on valence judgment of emotional face in individuals with insomnia.

Materials and methods: Twenty-nine young adults aged 18–23 (18 female, 11 male) recruited from the university joined this study. All of them were assessed with the Brief Insomnia Questionnaire and fulfilled the diagnostic criteria of insomnia. Depression Anxiety Stress Scale (DASS-21) and Pittsburgh Sleep Quality Index (PSQI) were used to assess participant's depressive symptoms and sleep quality, respectively. Sixteen participants (eight Nap, nine Wake) formed the insomnia group without depressive symptoms, while the remaining 11 (seven Nap, eight Wake) formed the insomnia group with depressive symptoms. On the experimental day, participants completed an Emotional Recognition Task (ERT) to test the baseline valence judgment on emotional faces. In the beginning of the task, participants were presented with faces of a male and a female that expressed increasing degrees of emotional intensity, slowly changing from neutral to a full intensity happy, sad, fearful, and angry expression. The presented faces appeared in random order, and participants were instructed to judge the emotional valence of the faces. After the pre-test, participants in each group were randomly assigned to either have a polysomnography-monitored nap or stay awake for 90 minutes. Afterwards, participants completed the ERT again to assess changes in valence judgment of emotional faces so as to examine the effect of napping in each group.

Results: Two-way analysis of covariance with Group (normal and mild-to-severe depressive symptoms) and Condition (nap and wake) as between group variables and sleep quality as covariate were conducted to investigate the changes in valence rating. When judging the 80% happy faces, significant Group*Condition interaction was found, $F(1,27) = 5.37$, $p = 0.028$, after controlling the effect of sleep quality. Post-doc analyses showed that positive ratings decreased in the wake condition but maintained after nap in the group with mild-to-severe depressive symptoms. However, no difference valence ratings was found in the group with normal depressive symptoms. Significant Group*Condition interaction was also found for 40% happy faces, $F(1,27) = 9.06$, $p = 0.006$. Positive ratings were increased across wake but maintained after nap in the Insomnia group with mild-to-severe depressive symptoms. However, no significant difference was found in those with normal depressive symptoms. For angry faces of the full range of emotional intensity, significant Group*Condition interaction was found, $F(1,27) = 7.77$, $p = 0.01$. Negative rating was increased across wakefulness but maintained after nap in the insomnia group with normal depressive symptoms. No significant changes were found in the group with mild-to-severe depressive symptoms. No other significant interactions were found for sad or fearful faces.

Conclusion: Our results show that depressive symptoms modulated the effect of napping on valence judgment of happy and angry faces in individuals with insomnia. Changes in valence rating toward emotional faces across the day were blunted after a nap, suggesting that napping might stabilize emotional judgment in depressed individuals with insomnia.

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What determines perceived sleep quality in people with and without insomnia?

E. Libman¹, C. Fichten², M. Jorgensen³, D. Tran⁴, K. Conrod⁵, L. Creti¹

¹Jewish General Hospital, McGill University, Canada

²Jewish General Hospital, McGill University, Dawson College, Canada

³Adaptech, Canada

⁴Jewish General Hospital, Université de Montréal, Canada

⁵Jewish General Hospital, Canada

Introduction: Although sleep quality is a construct widely used and measured, we have little idea of how the appraisal of sleep quality is derived. Is it based on nocturnal or daytime experience? We gathered descriptions of what constitutes both poor and good sleep quality by individuals with and without insomnia.

Materials and methods: Two groups included 23 individuals seeking or already enrolled in cognitive behavior insomnia therapy (CBT-I) (8 male, 15 female, mean age = 51, range = 19–83, median = 51) and a convenience sample of 29 non-treatment seeking individuals (Control Group: 12 male, 17 female, mean age = 50, range = 19–73, median = 48). CBT-I participants had to meet the following criteria: presenting for insomnia treatment at our clinic and a diagnosis of insomnia based on the Sleep Questionnaire. None of the participants in the Normal Sleeper Control Group met either of these criteria. Participants in the CBT-I group had experienced insomnia for a mean of 9 years (SD = 10, range = 5–30 years, median = 12 years). All participants completed the Sleep Questionnaire and responded to an open-ended Sleep Quality Measure (“How do you tell if you have had a good night’s sleep?” “How do you tell if you have had a poor night’s sleep?”). The open-ended responses were coded independently by two trained coders blind to the participant’s group in accordance with a coding manual. This yielded 21 Good and 21 corresponding Poor Sleep Quality categories.

Results: Scores on the Sleep Questionnaire indicate that the CBT-I participants were significantly worse on almost all variables compared with Controls. On the Open-Ended Sleep Quality Measure, chi-square tests on the raw frequency scores showed no significant differences between the CBT-I and Control groups on any of the 21 categories. Both good and poor sleep quality descriptor frequencies were similar among participants with and without insomnia. However, poor sleep quality-related responses were represented in significantly more descriptive categories than good, $F(1,50) = 15.21$, $p = 0.000$, and more responses fell into the daytime than the nocturnal categories, $F(1,50) = 8.74$, $p = 0.005$. Moreover, there was a significant interaction between time of day and sleep quality: more participants mentioned aspects of poor than of good sleep quality in the night, $F(1,50) = 4.51$, $p = 0.039$. Among the six good sleep quality categories with responses by at least 10% of participants, five (83%) relate to the daytime. On the other hand, of the 14 poor sleep quality categories with responses by at least 10% of participants, only nine (64%) were related to the day.

Conclusion: The nature of perceived sleep quality, both good and poor, is similar among individuals with and without insomnia. Daytime experience is most important for judging sleep quality; sleep continuity is the most important nocturnal variable. Individuals use a wider range of descriptors related to poor than of good sleep.

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Help-seeking behaviors for insomnia and their correlates among adults and adolescents in Hong Kong Chinese

Y. Liu, J. Zhang, S. Lam, J. Zhou, S. Li, M. Yu, N. Chan, Y. Wing
Department of Psychiatry, Faculty of Medicine, The Chinese University of Hong Kong, Shatin, Hong Kong SAR, China

Introduction: There were limited data of help-seeking behaviors for insomnia among community-based population. We aimed to determine the prevalence and correlates of help-seeking behaviors for insomnia in Hong Kong Chinese adults and adolescents.

Materials and methods: A total of 2293 adults (mean [SD] = 46.6 [16.0] years old, range: 30–74 years old, 46.5% males) and their 2186 offsprings (mean [SD] = 13.4 [2.6] years old, range: 6–18 years old, 48.1% males) were recruited into this study in 2008. Among them, 219 adults and 146 adolescents with insomnia were included into the analysis. Insomnia was defined as difficulty in initiating sleep (DIS), difficulty in maintaining sleep and early morning awakening up to three times/week over the past 12 months. Socio-demographic, other sleep problems, daytime symptoms, and chronic medical problems in the past 1 year were also measured.

Results: The percentage of help-seeking behaviors for insomnia were 3.8% in adults and 0.7% in adolescents, respectively ($p < 0.001$). Adults with insomnia had the highest percentage of seeking help from Western medicine practitioners (34.1%), followed by traditional Chinese medicine practitioners (28.4%), self-treatment (15.9%), leave it alone (15.9%), and alternative treatment (5.7%). However, adolescents with insomnia had the highest percentage of leave it alone (60.0%), followed by alternative treatment (20.0%) and Western medicine practitioners (13.3%), traditional Chinese medicine practitioners (6.7%), and self-treatment (0%). Among adults with insomnia, higher family income (adjusted odds ratio [OR]: 3.2, 95% confidence interval [CI]: 1.6–6.3, $p = 0.001$), DIS (adjusted OR: 3.3, 95% CI: 1.6–6.6, $p = 0.001$), chronic medical conditions (adjusted OR: 4.6, 95% CI: 2.0–10.8, $p < 0.001$), and higher ISI total score (adjusted OR: 2.6, 95% CI: 1.4–5.1, $p = 0.004$) were associated with help-seeking behaviors. However, only morning headache was found significantly associated with help-seeking behaviors in adolescents with insomnia.

Conclusion: There was a high percentage of insomnia subjects (nearly 60% of adults and 90% of adolescents) who did not seek help for their insomnia. More studies are needed to explore the determinants of help-seeking for insomnia, especially for adolescents, and to find effective ways for improving their help-seeking behaviors.

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Determinants of self efficacy for sleep in insomnia disorder: Preliminary results

L. Caccavale, L. Palagini, A. Gronchi, M. Mauri
Sleep Clinic, Department of Clinical Experimental Medicine, Psychiatric Unit, University of Pisa, Italy

Introduction: Elevated sleep-related self-efficacy has been associated with both successful hypnotic tapering and adherence to cognitive-behavioral therapy in insomnia. To identify factors impacting self-efficacy for sleep in insomnia, the aim was to examine

potential determinants including sleep severity, sleep quality, stress-related sleep reactivity, dysfunctional beliefs about sleep, depressive and anxiety symptoms.

Materials and methods: This correlational cross-sectional study was conducted in Sleep Center of the Psychiatric Unit II, University of Pisa, Italy. It consisted of 93 patients who met diagnostic criteria for Insomnia disorder according to the Diagnostic and Statistical Manual of Mental Disorders fifth edition (DSM-5). Exclusion criteria were: cognitive decline, previous or present diagnosis of psychiatric disorders, other sleep disorders i.e. obstructive sleep apnea syndrome, restless legs syndrome or other sleep disorders. Surveys instruments included the Insomnia Severity Index (ISI), Pittsburgh Sleep Quality Index (PSQI), Ford Insomnia Response to Stress Test (FIRST), Dysfunctional Beliefs about Sleep scale (DBAS), Self-Efficacy for Sleep Scale (SES), Beck Depression Inventory (BDI), Zung Self-Rating Anxiety Scale (SAS), and the State-Trait Anxiety Inventory (STAI). Analytic techniques included descriptive statistics to characterize the study sample, Pearson or Spearman correlation coefficients to examine individual associations with self efficacy for sleep and multiple linear regression analysis to identify determinants of self efficacy for sleep. Rating scales were then submitted to principal components analysis (PCA) in order to reduce the dimensionality of redundant constructs by determining the number of components to retain and producing linear combinations of the variables.

Results: Elevated SES scores were correlated negatively with the sum score of ISI ($r = -609$, $p < 0.01$), FIRST ($r = -237$, $p < 0.5$), DBAS ($r = -671$, $p < 0.01$), BDI ($r = -441$, $p < 0.01$), SAS ($r = -363$, $p < 0.01$). Multiple linear regression analysis demonstrated the independent determinant of low levels of self efficacy for sleep to be higher stress related sleep reactivity score (FIRST $B = -258$, $p < 0.5$), insomnia severity (ISI $B = -388$, $p < 0.05$), and higher score in Dysfunctional Beliefs about Sleep (DBAS $B = -205$, $p < 0.01$). PCA extracted three components: SES score significantly loaded on the same component (PCA1) with FIRST, ISI and DBAS (respectively -0.71 , 0.72 , 0.61 , 0.89), SAS and BDI in the second component (PCA2) (respectively 0.86 , 0.84), and PSQI and STAI in the third one (PCA3) (respectively 0.62 , 0.76).

Conclusion: Findings suggest potential implications: poor self efficacy on sleep may depend on insomnia features such as (i) insomnia severity, (ii) high stress related sleep reactivity and (iii) high levels of dysfunctional beliefs about sleep. If these data are confirmed in longitudinal studies, these determinants need to be assessed and managed.

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Dysfunctional beliefs about sleep are associated with stress-related sleep reactivity in insomnia disorder: Preliminary data

L. Palagini, A. Gronchi, L. Caccavale, M. Mauri
Sleep Disorder Clinic, Department of Clinical Experimental Medicine, Psychiatric Unit II, University of Pisa, Italy

Introduction: Sleep related cognitions have been shown to play an important role in insomnia. In addition it has been shown that stress-related sleep reactivity is elevated in insomnia. The aim was to study the relationships between dysfunctional beliefs about sleep and sleep-related stress reactivity in insomnia using a set of variables.

Materials and methods: This cross-sectional study was conducted in Sleep Center of the Psychiatric Unit II, University of Pisa, Italy. It consisted of 95 patients who met diagnostic criteria for Insomnia disorder according to the Diagnostic and Statistical Manual of Mental Disorders fifth edition (DSM-5). Exclusion criteria were:

cognitive decline, previous or present diagnosis of psychiatric disorders, other sleep disorders i.e. obstructive sleep apnea syndrome, restless legs syndrome or other sleep disorders. Instruments included the Insomnia Severity Index (ISI), Pittsburgh Sleep Quality Index (PSQI), Dysfunctional Beliefs about Sleep scale (DBAS), Ford Insomnia Response to Stress Test (FIRST), Beck Depression Inventory (BDI), Zung Self-Rating Anxiety Scale (SAS), and the State-Trait Anxiety Inventory (STAI). Statistical analysis included descriptive statistics to characterize the study sample, Spearman correlation coefficients to examine individual associations with dysfunctional beliefs about sleep and multiple linear regression to identify determinants of dysfunctional beliefs about sleep. Rating scales were then submitted to Principal Components Analysis (PCA) in order to reduce the dimensionality of redundant constructs and to produce linear combinations of the variables.

Results: Elevated DBAS scores were correlated with the sum score of ISI ($r = 0.594$, $p < 0.01$), PSQI ($r = 0.3206$, $p < 0.05$), FIRST ($r = 473$, $p < 0.01$), SAS ($r = 0.238$, $p < 0.05$) and BDI ($r = 0.241$, $p < 0.05$). Multiple linear regression demonstrated elevated dysfunctional beliefs about sleep to be best determined by higher stress related sleep reactivity score (FIRST $B = 1422$, $p < 0.01$) and insomnia severity (ISI $B = 1790$, $p < 0.001$). PCA extracted three components: DBAS score significantly loaded on the same component (PCA1) with FIRST and ISI (respectively 0.84 , 0.68 , 0.53), STAI, SAS and BDI significantly loaded in the second component (PCA2) (respectively 0.63 , 0.79 , 0.89), and PSQI and ISI in the third one (PCA3) (respectively 0.83 , 0.61).

Conclusion: Findings suggest potential implications: dysfunctional beliefs about sleep in insomnia disorder (i) are related to insomnia severity, they may favor it, (ii) are associated to sleep related stress reactivity, they may favor intrusive thoughts which may affect subsequent sleep reactivity. Longitudinal studies may help design therapeutic strategies for insomnia.

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Italian validation of the sleep condition indicator, a clinical screening tool to evaluate insomnia disorder according to DSM-5 criteria: Preliminary results

L. Palagini¹, L. Caccavale¹, G. Ragno², A. Gronchi¹, M. Terzaghi², M. Mauri¹, S. Kyle^{3,4}, C. Espie^{4,5}, R. Manni²

¹ Sleep Disorder Clinic, Department of Clinical Experimental Medicine, Psychiatric Unit, University of Pisa, Italy

² Unit of Sleep Medicine, IRCCS C. Mondino National Neurological Institute Foundation, Pavia, Italy

³ School of Psychological Sciences, University of Manchester, UK

⁴ Sleepio Limited, London, UK

⁵ Nuffield Department of Clinical Neurosciences/Sleep & Circadian Neuroscience Institute, University of Oxford, UK

Introduction: The Sleep Condition Indicator (SCI) is an eight-item questionnaire recently validated as a clinical tool for appraising insomnia according to Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria. The aim was to evaluate the validity and reliability of the Italian version in subjects with insomnia disorder.

Materials and methods: Consecutive outpatients attending the Sleep Center of the Psychiatry Unit II, University of Pisa, Italy, and the Unit of Sleep Medicine, IRCCS C. Mondino, Pavia, Italy, who met diagnostic criteria for Insomnia disorder according to DSM-5 were recruited for the study. At the first evaluation (T0), subjects underwent a face-to-face evaluation; the Italian version of the SCI and of the Insomnia Severity Index (ISI) were administered. Subsequently

participants completed the SCI a second time 2 months later (Time Retest: TR). The Italian version of the SCI was obtained after two independent translations had been done from the English version. The scale was translated with the forward–backward procedure in collaboration with the authors. According to the SCI authors' recommendations sum score ≤ 16 was considered indicative of insomnia disorder. Statistical analysis included descriptive statistics to characterize the study sample. Reliability of the SCI was measured with internal consistency, calculating the Cronbach's alpha co-efficient (excellent values $\alpha > 0.70$), and stability (test/retest), performing the Spearman's correlation (significant values > 0.5). Current validity was studied measuring convergent validity with the Insomnia Severity Index: Pearson correlation analysis was performed.

Results: Eighty-eight subjects were recruited as test group at T0 (37 male, mean age 50.1 ± 15.8). At T0 SCI mean score was $11.2 + 5.7$ and ISI mean score was $10.92 + 6.1$. Sixty-five participants of the test group completed the re-test part (26 male, mean age 49.6 ± 16.8). SCI mean score was $10.92 + 6.1$. Cronbach's alpha co-efficient was 0.718 at T0 and 0.785 at TR, indicating an excellent internal consistency. The scale also showed very good stability: each SCI item resulted significantly related and, in turn, similar at T0 vs TR (SCI 1 $r^2 = 0.712$, $p < 0.001$, SCI 2 $r^2 = 0.528$ $p < 0.001$, SCI 3 $r^2 = 0.267$ $p < 0.05$, SCI 4: $r^2 = 0.594$ $p < 0.001$, SCI 5: $r^2 = 0.672$ $p < 0.001$, SCI 6 $r^2 = 0.892$ $p < 0.001$, SCI 7 $r^2 = 0.523$ $p < 0.001$, SCI 8 $r^2 = 0.669$ $p < 0.001$). No significant differences were found among SCI items at T0 vs TR (SCI 1 $p = 0.32$, SCI 2 $p = 0.363$, SCI 3 $p = 0.362$, SCI 4 $p = 0.362$, SCI 5 $p = 0.363$, SCI 6 $p = 0.1$, SCI 7 $p = 0.06$, SCI 8 $p = 0.55$) confirming the SCI stability. At T0 Pearson correlation analysis showed a convergent negative correlation with the ISI score ($r_s = -0.6808$ $p < 0.01$) confirming current validity of SCI.

Conclusion: These findings suggest that the Italian version of the Sleep Condition Indicator shows good internal consistency and stability. It also shows a convergent relation with the Insomnia Severity Index confirming current validity. Further studies need to test the discriminant validity of the SCI against clinical diagnosis of insomnia disorders.

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Are drivers with OSA getting bad press?

D. Rizzo¹, G. Lavigne², L. Creti³, J. Bergeron², M. Baltzan⁴, D. Tran¹, K. Controd⁵, B. Capozzolo⁶, S. Bailes³, C. Fichten⁷

¹ Jewish General Hospital, Université de Montréal, Canada

² Université de Montréal, Canada

³ Jewish General Hospital, McGill University, Canada

⁴ OSR Medical, McGill University, Canada

⁵ Jewish General Hospital, Canada

⁶ OSR Medical, Canada

⁷ Jewish General Hospital, Dawson College, Canada

Introduction: Sleepiness is known to be a prominent aspect of OSA and also has been implicated in increased automobile crash risk. Only recently have studies indicated that fatigue may be an important symptom of OSA. This study explores the relationship between sleepiness and fatigue in OSA and driving behavior.

Materials and methods: Population: 25 OSA participants (12 females, 13 males; age mean = 50.32 ; $SD = 11.56$) age and gender-matched to Control participants (12 females, 13 males; mean age = 49.92 , $SD = 11.62$). Participants with OSA were recruited from sleep clinics after receiving their polysomnography results from their

doctor but before beginning treatment. Controls were a convenience sample, screened for OSA. All participants completed the Empirical Sleepiness and Empirical Fatigue Scales as well as the Driving Behavior Questionnaire (DBQ).

Results: t-Test comparisons on self-reported sleepiness-related symptoms show that OSA participants ($M = 10.34$, $SD = 3.74$) experienced more sleepiness than Control participants ($M = 7.72$, $SD = 3.58$) ($t(48) = -2.53$, $p = 0.015$) on self-reported fatigue-related symptoms, OSA participants ($M = 7.66$, $SD = 3.53$) experienced more fatigue than Control participants ($M = 4.6$, $SD = 3.39$) ($t(48) = -3.13$, $p = 0.003$). Responses on the Driving Behaviors subscales indicate that individuals with OSA are no different from Control participants on any of the four subscales (i.e., aggressive driving, ordinary infractions, driving errors, lapses). For the OSA group, fatigue was correlated with scores on the following DBQ subscales: ordinary infractions, $r(23) = 0.47$, $p < 0.05$, driving errors, $r(23) = 0.68$, $p < 0.01$, and lapses, $r(23) = 0.66$, $p < 0.01$. For the Control group, fatigue was correlated with driving errors, $r(23) = 0.48$, $p < 0.05$, and lapses, $r(23) = 0.50$, $p < 0.05$. Sleepiness was not significantly correlated with risky driving behaviors on the DBQ (i.e., none of the subscales) for either group.

Conclusion: Individuals with OSA did not differ from Control participants on reported risky driving behaviors. Fatigue was related to risky driving behaviors in both groups. Sleepiness was not. Our results strongly suggest that the common belief in OSA and in sleepiness as the culprits for risky driving needs to be re-evaluated.

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Characteristics of mothers' sleep at 2 and 6 months postpartum

D. Tran¹, L. Creti², D. Rizzo¹, P. Zekowitz², E. Libman²

¹ Jewish General Hospital, Université de Montréal, Canada

² Jewish General Hospital, McGill University, Canada

Introduction: The postpartum period is characterized by disrupted sleep, and other stressors, due to caring for a newborn baby. This study explores how sleep disruption affects healthy first-time mothers. Specifically, we examine their night time sleep as well as their daytime sleepiness and fatigue at 2 and 6 months post-partum.

Materials and methods: First time mothers were recruited from the postpartum unit at the Jewish General Hospital. Data collection took place in the consenting participants' homes. Only mothers, living with their partners who had a healthy, normal birth weight infant following a vaginal delivery were selected for this study. Thirty-seven mothers (mean age = 29.22 , $SD = 5.51$) completed a battery of questionnaires including the Empirical Fatigue and Sleepiness Scales, the Insomnia Severity Index (ISI) and 1 week of sleep diaries at 2 and 6 months postpartum. Mothers were separated into high ($N = 18$) and low ($N = 19$) insomnia severity based on the ISI at 2 months and were compared on measures of sleep and daytime variables. Since psychological functioning may be affected in the postpartum, anxiety and depression were also examined. The following measures were used: Edinburgh Postnatal Depression Scale (EPDS) and the Generalized Anxiety Disorder Scale (GAD-7 scale).

Results: Independent samples t-tests revealed that at 2 months postpartum, mothers in the high ISI group were significantly more fatigued and sleepy than those in the low ISI group. However, their average total sleep time (TST) and number of sleep episodes did not differ significantly. The same pattern of results was evident

at 6 months for these groups. For the psychological variables, the average depression and anxiety scores were in the normal range at both time periods. However, mothers scoring high on ISI at 2 months were significantly more depressed and anxious than mothers in the low ISI group. At 6 months, these differences no longer existed. Paired sample t-tests indicated that, for the sample as a whole, TST, number of sleep episodes, sleepiness and anxiety significantly improved at 6 months but fatigue and depression did not. In addition, at 6 months, only eight out of the 18 mothers remained in the high ISI group. The 10 mothers who switched into the low ISI category at 6 months showed significant improvement in TST, fatigue, sleepiness and anxiety. The eight mothers who remained in the high ISI category showed no significant improvement on any of the measures.

Conclusion: Although 49% of mothers initially experienced difficulty initiating and maintaining sleep, sleep and daytime sleepiness improved at 6 months, suggesting that in this healthy sample, most mothers are quite resilient to the temporary sleep disruption of a needy baby. Nevertheless, in a substantial 44%, the initial insomnia pattern was maintained.

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Nocturnal rumination as a mediator between sleep disturbance and negative affect

A. Donners¹, P. Cheng², J. Verster¹, T. Roth², C. Drake², V. Pillai², J. Ciesla³

¹ Division of Pharmacology, Utrecht University, Netherlands

² Sleep Disorders and Research Center, Henry Ford Health System, USA

³ Department of Clinical Psychology, Kent State University, USA

Introduction: Prior research has almost exclusively targeted the sleep-disruptive effects of nocturnal rumination (i.e., rumination in the pre-sleep period). Examining the impact of nocturnal rumination on affect may offer insight into the prospective association between insomnia and depression, a disorder characterized by affective dysregulation.

Materials and methods: Thirty nine university students (19.6 ± 3.2 years old; 73.8% female) all of whom scored 2 SDs above the mean on a trait measure of rumination (RRS-R: Response Style Questionnaire – Rumination Scale) participated in a week-long daily diary study. Participants completed a self-report measure of daily negative affect before going to bed each night. Upon waking each morning, they completed another short questionnaire assessing nocturnal rumination and sleep disturbance the previous night. Negative affect was measured using the sadness subscale of the Positive and Negative Affect Schedule – Expanded Form (PANAS-X); the sleep assessment queried about sleep onset latency (SOL), total sleep time (TST) and sleep quality (SQ); and nocturnal rumination was assessed using a modified version of the RRS, such that the question stem, ‘prior to sleep last night’ preceded all rumination items on this scale.

Results: Hierarchical linear model analyses showed that nightly fluctuations in SOL were significantly predictive of next-day negative affect ($\beta = 0.66$; $z = 2.23$; $p < 0.05$), even after controlling for previous day negative affect, gender, SQ, and TST. Specifically, longer SOLs were associated with greater negative affect. Importantly, including nocturnal rumination in the model reduced this association to non-significance. Mediation analyses, per the Fairchild and MacKinnon method, indicated statistically significant mediation

($\beta = 0.2$; PRODCLIN 95% CI = 0.05–0.39) i.e., nocturnal rumination mediated the impact of SOL on negative affect.

Conclusion: This study is the first to establish nocturnal rumination as a mediator between sleep disturbance and negative affect. Findings suggest that an underlying ruminative trait may account for the comorbidity between insomnia and depression.

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Psychological mechanism of dreams and nightmares

C. Wang¹, P. Shen², F. Fengfan¹, J. Zhang¹, G. Li¹, X. Liu³, C. Tang¹, W. Wang¹

¹ Psychology and Sleep Department of Guang'anmen Hospital of China Academy of Chinese Medical Sciences, China

² Shanghai University of Traditional Chinese Medicine, China

³ Beijing University of Chinese Medicine, China

Introduction: Based on Five Shen Theory of Traditional Chinese Medicine (TCM), the mechanism of dreams and nightmares TCM psychological treatment would be analyzed from the perspectives of “Hun (ethereal soul)” and “Yi (intellect)”.

Materials and methods: A Nightmare is an unpleasant dream that can cause a strong emotional response from the mind, typically fear or horror but also despair, anxiety and great sadness. Consulting on the ancient literature of TCM, “Hun (ethereal soul)” is a spirit accompanying conscious activities, playing the role of the cache of spirits. “Yi (intellect)” refers to a state when attention is highly paid. During the process of sleep, “Hun (ethereal soul)” can rearrange information to create dreamland and the impression of highly paid attention in the dreamland becomes dreams.

Results: The mechanism of nightmares lies in that patients have suffered some feelings due to stimulatory factors. During sleeping, the information based on feelings is rearranged and the feelings, like fear, make the attention be highly paid in the dreamland; finally nightmares take place. The TCM therapy is to induce patients to re-experience concrete stimulatory events in daily life via Thought Imprint Psychotherapy (TIP) and then to suggest patients to relax instead of focusing on the dreamland.

Conclusion: On the basis of traditional Chinese medicine, the psychological mechanism of dreams and nightmares can be interpreted uniquely, which has profound enlightenments on clinical work.

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Short presentation of insomnia non-drug therapies

Z. Xuanzi¹, L. Xue¹, X. Jiapeng¹, B. Yoann¹, W. Weidong²

¹ Beijing University of Chinese Medicine, China

² Guang'anmen Hospital, China Academy of Chinese Medical Sciences, China

Introduction: Because of the diversity of the causes of insomnia and the adverse reactions of hypnotic drugs, integrate therapies are often used against insomnia, in which non-drugs therapies

are important, especially for temporary psycho-biological insomnia.

Materials and methods: Systemic presentation of the principles and methods of operation of insomnia non-drugs therapies, including Chinese medicine physical therapies: acupuncture, massages; modern physical therapies: magnetic therapy, light therapy; psychotherapies: cognitive behavioral therapy (CBT), Morita therapy, psychoanalysis, flotation therapy, relaxing therapy, suggestion and hypnosis therapy, music therapy; Chinese medicine traditional psychotherapy: emotional mutual control therapy; Chinese medicine modern psychotherapy: Thought Imprint Psychotherapy in a lowered resistance state (TIP).

Results: Among insomnia non-drugs therapy, CBT shows credible results and obtain the approval of the American Psychological Association. Nowadays, it is already the most common used and the most efficient non-drugs therapy against insomnia.

Conclusion: non-drugs therapies can avoid the worsening of insomnia, reduce the quantity of drugs taken and reduce drugs dependence and side effects. Following the transformation of the medical model, non-drugs therapies are becoming a focal point of the medical profession.

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Chinese medicine treatment of hypnotics-dependent insomnia

Z. Xuanzi, W. Fang, W. Weidong
Beijing University of Chinese Medicine, Guang'anmen Hospital, China
Academy of Chinese Medical Sciences, China

Introduction: These past years, hypnotics-dependent insomnia is becoming more and more common; Western medicine drugs substitution therapy is effective but presents potential risks, and more and more specialists are starting to look for Chinese medicine treatment.

Materials and methods: Presenting the main methods of treating hypnotics-dependent insomnia with Chinese medicine. (1) Chinese medicine drugs: Mr. Sun divides hypnotics-dependent insomnia into three groups: intern phlegm heat, liver qi congestion and insufficiency of qi and yin, treating respectively with Huang Lian Wen Dan Tang, Dan Zhi Xiao Yao San and Sheng Mai San. (2) Acupuncture: Mr. Sun and others puncture mainly baihui (DU20), fengchi (GB20), tianzhu (BL10) and naokong (GB19), etc. (3) Tuina massages: Mr. Li uses Tuina techniques to treat hypnotics-dependent insomnia, using mainly baihui (DU20), touwei (ST8), yintang (EX-HN3) and sishencong (EX-HN1), etc. The techniques used are Yizhi chan, kai tianmen, etc. (4) Chinese medicine psychotherapy: Ms. Wang on the basis of Mr. Wang's TIP sleep regulation technique considered the hypnotics reduction process and created a TIP drug reduction technique used specially to reduce the use of hypnotics. It includes cognitive drug-reducing method, substitution drug-reducing method and symptomatic drug-reducing method.

Results: Chinese medicine drugs, acupuncture, Tuina massages and Chinese medicine psychotherapy are the main therapies used by Chinese medicine to treat hypnotics-dependent insomnia and all have some efficacy. Among them Mr. Zhang discovered that acupuncture could inhibit REM sleep rebound, maintain and increase slow wave sleep, regulate autonomic nervous system and have some placebo-like effects.

Conclusion: In all the above reports no serious side-effects were observed. Comparatively with Western medicine drugs, Chinese medicine probably is safer and more easily accepted by patient to treat hypnotics-dependent insomnia.

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Parkinson's disease and chronic insomnia disorder

A. Ylikoski¹, K. Martikainen², M. Partinen¹

¹ Helsinki Sleep Clinic, Vitalmed Research Centre, Helsinki, Finland

² Finnish Parkinson Association, The Finnish Parkinson Foundation, Turku, Finland

Introduction: Various sleep related complications are common in Parkinson's disease (PD). The prevalence of chronic insomnia disorder (ICD-10) and its association with other symptoms were studied.

Materials and methods: Altogether 1447 Parkinson patients, aged 43–89 years, participated in a questionnaire study. The response rate was 59.0% and of these 80.8% had answered to all questions used in the analyses (N = 689).

Results: Prevalence of insomnia was 36.8% (95% CI 33.3–40.5). Difficulty initiating sleep (≥ 3 evenings per week) was 18.0% (95% CI 15.1–20.9), disrupted sleep (≥ 3 nights per week) 81.54% (78.5–84.4), frequent awakening during the night (≥ 3 nights per night) 31.3% (27.8–34.8), early morning awakening (≥ 3 mornings per week) 40.4% (36.8–44.1) and non-restorative sleep (at least over the last month) 38.5% (34.8–42.1). Young age, female gender, early onset of PD and longer duration of PD are more common in patients with insomnia than in patients without insomnia. In adjusted logistic regression model, chronic insomnia (OR 2.49; 95% CI 1.75–3.53) and REM behavior sleep disorder (1.78; 1.26–2.50) were significantly associated to poor quality of life (WHO5 <13).

Conclusion: Occurrence of insomnia according to ICD-10 in patients with PD is more common than previously reported prevalences of insomnia disorder in general population. The most common insomnia symptoms reported by PD patients were sleep fragmentation, early awakenings and non-restorative sleep.

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Validation of Chinese version of structured diagnostic interview for insomnia disorder: A preliminary report

W. Yu, J. Zhang, Y. Wing

The Chinese University of Hong Kong, Hong Kong

Introduction: Objectives: The Diagnostic Interview for Sleep Patterns and Disorders (DISP) has been shown to have satisfactory psychometric property to determine the diagnoses of various common sleep disorders. This study aimed to validate the Chinese version of DISP in differentiating patients with and without lifetime insomnia disorder.

Materials and methods: The translation and back-translation of DISP were conducted under the standardized protocol. The consecutive patients with various sleep disorders attending sleep

assessment unit were recruited into this study from November 2013 to June 2014. The clinician diagnosis of insomnia disorder according to The International Classification of Sleep Disorders, second edition (ICSD-2) was considered as gold criteria. The DISP was administered by trained researcher assistant.

Results: A total of 130 patients (30.8% females) were recruited with a mean age of 54.0 years old. Among them, 59 patients (45.4%) were determined as suffering from insomnia disorder by gold criteria. The sensitivity and specificity of DISP for insomnia disorder were 91.7% and 85.1%, respectively. The consistency between gold criteria and DISP for insomnia disorder was moderate with a kappa coefficient of 0.59.

Conclusion: The Chinese version of DISP has good validity in diagnosing insomnia disorder. This tool may serve as an effective tool for diagnosis and evaluation of insomnia disorder to facilitate future clinical and research studies, especially in large scale epidemiologic study.

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Common wrong cognitions of Chinese insomniacs in the clinic

J. Zhang, X. Liu, J. Xue, Q. Liang, H. Du, X. Lv, X. Zhou, W. Wang
Guang'anmen Hospital, China Academy of Chinese Medical Sciences

Introduction: Insomnia is a common disease in hospital outpatient service. Most of the insomniacs' cognitions have distinctive cultural features. We summarize Chinese insomniacs' common psychological factors through inducing and reorganizing the data of insomnia in the clinic.

Materials and methods: Each country or region has its own unique cultural traditions, these traditions will be in imperceptible influence people's perception of things, and these cognitions can affect the health of individuals. We found that there are different forms of insomniacs in outpatient. We use the outline type operation and the insomniac's structured case for the first option. The outline type operation includes: 1, sad, injustice, painful events; 2, fear, fear, worry about events; 3, emotional and sexual difficult events; 4, the most trusted, dependable, unforgettable person, and why; 5, the most relaxed time and the reasons of the joy and happiness. And the insomniac's structured case includes general information, interrogation of symptoms, predisposing factors, special interrogation, personal history, family history and personal growth experience, etc. We collect 170 cases totally, then analyzed and summarized common wrong cognitions of insomniacs through induction and reorganization.

Results: Through induction and reorganization, we found that insomniacs have some mistakes about sleep awareness indeed. Chinese insomniacs pay attention to sleep feelings, pursuit of perfect sleep state, but this kind of feeling is difficult to adjust through medication. So many patients seek treatment in TCM. The wrong cognitions of sleep feelings and symptoms seeking present on the following: (1) I must fall asleep in a fixed time; (2) Sleep affects everything; (3) Touches the pillow should be asleep; (4) 8 hours sleep time must meet; (5) There cannot be any interference when sleeping; (6) Dream affect morpheus quality; (7) Wake up at night affect morpheus quality; (8) The body disease will affect the sleep; (9) Must sleep on the bed. These aspects show patients' perfect requirements to sleep time, sleep quality, sleep time, sleep environment and daytime function. For such wrong cognitions, we adopt the TCM psychotherapy, Low Resistance Thought Induction Psychotherapy; help people to set up correct concept of sleep and health behavior; reduce the occurrence of subjectivity insomnia and drug use.

Conclusion: The wrong cognitions of Chinese insomniacs embodies a part of health concept in Chinese culture. Clearing these problems could make a big progress of the prevention and treatment of insomnia. Here we speculate that different parts of the traditional culture could affect people's understanding and the pathogenesis of insomnia.

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Exposure to extinction-associated context tone during slow-wave sleep and wakefulness differentially modulates fear expression

S. Ai¹, J. Chen¹, J. He¹, Y. Bao¹, F. Han², X. Tang³, L. Lu⁴, J. Shi⁵

¹ National Institute on Drug Dependence, Peking University, China

² Department of Pulmonary Medicine, Peking University People's Hospital, China

³ Sleep Medicine Center, Translational Neuroscience Center, Mental Health Center, West China Hospital of Sichuan University, China

⁴ Sixth Hospital/institute of Mental Health and Key Laboratory of Mental Health, Peking University, China

⁵ National Institute on Drug Dependence, Peking University, China

Introduction: Recent research use context cues (odor or auditory cues) to target memories during sleep, which is called targeted memory reactivation (TMR). Declarative and procedural memories can be enhanced with TMR paradigm during slow-wave sleep (SWS). However, the effects of TMR on emotional memory are still unknown.

Materials and methods: The participants underwent Pavlovian fear conditioning on the first day, during which colored squares served as the conditioned stimulus (CS) and a mild shock served as the unconditioned stimulus (US). The next day, they underwent extinction, during which the CS was presented without the US but was accompanied by contextual cue (pink noise). Immediately after extinction, the participants were required to take a nap or remain awake and randomly assigned to six groups. Four of the groups were separately exposed to the related tone (i.e., SWS-Tone group and Wake-Tone group) or an irrelevant tone (control stimulus, CtrS) (i.e., SWS-CtrS group and Wake-CtrS group), and the other two groups (i.e., SWS-No Tone group and Wake-No Tone group) were not. The conditioned responses to the CS were tested after the participants took a nap or remained awake to evaluate the effect on fear expression.

Results: All of the participants showed successful levels of fear acquisition and extinction. During the recall test, the fear responses were significantly higher in the SWS-Tone group than in the SWS-No Tone group and the SWS-CtrS group, while the participants of the Wake-Tone group exhibited attenuated fear responses than the Wake-No Tone group and Wake-CtrS group.

Conclusion: Distinct conditions during which reexposure to extinction memory-related contextual tone cue contributes to differential effects on fear expression.

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Memory consolidation and inducible nitric oxide synthase expression during different sleep stages in Alzheimer's disease

H. Likai, W. Dean, H. Chaur-Jong, K. Yi-Chun
Department of Neurology, Taipei Medical University – Shuang Ho Hospital, Taiwan

Introduction: Memory consolidation is known as sleeping improves subsequent performance in memory tasks. A previous study showed that memory consolidation in PD was not different from normal controls. In our study, we explored changes in biologic molecules during various sleep stages and the effects of sleep on memory consolidation in AD.

Materials and methods: Ten AD patients and 14 volunteers without AD participated in our study. The gene expression of inducible NO synthase (iNOS) in all sleep stages was measured using realtime polymerase chain reaction (PCR) based on polysomnography (PSG)-guided peripheral blood sampling. In addition, the efficiency of memory consolidation during the sleep of the participants was measured using the Wechsler Memory Scale, third edition (WMS-III).

Results: Regarding memory consolidation, the performance of the control group in logical memory task showed significant improvement after sleep. In contrast, the performance of the patient group in the same tasks showed no significant improvement.

Conclusion: Memory consolidation might be weaker or even lost in AD patients. The pathophysiology of defective memory processing needs more studies to understand.

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Learning of emotional and nonemotional visual stimuli is related to sleep macrostructure

S. Seifpour¹, A. Khorrami Banaraki², M. Torabi Nami³, K. Sadeghniai Haghighi⁴, M. Mikaili¹, A. Hekmatmanesh¹

¹ Department of Biomedical Engineering, Faculty of Engineering, Shahed University, Tehran, Iran

² ICSS (Institute for Cognitive Science Study), Tehran, Iran

³ Department of Neuroscience, School of Advanced Medical Sciences and Technologies, Shiraz University of Medical Sciences, Shiraz, Iran

⁴ Occupational Sleep Research Center, Tehran University of Medical Science, Tehran, Iran

Introduction: Previous studies have shed light on the role of sleep in declarative memory consolidation. The relationship between emotional memory consolidation and sleep architecture has however received insufficient attention. This study used a nap paradigm to investigate the relationship between the emotional or neutral declarative memory consolidation and sleep macrostructure parameters.

Materials and methods: The sleep EEG of 16 healthy young subjects (seven males and nine females) was studied. Age ranged from 20 to 26 years. The exclusion criteria were history of neurologic, psychiatric, or sleep disorders, past history of drug abuse, and current use of antidepressant or hypnotic medications. Subjects spent nap sessions in 2 consecutive days at our sleep laboratory. The first day nap session was recorded as baseline. On day 2 and during the memory encoding task, subjects observed 96 emotionally-negative and neutral images taken from the IAPS (International Affective Picture System). Following the subjects' nap, the recognition task was done to evaluate their emotional memory function. During the

recognition task, participants were again presented a series of 192 images, while this time, 96 image were presented from the original set they had viewed in the encoding task and the other 96 were new. During the nap period, polysomnography recording was performed in accordance with standardized techniques using digital electroencephalography, electromyogram, and electrooculogram signals acquired with an Embla N7000 system. Recordings were scored visually by an expert following standard criteria on 30 s epochs as NREM stages 1–4, REM sleep, awake, or movement time and the data were submitted to statistical analysis.

Results: Accordance to signal detection theory, four response categories were possible: hit, miss, correct rejection, and false alarm. To examine the relationship between sleep architecture and emotional memory function, correlation analysis was performed between sleep-stage values on test day and number of incorrect responses during the recognition task. To this end, we focused on sleep macrostructure parameters including total recording time, sleep period time, total sleep time, sleep efficiency, sleep latency, duration and percentage of all NREM and REM stages; as well as the recognition task parameters including total errors, total misses, total false alarms, emotional image misses, neutral image misses, emotional image false alarms, neutral image false alarms, emotional and neutral image errors. There was a significant positive correlation between the total errors and the amount of N1 sleep obtained across subjects. This applied both to N1 percentage ($r = 0.54$, $p < 0.04$) and N1 minutes ($r = 0.62$, $p < 0.02$). Likewise, a significant positive correlation was noted between the neutral image errors and the N1 percentage ($r = 0.53$, $p < 0.04$) and N1 minutes ($r = 0.57$, $p < 0.03$) across the naps. Furthermore, there was a positive relationship between the REM latency with total errors ($r = 0.52$, $p < 0.05$) and as well as neutral image errors ($r = 0.51$, $p < 0.05$).

Conclusion: According to our findings, the faster subjects entered REM sleep (shorter REM latency), and less stage-1 NREM sleep obtained, the better they could recall all images (sum of the two categories). This correlation was more significant with neutral images.

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The impairment of cognitive functions in patients with chronic insomnia

M. Subbotina, M. Poluektov

I.M. Sechenov First Moscow State Medical University, Russia

Introduction: It was shown that subjective sleep problems in later life could be predictor of cognitive decline (Altena et al., 2010). Different modalities of cognitive functions were shown to be impaired – vigilance, working memory, motor control and motor learning.

Materials and methods: Fifty patients with diagnosis of chronic insomnia disorder according ICSD-3 aged 59.0 ± 15.9 years, 45 females and 5 males, were studied with the battery of tests on cognitive functions. The following tests were used: Stroop for attention; clock drawing test for visuo-constructive abilities; Benton visual retention test for visual perception and visual memory; verbal fluency test for performance of semantic memory; trail making test (TMT) for visual attention and task switching. Disordered sleep was estimated by Insomnia severity index and clinical data.

Results: Spearman rank correlation test revealed significant ($p < 0.05$) correlations between the results of Stroop task and sleep

duration ($r = -0.34$), Benton test and number of awakenings ($r = -0.53$) and verbal fluency test and insomnia duration ($r = -0.45$). Mann–Whitney U test also revealed significant differences between results of Benton tests in patients with frequent (10.9 ± 2.2) and episodic (11.9 ± 2.1) night awakenings.

Conclusion: We found very weak and inconsistent connection between the presence of any sleep disturbances in chronic insomnia patients and the results of cognitive function tests.

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Clinical manifestation of narcoleptic patients with family history

D. Xiaosong, X. Liyue, L. Qinghua, H. Yan, L. Xiao, L. Jing, A. Pei, Z. Long, Z. Xueli, H. Fang
Peking University People's Hospital, China

Introduction: Narcolepsy has been recognized as a genetic sleep disorder. However, only 1–2% of the cases had family history with definite narcolepsy–cataplexy. The current study aims to explore the clinical presentation of familial cases with narcolepsy–cataplexy in a large Chinese narcoleptic sample, as a phenotype study for genetic research.

Materials and methods: The study groups included 66 probands with narcolepsy–cataplexy had definite family history of narcolepsy with cataplexy (group 1), 194 type I narcolepsy proband with family history of excessive daytime sleepiness only (group 2), and 212 sporadic patients diagnosed with narcolepsy with cataplexy but no indication of EDS family history (group 3). All patients underwent a standardized questionnaire for clinical evaluation on narcolepsy. Nocturnal polysomnogram (PSG), followed by a daytime multiple sleep latency test (MSLT), HLA typing for DQ0602 were carried out.

Results: Group 1 had similar proportion of male with 2.4:1 as the other two groups (2.13:1 for group 2) and (2.65:1 for group 3). Patients in group 1 had a younger disease onset age (10.09 ± 7.00 years) than the other two groups (11.07 ± 5.49 years for group 2) and (12.42 ± 4.86 years for group 3). There are no significant difference among three groups as to clinical symptoms including hallucination, sleep paralysis and nocturnal disturbed sleep. Group 1 had higher proportion of narcolepsy tetrad. However, there were no significant difference in sleep latency, REM latency and SOREM times among three groups on MSLT.

Conclusion: Type 1 narcolepsy, i.e. hypocretin deficiency indicated by CSF hypocretin measurement or predicted by the occurrence of narcolepsy cataplexy and positive HLA-DQB1*06:02 with family history of narcolepsy with cataplexy had earlier disease onset age compared with type 1 narcolepsy with excessive daytime sleepiness family history and those without family history.

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Incidence of narcolepsy before and after the pandemic influenza a (H1N1) vaccination in the Korean military

W. Kim¹, S. Lee², E. Lee¹, K. Namkoong¹, K. Choe³, J. Song⁴, H. Cheong⁴, H. Jeong⁵, J. Heo⁵

¹ Department of Psychiatry and Institute of Behavioral Science In Medicine, Yonsei University College of Medicine, Sleep Health Center, Severance Hospital, Korea

² Department of Psychiatry, Armed Forces Capital Hospital, Korea

³ Department of Internal Medicine, Armed Forces Capital Hospital, Korea

⁴ Department of Internal Medicine, Korea University College of Medicine, Korea

⁵ Department of Internal Medicine, Chungbuk National University, Korea

Introduction: Narcolepsy is hypothesized to be caused by autoimmune-mediated process. Previous reports suggested association between occurrence of narcolepsy and the influenza A(H1N1)pdm09 vaccine adjuvanted with AS03. During the 2009 H1N1 pandemic, the Korean military performed a vaccination campaign with one type of influenza vaccine containing the MF59-adjuvants.

Materials and methods: Our aim was to investigate the background incidence rate of narcolepsy in the Korean military and the association of the vaccination using the MF59-adjuvanted vaccine with the occurrence of narcolepsy in a young adult group. We conducted a retrospective chart review of narcolepsy or hypersomnia cases in 2007–2013 to assess the incidence of narcolepsy in the Korean military, using the computerized disease registry and the medical record system of the Korean armed forces. The screened cases of narcolepsy were classified by two sleep specialists according to the Brighton Collaboration case definition of narcolepsy.

Results: A total of 41 cases were finally diagnosed with narcolepsy in 2007–2013 (male sex, 95%; median age, 21 years). The average background incidence rate of narcolepsy in Korean soldiers was 0.91 cases per 100,000 person-years. During the prior 9 months before the implementation of the vaccination (April–December 2009), six narcolepsy cases occurred, while during the next 9 months (January–September 2010) including the 3-month vaccination campaign, five cases occurred.

Conclusion: The incidence of narcolepsy in Korean soldiers was not increased after the pandemic vaccination campaign using the MF59-adjuvanted vaccine. Our result suggests that the MF59-adjuvanted H1N1 vaccine did not contribute to the occurrence of narcolepsy in a young adult male group.

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Coping strategies in patients with narcolepsy: Another focus of cognitive behavioral intervention in narcolepsy

H. Marín Agudelo¹, U. Jiménez Correa², R. Haro Valencia³, S. Tufik⁴

¹ Facultad de Psicología, Universidad Cooperativa de Colombia, Colombia

² Clínica de Trastornos del Sueño, Universidad Nacional Autónoma de México, Mexico

³ Instituto Mexicano de Medicina Integral del Sueño, Mexico

⁴ Universidade Federal de Sao Paulo, Brazil

Introduction: Given a single stressful event, people react in different ways, as also occurs in patients with narcolepsy, which react with different intensity. The aim of this work, was to relate coping strategies, in a sample of patients with Narcolepsy, not just pharmacological treatment.

Materials and methods: Cross-sectional study where Ullanlina Narcolepsy Scale were applied, The Stanford cataplexy scale, Multiple Sleep Latency Test and Narcolepsy Coping Strategies Questionnaire, in a sample of 22 patients diagnosed with narcolepsy, among 25 and 42 years of age, prior informed consent.

Results: The coping strategies questionnaire demonstrated a Cronbach's alpha of 0.819, and a significant correlation ($p < 0.001$), with multiple test latency and Ullanlina sleepiness scale. In general characterization of patients with Narcolepsy regarding coping profile significance ($p < 0.001$) was found between the test latency and multiple scales of narcolepsy and cataplexy Ullanlina of stanford, with low scores in the domains direct coping, social support or information, planning and problem solving, self-control and self-care behaviors, on the other hand scores high in escape or avoidance, emotional shock, denial or distancing. Fifty-five percent of these scores are explained (after linear regression analysis) for these scores, explaining the intensity of cataplectic symptoms, 20% symptoms of sleepiness, and hypnagogic hallucinations 15% and 10% sleep paralysis.

Conclusion: Particularly striking is the high ratio of coping strategies, which outline the symptoms of cataplexy, which becomes the focus of psychological intervention and help in the symptomatic management of the syndrome.

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Prevalence and characteristics of primary headache and dream-enacting behavior in patients with narcolepsy and idiopathic hypersomnia: A multi-center cross-sectional study

K. Suzuki¹, M. Miyamoto², T. Miyamoto³, K. Matsui⁴, S. Nishida⁴, K. Hayashida⁵, A. Usui⁴, Y. Inoue⁴, M. Nakamura⁴, K. Hirata¹

¹ Department of Neurology, Dokkyo Medical University, Japan

² School of Nursing, Dokkyo Medical University, Japan

³ Department of Neurology, Dokkyo Medical University Koshigaya Hospital, Japan

⁴ Yoyogi Sleep Disorder Center, Japan

⁵ Sleep & Stress Clinic, Japan

Introduction: Prevalence and characteristics of primary headache in patients with narcolepsy and idiopathic hypersomnia have been unclear.

Materials and methods: In a multicenter cross-sectional survey, among consecutive 576 outpatients with sleep disorders, 68 narcolepsy and 35 idiopathic hypersomnia patients were included. Thirty six healthy control subjects also participated. The semi-structured headache questionnaires were administered to all participants.

Results: Patients with narcolepsy (52.9%) and idiopathic hypersomnia (77.1%) had a significantly increased headache prevalence compared with healthy controls (27.8%) ($p = 0.021$). Prevalence rates of migraine and tension-type headache in narcolepsy patients, idiopathic hypersomnia patients and controls were as follows: migraine, 23.5%, 41.2% and 8.3% ($p < 0.001$) and; tension-type headache, 16.2%, 23.5% and 13.9% ($p = 0.051$), respectively. The presence of migraine was associated with excessive daytime sleepiness, defined as an Epworth Sleepiness Scale score of ≥ 10 , in patients with narcolepsy (93.8% vs. 65.6%, $p = 0.040$) and idiopathic hypersomnia (86.7% vs. 37.5%, $p = 0.026$), as compared with those without headache. Dream-enacting behavior, evaluated by rapid eye movement sleep disorders questionnaire, was more frequently observed in with narcolepsy patients than in idiopathic hypersomnia patients and controls.

Conclusion: Migraine was frequently observed in narcolepsy and idiopathic hypersomnia patients relative to control subjects. Further studies are needed to assess contributing factors of migraine in narcolepsy and idiopathic hypersomnia.

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Increased cancer incidence in patients of narcolepsy – A nationwide population-based study

M. Tsai¹, C. Hsu², M. Wu², C. Hsieh², Y. Chung¹, C. Yang¹, I. Chong¹, M. Huang¹

¹ Division of Pulmonary and Critical Care Medicine, Department of Internal Medicine, Kaohsiung Medical University Hospital, Kaohsiung Medical University, Kaohsiung, Taiwan

² Department of Neurology, Kaohsiung Medical University Hospital, Kaohsiung Medical University, Kaohsiung, Taiwan

Introduction: Factors contributing to narcolepsy include genetic factors, infection and neuro-immunology, which are also contributing factors for cancer. However, the cancer incidence of patients with narcolepsy has not been reported previously. We therefore conducted a nationwide population-based study to further identify the association between narcolepsy and cancer.

Materials and methods: From the dataset of one million subjects randomly sampled from individuals enrolled in the Taiwan National Health Insurance (NHI) system before the end of 2000, we enrolled adult patients with newly diagnosed narcolepsy. Patients with any cancer diagnosis prior to narcolepsy diagnosis were excluded. Each patient was followed from the date of first narcolepsy diagnosis to the first occurrence of cancer or end of record, whichever came first. The occurrence of cancer was identified from the catastrophic disease claim dataset. The standardized incidence ratio (SIR) was calculated using data from Taiwan Cancer Registry (TCR) to compare the cancer risk of narcolepsy patients with the general population.

Results: A total of 1025 narcolepsy patients were identified. After excluding patients by an algorithm to maximize the accuracy of patient identification and exclude patients having cancer diagnosis before narcolepsy diagnosis, a total of 308 narcolepsy patients were included for analysis. The expected cancer incidence calculated with the data from TCR was 17.3 patients, whereas 38 narcolepsy patients actually developed cancer (SIR = 2.2 [95% CI: 1.6–3.0]). Liver cancer is the most common cancer in these patients ($n = 26$; expected = 2.6; SIR = 9.9 [6.5–14.5]). Sensitivity analyses using different algorithms showed consistent results.

Conclusion: Our study revealed a significant higher cancer incidence, especially incidence of liver cancer, in narcolepsy patients as compared with the general population. Further study may be needed to identify the mechanism underlying the association between narcolepsy and cancer.

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Blood pressure profile in children narcolepsy patients with cataplexy

J. Wang¹, J. Li², X. Dong², P. An², L. Zhao², C. Lv¹, X. Wang¹, F. Han²

¹ Department of Pulmonary Medicine, Shan Dong Bin Zhou Medical University, China

² Department of Pulmonary Medicine, Peking University People's Hospital, China

Introduction: To prospective describe the hypothesis that hypocretin may affect cardiovascular function in narcolepsy–cataplexy (NC).

Materials and methods: Clinical, sleep, blood biochemical index were recorded in 50 narcolepsy patients under 18 years of age with cataplexy. Twenty-four hours of ambulatory blood pressure were also recorded before and after the drug (methylphenidate hydrochloride, 18 mg/d) in these patients. We also compared these data

of 24 hour ambulatory blood pressure with the normal controls with equivalent sex, age and BMI.

Results: SBP, DBP, HR was significantly higher in narcolepsy patients with cataplexy during the day (6:00–22:00) after the drug (119.6 ± 10.0 and 115.0 ± 7.8 , $p = 0.000$, 73.3 ± 6.1 and 69.9 ± 5.9 , $p = 0.000$, 96.4 ± 14.4 and 89.4 ± 12.7 , $p = 0.000$, respectively), whereas it did not differ significantly between them during night (22:00–6:00) (106.9 ± 10.4 and 105.8 ± 8.3 , $p = 0.091$, 62.3 ± 5.3 and 61.2 ± 6.1 , $p = 0.177$, 75.8 ± 14.2 and 73.5 ± 11.3 , $p = 0.326$, respectively). Compared with NC, SBP was significantly higher in normal controls during the day (115.0 ± 7.8 and 121.1 ± 11.1 ; $p = 0.000$), but at night there is no significant difference (105.8 ± 8.3 and 102.9 ± 11.8 ; $p = 0.057$) between these two group.

Conclusion: Methylphenidate hydrochloride could increase the level of blood pressure and heart rate. Hypocretin may affect cardiovascular.

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Symptoms of depression/anxiety and latencies of the sleep in elderly

C. Caruccio Montanari¹, K. Rodrigues², E. Ferreira Martins³, R. Pacheco Da Silva³, M. Fagundes³, M. Madalena Pedroso³, B. Mattei Peukert¹, C. Zappe Fiori⁴, D. Martinez⁴

¹ Graduate Program in Medical Sciences, Universidade Federal do Rio Grande do Sul (UFRGS), Brazil

² Cardiology Unit, Hospital de Clínicas de Porto Alegre (HCPA – UFRGS)

³ Graduate Program in Cardiology and Cardiovascular Sciences, UFRGS

⁴ Graduate Program in Medical Sciences, Universidade Federal do Rio Grande do Sul (UFRGS), Cardiology Unit, Hospital de Clínicas de Porto Alegre (HCPA – UFRGS), Graduate Program in Cardiology and Cardiovascular Sciences, UFRGS

Introduction: Depression and anxiety affect sleep–wake patterns. Reduced REM sleep latency is an organic depression marker. Latency to prolonged sleep in depressed/anxious individuals is not described in the elderly. The objective is to associate latency to the different stages of sleep and symptoms of depression and anxiety in the elderly.

Materials and methods: Patients with suspected sleep disorders who underwent overnight polysomnography in sleep clinic were selected in two age groups: 100 patients older than 80 years and 156 controls aged 60. All participants completed demographic questionnaires and psychiatric symptoms (SCL-90R). To predict symptoms of depression and anxiety was performed multiple linear regression analysis controlling for polysomnographic variables (sleep latency) and confusion.

Results: The latencies to sleep stages were longer in the group of cases than in controls, but significantly different only in stages N3 (79 vs. 45 min; $p = 0.001$) and REM (150 vs. 120 min; $p = 0.012$). The depression scores were similar in both two groups (0.69 vs. 0.7), but the anxiety were higher in older subjects (0.63 vs. 0.51), without reaching significance. Women had both depression scores (0.88 vs. 0.49; $p < 0.001$) and anxiety (0.74 vs. 0.31; $p < 0.001$) higher than men, regardless of whether 60 or more than 80 years. Correlations between latency to sleep stages and the scores of depression and anxiety were not significant for any group. However, the correlation coefficients were higher in the control group than in the group of cases. Multivariate analysis did not show significant models to explain the scores of anxiety and depression, using the latencies to sleep stages as covariates and adjusting for gender and group.

Conclusion: The negative result of this work was unexpected. With increasing age the symptoms of depression and anxiety are to be associated with other mechanisms not related to sleep. Studies on the mechanisms of etiology of depression/anxiety with advancing age are needed to understand these findings.

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A longitudinal association between sleep and body weight changes from birth to 2 years

S. Chung¹, S. Chu², Y. Huang³, W. Liao⁴, C. Chen⁵, P. Chen¹

¹ College of Medicine, School of Nursing, Chang Gung University, Taiwan

² Department of Newborn Medicine, Chang Gung Memorial Hospital, Taiwan

³ Department of Child Psychiatry and Sleep Center, Chang Gung Memorial Hospital, Taiwan

⁴ School of Nursing, Chung-Shan Medical University, Taiwan

⁵ Department of Biostatistics and Bioinformatics, National Health Research Institutes, Taiwan

Introduction: Short sleep in infancy has been identified to be associated with childhood obesity in Western literatures. However, limited longitudinal evidence exists for Taiwanese children. The aim of this study was to investigate the longitudinal association between sleep status and body weight changes in healthy children from birth to 2 years.

Materials and methods: A convenient sampling technique were used to recruit interested primiparous (singleton delivery) mother–newborn pair at a medical center located in North Taiwan. The newborns were eligible for a 2-year follow-up if the following criteria are met: (1) ≥ 37 weeks gestation, (2) birth weight ≥ 2500 g, (3) discharge from newborn nursery (baby-room) or neonatal intensive care unit (NICU) without significant neonatal mobility, and (4) nursery or NICU stay less than 7 days. One hundred and fifty-three eligible newborns were recruited. Eligible newborns were scheduled for collecting sleep and anthropometric data every half-year from the first week after birth to second-year of age. Sleep assessment was performed in the home environment by mother-reported infant sleep diary, the Brief Infant Sleep Questionnaire, and an actiwatch to monitor movement of the child. Data were analyzed based on the study aims.

Results: The study results identified that infant sleep patterns are positively associated with body weight status from birth to 2 years-old. Poor sleeping status is not associated with body weight development among the age group of 0–2 years.

Conclusion: This study described sleep patterns in a sample of healthy 0 to 2 year-old Taiwanese children. However, sleep problems of this age range did not affect their weight development in this study. More subject involvement in the future will be helpful to confirm the results.

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Associations of sleep duration with cardiac remodeling in adolescents and young adults at risk of metabolic syndrome

Y. Jiao¹, J. Zhang², Y. Wang¹, Y. Wing², A. Kong²

¹ Beijing Chaoyang Hospital, Capital Medical University, China

² The Chinese University of Hong Kong, China

Introduction: Previous studies have shown that short sleep duration was associated with cardio-metabolic dysfunctions. However, the detailed mechanisms underlying these associations are still unclear. We aimed to determine the associations between sleep duration and cardiac remodeling parameters in adolescents and young adults.

Materials and methods: A total of 518 young individuals [mean age (SD) = 20.2 years (2.9), female = 48.8%] selected from Beijing Child and Adolescent Metabolic Syndrome (BCAMS) study were included in this study. All subjects had detailed measurements including bedtime and wakeup time and color Doppler echocardiography. Sleep duration was calculated by the difference between usual bedtime and usual wakeup time while mid-point of sleep was determined by the mean between usual bedtime and usual wakeup time. Individuals were divided into four groups according to their sleep duration [< 7 hours (n = 65), 7–8 hours (n = 199), 8–9 hours (n = 165), ≥ 9 hours (n = 89)] and mid-point of sleep (2:30 AM or earlier (n = 116), 2:30–3:30 am (n = 197), 3:30–4:30 AM (n = 149), 4:30 AM or later (n = 56)].

Results: Individuals with shorter sleep duration had larger interventricular diastolic thickness (IVSTd), larger left ventricular end-diastolic diameter (LVED), and left ventricular posterior wall thickness (LVPWd) when compared with those with longer sleep duration ($p < 0.05$). The associations between shorter sleep duration and worse echocardiographic parameters were presented in a dose-dependent pattern. No differences were found in IVSTd, LVED, and LVPWd among different groups. These results suggested that circadian alignment was not involved in the cardiac remodeling in these individuals.

Conclusion: Short sleep duration was associated with worse cardiac remodeling in adolescents and young adults at risk of metabolic syndrome.

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Most noradrenergic neurons and a few gabaergic axons within the cat locus coeruleus contain mu opioid receptor activation sites contributing to locus coeruleus opiate-induced sleep enhancement

O. Robayo, M. Alvira-Botero, M. Garzón

Department of Anatomy, Histology & Neuroscience, Medical School UAM, Spain

Introduction: Microinjections of mu opioid agonists in the cat locus coeruleus (LC) enhance slow wave sleep and suppress wakefulness, supposedly by inhibition of noradrenergic LC neurons. We aim to determine the ultrastructural location of mu opioid receptor (MOR) activation sites and their relationships to noradrenergic or GABAergic neurons of the LC.

Materials and methods: Seven adult cats were deeply anesthetized with pentobarbital (33 mg/kg i.p.) and their brains were fixed by aortic arch perfusion with paraformaldehyde 4% glutaraldehyde 0.2% in 0.1 M phosphate buffer. The brains were cut in coronal sections (50 μm thickness) containing the LC. We used electron microscopic immunocytochemical dual labeling for either MOR and the catecholamine-synthesizing enzyme tyrosine hydroxylase (TH) or MOR and GABA in single LC sections. Immunoperoxidase detection (avidin-biotin-peroxidase method) of either TH or GABA was followed by immunogold-silver detection of MOR. Dual-immunolabeled sections were postfixed in osmium tetroxide, dehydrated through a series of graded ethanols and propylene oxide, and embedded in Epon resin. Ultrathin sections were cut from the

outer surface of the LC tissue. These sections were collected on 400-mesh copper grids, counterstained with uranyl acetate and lead citrate, and examined with a Phillips 201 electron microscope (Jeol JEM 1010). All immunoreactive processes were counted in randomly sampled electron micrographs. Frequencies of single- and dual-labeled cellular profiles, as well as contacts between immunohistochemically-identified profiles were assessed. ANOVAs were used to determine whether there was significant variability in area density or in distribution of immunolabeling in different profile types with respect to different animals.

Results: MOR immunoreactivity in the cat LC was mainly localized in dendrites, of which near 35% contained TH (742/1391) and less than 1% contained GABA. Moreover, most noradrenergic dendrites were also MOR-labeled (742/1275). This strongly suggests that LC noradrenergic inhibition by mu opioid agonists is mainly produced by direct MOR activation in noradrenergic postsynaptic sites, thereby hyperpolarizing noradrenergic neurons. In addition, frequent appositional contacts and symmetric (inhibitory-type) synaptic contacts were observed between GABA-containing axon terminals and dendrites expressing plasmalemmal MOR, suggesting an inhibitory GABA input control of noradrenergic neurons. However, MOR was only present in 15.2% of GABA axon terminals and 15.4% of GABA preterminal axons within the LC, indicating that presynaptic MOR activation regulating inhibitory GABA input to LC seems a secondary mechanism in LC noradrenergic neurons regulation by mu opioid agonists.

Conclusion: These results show ultrastructural bases for direct inhibition of LC noradrenergic neurons that support MOR-mediated sleep enhancement in the cat LC and are relevant for the understanding of LC opioid-mediated control of behavioral states and sleep-wakefulness cycle states in relation to noradrenergic and GABAergic neurotransmission within the LC.

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Characteristics of sleep disturbance in 103 patients with Parkinson's disease and study on the clinical nursing strategy

J. Hung, K. Xiong, C. Mao, J. Li, R. Chen, C. Liu

The Second Affiliated Hospital of Soochow University, China

Introduction: In Parkinson's diseases (PD), sleep disturbance is a common non-motor symptom that interfere with life quality dramatically. We discuss the sleep structure and clinical features of sleep disturbance and analyze related factors and causes. Intervention strategies are applied to improve the quality of sleep and life in PD.

Materials and methods: Sleep status of 103 patients with PD and age- and sex-matched controls are assessed by Epworth Sleepiness Scale (ESS), Pittsburgh Sleep Quality Index (PSQI) and underwent video-polysomnography (PSG). All patients are continuously recorded 7–8 hours and observed the total sleep time (TST), sleep latency (SL), sleep efficiency (SE), awakening index (AI), fast, and REM sleep latency, sleep stage percentages, periodic leg index. Sleep disturbance in PD patients was diagnosed according to polysomnographic criteria. We use the AASM (2007 edition) for staging criteria to analyze the sleep structure and the features of sleep disturbance in PD. Then the targeted, individualized nursing intervention is applied for patients. Two months later, patients with PD were interfered in comprehensively and evaluated by ESS and PSQI again.

Results: The PSQI scores, sleep time, sleep broken and the occurrence rate of RBD were significantly higher in PD than controls

($p < 0.01$). In 29 cases of PD sleep latency is above 30 minutes, and 36 PD patients have more than three times of the awakening index and cannot sleep again in 5 minutes. There were no big differences in the apnea–hypopnea index, ESS scores and the incidence of awakening early between patients with PD and controls. Comparing the sleep structure of two groups, the ratio of slow wave became less, and REM latency period became longer in PD. Total sleep time and sleep efficacy deteriorated in PD group; longer sleep latency period, increasing percentage of stage 1 sleep, and increasing number of arousal times, increasing number of PLMSI, decreasing part of REM sleep were found in PD group ($p < 0.05$). After comprehensive interference of PD, the score of ESS and PSQI became lower ($p < 0.01$).

Conclusion: Sleep disturbance is common in PD, manifesting as difficulties in falling asleep, sleep fragment, RBD and PLMD, which is correlated with the severity of disease, cognition, depression, age and dopamine drugs. Given these reasons, corresponding interventions can overcome sleep disorders and improve life quality.

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Genial tubercle: An anatomical analysis and the implications for genioglossus advancement

S. Kim, K. Lee, J. Cho, S. Kim

Department of Otorhinolaryngology – Head and Neck Surgery, School of Medicine, Kyung Hee University, Korea

Introduction: Genioglossus advancement (GA) is one of the popular procedures for the treatment of obstructive sleep apnea. The purposes of this study were to determine the exact positions and dimensions of the GT and mental foramen (MF), and to make a reference in designing a location of the osteotomy during GA.

Materials and methods: Twenty four randomly selected adult cadavers with intact bony mandibular structures and precise measurements with a caliper to evaluate the dimensions of the GT and MF. Five variables were measured, including: (1) width of GT (GTW); (2) height of GT (GTH); (3) distance from inferior border of GT to inferior border of mandible (IGT-IBM); (4) distance from superior border of GT to inferior border of mandible (SGT-IBM); and (5) inter-mental foramen width (IMFW). In addition, the presence of AMF was analyzed. And possibility of proper osteotomy was evaluated when the osteotomy was performed in outer table of mandible at 2 mm higher than the estimation of inner table.

Results: The measurements were GTW 7.90 ± 1.44 (3.0–8.0) mm, GTH 7.3 ± 1.45 (5.0–10.0) mm, IGT-IBM 8.46 ± 1.93 (5.0–11.0) mm, SGT-IBM 15.85 ± 2.30 (14.5–20.0) mm and IMFW 56.38 ± 4.75 (43.0–60.0) mm. AMF were observed in only one patient. Among 24 cadavers, 23 cases showed proper osteotomy when the osteotomy was 2 mm higher than the estimation of inner table.

Conclusion: According to our results, proper osteotomy which includes genial tubercle may be possible when the osteotomy was 2 mm higher than the estimation of inner table in most patients.

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Nocturnal text messaging patterns on sleep health in adolescents

K. Grover¹, M. Malkowski², L. Kang³, S. Machado⁴, R. Lulla⁵, D. Heisey⁶, X. Ming¹

¹ New Jersey Medical School, Rutgers University, USA

² Union City High School, USA

³ Communications High School, USA

⁴ Emerson Junior/Senior High School, USA

⁵ New York University, USA

⁶ Scotch Plains-Fanwood High School, USA

Introduction: There is growing body of evidence on the negative effects of electronic usage on sleeping patterns that may compromise sleep quality and school performance in adolescents. We aimed to determine whether an association exists between nocturnal messaging, a constellation of daytime sluggishness symptoms and reported school performance.

Materials and methods: Two thousand one hundred thirty-nine students from three high schools in New Jersey completed anonymous questionnaires assessing sleep schedules; sleep duration; daytime sluggishness symptoms (naps, perception of inadequate sleep, daytime sleepiness); nocturnal text messaging habits; and self-reported academic performance. Logistic regression and odds ratios were applied for statistical analysis.

Results: Of the 1841 students reporting messaging, 94.7% messaged prior to lights out, 80.1% messaged after lights out, while 74.1% messaged both prior to and after lights out. 19.4% messaged only before midnight, 5.0% messaged only after midnight, and 27.6% messaged on both timing. Students messaging for various duration prior to lights out or after lights out were more likely to report DSS (p values 0.089 to < 0.0001), with the exception of messaging for less than 30 minutes prior to lights out. Students messaging both before and after midnight were more likely to feel DSS (OR: 2.193, $p < 0.002$) than students messaging only before midnight. Non-messaging students were less likely (OR: 0.494, $p = 0.01$) to experience daytime sluggishness symptoms than students messaging for any duration. Students messaging both before and after midnight were less likely (OR: 0.393, $p < 0.0001$) to report good grades compared with students messaging only before midnight.

Conclusion: Our results showed that excessive late night messaging negatively affected the daytime alertness of students in this cohort and contributed to poorer academic performance in students messaging both before and after midnight.

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Developing sleep services for Singaporean children and adolescents

I. Munt

Institute of Mental Health, Singapore

Introduction: A 2006 survey of Singaporean parents found that over 60% of presentations to a child and adolescent psychiatry clinic also had a significant sleep problem [1]. This paper outlines the steps undertaken to develop sleep services so as to better support these children and adolescents.

Materials and methods: (1) Survey of staff to ascertain (a) if they felt sleep problems were a significant concern and if so (b) what were the common problems they saw and (c) what support would they like. (2) Literature review: To search for appropriate information on assessment and management of sleep disorders with particular reference to Asian populations. (3) Collation and distribution of suitable Internet/printed resources for assessment/management of sleep problems plus patient education materials. (4) Liaison with existing local sleep services. (5) Attendance at educational courses. (6) Development of clinic to see children and adolescents with significant sleep disturbance.

Results: Staff responses strongly supported the development of a sleep service but interestingly the problems they noted most were in relation to adolescents have sleep disturbance as part of a mood disorder or linked to excessive Internet use with sleep phase disturbance whereas the 2006 survey found sleep problems generally associated with developmental problems such as ADHD or ASD.

Most research and resources for sleep disturbance are western focussed so may not necessarily take into account issues such as sharing a bedroom being much more common in Asian populations. Also Asian children and adolescents report sleeping less than their western peers.

Conclusion: There is strong support for a sleep service noting there needs to be further exploration of the reason for the discrepancy between what parents report as a sleep problem and what clinicians consider to be a significant sleep problem. More appropriate local resources need to be developed [2].

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Oral administration of Japanese sake yeast (*Saccharomyces cerevisiae* sake yeast) promotes non-rapid eye movement (NREM) sleep in mice, and improves the sleep quality in humans

Y. Nakamura¹, N. Monoi², E. Kimura², T. Sano², T. Midorikawa², A. Uchiyama², M. Murakoshi³, K. Sugiyama⁴, H. Nishino⁵, Y. Urade⁶

¹ Lion Corporation, WPI-IIIIS University of Tsukuba, Japan

² Lion Corporation, Japan

³ Lion Corporation, Kyoto Prefectural University of Medicine, Japan

⁴ Lion Corporation, Ritsumeikan University, Japan

⁵ Kyoto Prefectural University of Medicine, Ritsumeikan University, Japan

⁶ WPI-IIIIS University of Tsukuba, Japan

Introduction: Recent studies demonstrated that the activation of adenosine A2A receptors (A2AR) promote NREM sleep. To improve the sleep quality in humans, we screened food-materials associated with the agonist activity against A2AR, and found Japanese sake yeast (*Saccharomyces cerevisiae* sake yeast) as a potential candidate.

Materials and methods: (1) We examined the effect of test components on the sleep–wake behavior in adult male C57BL6/N mice after the oral administration. Mice were implanted with electroencephalogram (EEG) and electromyogram (EMG) electrodes for polysomnographic recording. After recovery, animals were habituated and vehicle or the test samples were administered orally to mice at the onset of dark period. EEG and EMG were then analyzed and scored as wake, REM and NREM sleep, by using SLEEPSIGN software, according to the standard criteria. (2) We investigated the effects of sake yeast on sleep quality in a clinical trial by a double-blind placebo-controlled cross-over study with 68 healthy participants (35 females and 33 males, 24–57 years old, Pittsburgh Sleep Quality Index (PSQI) ≥ 5). The subjects were provided with tablets (500 mg of Japanese sake yeast (*Saccharomyces cerevisiae* sake yeast) or the placebo), and tablets were ingested 1 h before sleeping over a period of 1 week. EEG recordings were made during sleeping periods. Questionnaire based evaluation was done

by using Ogri–Shirakawa–Azumi sleep inventory MA version (OSA-MA).

Results: Results showed that oral administration of Japanese sake yeast containing S-adenosylmethionine (SAME) in mice increased NREM sleep dose-dependently (100, 200, 300 mg/kg body weight), but REM sleep remain unchanged. On the other hand, sake yeast without SAME did not affect the sleep–wake behavior, suggesting that SAME or its metabolites are the active ingredients for sleep-promoting effect. The sleep promoting effect of Japanese sake yeast was abolished by pretreatment of A2AR selective antagonist, ZM241385, indicating that Japanese sake yeast promotes NREM sleep via activating A2AR. Human data showed significant increase in EEG delta power, during first sleep cycle, in subject with Japanese sake yeast administration when compared with placebo group. Further, questionnaire based evaluation revealed that ingesting Japanese sake yeast improves sleep quality and subjects feel less fatigue in the morning.

Conclusion: Oral administration of Japanese sake yeast promotes NREM sleep via activation of A2AR in mice. Japanese sake yeast improves the sleep quality in terms of the delta power during the first slow-wave sleep cycle and reduces morning fatigue in humans.

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Short sleep time increases risk behavior among U.S. middle school students

J. Owens¹, G. Wang², A. Baylor¹, E. Skora¹, D. Lewin¹

¹ Children's National Medical Center, USA

² School of Psychology and Cognitive Science, East China Normal University, Children's National Medical Center, China

Introduction: Short sleep duration has been linked to increased risky behaviors such as alcohol and drug use in adolescents. We examined the association between sleep and peer/individual risk factors (e.g., rebelliousness, sensation seeking) in a large ethnically and socioeconomically diverse community sample of early adolescents.

Materials and methods: We used data collected by a modified version of the Youth Risk Behavior Survey (YRBS) from 10,718 and 11,240 eighth grade students in a large suburban school district in 2010 and 2012, respectively. Self-reported school-night sleep duration (SD) was grouped as <4, 5, 6, 7, 8, 9, and >10 h. Scores on 10 peer/individual risk behavior scales (i.e., Communities That Care Survey) included within the YRBS were dichotomized according to national cut-points established for eighth grade. Multilevel modeling was used to explore the relationship between SD and high versus low risk factor scores after adjusting for gender, race and a proxy measure of socioeconomic status.

Results: The percentage of students reporting an “optimal” SD of 9 h was 14.8%, and 15.6% in 2010 and 2012, respectively, while 45.6% and 46.1% reported <7 h. Odds ratios (ORs) for nine of 10 risk factor scales were elevated when students slept <7 h, with a dose-response effect for each hour of less sleep compared with an SD of 9 h. For example, ORs for students sleeping 7 h ranged from 1.3 (early initiation of antisocial behavior) to 1.8 (early initiation of drug use). The risk factor scale ORs for <5 h SD ranged from 3.0 (sensation seeking) to 6.4 (gang involvement).

Conclusion: Middle school students are at high risk for insufficient sleep; an SD <7 h is associated with an increase in risk factors linked to high risk behaviors such as lifetime and recent substance use.

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Correlation between tonsil shadow on lateral cephalometry and volume of tonsil after tonsillectomy

J. Park

Asan Medical Center, South Korea

Introduction: Adenotonsillectomy is a common operation on children who have sleep apnea, snoring and so on. In this study, we investigated the correlation between the initial examination of tonsil, area of tonsil on lateral cephalogram and tonsil volume after tonsillectomy.

Materials and methods: From January to June 2014, we reviewed retrospectively medical records of 234 patients who underwent adenotonsillectomy in Asan Medical Center and all of them were evaluated the degree of their tonsil hypertrophy and were performed lateral cephalogram preoperatively. Also, we measured the volume of tonsils at the time of surgery; the measurement was as follows: 10 cc saline filled in 20 cc syringe tube, and measured the increasing saline volume by placing tonsil into the tube. The average value of both tonsils was obtained.

Results: At the first visit, hypertrophy grade I was 5, II was 21, III and IV were 126 and 82, respectively, and there were 180 cases whose tonsil shadow was visible on cephalogram but 54 cases were invisible on the radiograph. In cases of visible tonsil shadow, the oval area was calculated by measuring long (a) and short diameters (b) of shadow ($S = \pi ab/4$). The postoperative volumes of tonsils varied from 1.0 to 9.5 cc. Correlation between hypertrophy grade and postoperative volume of tonsil showed the significance diffusely ($p < 0.01$) but partially, there were some correlations that not shown statistically significances. The tonsil volume was significantly greater in the visible tonsil group on the lateral radiograph than the invisible group. ($p = 0.002$). In addition, we found the more positive correlation between oval area on lateral cephalogram and tonsil volume measured after surgery than correlation between hypertrophy grade and tonsil volume ($r = 0.489$, $p < 0.000$ and $r = 0.239$, $p = 0.001$, respectively).

Conclusion: We can evaluate tonsillar hypertrophy more accurately using the lateral cephalometry compared with clinical examination, and this can be helpful for predicting the result of tonsil surgery.

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Erythropoietin (EPO) inhibits the increase of nonrapid-eye-movement sleep (NREMS) that is present in rats with bleomycin (BLM)-induced pulmonary fibrosis (PF)

D. Tsavlis, A. Tektonidou, A. Tzoumaka

Department of Experimental Physiology, Aristotle University of Thessaloniki, Greece

Introduction: PF is characterized by fibroblasts proliferation and extracellular matrix remodelling due to reactive oxygen species' generation and apoptosis. EPO is a cytokine with anti-oxidative and anti-apoptotic properties. Our aim was to investigate whether EPO along with the respiratory function improvement could also have any effect on the sick rats' sleep.

Materials and methods: Fifty Wistar rats (300 g) were divided into five groups: Group 1 ($n = 10$): control group. Group 2 ($n = 10$): intratracheal (it) and intraperitoneal (ip) injection of saline (0.5 ml/kg). Group 3 ($n = 10$): intratracheal BLM injection (7.5 mg/kg). Group 4 ($n = 10$): intratracheal BLM injection (7.5 mg/kg) followed by EPO intraperitoneal injection (2000 iu/kg). Group 5 ($n = 10$): intratracheal injection of saline (0.5 ml/kg) and intraperitoneal injection of EPO (2000 iu/kg). All rats were sacrificed after 14 days. Histological evaluation was performed on paraffin sections stained with hematoxyline-eosin and lung injury was estimated quantitatively in 15 randomly selected fields/slide by Image Pro Plus software version 4. Rats were instrumented to obtain standard polygraphic recordings, which included EEG, gross body movement (via an infrared sensor) and cortical brain temperature (Tcort, via an epidural thermistor). Recordings began at the dark onset of the last night before sacrifice and continued until the next morning. Polygraphic signals were digitized and stored until visual scoring. EEG power densities were determined by fast Fourier transform.

Results: In groups 1, 2 and 5 (control groups), the tissue damage was very small. There were fibrotic lesions only in the 10% of the lung surface. In group 3 (BLM group) the fibrotic lesions almost covered the lung surface (95%). On the other hand, in group 4 (BLM + EPO group) the fibrotic damage was as small as in the control groups, around 10% of the lung surface. The appearance of fibrotic lesions and tissue damage took place in group 3 and in group 4 ($p < 0.001$ and $p < 0.05$ respectively). The duration of NREMS was normal in groups 1, 2 and 5 (control groups). The same happened with the Tcort and the activity of the EEG. In group 3 (BLM group) the duration of NREMS is extremely prolonged and its architecture was altered. The REM sleep was inhibited and the EEG hallmark was also affected i.e. theta activity. In group 4 (BLM + EPO group) the administration of EPO inhibited the increase of the duration of the NREMS and kept the REM sleep in normal limits. Moreover, the EEG was almost as normal as in the control groups 1, 2 and 5, as well as the Tcort.

Conclusion: Treatment with EPO significantly ameliorated the extent and severity of the BLM-induced toxicity in lung tissue. NREMS was in normal limits in the control groups and the group of EPO-animals.

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Sleep patterns of the 29th Chinese winter-over expeditioners during prolonged stay at Antarctica

C. Xu¹, N. Chen², J. Hu³, Y. Xiong²

¹ Institute of Basic Medical Sciences, Chinese Academy of Medical Sciences, China

² Institute of Basic Medical Sciences, Chinese Academy of Medical Sciences, School of Basic Medicine Peking Union Medical College, China

³ People's Hospital of Pingxiang, Jiangxi Province, China

Introduction: Sleep disturbances and changes of sleep patterns among overwintering members were reported at American, British and Indian stations in the Antarctic. These alterations prevailed during winter and were attributed to the rigorous climate, polar days and nights, or psychophysiological reactions to isolation. The sleep patterns of Chinese winter-over expeditioners are unknown.

Materials and methods: A total of 56 polysomnographic (PSG) sleep recordings were carried out on 14 subjects of the 29th Chinese

Antarctic winter-over expedition for four sessions. Baseline recordings were obtained for each subject in Guangzhou, China (23°06'32"S, 113°15'53"E) in November 2012. The next three sessions in Antarctica were carried out at Zhongshan Station (69°22'24"S, 76°22'40"E) in March 2013 (before winter), July 2013 (polar nights) and November 2013 (polar days). The portable PSG was performed with a level 2 portable sleep device (Embletta X100, Embla Systems, Colorado) which is shown to be a reliable alternative for standard PSG. The PSG measured electroencephalogram (EEG), electrooculogram (EOG), electromyogram (EMG), nasal pressure, thoracic and abdominal effort, oximetry, body position, peripheral oxygen saturation (SpO₂) and pulse. The PSG recordings were manually scored epoch by epoch by the qualified PSG technician based on the American Academy of Sleep Medicine criteria. Statistical analyses of sleep data were carried out using one-way ANOVA to compare values recorded in Antarctica and baseline values recorded in Guangzhou.

Results: Compared with baseline values, sleep period time (SPT) and total sleep time (TST) showed no significant changes in Antarctica, while sleep latency and sleep efficiency both had a decrease trend. Awakening times and wake after sleep onset (WASO) had an increasing trend, and WASO increased significantly ($p < 0.05$) in polar days. Stage 2 of the non-rapid eye movement sleep (NREM) decreased significantly before winter and in polar nights ($p < 0.05$), whereas stage 1 and stage 3 of NREM tended to increase. No significant variation was seen in rapid eye movement sleep (REM). Some sleep variables varied in certain subjects. Such was the case for sleep efficiency, which decreased by 33% in polar nights in one subject, whose stage 3 of NREM disappeared in Antarctica.

Conclusion: Insomnia or major sleep disturbances are not a common feature in Chinese winter-over expeditioners living in a modern and comfortable Antarctic station. Sleep pattern variations may be related to numerous environmental and personal factors, with different psychological adaptations in small isolated human groups and to the extreme light–dark alternation.

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A brief description of drowsiness phenomenon treated by superstition rituals

J. Zhang, F. Feng, J. Feng, W. Wang

Guang'anmen Hospital, China Academy of Chinese Medical Sciences, China

It can be understood as “lost soul”) but most people do not see a doctor because their “Diaohun” was cured by “Jiaohun”. So we collect the information through the clinic and life events compared with similar phenomenon the female is higher than the male in the incidence of adults. Its etiology is unknown etc. then they become better. This kind of therapy is an ancient superstitious rituals Yes T China b

Introduction: There is a phenomenon in China: Some people could show some symptoms, such as drowsiness, for unknown reasons. The doctor also have no ideas, so many people think that is the result of the ghosts and gods, and use superstition rituals “Jiaohun” to treat.

Materials and methods: “Hun” is a relatively broad concept in Chinese culture, Proverb called “Sanhunliupo” the three finer spirits and six baser instincts that motivate a human being three souls and six senses), if lost a part of the soul or spirit, the body will appear

drowsiness, lethargy, fever and other symptoms. In some parts of China there is a well known phenomenon: “Diaohun” (To some extent, it can be understood as “lost soul”), these people may appear drowsiness, listless without any reasons, these symptoms do not become better after medical treatment, while after the ancient ceremony of “Jiaohun” (“called the soul back”) they could even be healed immediately. We met such patients in clinic, but most people do not see a doctor because their “Diaohun” was cured by “Jiaohun”. So we collect the information through the clinic and life events, ask relevant people to confirm information authenticity, describe the phenomenon of symptom, the process of pathogenesis, treatment and recovery. Describing the phenomenon, compared with similar phenomenon, and explains the phenomenon of treatment, then put forward our questions in order to discussion and the next step research.

Results: This kind of phenomenon is common in rural areas, known as the “Diaohun”. This phenomenon mainly found in the minors. Adults also could appear, but relatively few, the female is higher than the male in the incidence of adults. Its etiology is unknown, but some patients' common reason is frightened. These people will appear unexplained drowsiness, fever, limb-weakness, fatigue, etc., drowsiness is their main and common symptoms. When patients began to appear afore-mentioned symptoms, some people would be considered to have a cold, some people would be considered lethargy, After treatment symptoms could not be improved and long time couldnot recover. The “Diaohun” symptom range from 1day to 7 days. Some old people used “Jiaohun” rituals treat these patients, then they become better. This kind of therapy is an ancient superstitious rituals, regarded as superstitious behavior medicine at present Chinese medicine, TCM think it is one therapy of “Zhuyou” (witched-doctor treating disease by prayer and incantation). “Diaohun” is similar with Dissociative Trance Disorder (DTD). No exact objective physiological and psychological evidence could explain “Diaohun” and “Jiaohun” superstition rituals at present.

Conclusion: There is no psychological characteristics and physiological evidence to support “Diaohun”, it may be related to culture. Here, rendering such problem we hope it could cause attention of related fields, discuss such issues together for further study of the mechanism of this kind of phenomenon.

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Psychometric properties of the Symptom Checklist-90-R in elderly over 80 years

E. Ferreira-MARTINS¹, C. Fiori¹, C. Montarina², B. Peukert², M. Fagundes¹, M. Pedroso¹, R. Pacheco¹, D. Martinez³

¹ Graduate Program in Cardiology and Cardiovascular Sciences, Universidade Federal do Rio Grande do Sul, Brazil

² Graduate Program in Medical Sciences, Universidade Federal do Rio Grande do Sul, Brazil

³ Cardiology Unit, Hospital de Clínicas de Porto Alegre (HCPA – UFRGS), Brazil

Introduction: Psychiatric symptoms are common among patients suffering from sleep disorders. Questionnaires to identify psychological symptoms were not validated in populations over 80 years. The aim of this study was to analyze the reliability of the SCL-90R (Symptom Checklist-90-R) in elderly over 80 years.

Materials and methods: Patients with suspected sleep disorders who underwent overnight polysomnography in sleep clinic were selected in two age groups: 100 cases of elderly over 80 years and

156 controls with exactly 60 years. All participants answered demographic questionnaires and the SCL-90R questionnaire. To analyze the psychometric properties was conducted reliability test of 90 questions of the SCL-90R measured by Cronbach's alpha.

Results: Among the elderly, the percentage of men was similar between cases and controls (43.4% vs. 43.6%, respectively). The result of the Cronbach's alpha was similar and highly reliable among those with over 80 years and 60 years (0.974 vs. 0.968, respectively). When analyzed regarding sex the Cronbach's alpha continued with high reliability (0.951 vs. 0.972, respectively). The Cronbach's alpha does not change after removal of questions with lower correlation.

Conclusion: The Cronbach's alpha test of SCL-90R in people over 80 years achieved excellent coefficient demonstrating high reliability and understanding of the questionnaire. These results suggest that the SCL-90R questionnaire is a robust and reliable tool for screening of psychiatric symptoms in elderly over 80 years regardless of gender.

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A comparison of treatment outcome of cognitive behavioral therapy for insomnia (CBT-I) and behavioral activation therapy for depression (BAT-D) in patients with comorbid depression and insomnia

C. Lin¹, H. Lane¹, C. Huang¹, C. Yang²

¹ Department of Psychiatry, China Medical University Hospital, Taichung, Taiwan

² Department of Psychology, National Chengchi University, Taipei, Taiwan

Introduction: Insomnia and depression have a reciprocal relationship, in which each exacerbates the other. The present study aimed to explore whether the effects of interventions targeting insomnia only (i.e. CBT-I) or depression only (i.e. BAT-D) can lead to beneficial effect on the other symptoms in the insomniac depression.

Materials and methods: Forty-three patients with comorbid insomnia and depression were randomly assigned to either of two treatment groups: the CBT-I (n = 23) group and the BAT-D (n = 20) group. The interventions were conducted following the treatment manuals of CBT-I and BAT-D. The severity of depression and insomnia was assessed with Beck Depression Inventory (BDI) and Insomnia Severity Index (ISI) respectively, at baseline and after 6 weeks of treatment (post-treatment). Additionally, the participants recorded sleep log during therapy. Sleep efficiency (SE) was derived from the sleep log data. Outcome measures included the total scores of BDI and ISI, and SE. Two-way analysis of variances (ANOVAs) were conducted to compare these variables at different time points (baseline vs post-treatment) and between groups (CBT-I vs BAT-D).

Results: The scores on BDI and ISI, as well as SE, were not significantly different between the two groups at baseline. The depression and insomnia symptoms of both groups were reduced after treatments (F = 57.70 and 27.14, respectively, ps < 0.01). However, the reduction of BDI score in BAT-D group was significantly higher than that in CBT-I group (t = 2.27, p < 0.05), whereas the reduction of ISI score in CBT-I group was significantly higher than that in BAT-D group (t = 2.91, p < 0.01). SE also showed significant improvements after treatment (F = 43.47, p < 0.01) for both groups; however, the improvement was higher after CBT-I than BAT-D (F = 43.47, p < 0.01).

Conclusion: Either CBT-I or BAT-D alone was effective in ameliorating insomnia and depression in depressed insomnia patients. However, CBT-I was more effective in improving sleep, whereas BAT-D was more effective in meliorating depressive symptoms.

Moreover, intervention of only insomnia (CBT-I) or depression (BAT-D) demonstrated a transfer of gains to each other.

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Sleep disturbance among people with major depressive disorders (MDD) in Singapore

L. Seow, M. Subramanian, E. Abdin, J. Vaingankar, S. Chong
Institute of Mental Health, Singapore

Introduction: Major depressive disorder (MDD) has been identified as the most pervasive mental disorder in Singapore. With sleep problems found to be a common clinical feature of depression, this study aimed to establish the prevalence of sleep disturbance among Singaporeans with MDD, as well as its socio-demographic and clinical correlates.

Materials and methods: Data were collected from the Singapore Mental Health Study, a cross-sectional epidemiological survey of the residential population aged 18 years and above. Door-to-door visits were conducted by trained field interviewers. The respondents were randomly selected from a national registry and a disproportionate stratified sampling (by age and ethnicity) was adopted for the study to ensure an adequate sample in the minority group. The diagnoses of mental disorders including MDD were established using the World Mental Health Composite International Diagnostic Interview (WMH-CIDI) Version 3.0. Sleep disturbance was defined as: 'having a lot more trouble than usual either falling asleep, staying asleep, or waking too early nearly every night' during that period of being (sad/empty/depressed) lasting several days/2 weeks or longer. Socio-demographic information including age, gender, ethnicity, marital status, education, employment status and income were collected using a structured questionnaire. Nicotine dependence was established using the six-item Modified Fagerstrom Test. Information on suicidal behaviours and a checklist of chronic physical conditions including diabetes, hypertension, chronic pain, cancer, ulcers, as well as neurological, cardiovascular and respiratory disorders were also collected. Lastly, treatment contact of those with MDD and sleep disturbance was assessed.

Results: Of the 6616 respondents interviewed, 417 were identified with lifetime MDD and included in the analysis. The prevalence of sleep disturbance among those with lifetime MDD was 90.9%. Multiple logistic regression analyses revealed ethnicity (p < .001) and education (p < 0.05) to be significantly associated with sleep disturbance. Malays were less likely to have sleep problem(s) than the Chinese. Those with secondary education and below were more likely to have sleep problem(s) compared with those with university education. Those with MDD and sleep disturbance were found to have higher odds of comorbid obsessive compulsive disorder (6.1), diabetes (10.1) and hypertension (6.0) than those with MDD only. No significant association was observed with any form of suicidal behavior. Only 28.6% among those with lifetime MDD and sleep disturbance sought help from a medical doctor or other professionals such as psychologists, counselors, spiritual advisors, herbalists, acupuncturists and other healing professionals. Among those who sought help and had sleep disturbance, 74.8% considered the treatment as helpful or effective and 20.8% reported that they were hospitalized overnight for being severely depressed.

Conclusion: Sleep disturbance affects the majority of individuals with MDD in Singapore. Those with MDD and sleep disturbance differ from those with MDD only in terms of socio-demographic and clinical profile. Detection for insomnia symptoms has to be optimized and effective MDD interventions based on these symptoms have to be explored.

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Sleep disturbance in patients with different subtypes of eating disorders

T. Tanahashi, K. Wakabayashi, M. Sonoda, M. Suda, A. Hoshi, N. Tamura, T. Ishikawa

Department of Psychosomatic Medicine, National Center for Global Health and Medicine Kohnodai Hospital, Japan

Introduction: Sleep disturbance in patients with eating disorders is common, but research in this field has been insufficient. Using the sleep disturbance scale of the General Health Questionnaire (GHQ) – 30 Japanese version, we compared the degree of sleep disturbance among patients with different subtypes of eating disorders, somatic disease, and mental disorder.

Materials and methods: Participants were new outpatients who visited our department between 1 April 2010 and 28 February 2014, and who responded to the GHQ-30 properly (with incorrect answers to less than 5 items out of the 30). We classified patients with an eating disorder based on the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision (DSM-IV-TR) as anorexia nervosa (AN) restricting type (ANr), AN binge-eating/purging type (ANbp), bulimia nervosa (BN) non-purging type (BNnp), BN purging type (BNp), and eating disorder not otherwise specified (EDNOS). Patients with physical disease, without an eating disorder or any other mental disorder, were classified as somatic disease group (SD). Patients with a mental disorder, including complications of a physical disease, were classified as mental disease group (MD). We compared the adjusted mean sleep disturbance scale of the GHQ-30 (range: 0–5, with higher scores representing worse sleep disturbances) among groups through analysis of covariance (ANCOVA) with gender, age, and BMI, using Bonferroni post-hoc analysis. All patients in this study provided informed consent.

Results: Participants consisted of 1374 outpatients; 1019 women (74%), mean age 39 ± 19 years, mean BMI 20.4 ± 4.7 kg/m². Classification: ANr, 72 patients; ANbp, 87 patients; BNnp, 15 patients; BNp, 108 patients; EDNOS, 70 patients; SD, 281 patients; and MD, 741 patients. Adjusted mean sleep disturbance scale of GHQ-30: ANr, 2.6 ± 0.2 score; ANbp, 3.5 ± 0.2 score; BNnp, 3.6 ± 0.5 score; BNp, 3.3 ± 0.2 score; EDNOS, 2.8 ± 0.2 score; SD, 2.6 ± 0.1 score; and MD, 3.2 ± 0.1 score. Only ANr vs ANbp demonstrated a significant difference among subtypes of eating disorders. SD vs ANbp, SD vs BNp, and SD vs MD all showed a significant difference ($p < 0.05$).

Conclusion: Patients with ANbp were found to experience greater sleep disturbances than patients with ANr. Additionally, patients with eating disorder subtypes, which included purging types (ANbp and BNp), experienced greater sleep disturbances than SD patients.

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Sleep disturbances and associated factors in Chinese kindergarten children: A mixed-methods study

G. Wang¹, Y. Sun¹, G. Xu¹, E. Skora², D. Lewin², J. Owens²

¹ School of Psychology and Cognitive Science, East China Normal University, Shanghai 200062, China

² Children's National Medical Center, 111 Michigan Avenue NW, Washington, DC, USA

Introduction: This study aimed to examine characteristics and associated factors of sleep disturbances in Chinese kindergarten children using mixed-methods (parent-reported questionnaire and semi-structured interview).

Materials and methods: Parents of 1632 kindergarten children (52.4% male) aged 3–6 (4.28 ± 0.92) years from 10 cities across China completed the Children's Sleep Habits Questionnaire (CSHQ) and the Strengths and Difficulties Questionnaire (SDQ). A semi-structured interview was conducted with 18 parents who had concerns with sleep of their kindergarten children in Shanghai.

Results: Quantitative data showed that the prevalence of global sleep disturbances (defined as CSHQ total score >41) was 88.6%, with sleep resistance (59.9%), sleep anxiety (49.4%) and daytime sleepiness (21.4%) occurring most frequently. Sociodemographic factors significantly associated with increased global sleep disturbances included high maternal education (OR = 0.70), less strict parenting (OR = 0.51), inconsistent interparental attitudes (OR = 1.90), cosleeping (OR = 0.52), and electronics use before bedtime (OR = 1.31). Controlling for these covariates, emotional symptoms ($\beta = 0.16$), conduct problems ($\beta = 0.09$), hyperactivity ($\beta = 0.08$) and less prosocial behavior ($\beta = -0.064$) were significant predictors of increased global sleep disturbance. Qualitative data showed four themes describing the sleep disturbances: bedtime problems, problems during sleep, excessive daytime sleepiness, and irregular sleep/wake patterns. Potential factors associated with increased sleep disturbances included four main themes: poor sleep hygiene, physical problems, psychological issues, and parent/family factors.

Conclusion: Sleep disturbances are very common in Chinese kindergarten children, and contributors to this issue include multiple biopsychosocial factors. Our findings highlight the importance of preventing, identifying and treating sleep disturbances in this population, which can be implemented through parent-centered approaches such as parent education about sleep health.

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Heart Rate Variability (HRV) and Basic Rest Activity Cycle (BRAC) – New variables for the autonomic function in sleep–wake cycle?

J. Zeitlhofer, P. Hauschild

Sigmund Freud University, Austria

Introduction: The autonomic nervous system (ANS) plays an important role in normal sleep and sleep disturbances. Variables of Heart Rate Variability (HRV) and Basic Rest Activity Cycle (BRAC) are an efficient instrument to measure function of autonomic nervous system, especially sympathal–parasympathetical balance.

Materials and methods: In 16 normals (6 males, 10 females; age 45.73 ± 10.59), 12 depressives (7 males, 5 females; age 48.17 ± 7.27), 23 burnouts (18 males, 5 females; age 46.04 ± 8.53), and 21 patients with insomnia (17 males, 4 females; age 46.87 ± 7.56) 24 hour-recordings were performed. Analyses of Sleep Score (duration of a particular sleep-stage in minutes multiplied by the sleep-stage-score, representing recovery), Activation Score (Evaluation of activity during the day, i.e. duration of a particular

activation phase, determined from the weighted mean values of the HRV frequency multiplied by a wakefulness-score, representing individual subjective stress) and chrono-dynamic BRAC rhythmicity (of a 2 hour cycle of rest and activation) were performed.

HRV – variables (in frequency domain) are power intensity (total power).

High Frequency (HF) for vagal activity, Low Frequency (LF) for sympathetic activity, LF/HF ratio for vegetative quotient, weighted mean frequencies for vegetative balance (VB) and BRAC for the 24 h Basic Rest Activity Cycle.

Results: In normals the mean of Sleep Score was 1161.50, of Activation Score 2064.13 and chrono-dynamic BRAC rhythmicity (max 5.51; min –0.12). The vegetative balance (VB) of day-cycle in normals leads to a score between activation and recovery of 1.01, adjusted to duration of recording. Recovery is able to compensate complete activation (101%).

In depressive patients a Sleep Score of 734.44, an Activation Score of 1772.91 and chrono-dynamic BRAC rhythmicity between 5.19 and 5.13 were seen. Patients' power intensity (respectively high frequencies HF) and recovery were reduced, and vegetative balance (VB) leads to a score of 0.85. Recovery is able to compensate activation to 85%.

Burnout patients (fatigue syndrome) had a Sleep Score of 865.73, Activation Score of 1950.91 and chrono-dynamic BRAC rhythmicity between 8.01 and 0.21.

The vegetative balance (VB) leads to a score of 0.82. Recovery is able to compensate activation to 82%.

In sleep disturbed patients the Sleep Score was 603.14, Activation Score 1594.90 and chrono-dynamic BRAC rhythmicity between 2.37 and 3.97. The vegetative balance (VB) leads to a score of 0.74. Recovery is able to compensate activation to 74%.

Conclusion: Different variables of heart rate variability and chrono-dynamic BRAC rhythmicity support diagnostic process of sleep and activation and sleep–wake-cycle associated psychic disorders; moreover they are helpful for prevention and therapy of sleep disorders. The balance of activation and recuperation gives information of a healthy BRAC or the risk of disorders.

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Polysomnographic and corticomuscular coherence analyses characterizing patients with REM sleep behavior disorder with or without synucleinopathy

G. Choi¹, J. Kim², Y. Choi¹, J. Yun¹, J. Park¹, J. Kim¹, C. Im², H. Lee¹

¹ Departments of Neurology and Medical Science, Ewha Womans University School of Medicine, Seoul, Korea

² Department of Biomedical Engineering, Hanyang University School of Engineering, Seoul, Korea

Introduction: REM sleep behavior disorder (RBD) is characterized by the loss of normal muscle atonia and increased locomotor drive during REM sleep, which can be associated with risk of the development of synucleinopathy. This study aims to evaluate clinical and polysomnographic characteristics of patients with idiopathic RBD and RBD with synucleinopathy.

Materials and methods: We enrolled 52 subjects so far, including 30 patients with idiopathic RBD, 11 patients with combined RBD and synucleinopathy, and 11 healthy subjects. Neurological examinations including olfactory, autonomic, motor, and cognitive function tests were performed in all subjects. Unified Parkinson's disease Rating Scale (UDPRS) III, Mini-Mental Status Examination (MMSE) and/or Neuropsychiatric Inventory (NPI) were used for evaluation

of specific motor and cognitive performances. All participants underwent polysomnography (PSG) including 10–20 system electroencephalography (EEG) during one night in sleep laboratory. We performed quantitative analyses of beta frequency range corticomuscular coherence (CMC) between EEG and chin/limb muscle EMG and muscle atonia index during entire sleep periods in all sleep stages including REM sleep. Group differences were compared by repeated measures analysis of variance (ANOVA) using the Statistical Package for the Social Sciences 19.0 (SPSS Inc., Chicago, IL, USA) with the statistical significance defined as $p < 0.05$.

Results: Overall demographic data showed 30 patients with idiopathic RBD (19 men, 11 women, mean age 61 ± 12.1 years), 11 patients with synucleinopathy (7 men, 4 women, mean age 67 ± 7.8 years, mean Hoehn and Yahr stage 2.1), and 11 healthy subjects (6 men, 5 women, mean age 60 ± 5.3 years). Compared with idiopathic RBD group, duration of RBD since symptom onset tended to be longer (6 ± 7.3 vs 4 ± 3.8 years) and MMSE score was slightly lower (26 ± 5.3 vs 29 ± 1.2) in patients with combined RBD and synucleinopathy without statistical significance. PSG study revealed that REM latency tended to be prolonged and PLM index was higher in both idiopathic RBD and combined groups compared with control subjects, and REM sleep tended to be shorter in patients with combined RBD and synucleinopathy compared with other groups. During REM sleep, both patient groups with idiopathic RBD and combined RBD and synucleinopathy had higher CMC value and lower muscle atonia index than controls ($p = 0.03$, $p = 0.01$, respectively). In addition, posthoc analyses showed that CMC value was higher and muscle atonia index was lower during REM sleep in patients with combined RBD and synucleinopathy compared with those with idiopathic RBD group ($p > 0.05$).

Conclusion: These findings indicate that changes demonstrated by CMC and muscles atonia index were more prominent in patients with combined RBD and synucleinopathy compared with idiopathic RBD, suggesting the possibility of more severe alteration of REM sleep in RBD patients with neurodegenerative diseases.

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The comparison of sleep structure, REM period features and tonus in between idiopathic Parkinson's disease and Parkinson's plus syndrome patients with healthy subjects

H. Ekmekci, E. Kaplan, S. Ozturk
Neurology Department, Selçuk University School of Medicine, Konya, Turkey

Introduction: Nowadays, the importance of sleep disorders in Parkinson's disease (PD) is having a rising value in clinical practice, more particularly in Parkinson's plus syndromes (PPS). Beside vast symptomatology of sleep disorders, REM period Behaviour disorder (RBD) is very privileged position in both PD and PPS.

Materials and methods: Thirty idiopathic PD patients and six PPS patients were studied and polysomnography findings were compared in between themselves and with 30 healthy individuals who had no primary sleep problems. Hoehn and Yahr stages of PD and responsivity/sensitivity for L-Dopa were evaluated for all patients. Mild cognitive impairment (MCI) and score of mini mental state examination (MMSE) were measured also.

Results: The average oxygen saturation of PPS patients remained low compared with that of patients with PD in all sleep stages. On the other hand, apnea–hypopnea indexes (AHI) were all

higher in PPS group. These two findings – O₂ saturation and AHI score – were valid even though none of the patients suffered from any OSAS or any other respiratory diseases. Another conspicuous finding was that periodic limb movement disorder (PLMD) was higher in PPS group. Sleep efficiency (SE) and sleep maintenance (SM) of PPS group was significantly lower in comparison with two other groups. A surprising finding was the higher score of snore index in PD than PPS and normal group.

Conclusion: Severity of underlying causes for PPS is a rate limiting step for a strong correlation with presence of sleep disorders. Polysomnographic records and good interpretation seem to be gold standard for understanding the differentiation and early and rich abnormalities in PSG is precious in PPS and PD patients.

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REM sleep behavior disorder is a predictor of dementia in Parkinson's disease

E. Lyashenko¹, M. Poluektov², O. Levin¹

¹ Russian Medical Academy of Postgraduate Studies, Russia

² I.M. Sechenov First Moscow State Medical University, Russia

Introduction: REM sleep behaviour disorder (RBD) has received considerable recent attention because it is strongly associated with neurodegenerative diseases such as Parkinson's disease (PD). This study aimed to estimate cognitive functions of PD patients without RBD versus those with RBD in connection with time of an RBD occurrence.

Materials and methods: Forty-five patients with PD were evaluated with detailed clinical history and examination. PD patients underwent polysomnography (PSG) to confirm the presence of RBD according to AASM 2007 criteria. Clinical exam included RBD screening questionnaire (RBDSQ), UPDRS, H&Y, Schwab and England (S&E) scale, Parkinson's disease Sleep Scale (PDSS), Epworth Sleep Scale (ESS) and Montreal Cognitive Assessment (MoCA). Patients were divided into two groups according to the presence of RBD (30 patients in RBD group and 15 patients in control group). RBD patients were divided into two groups – pre-PD and post-PD. Groups were compared with the use of Mann–Whitney U test.

Results: Patients with RBD were worse in MoCA test ($p < 0.05$). The most prominent differences were observed in visual–spatial functions. Patients with RBD had significantly higher score in ESS ($p < 0.05$). Post-PD RBD patients had significantly lower score in MoCA test than pre-PD RBD patients ($p < 0.05$).

Conclusion: Occurrence of RBD in PD patients could be the marker of higher risk of dementia. First of all it concerns patients with start of RBD after manifestation of PD. We suppose that RBD could be a predictor of definite type of PD with more complex neurodegenerative process.

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Case series of sleep disorders with Parkinson disease

M. Ruthranesan, A. Am

Institute of Respiratory Medicine, Malaysia

Introduction: Altered sleep are among the most frequent non-motor symptoms in parkinsonism. As many as 15–59% patients with Parkinson's disease suffer from rapid eye movement sleep behaviour and 30% from excessive daytime sleepiness.

Materials and methods: Two cases of rapid eye movement sleep behaviour and one case of hypersomnolence secondary to Parkinson's disease were diagnosed from July 2013 until March 2014 and reviewed retrospectively.

Results: All three patients were males. The mean age for the patients with REM behaviour disorder was 55 years (53–57 years old). Both patients had EEG features of REM sleep without atonia. He responded well to clonazepam. The patient with central hypersomnolence secondary with Parkinson's disease remained symptomatic of excessive sleepiness despite optimal CPAP treatment for his obstructive sleep apnea and on PSG showed prolonged TST. He improved after being treated for his newly recognized long standing Parkinson's disease and treatment with a stimulant.

Conclusion: It is paramount that the clinician obtain a detail history about sleep problems in patients with Parkinson's disease. This will enable the clinician to distinguish the different sleep related problems in individuals with alpha synucleopathies such as Parkinson's disease.

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REM sleep without atonia predicts cognitive impairment in REM sleep behavior disorder

D. Sandness, E. St. Louis, B. Boeve, M. Silber

Mayo Clinic, United States

Introduction: REM sleep behavior disorder (RBD) is strongly associated with synucleinopathy and is caused by REM sleep without atonia (RSWA), the loss of normal muscle atonia during REM sleep. We aimed to determine whether RSWA severity was associated with cognitive functioning in RBD.

Materials and methods: Both idiopathic (iRBD) and symptomatic RBD (sRBD) patients completed two cognitive batteries: CNS Vitals Signs (CNS-VS) and Useful Field of View (UFOV). All subjects underwent PSG and their muscle (SM: submental; AT: anterior tibialis) tone during REM sleep was visually and automatically scored. Group differences between sRBD and iRBD were then compared, and regression models fit to determine the relationship of RSWA and dependent cognitive measures.

Results: Twenty iRBD and 10 sRBD participated. Demographics were similar between groups.

Deficits on cognitive testing were observed on CNS-VS in processing speed ($p = 0.014$) and psychomotor speed (sRBD < iRBD, $p = 0.019$) and on Total UFOV and subtests 2 and 3 (sRBD > iRBD, all $p < 0.002$). sRBD patients had greater combined phasic and tonic RSWA in SM ($p = 0.026$) and longer mean phasic burst duration ($p = 0.03$). Regression analyses demonstrated that SM RSWA independently predicted overall CNS-VS Neurocognitive Index (NCI) ($F = 4.5$, $p = 0.006$), adjusting for age, gender, depressive symptoms (Zung score), and sleep disturbances (PSQI), and this relationship also remained significant in the iRBD group after excluding sRBD patients ($F = 3.5$, $p = 0.03$).

Conclusion: SWA is predictive of lower overall cognitive performance in patients with RBD.

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Recovery of theta-band neural synchronies during a working memory task after dopaminergic medication in patients with restless legs syndrome

K. Cha¹, J. Choi¹, S. Kim², B. Lee², K. Jeong², K. Kim¹

¹ Department of Biomedical Engineering, Yonsei University, Wonju, South Korea

² Department Of Neurology, Seoul National University College of Medicine, Seoul, South Korea

Introduction: Dopaminergic dysfunction is believed to play a central role in cognitive deficits in restless legs syndrome (RLS), but its neural mechanism remained unknown. In this study, to identify the effects of dopaminergic medication on cognitive function in RLS, we investigated the neural synchronies during a working memory task.

Materials and methods: Thirteen normal controls and 13 drug naïve RLS patients were participated in the study. Dopamine agonist, pramipexole, was administered in RLS patients over a period of 12 weeks every night 1 h before bedtime. Two event-related potential (ERP) studies were carried out in RLS patients; the first was performed just before giving the first dose of pramipexole (baseline condition) and the second was conducted at 12–16 weeks after commencement of pramipexole administration (follow-up condition).

Subjects performed a Sternberg working memory task. At encoding phase, a series of digit number was presented after visual orienting cue sign. After 2-s maintenance interval, a probe item was shown at retrieval phase. Subjects were required to press a button if the probe corresponded to one of the number shown in the encoding phase.

During the task, 19 channel electroencephalograms (EEGs) were recorded. We analyzed the event-related theta-band activity (TBA) and interregional phase synchrony in theta-band (TBPS) during retrieval phase.

Results: At 500–700 ms after the prove onset, the remarkably stronger theta power was observed for normal control and both conditions in RLS patients, mainly at frontal area. At this period, RLS patients in baseline condition showed the significantly weaker TBA compared with normal control, especially, at frontal area. However, this alteration for RLS patients was significantly recovered to the normal level after the medication.

Considerable increment of TBPS was observed mainly between anterior and posterior regions at 400–900 ms period for all subjects. At this period, the anterior–posterior TBPS for RLS patients in baseline condition was remarkably weaker compared with normal control, but recovered after the medication.

Conclusion: In sum, we observed the significant alterations of neural synchronies in theta-band for RLS patients. Also, these abnormalities were restored after dopaminergic medication. Our findings imply that dopamine plays a major role in the cause and recovery of cognitive deficit in RLS patients.

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Prevalence and determinants of periodic limb movements during sleep in the general population: The HypnoLaus study

J. Haba-Rubio^a, H. Marti-Soler^b, N. Tobback^a, D. Andries^a, M. Tafti^a, R. Heinzer^a

^a Center for Investigation and Research in Sleep (CIRS), Lausanne University Hospital (CHUV), Switzerland

^b Institute of Social and Preventive Medicine (IUMSP), Lausanne University Hospital (CHUV), Switzerland

Introduction: The aim of this study was to describe the prevalence and determinants of periodic limb movements during sleep (PLMS) in the adult general population.

Materials and methods: Data from 2162 subjects (51.2% women, mean \pm SD age: 58 \pm 11 years, range: 40.5–84.4 years) participating in a population-based cohort study (HypnoLaus, Lausanne, Switzerland) was collected. They completed a series of sleep related questionnaires and underwent a complete polysomnographic recording at home. PLMS index (PLMSI) was determined according to AASM 2007 criteria. A PLMSI > 15/h was considered to be of clinical significance.

Results: For the whole population the PLMSI was (median [P05–P95]) 14 [1–75]/hour of sleep and 618 subjects (28.6%) had a PLMSI > 15/h (34 [17–97]). Compared with subjects with a PLMSI \leq 15/h, subjects with a PLMSI > 15/h were older (63.7 \pm 10.7 vs. 56.4 \pm 10.5 years, $p < 0.001$), the percentage of men was higher (53.4% vs. 47%, $p = 0.007$), and they had higher body mass index (26.1 \pm 4.3 vs. 25.5 \pm 4.2, $p < 0.001$). A higher percentage of them had a restless legs syndrome (RLS) (25.3% vs. 15%, $p < 0.001$), diabetes (14.2% vs. 8.2%, $p < 0.001$), hypertension (54.5% vs. 36.3%, $p < 0.001$) and more of them were taking neuroleptics (2.8% vs. 1.6%, $p = 0.069$), hypnotics (10.8% vs. 8%, $p = 0.037$) and antidepressants (11.5% vs. 8.9, $p = 0.070$). In a multivariate analysis, age, gender (male) and having RLS were independently associated with a PLMSI > 15/h.

Conclusion: PLMS are highly prevalent in the general population. Age, male gender and RLS are independently associated with a PLMSI higher than 15/h. Further studies are needed to evaluate the clinical impact of PLMS.

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Recovery of abnormal slow-wave activity during nrem sleep after dopaminergic treatment in patients with restless legs syndrome

M. Jeong¹, J. Choi¹, S. Kim², B. Lee², K. Jung², K. Kim¹

¹ Department of Biomedical Engineering, College of Health Science, Yonsei University, Wonju, South Korea

² Department of Neurology, Korea University Medical Center Anam Hospital, Korea University College of Medicine, Seoul, South Korea

Introduction: We hypothesized that the altered cortical excitability in RLS would lead to changes of sleep slow-wave activity (SWA). Based on sub-band power and functional connectivity of EEG, we investigated the abnormality of SWA during NREM sleep in RLS, and whether the abnormal changes can be restored by the dopamine treatment.

Materials and methods: Nineteen-channel EEGs were recorded from 12 drug-naïve RLS patients (age: 48.83 \pm 12.10; baseline condition) and 16 healthy controls (age: 48.38 \pm 9.04) during one overnight sleep. A dopamine agonist, pramipexole was administered to the patients for 12 weeks. After the medication, 19-channel EEGs were also recorded from 12 follow-up patients (follow-up condition).

Power spectral density (PSD) in delta-band (0.5–4 Hz) during NREM sleep was calculated using Welch's method. Statistical comparison of delta-band power was performed using repeated measures analysis of variance (ANOVA). Correlation between averaged delta-band power over all NREM sleep stages and clinical measures was investigated by Spearman's rank correlation

coefficient. Phase-locking value (PLV) in delta-band was computed as an index of inter-regional phase synchronization (PS) (Lachaux et al., 1999) and significant connections were determined by an arbitrary threshold. The spatial characteristics of PS during N3 stage were quantified by three graph theoretical measures, including clustering coefficient (C), characteristic path length (L), and small-worldness index (SWI). Graph theoretical measures were statistically compared using independent or paired t-test, after adjusting the number of connections to be identical for each three groups.

Results: Delta-band power was significantly higher in RLS patients compared with that of normal controls in baseline condition, but it was recovered to the normal level after the medication. Averaged delta-band power over all NREM sleep stages was significantly correlated with international RLS severity scale (IRLS) in both RLS baseline and follow-up conditions.

Delta-band PS during whole NREM sleep was higher for the patients in baseline condition compared with that in normal controls, but decreased remarkably after the medication. The SWI was significantly reduced in RLS patients in baseline condition during N3 stage, compared with that for normal controls, but it was recovered to the normal level after the medication. Recover of SWI was mainly due to the increased C in RLS follow-up condition.

Conclusion: We observed significantly increased delta power and reduced small-worldness during NREM sleep in RLS. These abnormalities were remarkably restored after dopaminergic medication. In light of these findings, our study suggests that the dopamine plays a crucial role in the cause and recovery of abnormal SWA during sleep in RLS.

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Fragmentary myoclonus during full-night polysomnography in a neurological sleep lab – A cohort study

K. Spiegl, S. Eibensteiner, M. Boeck, G. Kloesch, S. Seidel
Medical University of Vienna, Austria

Introduction: To investigate the frequency of fragmentary myoclonus (FM) in a population admitted to a neurological sleep lab and to analyze potential associations with polysomnographic correlates.

Materials and methods: Retrospective review of 204 polysomnographic recordings. FM was diagnosed according to the published criteria (FM >50 μ V), but also with an amplitude cut-off of 25 μ V according to Hogue et al. (FM >25 μ V).

Results: Two hundred four patients (78 female) with a mean age of 55.8 \pm 16.3 years (range 18–89 years) and a mean body mass index (BMI) of 28.3 \pm 6.2 (range 17–48) were analysed. The mean FM index (i.e. FM per hour of sleep) was 16.1 \pm 37.3 (FM >50 μ V) and 50.3 \pm 74.4 (FM >25 μ V). The FM 50 μ V index correlates positively with age ($p = 0.045$), total wake time ($p = 0.001$), sleep latency ($p = 0.001$), arousal index ($p = 0.004$), FM 50 μ V index while awake ($p < 0.001$) and negatively with total sleep time ($p = 0.025$), whereas the FM 25 μ V index correlates positively with age ($p = 0.001$), total wake time ($p = 0.001$), sleep latency ($p = 0.001$) and also negatively with total sleep time ($p = 0.032$). Three patients (1.4%) fulfilled the criteria for excessive fragmentary myoclonus (i.e. > 5 FM potentials per minute).

Conclusion: In our patients, we found positive correlations between FM and age as well as criteria of insomnia (e.g. sleep latency, total sleep time). Intriguingly, FM did not correlate with periodic limb movements during sleep. Further studies have to elucidate the causal relationship between FM and complaints of insomnia.

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Restless legs syndrome/Willis–Ekbom disease among Japanese children

Y. Oka^a, H. Shimizu^a, Y. Kawasaki^a, Y. Fujino^a, S. Tanno^a,
A. Uetani^b, K. Nishimura^b, Y. Tokui^c, F. Horiuchi^d

^a Center for Sleep Medicine, Ehime University, Japan

^b Center for Sleep Medicine and Department of Cardiology, Ehime University, Japan

^c Hioshima Sleep Center, Japan

^d Department of Neuropsychiatry, Ehime University Graduate School of Medicine, Japan

Introduction: RLS/WED in children differs from that of adults in many aspects including frequent occurrence of daytime symptom, more prevalent family history, and different treatment options. The aim of the study was to identify the clinical characteristics of childhood RLS among Japanese children.

Materials and methods: Children with RLS/WED who consulted two sleep centers in Japan were included in our analysis. Clinical symptoms, family history, serum ferritin levels and treatment options were investigated.

Results: All children (3 boys, 5 girls, 4–14 years old) have moderate to severe RLS and half of them suffered from daytime symptom. Serum ferritin level was below 50 ng/ml in all patients. Patients were treated initially with iron, and most children were also treated with pramipexole, rotigotine transdermal and/or gabapentin/encarbil. Daytime dosage of dopamine agonists improved RLS symptoms throughout the day. Some patients were discontinued of medication after the improvement of symptoms.

Conclusion: Clinical characteristics of RLS/WED among Japanese children were mostly compatible with previous reports. Daytime dosage of dopamine agonists were effective for the control of daytime symptoms, and in some of them, medication was successfully discontinued after the improvement of RLS symptoms.

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Periodic leg movements associated with peripheral vasoconstriction during sleep

A. Salminen¹, J. Nupponen², V. Rimpilä¹, O. Polo³

¹ School of Medicine, University of Tampere, Finland

² The Department of Pervasive Computing, Tampere University of Technology, Finland

³ Unesta Research Centre, Finland

Introduction: Periodic leg movements (PLM) during sleep are temporally associated with elevations in heart rate and blood pressure, indicating sympathetic activation. In this study, we evaluate if the sympathetic activation can also be seen in peripheral skin blood flow, through measurement of toe pulse-wave amplitude (PWA).

Materials and methods: Ten patients with restless legs syndrome were recruited to the study. They went through a polysomnography with toe photoplethysmogram recording after

discontinuation of pramipexole medication. The sleep study was repeated after the re-continuation of pramipexole. Leg movements were marked manually and PWA dips were detected using a custom script. Temporal relationship between leg movements and transient PWA phenomena was assessed both during wakefulness and sleep. Events with marked disturbance in the plethysmogram signal were excluded from the analysis.

Results: A total of 2606 leg movements were included in the analysis. We found that half of the patients had transient dips in PWA following the start of the leg movements. In these patients, the PWA dipped by an average of 24% (range 12–30%) during sleep and 12% (range 6–20%) during wakefulness. PWA phenomena did not herald the leg movements but started 2–10 seconds after the movement. Most commonly, the dip lasted for 10–20 seconds. The other half of the patients did not show similar dips. When present, both leg movements and PWA dips were suppressed by pramipexole.

Conclusion: The results suggest that PLM are associated with transient peripheral vasoconstriction in some patients with RLS. The vasoconstriction is in tight temporal relationship with the leg movement. Pramipexole suppresses both PLM and the associated transient vasoconstriction.

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Association of co-incident hypertension with periodic limb movements during sleep in hospital based cross-sectional study

K. Yang¹, Y. Cho², Y. Hwangbo³, D. Kim⁴, M. Song⁵

¹ Division of Epilepsy and Sleep Disorders, Department of Neurology, Soonchunhyang University College of Medicine, Cheonan, South Korea

² Department of Neurology, Dongsan Medical Center, Keimyung University School of Medicine, Daegu, South Korea

³ Department of Preventive Medicine, Soonchunhyang University College of Medicine, Cheonan, South Korea

⁴ Division of Epilepsy and Sleep Disorders, Department of Neurology, Cheonan Hospital, Soonchunhyang University College of Medicine, Cheonan, South Korea

⁵ Graduate School of Nursing, Dongsan Medical Center, Keimyung University School of Medicine, Daegu, South Korea

Introduction: There is growing evidence of an increased cardiovascular risk including hypertension in patients with PLMS. In a recent multiethnic cohort study, the association between prevalent hypertension and PLMS varied according to the racial difference. We studied whether PLMS is associated with hypertension in Korean adults.

Materials and methods: We investigated 1152 man and woman above 18 years old in two tertiary university hospitals, who had performed in-lab polysomnography (PSG) from 2012 to 2014. The subjects completed a sleep questionnaire prior to PSG study. Individual's sleep states over the previous 1 month were recorded from their answers to a question. The data were derived from well formed sleep questionnaire-PSG registry. The Epworth Sleepiness Scale – Korean version (KESS), Insomnia Severity Index – Korean version (KISI), Pittsburgh Sleepiness Quality Index – Korean version (KPSQI), and Beck Depression Inventory (BDI), the symptoms of restless legs syndrome (RLS), body mass index (BMI), and the presence of cardiovascular disease were consisted. The presence of hypertension was defined as self-reported, ascertained by a “yes” response to the question, “Have you ever been told by a doctor or health professional that you have hypertension?” We analyzed the association between periodic limb movement index (PLMI), periodic limb movement arousal index (PLMAI) and hypertension. PLMI and PLMAI in three categories were PLMI <5, 5 to <30, and ≥30; and PLMAI <1, 1

to <5, and ≥5. Covariates; age, sex, BMI, RLS, apnea–hypopnea index (AHI), arousal index (AI), and average oxygen saturation were adjusted by stepwise multivariate regression model.

Results: The subjects had a mean age of 50.5 ± 14.9 years and 58.3% (n = 671) were men. The PLMI and PLMAI increased with advanced mean age, respectively (p < 0.001). The most of the subjects were in the lowest PLMI and PLMAI categories; 78% with PLMI < 5, 12.6% with 5 to <30, 9.4% with PLMI ≥ 30, 81.1% with PLMAI < 1, 11% with 1 to <5, and 7.9% with PLMAI ≥ 5. Three hundred one (26.1%) subjects had hypertension. Co-incident hypertension was associated with PLMAI (p = 0.036) but not with PLMI (p = 0.15) in chi-square analysis. Finally, it was not associated with PLMI (p = 0.7) and PLMAI (p = 0.4) after adjusting for all covariates.

Conclusion: In a retrospective hospital based study, there was no association between co-incident hypertension and PLMS in Korean adults.

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Correlation between upper airway obstruction sites during sleep video fluoroscopy and natural overnight sleep

J. Ahn, W. Lee, H. Kim, J. Kim

Bundang Hospital, Seoul National University, South Korea

Introduction: Sleep video fluoroscopy (SVF) is useful to assess dynamic pharyngeal obstruction in obstructive sleep apnea syndrome but it is conducted within several minutes of drug-induced sleep. This study aimed to evaluate the correlation between upper airway obstruction sites within short duration of drug-induced sleep and full overnight natural sleep.

Materials and methods: This study included patients who underwent both SVF during midazolam induced short (about 15 minutes) sleep and pharyngeal manometry (PM) during overnight polysomnography (PSG) from 2004 to 2007. PM measures percents of retropalatal and retroglottal obstruction events during respiratory distress events. On the other hand, SVF measures the obstruction level during desaturation events. In SVF, obstruction levels are soft palate, tongue base and both levels.

Results: Among a total of 102 patients, there were 94 male and 15 female patients. The mean age was 44.2 ± 10.4 years old. The mean percent of retroglottal obstruction events in PM was 30.5 ± 30.0%. In SVF, there were 57 patients with soft palatal level obstruction, 7 with tongue base level and 38 with both levels. SVF results had a weak correlation (R² = 0.05, p = 0.035) with PM results while sex, age, body mass index and PSG parameters had no correlation. Among 45 cases of tongue base associated obstruction in SVF, 44 showed retroglottal obstruction events in PM. However, among 57 cases of soft palatal level obstruction, only nine showed absolute retropalatal obstruction events. SVF had a low sensitivity 47.8% and high specificity 90.0%.

Conclusion: Although SVF provides information of the obstruction sites, it weakly represents obstruction events during the overnight sleep. In particular, soft palatal level obstruction in SVF could not exclude retroglottal obstruction events in natural sleep.

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Nasal chondromesenchymal hamartoma causing sleep-disordered breathing in an infant

J. Bae, S. Kim, Y. Park

Department of Otorhinolaryngology, School of Medicine, Ewha Womans University, South Korea

Introduction: Infants are vulnerable to sleep-related airway obstruction due to both anatomical and physiological predispositions. In this report, we present a rare case of huge nasal chondromesenchymal hamartoma causing sleep-disordered breathing that was successfully treated with image-guided endoscopic surgery.

Materials and methods: A 10-month-old boy presented with a 6-month history of nasal congestion and mouth breathing. Before 1 month, he showed loud snoring, episodes of breathing cessation, irritability, and sternal recession during sleep witnessed by parents. Computed tomography scan revealed a large, minimally enhancing homogeneous mass in the right nasal cavity. Surgical excision via endoscopic approach was done. Intraoperatively, the mass was solid and appeared to originate from the roof of the right nasal cavity. But it was easily freed from the septum, the nasal floor, the middle turbinate. Resection of the mass was carried out in a piecemeal manner with microdebrider and cutting forceps. No significant bleeding occurred during the operation, and complete resection of the tumor mass was achieved.

Results: The recovery of the patient was uneventful, and he was discharged a day later. The patient's sleep disturbance was completely resolved.

Histopathologic examination showed multiple, irregular islands of chondroid tissue within spindle cell pattern with occasional binucleated mesenchymal cell proliferation. The spindle cells possessed reactivity for vimentin, S-100 protein, smooth muscle actin, epithelial membrane antigen, and myelin basic protein were negative in immunohistochemical studies. At a 12-month follow-up, there was no evidence of recurrence.

Conclusion: Huge nasal chondromesenchymal hamartoma is an extremely rare condition that can account for sleep-disordered breathing in infants.

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Acoustic analysis of whole night snoring events in habitual snoring children

J. Bae¹, H. Lee², S. Kim¹, Y. Park¹

¹ Department of Otorhinolaryngology, School of Medicine, Ewha Womans University, South Korea

² Department of Neurology, School of Medicine, Ewha Womans University, South Korea

Introduction: Habitual snoring, a symptom that may indicate the presence of the OSA, is also common in children. The exact mechanism and etiology remains still unclear. We aimed to record and analyze whole night snoring events in these patients. The correlation between clinical parameters and snoring pattern also was investigated.

Materials and methods: Twenty-one pediatric patients with a chief complaint of habitual snoring participated in this study. Demographic data, clinical examination including oral and nasal endoscopy, and skull lateral view were obtained. Overnight PSG in the sleep laboratory or portable home PSG data were obtained for diagnosis of potential sleep-disordered breathing. The recording of the snoring sounds were performed by two independent digital recording systems. The intensities of the recorded snoring sounds, the frequency power spectrum was created by fast Fourier transformation. Average intensity and power spectral density parameters were calculated, the sound segments are classified into normal breath, snore, and apnea segments. A correlation analysis was done between full night breathing sound, PSG data, and clinical data.

Results: The mean age of participated was 6.4 (from 3.5 to 8 years old), body mass index was 13.4, Brodsky tonsil size was 3.4, pulse oximetry saturation level was 94%, and AHI was 17.2. The average

intensity of snoring sound and proportion of apnea segments were associated with AHI, tonsil and adenoid size, BMI. In particular, tonsil size was strongly correlated with snoring sound intensity.

Conclusion: In habitual snoring children, including tonsil and adenoid hypertrophy patients, acoustic analysis of snoring sounds seems to be a promising additional diagnostic tool by itself.

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Effects of endocannabinoids system on glucose metabolism of chronic intermittent hypoxia rats

W. Bei

The Second Hospital of Shanxi Medical University, China

Introduction: This experiment by CIH of OSAHS model simulation of pathophysiological changes in rats, which ECS disorder in CIH-induced glucose metabolic disorders play a role in the mechanism are discussed.

Materials and methods: Forty-eight rats were divided into groups by random permutation table method: normal control group (which were filled with compressed 21% air oxygen concentration), intermittent hypoxia group (which were given intermittent hypoxic exposure every day 8 h), intermittent hypoxia + rimonabant intervention group [which were given intraperitoneal injection of rimonabant (1 mg/kg/d) before the exposure]. This experiment ended after 4 and 6 weeks, then the level of fasting plasma glucose, insulin, C-peptide and the expression of ECS receptor CB1 in rats of each group were tested, and then evaluated CIH on the indexes of glucose metabolic abnormalities.

Results: The results showed that the level of fasting plasma glucose, insulin, C-peptide and the expression of ECS receptor CB1 in rats of each intermittent hypoxia groups were significantly increased, as compared with the level of those quotas of the normal controls ($p < 0.05$). These measured indexes increased more ($p < 0.05$) when the time of intermittent hypoxia was extended and after giving rimonabant intervention; the above indexes were reduced significantly ($p < 0.05$). The level of CB1 was significantly positively correlated with the level of fasting plasma glucose, insulin, C-peptide ($r = 0.856, 0.758, 0.827, p < 0.05$).

Conclusion: Endocannabinoids system (ECS) may play a role in the abnormal glucose metabolism caused by CIH.

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Study on assessing subjective sleep quality in patients with obstructive sleep apnea syndrome and its effective factors

Q. Cai¹, J. Xu²

¹ The Tumor Hospital of Xinjiang, China

² Urumqi General Hospital of Lanzhou Command of PLA, China

Introduction: To assess the subjective sleep quality in patients with obstructive sleep apnea syndrome, and investigate the effect of the influencing factors on subjective sleep quality of the patients.

Materials and methods: This study used a descriptive survey; 190 of the patients were inquired questionnaire type survey, which including: general condition of the patient, the Pittsburgh sleep quality index scale (PSQI) assessment of subjective sleep quality and self rating Depression Scale (SDS) assessment of depression symptoms, each patient after all night polysomnography and sleep status data acquisition.

Results: PSQI scores of OSAS patients in 93 cases (48.9%) were over 7 points, PSQI score and 7 factors scores in OSAS patients compared with the normal group had statistical significance; age, gender, smoking, drinking, BMI, AHI, depression influence on subjective sleep quality were patients with OSAS however, education, occupation, arousal index, the average and lowest oxygen saturation of blood oxygen saturation has no obvious correlation with the subjective sleep quality in patients with OSAS. Multi-variable logistic regression analysis showed depression ($B = 1.174, p < 0.01$), smoking ($B = 0.797, p < 0.05$), and age ($B = 0.353, p < 0.05$) as the main influence factors of subjective sleep quality.

Conclusion: Age, smoking, and depression are the important factors that influence the quality of subjective sleep quality in patients with OSAS, the relationship between depression and subjective sleep in patients with OSAS the most closely.

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Evaluation of possible predicting factors of adenotonsillectomy for pediatric OSAS

T. Chang

Taipei Veteran General Hospital, Taiwan

Introduction: Adenotonsillectomy is the treatment of choice for pediatric obstructive sleep apnea syndrome (OSAS). The successful rate of adenotonsillectomy varies according to individuals. This article aims to evaluate possible factors influencing the successful rate of adenotonsillectomy for pediatric obstructive sleep apnea syndrome.

Materials and methods: Retrospectively, 63 pediatric patients ranged from 2 to 16 years old were included. Syndromic and patient who received orthodontic or orthognathic surgery was excluded. All patients received pre-operative and post-operative polysomnography and pre-operative cephalometry. All patient received adenotonsillectomy by a single surgeon.

Results: The surgical success rate (defined as improvement of AHI value $>50\%$ or post-operative AHI < 5) is not statistically significant in relation to pre-operative cephalometry parameters, age, gender, body mass index (BMI) and adenoid size. However, the surgical success rate is significantly related to pre-op AHI and tonsil. In addition, all patients who received adenotonsillectomy showed improved polysomnography parameters which reached significant difference.

Conclusion: Although adenotonsillectomy cannot cure all pediatric OSAS patients, all patients show improvement of polysomnography parameters. Besides, pre-op AHI and tonsil grade may be the possible predicting factors for the success rate of adenotonsillectomy for pediatric OSAS patients.

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Safety and effectiveness of intraoral pressure gradient device for obstructive sleep apnea patients

T. Liu¹, W. Hsieh², B. Chen¹, W. Su³

¹ Otolaryngology Head & Neck Surgery Department, Mackay Memorial Hospital, Hsinchu Branch, Taiwan

² Chest Department, Mackay Memorial Hospital, Hsinchu Branch, Taiwan

³ Radiology Department, Mackay Memorial Hospital, Hsinchu Branch, Taiwan

Introduction: A newly developed intraoral pressure gradient therapy system had been introduced to be an alternative treatment

of obstructive sleep apnea (OSA). This study evaluated the safety and effectiveness of the new device for Obstructive Sleep (OSA) Apnea Patients. (iNAP Sleep Therapy System, Somnics).

Materials and methods: The intraoral pressure gradient therapy system (iNAP Sleep Therapy System) consisted of an oral interface, a tube set and a negative pressure console. Negative pressure is introduced from the oral interface and the pressure pulls the tongue, soft palate and uvula forward in order to keep the oropharynx patent during sleep. All patients underwent a baseline polysomnography (PSG) and single-treatment night PSG in this single-center, non-controlled study. All patients with AHI ≥ 5 were analyzed. Treatment AHI < 20 and with a 50% reduction from baseline was defined as treatment success.

Results: Forty adults (37 male/3 female) completed baseline and iNAP-treatment PSG. Overall age was 41.9 ± 12.49 years [SD], mean BMI 26.5 ± 4.02 kg/m² [SD], AHI 41.77 ± 26.43 [SD]. Two patients were diagnosed as simple snoring and excluded from analysis. Thirty-eight OSA patients had a median of AHI 40.25 (interquartile range 22.4, 61.5) without the device and 21.0 (9.4, 55.57) with the device. The median of AHI change percentage is -23.07% ($-52.86, -0.3$). Overall treatment success rate is 31.57%. However, for those AHI between 5 and 50 (22 patients), median AHI was significantly decreased from baseline: 23.05 (19.12, 26.97) to treatment: 10.15 (7.85, 15.97). The success rate was increased to 54.5%. Only minimal to mild adverse events (tongue discomfort, oral tissue irritation, etc.) were observed during the study.

Conclusion: Under the definition of 50% reduction from baseline AHI and treatment AHI less than 20, this preliminary study suggests that AHI between 5–50 will have a higher success rate with the novel negative pressure device. In all 40 subjects that underwent the intraoral pressure gradient negative device therapy, no major complication was observed.

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Nasal cycle during sleep

S. Chiba¹, T. Yagi¹, N. Onda², R. Sawai², A. Yoshigoe², Y. Ando², S. Watanabe², H. Moriwaki²

¹ Ota Memorial Sleep Center, Japan

² Jikei University School of Medicine, Japan

Introduction: The phenomena of periodic cycles of vascular engorgement on the nasal cavity mucosa that alternate between right and left sides are termed the “nasal cycle.” The physiologic mechanisms underlying this cycle have not been entirely clarified, even more so during sleep.

Materials and methods: Our team utilized a method for functional rhinologic assessment, the portable rhinoflowmeter (Rhinocycle, Rhinometrics, Lyngby, Denmark), measuring airflow independently through each nostril during 24 hours on 20 healthy subjects aged 20–56 years, and without any nasal pathology or diagnosed medical, psychiatric, or sleep disorders. In addition, a nocturnal polysomnogram was simultaneously performed during sleep.

Results: Nineteen of 20 subjects showed a detectable nasal cycle, and 16 of 19 subjects presented a change of the cyclic phase during sleep. The mean nasal cycle duration was 234.26282.4 minutes (median, 164.1 minutes), although variation was considerable. The mean cycle duration time during sleep was significantly longer than that in wakefulness ($p < 0.005$). The reversal of cyclic phase during sleep tended to be associated with REM sleep (68.8%) and postural changes (18.8%). It never occurred in slow-wave sleep.

Conclusion: Nasal cycle duration during sleep is longer than in wakefulness. Changes in laterality of nasal cycle frequently coincide with switches in posture, tend to occur in REM sleep, never occur in slow-wave sleep, and may be absent in subjects with severe nasal septal deviations.

Acknowledgements: Phase of nasal cycle during sleep tends to be associated with sleep stage.

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Association between sleep apnea severity and blood hemorheology

A. Chikadze, L. Khuchua, J. Burduladze, M. Jibladze, M. Mantskava, T. Chikadze, R. Shakarishvili
P. Sarajishvili Institute of Neurology, Georgia

Introduction: Sleep apnea (SA) and obesity are pathological conditions and are associated with hemorheological characteristics which could increase the cardiovascular risk. We investigated the night sleep structure and hemorheological characteristics in patients with obesity and sleep apnea using PSG and blood tests.

Materials and methods: Fifty-five male patients (mean age 48.0 year) with clinical manifestation of Dyssomnia, Obstructive Sleep Apnea/Hypopnea Syndrome (OSAHS), Habitual Snoring and Periodic Limb Movements (PLM) were investigated. All of them underwent a Polysomnography by. Sleep questionnaires were completed and sleep parameters were calculated in all cases. Body mass index (BMI) and the apnea/hypopnea index (AHI) were determined for categorization of obesity and sleep apnea status. Blood was sampled for hematocrit, blood viscosity, RBC deformability, and aggregation.

Results: In patients with hypopnea, accompanied by less snoring (group I), high percentage of sleep III stages and less of REM sleep, were found as, well as a long sleep latency period. In patients with hypopnea, accompanied by less mixed apnea and high snoring percentage (group II), a defragmentation of the sleep II and III stages and high percentage of REM sleep were found, compared with group I. In group III (patients with hypopnea, accompanied by the highest percentage of snoring, central, obstructive and mixed apnea indexes), defragmentation of the sleep II stage and high percentage of REM sleep were revealed, compared with group II. In those patients, sleep III stage was not found but high frequency of PLM was determined. We found that in patients with sleep apnea trustworthy changes of hemorheological data were in evidence in cases of OSAHS, than in other types of SA.

Conclusion: Investigation of night sleep using polysomnography can help researchers to reveal variability of sleep architecture during the different clinical presentation of SA. We conclude that HA represents a testing for prothrombotic states in SA patients.

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The tongue volume influences on the lowest oxygen saturation than apnea–hypopnea index in obstructive sleep apnea

H. Chung, S. Ahn, J. Kim, H. Min, J. Lee, C. Kim, H. Cho
Yonsei University College of Medicine, South Korea

Introduction: The aim of this study was to identify the correlation between the severity of sleep apnea and the volume of the tongue or posterior airway space using computerized tomography (CT) in patients with obstructive sleep apnea (OSA).

Materials and methods: Snoring/OSA male patients (n = 64) who underwent polysomnography, cephalometry, and CT scans were enrolled in this retrospective study. OSA was diagnosed when the apnea–hypopnea index (AHI) was greater than 5 (mild 5–14; moderate 15–29; severe > 30). The patients were also categorized into the normal–mild group (n = 22) and the moderate–severe group (n = 42). Using volumetric CT images with the three-dimensional reconstruction technique, the volume of the tongue, posterior airway space volume, and mandible-related variables were measured. The volumes, polysomnographic parameters, and physical examination findings were compared, and independent factors that are related to OSA were analyzed.

Results: No associations between tongue volume or posterior airway space and the AHI were observed. However, univariate and multivariate analyses showed that tongue volume was significantly associated with lowest O₂ saturation. The high BMI was related to the increase of tongue volume. The modified Mallampati stage meaningfully correlated with tongue size and it would be very useful to predict tongue volume. In the comparison between normal–mild and moderate–severe group that were categorized by AHI, the absolute tongue volume was not different but standardized tongue volume in moderate–severe group was significantly higher.

Conclusion: Absolute tongue volume was more associated with lowest O₂ saturation during sleep than with the severity of the AHI. We also found that high BMI was a relevant factor for an increase in absolute tongue volume and modified Mallampati grading was a useful physical examination to predict tongue size.

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Sleep spindle density before and after CPAP titration in severe obstructive sleep apnea: A pilot study

S. Chokroverty, S. Bhat, D. Donnelly, D. Gupta, M. Rubenstein, V. Debari
JFK New Jersey Neuroscience Institute, United States

Introduction: There is a clear relationship between sleep spindles and cognition which is impaired in patients with obstructive sleep apnea (OSA) but shows improvement after continuous positive airway pressure (CPAP) titration. We therefore hypothesize that the sleep spindle indices will improve after optimal CPAP titration in severe OSA patients.

Materials and methods: We included nine OSA patients with an apnea–hypopnea index (AHI) of 44–108 undergoing split night CPAP titration for this preliminary study. We selected 20 epochs (each of 30-second duration) of polysomnographic (PSG) samples before and after CPAP titration for sleep spindle scoring by visual counting and measuring spindle density (number of spindles/minute) during stage N2 using C3–M2 (fast spindles) electroencephalographic (EEG) derivation. Spindle identification was based on the following properties: frequency of 11–16 Hz, duration of 0.5–3 seconds, narrow conical shape with sinusoidal appearance excluding those waveforms if they are highly variable, too broad, too flat, and part of a K-complex. We used a non-parametric, matched pair method (Wilcoxon's signed rank test) to avoid making an assumption about the distribution of the data.

Results: There were eight men and one woman (mean age 51 with a range of 27–80 years). Five had high blood pressure and three had type 2 diabetes mellitus. Two were on both SSRI and benzodiazepine, and one was taking an SSRI. BMI ranged from 23 to 40 (mean = 32).

Before CPAP, subjects exhibited a median spindle density (SD) of 5.5 with an interquartile range (IQR) of 4.8–6.6 spindle/minute. After

CPAP, median SD increased to 8.2 (IQR = 7.3–9.4) [$p = 0.006$]. The pairing was highly significant, with a Spearman correlation coefficient (r_s) of 0.86 [$p < 0.001$]. A post hoc power analysis suggested that at an α of 0.05, these data yield a β error of <0.01 (power $> 90\%$), assuming a 15% increase in β based on the maximum value of the parametric asymptotic relative efficiency (ARE) for the Wilcoxon signed rank test.

Conclusion: In this pilot study we have shown a significant improvement of spindle density in severe OSA patients at the end of the night after achieving optimal CPAP titration. We are continuing our study and in the next phase of our research we expect to show a significant correlation of improvement.

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How sedentarism affects sleep apnea?

R. Pacheco Da Silva¹, C. Zappe Fiori¹, C. Gosenheimer Righi¹, E. Ferreira Martins¹, C. Caruccio Montanari², M. Madalen Pedroso¹, B. Mattei Peukert², M. Fagundes¹, K. Costa Da Silva¹, D. Martinez^{1,2,3}

¹ Graduate Program in Cardiology and Cardiovascular Sciences, Universidade Federal Do Rio Grande Do Sul (UFRGS), Brazil

² Graduate Program in Medical Sciences, UFRGS, Brazil

³ Cardiology Unit, Hospital De Clínicas De Porto Alegre (HCPA – UFRGS), Brazil

Introduction: Sedentarism and obesity often coexist. Both are linked to greater obstructive sleep apnea (OSA) severity. Yet, the relative participation of sedentarism and obesity in the respiratory disturbance index (RDI) is undetermined.

Materials and methods: We analyzed data from a database of 3122 patients who underwent full night, baseline polysomnography to assess suspected sleep disorder. Using questions from the International Physical Activity Questionnaire the individuals were classified as sedentary and regularly active. The RDI, minimum oxygen saturation, and time with saturation below 90% were used as indicators of OSA severity.

Results: The sample was composed mostly of men (61%), habitually sedentary (56%), aged 44 ± 14 years, body mass index (BMI) 29.9 ± 6.3 kg/m², 37% overweight, and 43% obese. The sedentary individuals had a BMI significantly higher than exercisers (31.2 ± 6.8 vs. 28.3 ± 5.1 kg/m²) as well as greater OSA severity, respectively: RDI (18 [8–37] vs. 14 [7–27]/hour); lowest O₂ saturation (83 ± 9 vs. $86 \pm 7\%$), and time with saturation below 90% (2 [0–17] vs. 0 [0–7]; all $p < 0.001$). In binary logistic regression, controlling for age, sex, and obesity, sedentarism remains a significant predictor of moderate and severe OSA. The odds ratio for severe OSA is similarly increased by sedentarism (1.62; 95% confidence interval 1.34–1.94) and overweight (1.77; 1.28–2.46); obesity increases the odds markedly (5.75; 4.2–7.88).

Conclusion: Sedentarism has a significant effect in worsening moderate and severe OSA. This may be an additional reason to support prescription of physical exercise in the treatment of OSA.

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Detrended fluctuation analysis of photoplethysmogram pulse intervals during sleep disordered breathing

P. Dehkordi¹, A. Garde¹, C. Petersen², D. Wensley³, J. Ansermino², G. Dumont¹

¹ Department of Electrical and Computer Engineering, University of British Columbia, Canada

² Department of Anesthesiology, Pharmacology and Therapeutics, University of British Columbia, Canada

³ Division of Critical Care, BC Children's Hospital, Canada

Introduction: During sleep disordered breathing (SDB), apnea events cause sleep fragmentation and disturbances in normal respiration, which affect heart rate fluctuation. We investigated heart rate fluctuation during SDB through the analysis of photoplethysmogram (PPG) using the Phone Oximeter – a device that integrates a pulse oximeter with a mobile phone.

Materials and methods: Overnight PPG recordings were collected from 160 children suspected of suffering from SDB during overnight stays at the polysomnography clinic of BC Children's hospital. A threshold of on average five apnea/hypopnea events per hour as observed by the attending pediatric respiratory specialist was used to divide the children into two groups with and without SDB.

All PPG signals were divided into 5-minute segments with 1-minute overlap. Each segment was assigned a signal quality index between 0 and 100 based on a cross correlation method and segments with low signal quality index (less than 50) were automatically rejected from further analysis. In order to obtain the PPIs time series, a simple zero-crossing algorithm was used to locate the pulse peaks in the PPG signal, and the intervals between successive peaks were extracted.

We analyzed the PPIs time series using Detrended Fluctuation Analysis (DFA). The short and long-range heart rate correlations were quantified over the time scales of 10–40 beats and 70–200 beats, respectively, expressed by scaling exponents. These two timescales were chosen to capture the effects of respiration (short-range) and episodic apnea (long-range) on the heart rate.

Results: In the group with SDB, both the short and long-range heart rate correlations were higher relative to the group without SDB. Since the short-range correlation is associated with the effects of breathing, we see evidence that the control of heart rate during respiration is much tighter in children with SDB. Furthermore, the higher long-range correlation in children with SDB shows that the modulation of heart rate is not limited to the high frequency respiration band (0.15–0.4 Hz). Instead, it takes the form of a large cyclical variation that correlates with episodic apnea or hypopnea, and elevates the components of the VLF band (<0.04 Hz).

Conclusion: Our findings show that SDB consistently affects the heart rate over a wide range of frequencies. This suggests that PPG signals recorded by a mobile oximeter can be used to assess the autonomic regulation of heart rate in SDB, potentially offering a novel approach to monitor SDB at home.

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CPAP compliance among patients with moderate/severe OSA – Appearances are deceptive!

U.H.S.S. Devaraj, P. Ramachandran, P. Biradar, P. Akkara, G. D'Souza St. John's Medical College and Hospital, India

Introduction: Continuous positive airway pressure (CPAP) is an effective therapy for obstructive sleep apnea (OSA). It is estimated that 29–83% of patients are non-adherent to CPAP therapy (CPAP use ≤ 4 hours of use per night). The compliance of CPAP therapy and factors affecting CPAP compliance were studied.

Materials and methods: By convenience sampling, all patients diagnosed to have moderate/severe OSA (AHI >15) from April 2013 to December 2013 and a residence within 200 km of Bangalore were contacted by telephone. The subjects were enquired about the compliance of CPAP therapy, and were invited for a visit to the sleep clinic. During this visit, the subjects received a brief explanation of OSA and the use of CPAP regularly. A predefined questionnaire which includes questions on number of hours of use of CPAP, CPAP used for number of nights per week, the challenges in using CPAP, QOL questionnaire and ESS were administered. The use of CPAP machine was noted from the downloaded data from their CPAP machines.

The subjects were reminded telephonically about CPAP use every 2 months and returned to the sleep clinic after 6 months for a review. The predefined questionnaire was administered again and the CPAP compliance, QOL and ESS was noted.

Results: Twenty five patients consented to participate in the study. Among them 20 subjects were men. The mean age of patients was 50.44 years. Twenty three patients had severe OSA and the mean AHI was 47.8/h. The average BMI of the patients was 32.5 kg/m². The mean duration of CPAP use as reported by the patients as well as their spouses/care takers was 320 mins (5 h 20 min). On analyzing the data of the CPAP machine, the mean duration of use was only 233 mins (3 h 53 min). The perceived duration and the actual usage of CPAP machine among OSA patients was significantly different ($p = 0.001$). Ten of 25 patients had used the device for less than 4 h per night.

Subjects reported social factors (noncompliant when relative/friends visit, or when subject is travelling), dryness of mouth, not reapplying machine after nocturia, power shut down and reduced motivation as reasons for non-compliance to use CPAP. None of them reported any claustrophobia with CPAP.

Conclusion: Despite the recognized benefits of CPAP, the acceptance of and adherence with therapy remains a considerable barrier. Objective assessment of CPAP compliance should be a part of routine follow up in OSA. Further studies are required to assess the factors affecting CPAP compliance among patients with OSA.

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Effects of thyroidectomy for thyroid cancer patients on sleep apnea

H. Eun, S. Oh

Presbyterian Medical Center – Jesus Hospital, Seonam University College of Medicine, South Korea

Introduction: Thyroidectomy decreases snoring and sleep apnea: fact or fantasy? Some paper claims thyroidectomy decreases snoring and sleep apnea symptoms. But another study claims that the thyroidectomy worsen sleep apnea. This study aims to investigate to evaluate and compare the effects of sleep apnea by thyroidectomy.

Materials and methods: A neuropsychiatrist and surgeon investigated with respect to the state before and after surgery for outpatients in head and neck surgery clinic who underwent surgery for thyroid cancer and also searched their medical records. Approval of Institutional Review Board (IRB) and informed consents were done. Socio-demographic data and several scales, past medical history taking data for thyroidectomy and sleep apnea with snoring, preoperative and postoperative Pittsburgh Sleep Quality Index (PSQI), preoperative and postoperative Epworth sleepiness scale (ESS), preoperative and postoperative Snoring Index (SI), preoperative and postoperative Global Life Satisfaction (Index of well-being) scale, chi-square test for some demographic data analysis, Wilcoxon signed rank test for hypothesis testing.

Results: Sample number (N = 100, men 20, women 80), mean age 48.10 ± 9.868 (men 48.30 ± 10.509, women 48.05 ± 9.771), rank of variables Pair 1 PSQI postoperative-preoperative, negative ranks (N = 20, postoperative < preoperative, mean rank 24.03, sum of ranks 480.50), positive ranks (N = 27, postoperative > preoperative, mean of ranks 23.98, sum of ranks 647.50), Ties (N = 53, postoperative = preoperative), total (N = 100), Pair 2 ESS postoperative-preoperative, negative ranks (N = 13, postoperative < preoperative, mean rank 23.31, sum of ranks 303.00), positive ranks (N = 45, postoperative > preoperative, mean rank 31.29, sum of ranks 1408.00), ties (N = 42, postoperative = preoperative), total (N = 100), Pair 3 SI postoperative-preoperative, negative ranks (N = 16, postoperative < preoperative, mean of ranks 22.25, sum of ranks 356.00), positive ranks (N = 34, postoperative > preoperative, mean of rank 27.03, sum of ranks 919.00), ties (N = 50, postoperative = preoperative), total (N = 100), Pair 4 life satisfaction postoperative-preoperative, negative ranks (N = 22, postoperative < preoperative, mean of rank 23.55, sum of ranks 518.00), positive ranks (N = 25, postoperative > preoperative, mean of rank 24.40, sum of ranks 610.00), ties (N = 53, postoperative = preoperative), total (N = 100), test statistics of Wilcoxon signed rank test, Pair 1 PSQI postoperative-preoperative $Z = -0.895a$, Asymp. Sig. (two-tailed) = 0.371, Pair 2 ESS postoperative-preoperative $Z = -4.317a$, Asymp. Sig. = 0.000, Pair 3 SI postoperative-preoperative $Z = -2.735a$, Asymp. Sig. = 0.006, Pair 4 Life satisfaction postoperative-preoperative $Z = -0.491a$, Asymp. Sig. = 0.623(a. Based on negative ranks)

Conclusion: The above results indicate that the snoring and daytime sleepiness is increased after thyroidectomy This means that the sleep apnea aggravated after surgery.

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Use of online educational module does not improve adherence to clinical follow-up or CPAP treatment for OSA

L. Fine¹, P. Repovic¹, K. Schulz², C. Li³

¹ Swedish Medical Center, United States

² Clark University, United States

³ University of Pennsylvania, United States

Introduction: While risks of untreated obstructive sleep apnea (OSA) are well-known, the adherence to treatment remains a challenge. To address this issue through patient education about OSA and its treatment, we use an online educational module (Emmi Solutions, Chicago, IL, USA). Herein we assess if this approach leads to improved treatment adherence.

Materials and methods: In this single-center retrospective study, medical records of 61 consecutive patients initially diagnosed with OSA in 2012 were reviewed. Outcomes measured were returned for follow-up at 1 and 2 years, as well as PAP use among patients who had follow-up. Patients who completed education module after the initial visit ($n = 25$) were compared with those who did not complete it ($n = 36$) with regard to follow-up and PAP use, using Pearson chi square. To evaluate selection bias, a third cohort of 38 patients who were not assigned educational module was used as a control.

Results: Of 99 patients, 61 were asked to review the online educational module; 25 patients completed the module. Among patients assigned to the education module, the likelihood of return for follow-up and CPAP use at 1 year was not significantly affected by participation in the educational module (follow-up: 64% vs 55%,

$\chi^2(1) = 0.435$, $p = 0.601$; CPAP use: 93% vs 100%, $\chi^2(1) = 1.327$, $p = 0.249$), and was comparable with patients who were not assigned the educational module. In our cohort, only the severity of OSA significantly correlated with the likelihood of clinical follow-up at 1 and 2 years (t -test, $p = 0.002$).

Conclusion: Our results suggest that participation in online educational module did not correlate with improved follow-up rate or compliance with CPAP therapy. These findings need to be confirmed in a larger sample. An interactive (two-way) rather than informative (one-way) educational approach may improve compliance with OSA treatment.

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Comparing acceptance of four questionnaires by patients of a sleep laboratory in a tertiary hospital

H. Glass¹, A. Garay-Molina², G. Berigo³, A. Guimaraes³, R. Costa³, L. Flores³

¹ Secretaria de Estado de Saúde do Distrito Federal, Brazil

² Hospital Santa Lucia, Brazil

³ ESCS-FEPECS, Brazil

Introduction: Questionnaires are important tools for accessing complaints, since they can provide an structured evaluation and anamnesis, as well as permit symptoms quantification. In this study we compared four different questionnaires for assessment of sleep symptoms in regard to patients' acceptance in a "real life" environment, our sleep laboratory.

Materials and methods: Inclusion criteria: patients that were scheduled for diagnostic polisomnography (PSG). Exclusion criteria: Second diagnostic PSG and PSG with devices, like orthodontic or Positive Airway Pressure devices. At PSG test night the technicians asked the patients to answer four questionnaires: Epworth Sleepiness Scale (ESS), MiniSleep Questionnaire (MSQ), our own Sleep Laboratory Questionnaire (SLQ) and a questionnaire of symptoms of sleep disorders (SS), downloaded from "Silent Sleep Partners" website, Canada. Both ESS (AN Bertolazi et al. Portuguese-language version of the Epworth Sleepiness Scale: validation for use in Brazil. *J. Bras. Pneumol.* 2009; 35(9):877–883) and MSQ (SMGP Togeiro, AK Smith. Diagnostic methods for sleep disorders. *Rev. Bras. Psiquiatr.* 2005; 27 (Suppl. 1):8–15) are translated into Portuguese and validated scales. SLQ is composed of 14 dichotomous questions (Y/N) and 11 categorical questions (No/seldom/sometimes/frequently). SS has 83 dichotomous questions. We used X2 test to compare non-acceptance (frequency of not-responded (NR) items) for each questionnaire. We also compared the non-acceptance for each questionnaire between genders.

Results: We included 431 patients, 173 females and 258 males. Age distribution was: < 40:127; 41–60:220; 61–60:220; 61–80:204; > 80:7. For 234 patients, only ESS and SLQ questionnaires, and for 197 (83 males, 114 females) all four questionnaires were offered. There was no difference in acceptance if the patients received two relatively short or four questionnaires. SLQ (3.25%) and SS (3.57%) had a higher NR-frequency ($p < 0.001$), than ESS (1.54%) and MSQ (1.31%). NR-percentages for Males were SLQ: 2.17%, ESS: 0.84%; SS: 3.49% and MSQ 1.06%; and females 4.87%, 2.57%, 3.68% and 1.62%, respectively. The size of questionnaires may play a role, as the scales presented were shorter, but seems not to affect acceptance in a linear form, because a very long questionnaire (83 questions) had the same acceptance as a shorter one (25). ESS and SLQ had a higher NR-frequency among women ($p < 0.001$), but SS and MS displayed no differences due to gender. Many women can

or do not usually drive and question about sleepiness while driving could not be responded.

Conclusion: Brazilian women had lower acceptance to our Sleep Laboratory Questionnaire than men. If size plays an important role remains unclear, but Scales had a higher acceptance than the questionnaires, despite known unfamiliarity of Brazilians with scales. Gender differences may be important when evaluating scales and questionnaires.

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Effects of fluid removal by hemodialysis on sleep apnea in end-stage renal disease patients

A. Ognà¹, V. Forni Ognà², A. Mihalache¹, M. Pruijm², G. Halabi³, O. Phan⁴, F. Cornette¹, J. Haba-Rubio¹, M. Burnier², R. Heinzer¹

¹ Center for Investigation and Research in Sleep (CIRS), University Hospital of Lausanne (CHUV), Switzerland

² Nephrology and Hypertension Department, University Hospital of Lausanne (CHUV), Switzerland

³ Hemodialysis Unit, Etablissements Hospitaliers Du Nord Vaudois, Yverdon, Switzerland

⁴ Hemodialysis Unit, Hôpital Intercantonal De La Broye, Payerne, Switzerland

Introduction: Recent observations suggest a role of overnight rostral fluid shift (fluid displacement from the legs to the neck) in the genesis of OSA. Our aim was to investigate the impact of fluid removal by hemodialysis on overnight body fluid shift and on the severity of OSA in end-stage-renal-disease (ESRD) patients.

Materials and methods: The severity of OSA was assessed during two consecutive attended polysomnographies (PSG), performed the night before and after an hemodialysis session and expressed as index of obstructive apneas and hypopneas per sleep hour (OAH). Total body overhydration and leg fluid volume were evaluated by bioimpedance. Neck circumference was assessed before and after each PSG.

Results: The mean overnight rostral fluid shift was 1.27 (± 0.41) L pre-hemodialysis; it correlated positively with fluid overload volume ($r = 0.393$, $p = 0.02$) and decreased significantly post-hemodialysis (0.78 (± 0.38) L, $p < 0.001$).

The reduction in fluid overload by hemodialysis correlated with the decrease in OSA severity, with a dose-dependent effect ($r = 0.494$, $p = 0.04$). Hemodialysis successfully reduced obstructive apnea-hypopnea index only in the group of 12 patients with successful reduction of fluid overload (-19% , $p < 0.01$) whereas it had no effect in those without fluid reduction.

Fluid overload – assessed by bioimpedance – was the best predictor of obstructive apnea-hypopnea index reduction obtained by hemodialysis (standardized $r = -0.683$, $p = 0.01$) in multivariate regression analysis.

Conclusion: Fluid overload and overnight rostral fluid shift influence OSA severity in ESRD patients undergoing intermittent hemodialysis. Fluid removal by hemodialysis decreases the overnight rostral fluid shift and the severity of OSA with a dose-dependent effect.

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Static hyoid position and dynamic lateral pharyngeal wall collapse predict OSA severity: Observations based on sleep MRI

L. Huon¹, S. Liu², T. Liu¹, G. Cho³, P. Wang¹

¹ Cathay General Hospital, Taiwan

² Division of Sleep Surgery, Department of Otolaryngology, Stanford School of Medicine, United States

³ Department of Otolaryngology, Stanford School of Medicine, United States

Introduction: Numerous cephalometric studies have been conducted to find predictors of OSA severity – all with the common handicap of relying solely on static radiographic measures. Using sleep MRI, we combined both static and dynamic measures to characterize OSA severity more accurately.

Materials and methods: This is a case-control study with 15 severe OSA patients (AHI > 40) who are age, gender, and BMI matched with 15 controls (AHI < 10). Upper airway imaging was performed during sleep inside a 3.0 T MRI scanner. The state of sleep was determined by a combination of snoring heard through the microphones of the cylinder with concomitant decrease of >4% in oxygen saturation.

Static midsagittal MRI slice was used to measure a priori predictors of OSA severity, including palatal plane, upper airway length, hyoid position (angle from Pogonion to hyoid to the posterior airway), and posterior airway space.

Axial and coronal views of the oropharynx were then rated by blinded, independent reviewers, focusing on lateral pharyngeal walls only. The degree of collapse was rated as none (0), partial (1), or complete (2).

Univariate analyses with were conducted with Pearson and Spearman tests with the a priori predictors as described. Multivariate analysis was then performed to identify independent predictors

Results: The mean age, BMI, and AHI of the control group were 42.6, 29.7, and 5.28. The mean age, BMI, and AHI of the severe OSA group were 42.4, 30.4, and 70.29. There were no statistically significant differences between the two groups.

When compared with age, BMI, and gender-matched controls, palatal plane ($r^2 = 0.46$, $p = 0.01$), hyoid position based on pogonion-hyoid-airway angle ($r^2 = -0.72$, $p < 0.001$), and lateral pharyngeal wall collapse from dynamic sleep MRI ($r^2 = 0.65$, $p < 0.001$) correlated significantly with severity of obstructive sleep apnea. Upper airway length and posterior airway space did not reach statistical significance.

In a multivariate analysis, both hyoid position and lateral pharyngeal wall collapse independently correlate with severity of OSA.

Conclusion: While impractical to use sleep MRI for OSA patients to identify sites of airway collapse, this study has important clinical implications. Few static and dynamic predictors are needed to identify severe OSA. Characterizing hyoid position and identifying lateral pharyngeal wall collapse, even from routine nasopharyngoscopy, can be sensitive and cost-effective.

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Risk of obstructive sleep apnea syndrome and its determinants in diabetics: Oman Diabetes Study

D. Jaju¹, S. Al-Sinani², M. Al-Abri¹, K. Al-Hashmi³, M. Hassan³, A. Al Mamari⁴, R. Bayoumi²

¹ Clinical Physiology, Sultan Qaboos University Hospital, Oman

² Department of Biochemistry, College of Medicine and Health Sciences, Sultan Qaboos University, Oman

³ Department of Physiology, College of Medicine and Health Sciences, Sultan Qaboos University, Oman

⁴ Department of Medicine, College of Medicine and Health Sciences, Sultan Qaboos University, Oman

Introduction: Obstructive sleep apnea syndrome (OSAS) is a known risk factor for diabetes mellitus (DM). Not always overnight polysomnography/portable sleep monitors; but questionnaires are useful for screening OSAS. We aim to investigate the association between DM and OSAS by Berlin Questionnaire and Epworth Sleepiness Scale (ESS) in Omani diabetic population.

Materials and methods: This was a case control study conducted between January 2010 and May 2012 in the Sultan Qaboos University Hospital (SQUH) (Oman Diabetes Study). Diabetic patients were recruited from the diabetic clinic of SQUH. Patients and healthy controls were matched for age and gender. All participants were asked to answer Berlin questionnaire which detects OSAS risk and Epworth Sleepiness Scale (ESS). They were also asked to complete a diary about their sleep timing and habits. Fasting glucose, HbA1C and lipid profile were measured for both for patients and controls.

Results: The total number of participants was 593 (patients: N = 242; controls: N = 351). The mean age of the study population was 51 ± 10 years with mean BMI of 30.0 ± 7 kg/m² with no significant difference between both groups ($p > 0.05$).

Diabetics had significantly high BMI, waist circumference, systolic BP, fasting glucose, HbA1c and triglycerides compared with controls. Night sleep duration was significantly reduced in diabetics compared with controls (Control 6.4 ± 1.2 vs DM 6.0 ± 1.0 ; $p = 0.012$).

OSAS risk was significantly associated with diabetes (χ^2 6.8; $p = 0.006$). Logistic regression showed that in controls, OSAS risk is independently increased with higher HbA1c (odds ratio: 1.94; C.I: 1.01–3.5; $p = 0.025$) but in diabetics it increased with higher TG (odds ratio: 2.85; C.I: 1.3–5.9; $p = 0.005$).

Conclusion: In this population, diabetes is significantly associated with high risk for OSAS as assessed by the Berlin Questionnaire. OSAS risk is independently associated with glycemic control in healthy subjects, while it is associated with triglyceride levels in diabetics.

Acknowledgements: Oman Diabetes Study.

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Sleep quality and asthma control in asthmatic children – Preliminary results

M. Janeiro¹, A. Sokolova¹, M. Meira Cruz², H. Loureiro^{1,2}

¹ Hospital Professor Doutor Fernando Fonseca, Epe, Portugal

² The Portuguese Association for Chronobiology and Sleep Medicine, Portugal

Introduction: Control of asthma is the main goal of therapy, but many patients remain symptomatic or uncontrolled despite appropriate treatments. Quality of sleep is usually altered in asthma patients. Sleep disturbances are reported by patients with asthma. This study examined the association between sleep quality and asthma control.

Materials and methods: Retrospective descriptive study of 28 asthmatic children followed in allergy out-patient clinic referred for a polysomnography (PSG) over the period 2012–2014.

Criteria of asthma control include current impairment (symptoms, need for rescue medication, limitation of activities, lung function) and future risk (exacerbations, medication side effects).

The most severe impairment or risk defined the level of asthma control (ICON pediatric asthma).

PSG was performed on all patients. Sleep stages and respiratory events were scored according to the AASM 2012 pediatric scoring criteria.

Demographic data, medical and allergy history, tonsillectomy and/or adenoidectomy, control therapy use, sleep and daytime behavior were analyzed.

Results: A total of 28 asthmatic children were evaluated: the median age was 11.5 years [4–17 yrs], 60.7% were male. Presented snoring 78.6%, rhinitis 78.6%, atopic dermatitis 25%, attention deficit hyperactivity disorder 42.9% and parasomnias 14.3%. Previously adenoidectomy in 39.3% and tonsillectomy in 17.9%. The level of asthma control was: 67.9% good, 17.9% complete and 14.3% partial. Spirometry was performed in 25 children. The used control therapy was: alone inhaled corticosteroids 28.6%, inhaled corticosteroids + beta adrenergic agonist-2 long-acting 57.1%, leukotriene receptor antagonists 50%, antihistaminic 64.3% and nasal corticosteroids 46.4%.

From PSG results, mean latency was 20.9 minutes (SD 17.9); mean efficiency was 81.3% (s.d.10.6), REM latency was 161 minutes (SD 67.3); N2 was increased 63.7% (SD 7.3); N3 was normal mean 20% (SD 6.3%) and REM was decreased (mean 12.9%; SD 3.7); AHI mean was 2.2/h (SD 1.2) events predominantly in REM and mean O2 sat 96% (SD 1.6).

Conclusion: In this small sample, asthmatic children had significant disturbed sleep with reduction on REM sleep, decreased efficiency and elevated AHI, even though most of the children were considered to have a good control of asthma. These results highlight the relevance of sleep evaluation in this group of children.

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The relationship and predictors of erectile dysfunction in obstructive sleep apnea syndrome

Y. Jeon¹, D. Han¹, T. Won¹, D. Kim¹, H. Shin²

¹ Department of Otorhinolaryngology, Seoul National University Hospital, Seoul, South Korea

² Obstructive Upper Airway Research (Ouar) Laboratory, Department of Pharmacology, Seoul National University College of Medicine, Seoul, South Korea

Introduction: Many lines of evidences have suggested that obstructive sleep apnea syndrome (OSAS) is associated with a high incidence of erectile dysfunction (ED). The aim of this study was to investigate the characteristics in OSAS patients with or without ED, and describe the plausible biopsychosocial predictors of ED.

Materials and methods: We conducted a longitudinal study of 1048 patients visiting Seoul National University Hospital for snoring and/or daytime sleepiness. Among them, 719 patients, who completed all requirements of questionnaire survey and polysomnographic (PSG) tests, were enrolled in this study. The questionnaire comprised of the Calgary Sleep Apnea Quality of Life Index (SAQLI), the Korean versions of the International Index of Erectile Function questionnaire (KIIEF-5), Beck Depression Inventory (BDI) and Epworth Sleepiness Scale (ESS). Patients with KIIEF-5 score <21 were diagnosed as ED in this study.

Results: Among 719 patients, 675 (93.9%) patients were diagnosed with OSAS and the severity of OSAS was distributed to moderate (31.9%, $15 \leq \text{AHI} < 30$) and severe (47.3%, $30 < \text{AHI}$). Most of OSAS patients were middle aged (mean age 45.3) and moderately obese (mean BMI 25.8). Regarding ED, 479 of 675 (71.0%) patients with OSAS had ED. BDI is an independent predictor of ED

in OSAS patients regardless of the severity of OSA ($p < 0.001$). But there was no significant correlation between ED and neck circumference, BMI, blood pressure, ESS or PSG data (lowest O₂ saturation, sleep latency and REM latency).

Conclusion: Clinicians should consider the possibility of sexual dysfunction and necessity of consultation when their male patients with OSAS showed high depression severity.

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Long-term adherence of positive airway pressure therapy in patients with obstructive sleep apnea syndrome: Are APAP and CPAP different?

E. Joo, S. Kim, S. Hong

Department of Neurology, Samsung Medical Center, Sungkyunkwan University School of Medicine, South Korea

Introduction: Positive airway pressure (PAP) is the gold standard treatment for obstructive sleep apnea syndrome (OSA). Yet, adherence to PAP is still challenging in many patients. To investigate the long-term adherence to PAP treatment in patients with OSA and to compare it between APAP and CPAP.

Materials and methods: We gathered PAP data of 1613 patients who were recommended to use PAP from January 2008 to August 2014. One thousand one hundred forty-seven patients (71.1%) agreed while 466 patients (28.9%) declined to use PAP after instruction about PAP. We investigated the overall adherence of PAP treatment and compared the clinical characteristics between patients with PAP use and those who discontinue PAP. Additionally, we compared the differences of adherence rate and other features between CPAP (n = 158) and APAP (n = 564) users.

Results: We gathered PAP data of 1613 patients who were recommended to use PAP from Jan. 2008 to Aug. 2014. 1147 patients (71.1%) agreed while 466 patients (28.9%) declined to use PAP after instruction about PAP. We investigated the overall adherence of PAP treatment and compared the clinical characteristics between patients with PAP use and those who discontinue PAP. Additionally, we compared the differences of adherence rate and other features between CPAP (n = 158) and APAP (n = 564) users.

Conclusion: Overall 45.9% of patients have continued PAP use for a long time and about 67.7% of patients have used PAP more than 70% of total sleep time. Long-term adherence of APAP and CPAP was not significantly different. Severe OSA and daytime sleepiness are the important factors to adhere to the PAP more strongly.

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Correlation between the apnea–hypopnea index determined by Sleepstyle HC608, a continuous positive airway pressure device and by manual scoring in patients with obstructive sleep apnea syndrome

D. Kim¹, Y. Hwangbo², J. Baek¹, J. Bae¹, J. Moon¹, K. Yang¹

¹ Division of Epilepsy and Sleep Disorders, Department of Neurology, Cheonan Hospital, Cheonan, Soonchunhyang University of College of Medicine, South Korea

² Department of Preventive Medicine, Soonchunhyang University College of Medicine, Cheonan, South Korea

Introduction: Continuous positive airway pressure (CPAP) can estimate the apnea–hypopnea index (AHI) using specific respiratory

event detection algorithms. The accuracy of algorithms has been systemically evaluated rarely. We compared between the residual AHI determined by Sleepstyle HC608 (HC) and by scoring manual v2.0 of PSG (MA) in patients with OSAS.

Materials and methods: Methods: Fifty seven patients underwent overnight attended CPAP titration using the HC device. All respiratory events from CPAP device were scored manually by v2.0 (MAAHI). We also obtained the smart card data (HCAHI) which were automatically recorded of apneas and hypopneas simultaneously. Furthermore, the apnea index (AI) and the hypopnea index (HI) were evaluated separately.

Results: Results: The mean AHI on the diagnostic PSG was 53.9 ± 22.4 . During CPAP titration, respiratory events were effectively suppressed (MAAHI, 6.0 ± 5.8 vs. HCAHI, 4.2 ± 6.0 , $p < 0.001$; MAAI, 0.9 ± 2.2 vs. HCAI 1.3 ± 2.8 , $p = 0.001$; MAHI, 5.2 ± 4.2 vs. HCHI, 2.9 ± 3.6 , $p < 0.001$). The average difference between the MAHI and the HCHI was 2.21 ± 3.10 and between the MAAI and the HCAI was -0.42 ± 0.93 . The MAHI ($\beta = 0.70$, $p < 0.001$), the MAAI ($\beta = -0.66$, $p < 0.001$), and arousal index by manual scoring ($\beta = 0.34$, $p = 0.018$) were associated with greater differences between the MAAHI and HCAHI in the multiple regression analysis.

Conclusion: This study suggests that the difference of AHI determined by CPAP device and by manual scoring in patients with OSAS can exist in case of using of scoring manual version 2.0, so residual AHI from CPAP data should be interpreted carefully.

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Association between obstructive sleep apnea syndrome and cerebral microbleeds in patients with ischemic stroke

D. Koo, H. Nam

Department of Neurology, Seoul National University Boramae Hospital, Seoul, South Korea

Introduction: Obstructive sleep apnea (OSA) was identified as a risk factor for cerebrovascular disease (CVD). Cerebral microbleed (CMB) is considered to be a predictor of stroke. We aimed to investigate the prevalence of cerebral microbleeds in patients with OSA and the correlation between OSA severity and prevalence of microbleeds.

Materials and methods: We enrolled the ischemic stroke patients who underwent both brain MRI, including gradient echo imaging, and polysomnography (PSG) within 6 months. Cerebral microbleed was defined as the rounded foci of < 10 mm in size that appear hypointense and distinct from vascular flow voids, leptomeningeal hemosiderosis, or non-hemorrhagic subcortical mineralization. PSG was applied to diagnose the presence of OSA and to estimate the severity of OSA. Univariate and multiple logistic regression models were used to identify the predictive factors, including OSA, for the presence of CMB.

Results: Of 137 cases who underwent both polysomnography (PSG) and MRI, 84 patients were finally included in this study by our criteria. Mean age was 61.8 ± 8.5 years and 51 (60.7%) patients were male. Out of 84 patients, 55 (65.5%) patients were diagnosed to obstructive sleep apnea with the apnea-hypopnea index (AHI) of higher than 5/h. Multivariate logistic regression analysis revealed that the independent factor for prediction of CMB was hypertension ($p < 0.041$), not OSA ($p < 0.12$). According to the severity of OSA, the patients with AHI ≥ 10 /h revealed slight preponderance of the presence of CMB, compared with the patients with AHI < 10 /h ($p = 0.056$).

Conclusion: We reported that CMB was significantly correlated with hypertension, though not with OSA. In our preliminary results, OSA could be the predictive factor for CMB in the patients with ischemic stroke.

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The relation between sleep-disordered breathing, emotional complaints and anthropometric parameters: The results of a screening survey in St Petersburg (Russia)

L. Korostovtseva¹, E. Dubinina², O. Rotar¹, E. Moguchaia¹, M. Boyarinova¹, E. Kolesova¹, S. Kravchenko¹, Y. Sviryaev¹, A. Alekhin³, A. Konradi¹

¹ Federal Almazov Medical Research Centre, Russia

² St Petersburg Psychoneurological Research Institute N.A. V.M.

Bekhterev, Herzen State Pedagogical University of Russia, Russia

³ Herzen State Pedagogical University of Russia, Russia

Introduction: Sleep quality is known to be associated with mental health. However, the relation between emotional state and sleep-disordered breathing (SDB) affecting sleep continuity is disputable. Thus, we assessed SDB relation to emotional complaints, anthropometric parameters and life style indicators in a representative sample of St Petersburg citizens.

Materials and methods: Altogether 358 subjects (aged 21–68 years old) underwent a structural interview and anthropometry. The following parameters were assessed: the presence and frequency of SDB (snore, apneas) and dissomnia complaints, emotional complaints, body mass index, life style indicators. Sleep quality was not assessed by 21.5% respondents (25.9% females vs. 14.2% males; $p < 0.05$). Altogether the data of 281 respondents (115 males and 166 females) were included in the analysis.

Results: Regular snoring was reported by 29.6% men and 22.9% women. There was a direct relation between age and snore frequency among females ($r = 0.21$, $p < 0.01$). Apneas were reported by 14.3% respondents without any gender differences between males and females. Snore frequency was associated with obesity indicators, including body mass index ($r = 0.26$; $p < 0.001$) and waist circumference ($r = 0.24$; $p < 0.001$) independent from age and gender. However, there was no association between apnea frequency and obesity indicators. Snore frequency was related to the daytime sleepiness ($r = 0.21$, $p = 0.001$), severity of reported emotional tension ($r = 0.24$, $p < 0.001$) and depression ($r = 0.20$, $p < 0.01$), bruxism frequency ($r = 0.18$, $p < 0.01$) and awakenings associated with dyspnea/chest discomfort ($r = 0.17$, $p < 0.01$). There was a correlation between apnea frequency and post-nocturnal asthenia ($r = 0.16$, $p < 0.01$), awakenings associated with dyspnea/chest discomfort ($r = 0.17$, $p < 0.01$) and bruxism frequency ($r = 0.16$, $p = 0.01$). There was no correlation between SDB and life style parameters.

Conclusion: SDB are reported by every fourth St Petersburg citizen and are associated with lower sleep quality, dissomnia and emotional complaints, and, partly, with the obesity indicators.

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Prevalence and predictors of nocturnal hypoventilation in amyotrophic-lateral-sclerosis patients with preserved respiratory functions: A two-center trial

P. Lee¹, N. Hsu², H. Wu³, C. Tsai⁴, T. Shiao⁵, G. Shiao⁵, C. Yang⁶

¹ Center of Sleep Disorder, National Taiwan University Hospital, Taiwan

² Institute of Health Care Organization Management and Center for Health Policy Research, College of Public Health, National Taiwan University, Taiwan

³ Department of Integrated Diagnostics and Therapeutics, National Taiwan University Hospital, Taiwan

⁴ Neurological Institute, Taipei Veterans General Hospital, Taiwan

⁵ Chest Department, Taipei Veterans General Hospital, Taiwan

⁶ Department of Neurology, National Taiwan University Hospital, Taiwan

Introduction: Nocturnal hypoventilation (NH) is not uncommon in amyotrophic-lateral-sclerosis (ALS) patients with forced vital capacity (FVC) < 50% and daytime hypercapnia. However, the prevalence in normocapnic ALS patients with FVC ≥ 50% is unclear. This study aimed to determine the prevalence and predictor of NH in ALS patients with FVC 50–80% of predicted.

Materials and methods: Patients with ALS were screened in the neurologic clinics in two medical centers in Taiwan. Patients who had FVC of 50–80% of predicted, maximal inspiratory pressure (P_{imax}) < –60 cmH₂O, and daytime normocapnia (PaCO₂ < 50 mmHg) were eligible. All enrolled subjects received a polysomnography (PSG) with transcutaneous carbon dioxide (P_{tc}CO₂) monitored where NH was defined as increment of P_{tc}CO₂ ≥ 10 mmHg at sleep compared with supine awake. Nighttime symptom, subjective sleepiness, sleep quality, and ALS functional rating scale revised (ALSFRS-R), arterial blood gas, and PSG parameters were compared between patients with and without NH to identify factors independently associated with NH. Predictive ability of those factors was assessed by multivariate logistic regression and area under receiver operation curve (AUROC).

Results: From April 2010 to May 2012, a total of 56 patients were eligible. Twenty-three patients were enrolled where NH was diagnosed in eight (34.8). Patients with NH were older (68.8 vs. 55.6 years old, *p* = 0.006) and had lower ALSFRS-R (19.0 vs. 25.7, *p* = 0.040), less deep sleep (0 vs 5.0 ± 8.5%, *p* = 0.028), higher TiSpO₂ < 90% (20.6 ± 28.5 vs 2.0 ± 3.3%, *p* = 0.014), and higher daytime PaCO₂ (47.5 ± 11.1 vs 40.1 ± 4.3 mmHg, *p* = 0.027). Multivariate logistic regression analysis identified age (OR: 1.16, *p* = 0.020) and ALSFRS-R (OR: 0.86, *p* = 0.041) were predictors for NH where the AUROC were 0.80 and 0.71, respectively.

Conclusion: One-third of normocapnic ALS with relatively preserved respiratory function had NH where age and ALSFRS-R could predict the development of it.

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Does treatment of SDB with CPAP have a protective effect on stroke? A systemic review

Y. Kim¹, Y. Koo², D. Kim³, H. Lee⁴, S. Lee¹

¹ Department of Neurology, Kangwon National University College of Medicine, South Korea

² Department of Neurology, Korea University College of Medicine, South Korea

³ Department of Neurology, Konkuk University School of Medicine, South Korea

⁴ Center for Preventive Medicine and Public Health, Seoul National University Bundang Hospital, South Korea

Introduction: Sleep disordered breathing (SDB) increases the risk of stroke and CPAP is considered treatment of choice for SDB. However, whether the treatment of SDB with CPAP reduces the occurrence of stroke is unclear. We aimed to evaluate the effect of CPAP on stroke occurrence, and factors associated with the effect.

Materials and methods: We conducted systemic review by searching Medline, Embase, and Cochrane library and included published research written in English. The target population was patients of any age with SDB. We excluded the studies which focused on outcomes after acute stroke or cardiovascular disease. The intervention was CPAP and the outcome of interest was incident stroke and mortality due to stroke.

Results: We identified five articles from a randomized controlled trial and three cohort studies, all conducted in Europe. Two articles from a same cohort consisted exclusively of women, and others predominantly of men, covering 2,456 SDB patients (1159 men and 1298 women), in their forties through sixties. Follow up duration was 48–89 months. All studies reported protective effect of CPAP on overall cardiovascular disease. Risk ratio was 0.22 [0.13–0.37] for mortality and 0.55 [0.41–0.74] for incidence of overall cardiovascular disease. In stroke, a cohort study of women showed significant risk reduction, more than in coronary heart disease. Meta-analysis yielded risk ratio 0.06 [0.01–0.34] for mortality and 0.38 [0.21–0.66] for incidence of stroke. No study stratified the data by gender and age or disease duration. The protective effect was shown in only compliant group who used CPAP for 4 hours/night or longer. According to SDB severity, a cohort study in women proved the benefit in only severe group with AHI higher than 30 and another cohort study comprising predominantly men showed the risk reduction of overall cardiovascular disease even in mild to moderate SDB.

Conclusion: CPAP treatment in middle aged patients with SDB has a beneficial effect on stroke, if their adherence is 4 hours/night or longer. It is applicable both in men and women, probably even in those with mild to moderate SDB. Additional studies are needed in the elderly and non-European countries.

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Elevated erythrocyte sedimentation rate may reflect severity of obstructive sleep apnea

W. Lee

Departments of Otorhinolaryngology, Seoul National University Bundang Hospital, South Korea

Introduction: There are a few studies on the relation between OSA and erythrocyte sedimentation rate (ESR), which is representative marker of inflammation. The aim of this study was to elucidate the possible association between elevated ESR and severities of OSA according to the apnea–hypopnea index.

Materials and methods: Total of 349 patients who visit our sleep center was enrolled. All of them underwent physical examination, overnight polysomnography (PSG), and blood sampling for ESR and high-sensitivity C-reactive protein (hs-CRP). We compared ESR and hs-CRP level according to the OSA severity. We also measured correlation between inflammation marker (ESR and hs-CRP) and PSG parameters.

Results: Measured ESR was significantly elevated in severe OSA than no (*p* = 0.014), mild (*p* = 0.011), and moderate OSA (*p* = 0.049). However, hs-CRP level in severe OSA was only significantly elevated

than in mild OSA ($p = 0.012$). In the correlation analysis, ESR showed the tendency of closer association with hypoxic episode (lowest oxygen saturation, time of saturation below 90%, and oxygen desaturation index) than hs-CRP. Multivariate analysis showed that severe OSA associated with elevated level of ESR in statistical significance ($p = 0.003$; correlation coefficient, $\beta = 0.855$; 95% confidence interval, 1.328–4.160), but did not with elevated level of hs-CRP ($p = 0.291$; correlation coefficient, $\beta = 0.386$; 95% confidence interval, 0.718–3.016).

Conclusion: ESR is in a better position than hs-CRP to assume the hypoxic episode during sleep. Moreover, ESR may be applicable to classify the OSA severity, especially in severe OSA.

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Efficacy of CPAP treatment for blood pressure reduction in hypertensive OSA patients

G. Liu, S. Lin, L. Chuang, Y. Lin, Y. Chen, N. Chen

Sleep Center, Chang Gung Memorial Hospital, Taoyuan, Taiwan

Introduction: Diseases related to obstructive sleep apnea were increasing, including cardiovascular diseases, metabolic syndrome, and neuroendocrine disorders. Hypertension was one of the comorbidities of OSA. Although the benefit of continuous positive airway pressure treatment for OSA was definite, the effect of blood pressure reduction in hypertensive OSA patients was controversial.

Materials and methods: OSA patients diagnosed by polysomnography at sleep center in Chang-Gung Memorial Hospital from 2010/06 to 2013/06 were reviewed. Patients with elevated blood pressure who received CPAP treatment were enrolled. According to CPAP compliance, patients were divided into two groups. In the first month, only CPAP days more than one week were considered as on-CPAP group, others were regarded as out-CPAP. Blood pressure was evaluated one month after CPAP treatment.

Results: A total of 179 patients were enrolled, and the mean systolic, diastolic, and mean blood pressure were 145, 89, and 108 mmHg individually. According to CPAP compliance, 36 were on-CPAP group, and 143 were out-CPAP. There was no significant difference in baseline blood pressure between on-CPAP group and out-CPAP group (systolic BP as 145.1 and 144.8, diastolic BP as 91.5 and 88.7, mean BP as 109.4 and 107.4 mmHg). After one-month CPAP treatment, on-CPAP has statistically significant decrease in diastolic (7.7 versus 1.2, $p = 0.003$) and mean (8.3 versus 2.1 mmHg, $p = 0.011$) blood pressure. Even adjusted age and OSA severity, the multiple linear regression showed only on-CPAP would influence diastolic BP reduction as 5.9 mmHg (95% CI: 1.543, 10.238, $p = 0.008$).

Conclusion: During one-month CPAP treatment, well compliance had benefit in diastolic and mean blood pressure reduction. On-CPAP was an independent factor in diastolic blood pressure improvement.

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Beneficial effect of bilevel positive airway pressure on Cheyne–Stokes respiration in patients with congestive heart failure

J. Liu¹, Z. Lu², X. Zhu¹, D. Zhang¹, M. Sun¹, X. Zhang³, G. Lu¹

¹ Jiangsu Geriatric Hospital, Nanjing, China

² Department of Cardiology, Nanjing Chest Hospital, Nanjing, China

³ First Affiliated Hospital of Nanjing Medical University, Nanjing, China

Introduction: By comparison between bilevel positive airway pressure ST mode (BPAP-ST) and continuous positive airway pressure (CPAP), to investigate which mode is more effective for treatment of Cheyne–Stokes respiration (CSR) in patients with congestive heart failure (CHF).

Materials and methods: Nineteen stable CHF patients with severe CSR (index of CSR > 30 events/h) were enrolled and randomized to receive treatment of BiPAP-ST ($n = 10$) or CPAP ($n = 9$) for 1 week. Following 1 week's washout period with no positive airway pressure treatment, a shift therapy was performed in which CPAP treated patients were shifted to BiPAP-ST treatment, while BiPAP-ST treated patients were shifted to CPAP treatment. Comparison of AHI and plasma N-terminal pro-brain natriuretic peptide (NT-proBNP) level were made pre and during each mode of positive airway pressure (PAP) treatment.

Results: Compared with the index of obstructive sleep apnea (OSA) (16.8 ± 7.2) and CSR (41.3 ± 6.5) prior to PAP treatment, there was a significant lower index of OSA and CSR during CPAP (3.1 ± 1.8 and 6.3 ± 2.6) and BiPAP-BT treatment (3.3 ± 2.1 and 3.1 ± 2.8). Comparison between BiPAP-BT and CPAP treatments showed that even though there was no significant difference in the index of OSA with both PAP therapies ($p > 0.05$), a further lower index of CSR was detected during BiPAP-ST treatment than that during CPAP treatment ($p < 0.05$). Compared with the plasma NT-proBNP level before PAP treatment (936.6 ± 55.9 pg/ml), it was significantly lower during CPAP (724.2 ± 46.7 pg/ml) and BiPAP-ST (582.6 ± 68.4 pg/ml) therapies with a statistical difference between the two PAP therapies ($p < 0.05$).

Conclusion: In CHF patients with severe CSR, both BiPAP-ST and CPAP could effectively improve CSR, coexistence OSA and plasma NT-proBNP level. However, BiPAP-ST treatment was more efficacious than CPAP treatment.

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Severity of apnea–hypopnea indexes among adults with obstructive sleep apnea: 26 A–Z sub-groups for assessments and easy communication

K. Muntarbhorn, S. Kunachak

Ramathibodi Hospital Sleep Disorder Center, Thailand

Introduction: Severity grades of abnormal apnea–hypopnea indexes (AHI/AHIs) for OSA adults are known: mild ≥ 5 to 15, moderate ≥ 15 to 30 and severe ≥ 30 (per hour) dependent of total sleep time but can one devise sub-groups for supplementary grades?

Question: “Is it feasible to devise supplementary 26 sub-groups using English alphabet?”

Materials and methods: Twenty six sub-groups (A–Z) were based on the English alphabet. Since normal AHI = 0–5/hour (dependent on TST), differences of 5 could differentiate abnormal sub-groups i.e. A = ≥ 5 to 10... to Y = ≥ 125 to 130 (and Z ≥ 130); and, in English communication, grade B is always understood to be worse than grade A (also E worse than D because E being lower in alphabet order e.g. E worse in examination grades). Detailed and prospectively collected data of Kunachak's patients at the “Snore” Clinic, Department of Otolaryngology, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok between January 1, 2001 and January 1, 2010 were tested for the research question. For convenient consecutive sampling, inclusion criteria included (i) primary snorers, (ii) patients of Department of Otolaryngology, and (iii) OSA. Exclusion criterion was “age under 18 years”. After excluding the under-aged subjects, there remained 613 adult subjects (N1): 402 males and 211 females (1.9M:1F) with mean age of 47.03 years, SD ± 10.58 and 95% CI of 46.37–47.69. Initial polysomnographic records were

reported by specialists (no current author) [international rules e.g. manuals for scoring sleep before 2012]. Categories of sub-groups were devised and analysis was performed by the senior author.

Results: Out of 613 subjects (N1), 59 had normal AHIs and 552 (N2) [382M:170F] had abnormal AHIs. Grades (numbers) were: A \geq 5–10 (66), B \geq 10–15 (52), C \geq 15–20 (52), D \geq 20–25 (55), E \geq 25–30 (36), F \geq 30–35 (37), G \geq 35–40 (25), H \geq 40–45 (35), I \geq 45–50 (31), J \geq 50–55 (15), K \geq 55–60 (15), L \geq 60–65 (22), M \geq 65–70 (21), N \geq 70–75 (17), O \geq 75–80 (23), P \geq 80–85 (10), Q \geq 85–90 (17), R \geq 90–95 (9), S \geq 95–100 (3), T \geq 100–105 (5), U 105–110 (2), V \geq 110–105 (0), W \geq 115–120 (1), X \geq 120–125 (1), Y \geq 125–130 (1) and Z \geq 130 (1). Conventionally, mild group [MLG] was A + B (118); moderate group [MDG] was C + D + E (143) and severe group [SVG] was F to and including Z (291 = N3). As the percentage N3/N2 of SVG = 52.71% of SVG, more than doubled 21.37% of MLG and 25.9% of MDG, one may consider splitting the SVG at the median AHI of 55.05 (range 30–131.2). Therefore, by splitting numbers of conventional N3 from K + sub-groups onwards, ‘new SVG’ subjects (AHIs \geq 30–55) would number 143 and ‘new very severe group’ subjects (AHIs \geq 55) would number 148 (new cut-off point at 55).

Conclusion: (1) Supplementary 26 A–Z sub-grades for severity of AHI indexes for OSA adults are feasible and may be helpful in communication; and (2) SVG (N3) is splittable at the median AHI of 55.05; and if so, the numbers of four groups are: 118 mild, 143 moderate, 143 severe and 148 very severe.

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Severity grading of lowest oxygen desaturations among adult snorers with OSA and abnormal apnea–hypopnea indexes: Alphabet minor groups and major groups

K. Muntarbhorn, S. Kunachak

Department of Otolaryngology, Ramathibodi Hospital, Mahidol University, Rama Vi Road, Bangkok 10400, Thailand

Introduction: Severity grading of lowest oxygen desaturations among adult snorers with OSA and abnormal AHIs has been posing quite a problem; here, lowest desaturations (LDs) are abnormal if $<$ 90% [different to SaO₂ $<$ 95% as abnormal among normal population].

“Is it feasible to use alphabet groups for severity grading of LDs?”

Materials and methods: As mean SaO₂ of adult snorers with normal AHIs had been 91.77 (median 91.1, SD \pm 5.78), our abnormal cut-off point became 90% for this new “alphabet” grading system. Differences of 5% (LDs) differentiated groups: A group \leq 90–85%, B $<$ 85–80% . . . to R group \leq 5%; and, there were 18 groups (minor groups).

In English communication, grade B [lower-order-in-alphabet] is commonly understood as worse than grade A, etc.

Detailed and prospectively collected data of the second author’s patients at the “Snore” Clinic at the Outpatients’ Department of the Department of Otolaryngology, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Bangkok between January 1, 2001 and January 1, 2010 were used to test the research question.

For convenient consecutive sampling, inclusion criteria included (i) primary snorers, (ii) patients of Department of Otolaryngology, and (iii) OSA. Exclusion criterion was “under 18

years”. After exclusion, there remained 613 subjects: 402 males and 211 females (1.9M: 1F) with mean age of 47.03 years, SD \pm 10.58 and 95% CI 46.37–47.69.

Their polysomnographic records were reported by specialists (not by current authors) [international rules e.g. manuals for scoring sleep before 2012]. The senior author (KM) devised and analyzed A–R groups and major groups. Sleep technicians recorded the LDs.

Results: Out of 613 subjects, 187 did not have abnormal LDs. Among 426 subjects with abnormal LDs, “alphabet” minor groups (subject numbers) in increasing order of magnitude severity of LDs were: A $<$ 90–85% (143), B $<$ 85–80% (110), C $<$ 80–75% (75), D $<$ 75–70% (33), E $<$ 70–65% (17), F $<$ 65–60% (8), G $<$ 60–55% (16), H $<$ 55–50% (9), I $<$ 50–45% (8), J $<$ 45–40% (4), K $<$ 40–35% (0), L $<$ 35–30% (1), M $<$ 30–25% (1), N $<$ 25–20% (0), O $<$ 20–15% (0), P $<$ 15–10% (0), Q $<$ 10–5% (1), R $<$ 5% (0).

Among 426 subjects (within A–R groups), groups with higher numbers (numbers in parentheses) were A (143), B (110) and C (75) [only 1 subject in L or M or Q; and, no subject in K, N, O, P and R groups].

In considering median of 82.25% (mean 78.74%, SD \pm 11.853, 95%CI 77.616–79.867), one was unable to classify these groups into three exact major categories i.e. mild, moderate and severe. However, one was able to classify the results into two major groups with abnormal LDs: (i) major group with less severe abnormal LDs (e.g. minor group A) and (ii) major group with more severe abnormal LDs (e.g. minor groups C and more) [minor group B = in-between].

Conclusion: (1) Cut-off point between major groups was median lowest desaturation at 82.25%; (2) LDs for less severe major group were $<$ 90–82.25% unlike LDs of $<$ 82.25% for the more severe major group; and (3) for grading, A–R minor groups and two major groups are suggested for better communication and academic publications.

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Comparison of mouth leaks during CPAP titration between long term adherence and non-adherence patients with mouth dyssness

M. Nakauchi, S. Nonoue, T. Kato, Y. Shigedo, Y. Kabeshita, H. Adachi, A. Mikami

Osaka University Hospital Sleep Medicine Center, Japan

Introduction: Mouth dryness is a common clinical complaint in OSA patients under nasal continuous positive airway pressure (nCPAP) therapy. The aim of this study is to compare mouth leaks during CPAP titration in the adherent and low-adherent OSAS patients with a complaint of mouth dryness.

Materials and methods: Retrospective analysis was done for 15 patients (age 68 \pm 13 [mean \pm SD] years; two females; body mass index (BMI) 25 \pm 5 kg/m²) who had moderate-to-severe OSAS (apnea hypopnea index (AHI) 38 \pm 16/hour). They complained of mouth dryness at clinical followed-up more than 3 months after the CPAP usage. Patients were divided into two groups, adherence (n = 8, F1; M7) and low-adherence groups (n = 7, F1; M6) according to the following criteria: CPAP was used for $>$ 4 hours per night over 70% of the 30 days prior to the follow-up. Sleep and respiratory variables were scored according to the standard method for the diagnostic and CPAP titration PSG data. On the CPAP titration night, mouth leaks were scored as ‘truncated’ expiratory CPAP flow with a nasal mask. Mouth leak period (MLP) was assessed as the percentage of total sleep time.

In addition, the number of mouth leaks during arousal (MLA) was counted and MLA event index per hour of sleep was calculated.

Results: Adherence and low-adherence groups did not differ for age, sex distribution, BMI. Time for follow-up after the beginning of CPAP therapy did not differ between the two groups. Adherence group used CPAP significantly longer (6.3 ± 0.9 [mean \pm SD] hours per night) compared with low-adherence group (4.4 ± 1.3 hours per night) ($p = 0.01$). Minimum and maximum CPAP pressure did not differ between the two groups. On the diagnostic PSG and CPAP titration nights, two groups did not differ for sleep and respiratory variables. However, on the CPAP titration night, MLA occurred more frequently in low-adherence group (4.2 ± 3.1 /hour) than in adherence group (8.8 ± 3.8 /hour) ($p = 0.03$) although no significant difference was found for MLP.

Conclusion: Frequency of mouth leaks during arousal can be associated with a low CPAP adherence in OSA patients with a complaint of mouth dryness.

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Prospective study of patients undergoing polysomnography

D. Ramachandran, D. Devaraj

St. John's Medical College & Hospital, Bangalore, India

Introduction: A small proportion of patients attending a pulmonary medicine clinic undergo polysomnography. Most of the studies from India have been retrospective. Hence this study was undertaken to study the profile of patients undergoing polysomnography.

Materials and methods: All patients undergoing polysomnography over 1 month period were administered the questionnaire and examination with regard to BMI, neck circumference and Mallampatti score was done. Patients underwent polysomnography in the sleep lab and some of them unobserved level 3 sleep study in the ward. Scoring and classification of obstructive sleep apnoea (OSA) were as per AASM recommendations. The results were analyzed using SPSS.

Results: Fifty patients underwent sleep study in 1 month period.

There were 31 males and 19 females. Most of them were in the age group of 50–60 (20 of 50).

Obesity was noted in 40% of them (BMI > 30). Physician initiated sleep study was done in 76% (38) of subjects. The predominant symptom noted was snoring in all subjects followed by choking spells (72%) and apnoeic spells in 66%. Excessive day time sleepiness (EDS) was noted in 38 of the subjects. Difficulty in concentration was noted in only 18 subjects. Nocturia was noted in 29 subjects. Mallampatti score was greater than 3 in 38 (76%) subjects. Most of the sleep studies 76% were initiated by the physician. twenty-seven subjects were hypertensive and 24 (88%) of them had severe OSA.

Epworth sleepiness score was greater than 10 in 33 of the 50 subjects, but Berlin questionnaire score was in the high risk range for all the patients. All the patients had obstructive sleep apnea (OSA). Maximum Apnea Hypopnea Index (AHI) was 150 and the lowest was 11. Nocturnal desaturation was noted in all the patients with lowest being 65%. The neck circumference correlated with the AHI better than the BMI.

Conclusion: Good history and Berlin Questionnaire had good predictive value. In spite of having sleep related problems, sleep studies were physician initiated because they are accepted as related to old age. Hence in a developing country like India a high index of suspicion would help identify people who would benefit from sleep study.

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Transcutaneous carbon dioxide during sleep-disordered breathing

V. Rimpilä¹, T. Saaresranta², K. Hosokawa³, H. Huhtala¹, A. Salminen¹, O. Polo⁴

¹ University of Tampere, Finland

² University of Turku, Finland

³ Unesta Research Center, Finland

⁴ Tampere University Hospital, Finland

Introduction: Sleep state is associated with increase in arterial as well as transcutaneous CO₂ (tcCO₂) levels. Carbon dioxide level is a key respiratory controller. We studied the levels of tcCO₂ during normal breathing at night and during various forms of sleep-disordered breathing (central, obstructive, mixed apnea, hypopnea, flow-limitation).

Materials and methods: We analyzed 555 clinical cardio-respiratory recordings, which had been performed to diagnose or exclude sleep-disordered breathing in symptomatic patients. The recordings were screened for sequences of apnea, hypopnea or flow limitation as well as for sequences of normal breathing during wakefulness and sleep. Apnea/hypopnea sequence was determined as 10 consecutive events or 5 minutes, and at least 50% of individual events with the predominant type. Sequences of stable flow-limitation were included if apnea/hypopnea sequences were also present. A linear drift correction was employed to match the tcCO₂ levels during wakefulness in the evening and during wakefulness in the morning after wake-up.

The average tcCO₂ levels during sequences of SDB were expressed as percentage of the tcCO₂ range observed between the tcCO₂ level during wakefulness (0%) and that during normal breathing during sleep (100%). The arterial oxyhemoglobin saturation (SaO₂) during the analyzed sequences was also calculated.

Results: Forty-four patients (34m/10f) with 88 sequences were included to the study. Mean age was 53 (range 32–70) Mean apnea-hypopnea-index (AHI) was 21.8/h, of which hypopnea-index was 13.4/h. Relative TcCO₂ levels increased in the following order: wakefulness (0%), mixed sleep apnea (43.2%) central sleep apnea (48.9%), hypopnea (62.4%), obstructive sleep apnea (88.6%), steady breathing (100%) and flow-limitation (132.9%). TcCO₂ was higher during flow-limitation than any other type of SDB ($p = 0.004$), tcCO₂ was lower during CSA than OSA ($p = 0.023$) and hypopnea lower than steady breathing ($p = 0.003$)

During the sequences of apnea, hypopnea or flow-limitation the SaO₂ levels were similar at the start. Desaturation was more marked during the obstructive and mixed apnea than during hypopnea. During flow-limitation, the SaO₂ levels did not differ from those during normal breathing during sleep.

Conclusion: The tcCO₂ during apnea/hypopnea sequences are higher than during wakefulness but lower than during normal breathing in sleep. During flow-limitation, the tcCO₂ increases above the levels observed in normal breathing. Our results suggest that the control of breathing is essentially different during sleep apnea and hypopnea and during flow-limitation.

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Impact of maxillo-mandibular advancement on quality of life in OSAS patients

F. Laganà¹, D. Rossi², G. Beltramini², M. Romano², A. Russillo², A. Gianni²

¹ Maxillofacial Surgery Ospedale San Martino Genova, Italy

² Maxillofacial Surgery and Odontostomatology Policlinico Di Milano Fondazione Ca' Granda Università Degli Studi Di Milano, Italy

Introduction: The aim of this study is to investigate the impact of maxillo-mandibular advancement on quality of life in OSAS patients that underwent surgery between 2005 and 2012.

Materials and methods: Eleven OSAS patients that underwent surgery participated in the study.

Data collection consisted of self-administered questionnaires incorporating Epworth sleepiness scale, The MOS 36-Item Short Form Health Survey (SF-36 Quality of life questionnaire), Short Form Oral Health Impact Profile (OHIP-14) and Calgary Sleep Apnea Quality of Life Index (SAQLI).

Results: The ESS have found improvements in all patients treated (before ESS: 10.5; post surgery ESS 4.09); the OHIP is the questionnaire which recorded the lowest number of improvements (average pre surgery OHIP: 15.64; average post surgery OHIP 19.36); the SF-36 gave overall good results.

Conclusion: The study that we have performed has shown us how that this syndrome affects the life of the patients, allowing to emphasize that maxilla-mandibular advancement can undoubtedly improve the quality of life in all its aspects.

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Phenotyping obstructive sleep apnea

M. Ruthransan, A. Am

Institute of Respiratory Medicine, Malaysia

Introduction: Ventilatory instability plays a role in the pathophysiology of obstructive sleep apnea. Ventilatory instability tends to occur when there is a high ventilatory drive. The concept of loop gain has been used to explain ventilatory instability.

Materials and methods: To highlight the importance of recognising phenotypes of Obstructive sleep apnea patients who would benefit from combination therapy with continuous positive airway pressure (CPAP) and acetazolamide. Case study of a patient who was treated with combination therapy.

Results: A 30 years old intern presented with a history of excessive daytime sleepiness, witnessed apnea and unrefreshed sleep. He had a body mass index of 33 kg/m² and a neck circumference of 42 cm. His Epworth Sleepiness scale (ESS) recorded 17/24. His arterial blood gases were normal. He was not on any other medications. He underwent a full overnight polysomnograph which showed severe obstructive sleep apnea with apnea-hypopnea index of 65.7/h with central apnea index of 21.2/h and obstructive index of 43.8/h. His central apneas occurred predominantly in the NREM stage His MRI brain, spirometry and echocardiogram were normal. He was subsequently put on (CPAP) but the apneic events persisted. We subsequently prescribed him with acetazolamide 250 mg 1 hour before sleep and then was put on Continuous Positive Airway Pressure which showed a reduction in apnea index, total duration of apnea and improvement in his daytime sleepiness as assessed by ESS.

Conclusion: It is important to recognise phenotypes of obstructive sleep apnea with a high loop gain mechanism as a combination of medications and CPAP achieves a better outcome.

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Prevalence of excessive sleepiness and insomnia in relation to severity of obstructive sleep apnea

I. Saxvig¹, S. Lehmann², S. Gulati², H. Aurlien², S. Pallesen³, B. Bjorvatn¹

¹ Center for Sleep Medicine and Norwegian Competence Center for Sleep Disorders, Haukeland University Hospital, Norway

² Center for Sleep Medicine, Haukeland University Hospital, Norway

³ Department of Psychosocial Science, University of Bergen and Norwegian Competence Center for Sleep Disorders, Haukeland University Hospital, Norway

Introduction: Obstructive sleep apnea (OSA) may often co-occur with other sleep-related symptoms. Whereas an association with excessive sleepiness has been widely recognized, a possible association with insomnia has received less focus. The aim of the study was to investigate the prevalence of insomnia and excessive sleepiness in relation to OSA severity.

Materials and methods: The sample comprised 1115 patients referred to a university hospital on suspicion of OSA. Mean age was 48.4 ± 13.4 years and 70.8% were male. OSA was diagnosed based on polygraphic sleep studies and classified according to the apnea-hypopnea index (AHI) as no OSA (AHI < 5), mild OSA (AHI 5–14.9), moderate OSA (AHI 15–29.9) or severe OSA (AHI ≥ 30). Excessive sleepiness was measured using Epworth Sleepiness Scale (ESS), a score ≥ 11 indicating excessive sleepiness. Insomnia was measured using the Bergen Insomnia Scale (BIS), which allows identification of insomnia according to both the old (DSM-IV, ICSD-2) and the new (DSM-V, ICSD-3) diagnostic criteria. Both questionnaires are validated in Norwegian. Data were explored using Pearson chi-square as well as bivariate logistic regression analyses with OSA severity (0 = AHI < 15, 1 = AHI ≥ 15) as the dependent variable.

Results: Among the patients referred to the hospital on suspicion of OSA, no OSA was found in 40.6% of the patients, whereas 29.8% had mild, 16.2% had moderate, and 13.4% had severe OSA, yielding a prevalence rate of OSA of 59.4%. The prevalence of excessive sleepiness increased steadily from 40.5% in the no-OSA group to 46.5% in the mild-OSA group, 52.0% in the moderate-OSA group and 58.0% among patients with severe OSA (p = 0.001). Insomnia on the other hand did not increase in prevalence depending on OSA severity. Using the old criteria, insomnia was found in 78.8% in the no-OSA group, 79.3% in the mild-OSA group, 74.3% in the moderate-OSA group and 76.3% in the severe-OSA group (p = 0.56) whereas, using the new diagnostic criteria, insomnia was found in 52.2% in the no-OSA group, 54.9% in the mild-OSA group, 48.5% in the moderate-OSA group, 44.6% in the severe-OSA group (p = 0.13). The logistic regression analyses showed that excessive sleepiness was positively associated with OSA severity with odds ratio 1.60 in the crude analyses (95% CI 1.23–2.08). Insomnia based on the new criteria was negatively associated with OSA severity with odds ratio 0.73 (95% CI 0.56–0.96).

Conclusion: Both excessive sleepiness and insomnia were prevalent in the OSA patients. The prevalence of excessive sleepiness increased with increasing OSA severity. The opposite trend was found for insomnia according to the new diagnostic criteria,

indicating that insomnia complaints were less common in severe than in less severe OSA.

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Hypoxia-inducible 5-eicosatetraenoates are potential markers for diagnosing obstructive sleep apnea

H. Shin¹, K. Cho², C. Rhee³, I. Hong⁴, D. So¹, J. Cho², J. Park¹

¹ Department of Pharmacology, Seoul National University College of Medicine, South Korea

² Department of Clinical Pharmacology and Therapeutics, Seoul National University Hospital, South Korea

³ Department of Otorhinolaryngology-Head and Neck Surgery, Seoul National University Hospital, South Korea

⁴ Seoul Sleep Clinic, South Korea

Introduction: Early detection of obstructive sleep apnea (OSA) is needed to reduce cardiovascular sequelae and mortality. Full-night polysomnography has been used for diagnosing OSA, but it is too expensive and inconvenient to address the increasing number of patients.

Materials and methods: To develop an alternative diagnostic method for OSA, we aimed to search for OSA markers reflecting hypoxic stress during sleep. We collected the first-morning urine from healthy male controls and from male OSA patients and performed metabolome-wide analysis to identify and validate surrogate markers for OSA diagnosis.

Results: Urinary levels of arachidonate derivatives 5-HETE and 5-oxoETE were identified to be higher in OSA patients. Both levels correlated with the apnea-hypopnea index and the lowest oxygen saturation on polysomnography. After OSA patients were treated with continuous positive airway pressure, the metabolite levels were significantly reduced compared with those before treatment. In cultured mononuclear cells, 5-HETE and 5-oxoETE production was induced during intermittent hypoxia depending on hypoxia-inducible factor 1 (HIF-1). When mice were exposed to intermittent hypoxia, 5-HETE and 5-oxoETE were more excreted in urine.

Conclusion: 5-HETE and 5-oxoETE were identified and verified as new OSA markers reflecting hypoxic stress.

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Effects of mandibular advancement devices for the treatment of sleep apnea syndrome based on cardiopulmonary coupling analysis

P. Song¹, H. Lee², Y. Lee², E. Joo³, S. Hong³

¹ Ilsan Paik Hospital, Inje University College of Medicine, South Korea

² Yonsei University, South Korea

³ Samsung Medical Center Sungkyunkwan University School of Medicine, South Korea

Introduction: Although mandibular advancement device (MAD) is considered to be an optional treatment for obstructive sleep apnea syndrome (OSA), it remains unclear whether MAD definitely improves sleep quality. We aimed to assess sleep quality before and with MAD based on cardiopulmonary coupling (CPC) analysis in patients with OSA.

Materials and methods: We enrolled 17 OSA patients who underwent polysomnography (PSG) before and with MAD. Sleep quality before and with MAD was evaluated by repeated PSG and CPC analysis, which was based on electrocardiogram-derived respiration and heart rate variability. Wilcoxon's signed ranks test was performed to compare the differences of CPC parameters (high-frequency coupling, HFC; low-frequency coupling, LFC; very low-frequency coupling, VLFC; and elevated low-frequency coupling, e-LFC) before and with MAD. Spearman's rank correlation analysis was conducted to investigate the differences of CPC parameters with PSG indices (time in bed, TIB; total sleep time, TST; sleep latency, SL; REM sleep latency, REM L; sleep efficiency, SE; apnea-hypopnea index, AHI; respiratory disturbance index, RDI; arousal index, AI; wakefulness after sleep onset, WASO, min. & %; N1%; N2%; N3%; REM %; and lowest oxygen saturation, SpO₂).

Results: Compared with before MAD, the following PSG indices were significantly decreased (TIB: 445.9 to 409.3, $p = 0.028$; AHI: 24.2 to 9.7, $p = 0.001$; RDI: 29.9 to 14.5, $p = 0.001$; AI: 30.4 to 18.7, $p = 0.001$; and N1%: 24.5 to 16.3, $p = 0.006$) and lowest SpO₂ % was significantly increased (84.4 to 88.2%, $p = 0.016$) with MAD. CPC parameters were significantly changed with MAD compared with before MAD (HFC: 34.9 to 47.9, $p = 0.002$; LFC: 48.2 to 32.6, $p = 0.006$; and e-LFC: 29.7 to 13.5, $p = 0.002$). However, no PSG index with MAD was significantly correlated with the changes of any CPC parameters.

Conclusion: Sleep with MAD definitely improves sleep quality based on PSG indices and CPC parameters. Clinical significance of negative correlation results between PSG and CPC values remains undetermined yet.

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Preliminary experiences with remotely controlled mandibular protrusion sleep studies for prediction of oral appliance treatment response in an Australian sleep clinic

K. Sutherland, J. Ngiam, P. Cistulli

Department Respiratory & Sleep Medicine, Royal North Shore Hospital and University of Sydney, Australia

Introduction: Initial investigation of a commercial remote controlled mandibular protrusion (RCMP) device for sleep titration studies has shown good prediction of Mandibular Advancement Splint (MAS) response for Obstructive Sleep Apnoea (OSA). We aim to test RCMP in an Australian sleep clinic and determine if patient-specific phenotypic data enhances predictive utility.

Materials and methods: OSA patients ($AHI > 10 \text{ h}^{-1}$) were recruited for a study of MAS treatment. Dental impressions in temporary advancement trays as well as maximum protrusive range were acquired by the study dentist. Sleep titration during overnight polysomnography was performed according to the manufacturer's instructions. Advancement trays were set at the lower protrusion limit and attached to the RCMP. After sleep onset, advancement in 0.2 mm increments was applied in response to obstructive respiratory events. Advancement continued until obstructive events no longer occurred or the maximum protrusive limit was reached. The RCMP sleep study was scored to obtain an AHI from total sleep time (AHIRCMP) as well as supine-REM sleep (AHIsupineREM) at the maximum advancement level. A prediction of 'success' or 'failure' was made based on the prediction rule adopted in the original study of $AHIsupineREM \leq \text{or} \geq 12 \text{ h}^{-1}$

respectively. Following the RCMP sleep study, patients received a customised two-piece MAS with instructions to incrementally titrate the device over a 2-month acclimatisation period until maximum comfortable advancement limit is reached. Final protrusive limit is confirmed by the dentist and full night polysomnography with MAS in situ is performed to determine MAS treatment response (AHIMAS).

Results: To date 15 RCMP studies have been completed (four females). Patients were on average 54.9 ± 13.1 years [\pm SD] and overweight (BMI 29.0 ± 2.7 kg m²) with AHI 30.4 ± 17.2 h⁻¹ (7 severe, 4 moderate, 4 mild OSA). The RCMP device was not tolerated in one patient. Of the remaining 14 studies, based on the AHISupineREM prediction rule, 7 are predicted “success”, 6 predicted “failure” and 1 “inconclusive” (no REM sleep). AHIRCMP was 7.9 ± 10.0 h⁻¹ (n = 14) with 10/14 achieving maximum protrusion limit during the study night. Nine out of 14 patients achieved an AHIRCMP <5 h⁻¹, 11/14 achieved AHIRCMP <10 h⁻¹ with 50% reduction from baseline AHI and 13/14 achieved 50% reduction in AHIRCMP compared with baseline AHI. Two patients have completed a MAS sleep study to date, both were predicted “failure” based on the AHISupineREM prediction rule. In one patient, AHIMAS was 9.5 h⁻¹ compared with AHIRCMP 13 h⁻¹ (baseline AHI 38.2 h⁻¹) and in the other, AHIMAS was 13.5 h⁻¹ compared with AHIRCMP 7.7 h⁻¹ (baseline AHI 38.2 h⁻¹).

Conclusion: Preliminary work indicates tolerance of the RCMP study and reduced AHIRCMP and two MAS treatment completers have shown a >50% reduction in AHI as indicated by AHIRCMP. Work is ongoing to determine whether the addition of patient-specific phenotypic data can enhance the predictive ability of the RCMP methodology.

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Predictors of initial acceptance of continuous positive airway pressure (CPAP) in obstructive sleep apnea patients after intensive educational–behavioral program

J. Pengjam¹, V. Tantrakul², W. Suwansathit¹

¹ Ramathibodi Hospital Sleep Disorder Center, Thailand

² Ramathibodi Hospital Sleep Disorder Center, Pulmonary and Critical Care Unit, Medicine Department, Ramathibodi Hospital, Mahidol University, Thailand

Introduction: Continuous positive airway pressure (CPAP) therapy is the most cost-effective treatment for obstructive sleep apnea (OSA) to-date. However acceptance for this treatment remained problematic for some patients, despite rigorous effort of trials.

Materials and methods: A prospective observational study conducted at Ramathibodi Hospital Sleep Disorder Center, Bangkok, Thailand during 6 month period. Patients newly diagnosis with OSA, referred for the intensive educational–behavioral program were included. Prescription of CPAP was indicated if patients have AHI ≥ 15 events/hour, regardless of symptoms or AHI 5–15 with co-morbidity or symptoms. The intensive education–behavioral program comprised of educational program regarding OSA, its consequence and treatment with CPAP using audio-visual aids and hands-on demonstration. Behavioral modification and trials of CPAP were given each week, in which patients were allowed to use CPAP weekly at home for three trials. At the end of the program, patients decide by themselves whether or not to get their own machines. During each trial records of CPAP use and questionnaire

assessment were performed. Data are shown as mean and standard deviation (mean \pm SD) if they have normal distribution; non-normal distribution is shown as median and interquartile range (median, IQR).

Results: Two-hundred and forty seven OSA patients (62% male) were included with mean age 55.36 ± 13.0 years, and AHI [median, IQR 41.5 (46.4)]. Overall, 210 (85%) patients accepted CPAP with rates according to OSA severity of 89.8% in severe (AHI ≥ 30); 80.0% in moderate (AHI 15–30); and 70.0% in mild (AHI 5–15) groups, respectively, p = 0.009. While only three patients refused to try any CPAP, rate of acceptance increased with number of CPAP trials (1-trial 77.5%; 2-trials 89.3%; and 3-trials 95.5%, p < 0.001).

Financial coverage affected CPAP acceptance rates; government reimbursement (89.8%); self-affordable (91.3%); and no reimbursement (48.4%), p < 0.001.

CPAP-acceptance and denial groups were similar with regard to gender (male 51.4% versus 64.8%), education level, age (55.85 ± 12.7 versus 52.6 ± 14.4 years), BMI (29.0 ± 5.9 versus 28.2 ± 5.8 kg/m²) and ESS (10.6 ± 4.8 versus 11.2 ± 5.1).

However, CPAP-acceptance group had higher AHI [median, IQR 43.1 (46.5) versus 25.5 (42.1), p = 0.01] and lower minimum O₂ desaturation (78.6 ± 11.1 versus 84.8 ± 8.5 , p < 0.001).

Multivariate analyses for predictors for CPAP acceptance were severe OSA odd ratio (OR) 4.1, 95% CI (1.20–13.88), p = 0.024, financial coverage (self-affordable OR 12.1, 95% CI (3.37–43.31), p < 0.001; government reimbursement OR 8.1, 95% CI (2.91–22.36), p < 0.001), and numbers of trials (two-trials OR 2.8, 95% CI (1.05–7.53), p = 0.04; three-trials OR 8.6, 95% CI (2.09–35.35), p = 0.003).

Conclusion: Intensive educational–behavioral program resulted in high initial acceptance rate of CPAP in OSA patients. Multiple trials of CPAP should be offered as more success occurred with increasing numbers of trials. Predictors of CPAP acceptance were severe OSA and no financial shortage. Alternative OSA treatment should be available for CPAP-denial patients.

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Different protein expression in the serum of Chinese patients with OSA

Z. Wang, X. Wu, Q. Sun, Y. Lv, Y. Piao

The First Hospital of Norman Bethune Medical College of Jilin University, China

Introduction: In order to study the differential protein expression in the serum of Chinese patients with obstructive sleep apnea (OSA), and their correlation to clinical syndroms and the parametre of PSG.

Materials and methods: To establish a database to provide baseline information for the prospective study, we used iTRAQ technology (isobaric tags for relative and absolute quantification) in Northeast of China for a preliminary study. The subjects were divided into groups of non-OSA control group (apnea–hypopnea index, AHI <5) and the OSA group (AHI ≥ 5). OSA group were divided into three subgroups according to the severity of which: A: $5 < \text{AHI} < 15$; B: $15 < \text{AHI} < 30$; C: $\text{AHI} \geq 30$). Blood samples were collected, packaged and frozen in -80 °C. Digestion, iTRAQ4plex labeling and mass spectrometric analysis of proteins were then performed (MALDI TOF/TOF). Subjects included 19 cases in the control group (age: 31–78 years old), 27 patients were included in the OSA group (age: 29–79 years of age). Select highly expressed

proteins, and observed the different protein expression in serum of Chinese patients with OSA.

Results: The results showed that there are different protein expression (Ceruloplasmin, Fibronectin 1, and Apo-B100) between OSA patients and control group; the values were 1.1605 ± 0.6434 , 1.2114 ± 0.8518 , 0.892 ± 0.6207 and 1.5871 ± 0.4416 , 1.6271 ± 0.7057 , 1.2532 ± 0.6218 respectively. The different protein expressions were also related to the severity degree of OSA.

Conclusion: There are different protein expressions in the serum of Chinese patients with OSA, which are also related to the severity degree of OSA.

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Uncovering the sleep disorders among young doctors

R. Yasin¹, D. Muntham², N. Chirakalwasan^{3,4}

¹ Institute of Respiratory Medicine, Hospital Kuala Lumpur and Excellence Center for Sleep Disorders, King Chulalongkorn Memorial Hospital, Thai Red Cross Society, Bangkok, Thailand

² Section for Clinical Epidemiology and Biostatistics, Faculty of Medicine, Ramathibodi Hospital and Excellence Center for Sleep Disorders, King Chulalongkorn Memorial Hospital, Thai Red Cross Society, Bangkok, Thailand

³ Excellence Center for Sleep Disorders, King Chulalongkorn Memorial Hospital, Thai Red Cross Society, Bangkok, Thailand

⁴ Thailand and Division of Pulmonary and Critical Care Medicine, Department of Medicine, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

Introduction: Sleepiness and tiredness are common complaints among young doctors. Sleep deprivation is believed to be the main culprit. However we believe that there may be other sleep disorders which may contribute to these symptoms such as occult obstructive sleep apnea (OSA).

Materials and methods: A prospective cross-sectional study was performed among young doctors with age less than 40 years old working at King Chulalongkorn Memorial Hospital, Bangkok, Thailand and Hospital Kuala Lumpur, Malaysia. The study was conducted during the period of January to September 2014. The primary objective of this study was the evaluation of the prevalence of OSA (AHI ≥ 5). The secondary objectives were the evaluations of the prevalence of OSAS (AHI ≥ 5 + excessive daytime sleepiness (EDS)), sleep deprivation (the difference of weekend and weekday wake up time of more than 2 hours), EDS (Epworth Sleepiness Scale Score ≥ 10), tiredness, and perception of not enough sleep. We also identified the predictors for OSA, OSAS, sleep deprivation, EDS, tiredness, and perception of not enough sleep. All the subjects who fulfilled the inclusion criteria were required to answer a questionnaire and undergo a portable sleep test (ApneaLink Plus) for one night. Only the subjects who completed at least 4 hours' evaluation time of portable sleep test were enrolled in the study. The data from portable sleep test were manually scored by the investigator blinded to the information from pretest questionnaire.

Results: A total of 52 subjects completed the study. Mean age was 31.3 ± 4 years. There was equal gender distribution. Sixty-one percent were Thai and 39% were Malaysian. The mean body mass index (BMI) was 23.3 ± 3.6 . The prevalence of OSA was 40.4% and for OSAS was 5.8%. One third of OSA subjects were at least moderate OSA. Prevalence of sleep deprivation, EDS, tiredness, and perception of not enough sleep were 44.2%, 15.4%, 65.4%, and 61.5%, respectively. Snoring, male sex, and perception of not enough sleep were significant predictors for OSA with the odds ratio of 34.5

($p = 0.016$, 95% CI = 1.92–619.15), 18.8 ($p = 0.001$, 95% CI = 3.10–113.41), and 7.4 ($p = 0.037$, 95% CI = 1.13–48.30); respectively. Only observed apnea was a significant predictor for OSAS with odds ratio of 30.7 ($p = 0.012$, 95% CI = 2.12–442.6). Number of nap per week was a significant predictor for EDS with the odds ratio of 1.78 ($p = 0.007$, 95% CI = 1.17–2.71). OSA and total number of call days per month were significant predictors for tiredness with the odds ratio of 4.8 ($p = 0.036$, 95% CI = 1.11–20.72) and 1.27 ($p = 0.050$, 95% CI = 1.0004–1.61), respectively. OSA was the only significant predictor for perception of not enough sleep with the odds ratio of 4.5 ($p = 0.022$, 95% CI = 1.24–16.59).

Conclusion: Our result demonstrated relatively high prevalence of OSA and OSAS among young doctors. Snoring, male sex, and perception of not enough sleep were significant predictors for OSA. Observed apnea was a significant predictor for OSAS. Interestingly OSA was a significant predictor for tiredness and perception of not enough sleep.

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Anatomical risk factors in obese adolescents with obstructive sleep apnea

H. Yuan¹, Z. Zhang², S. Hua¹, L. Peng¹

¹ The First Hospital of Jilin University, China

² Jilin Province People's Hospital, China

Introduction: The prevalence of obstructive sleep apnea syndrome (OSAS) in adolescents is increasing in conjunction with the rising prevalence of childhood obesity. However, the mechanisms leading to OSAS in obese adolescents are not fully understood. We hypothesized that both obesity and lymphoid hypertrophy would contribute to OSAS in obese adolescents population.

Materials and methods: Adolescents (aged 12–16 years; 28 obese with OSAS, 28 obese without OSAS and 30 lean controls) underwent upper airway magnetic resonance imaging (MRI) following the whole-night polysomnography. Upper airway structure was analyzed by commercial software (AMIRA). One-way ANOVA was used to compare among the three groups. Multiple logistic regression models were used to determine correlation between apnea hypopnea index (AHI) and body mass index (BMI) Z-score with each anatomical characteristic.

Results: We studied 28 obese subjects with OSAS (14.3 ± 1.3 years; BMI Z-score, 2.4 ± 0.4 ; AHI, 22.6 ± 28.9 N/h) and 28 obese control subjects (14.0 ± 1.5 years; BMI Z-score, 2.3 ± 0.4 ; AHI, 0.9 ± 1.8 N/h) and 30 lean control subjects (14.3 ± 1.5 years; BMI Z-score, 0.004 ± 1.1 ; AHI, 0.3 ± 0.4 N/h). Obese OSAS had a smaller nasopharyngeal airway ($P < 0.01$) compared with obese controls and lean controls ($p < 0.05$). However, no significance was found about retropharyngeal airway between the three groups. Obese OSAS had a larger adenoid ($p < 0.01$), tonsils ($p < 0.05$) than the two control groups, Obese OSAS and obese controls had larger tongue than lean controls ($p < 0.05$), and obese OSAS had a larger retropharyngeal lateral walls ($p < 0.05$) and a larger fat pad ($p < 0.05$) than the two control groups. Positive correlations were found between AHI and retropharyngeal lateral walls ($r = 0.601$, $p = 0.000$), AHI and fat pad ($r = 0.474$, $p = 0.000$), AHI and tonsils ($r = 0.554$, $p = 0.002$), AHI and adenoids ($r = 0.414$, $p = 0.000$). Positive

correlations were also found between BMI Z-score and retropharyngeal lateral walls ($r=0.383$, $p=0.004$) and fat pad ($r=0.453$, $p=0.015$). No significant correlations were found between BMI and other tissues.

Conclusion: Both obesity and upper airway lymphoid hypertrophy play roles in obese adolescents with OSAS. Obese controls who did not develop OSAS may have other protective mechanisms besides smaller lymphoid tissues.

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Sympathetic overactivity during NREM sleep stage in patients with arterial hypertension and obstructive sleep apnea

P. Zelveian, A. Aleksanyan, A. Matevosyan, G. Podosyan
Armenia

Introduction: In patients with arterial hypertension (AH) and obstructive sleep apnea syndrome (OSAS) autonomic control disturbance toward parasympathetic inactivation and sympathetic activation may increase cardiac risk.

The aim of this study was to assess the influence of AH associated with OSAS on sympathetic and parasympathetic activity during NREM sleep stage.

Materials and methods: Eighty untreated patients (93.8% male, mean age 47.6 ± 10.8 year, mean body mass index 34.6 ± 5.5 kg/m²), who underwent overnight polysomnography (PSG), were divided into two groups (gr.): gr. I ($n=36$) subjects with OSAS, gr. II ($n=44$) with OSAS and AH (BP $\geq 140/90$ mmHg). Cardiovascular autonomic control was estimated by spectral analysis of heart rate variability (HRV) using the power components in the low-frequency range (LF 0.04–0.15 Hz), and high-frequency range (HF 0.15–0.4 Hz), the LF/HF ratio represented the sympathovagal balance. To assess the NREM sleep stage autonomic abnormalities, we investigated the dynamics of the heart rate variability during this sleep stages. All PSG were done using «Embla N7000» and «Somnologica Studio 4.0» software. The statistical analysis was performed by CIA 2.2.0 software.

Results: Groups were comparable by mean age (47.3 ± 10.9 vs 47.9 ± 10.7 years, $p=0.83$), body mass index (35.3 ± 6.0 vs 33.8 ± 4.9 kg/m², $p=0.23$) and AHI (61.8 ± 28.4 vs 54.9 ± 29.1 events/hour, $p=0.28$). There were no significant differences between groups by LF (7137.4 ± 5400.2 vs 6504.0 ± 9106.3 , $p=0.714$). Were revealed statistically significant higher values of HF (1018.7 ± 507.1 vs 1580.4 ± 1015.7 ($p=0.006$) and lower values of LF/HF ratio (7.4 ± 5.7 vs 5.2 ± 4.4 , $p=0.054$) in patients of gr. II.

Conclusion: AH is an addictive factor in impairment of parasympathetic modulation during NREM sleep in patients with AH and OSA, which results in sympathetic overactivity.

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Effects of peroxisome proliferator-activated receptor (PPAR)delta agonist on sternohyoid muscle in MS model rats

M. Shi¹, L. Zhang¹, X. Diao¹, J. Wang², J. Hao¹, X. Bi¹

¹ Peking University Third Hospital, China

² Peking University Health Science Center, China

Introduction: Chronic intermittent hypoxia (CIH), as well as metabolic syndrome (MS) may cause sternohyoid muscle dysfunction via

oxidative stress. Peroxisome proliferator-activated receptor (PPAR)delta agonist (GW501516) may reduce oxidative stress and increase mitochondrial biogenesis in skeletal muscle. We examined the effects of GW501516 on sternohyoid muscle in MS model CIH rats.

Materials and methods: Seventy eight-week-old male Sprague-Dawley rats were randomly divided into seven groups: the control group, the CIH model group (CIH group), the MS model group (MS group), the MS model exposed to CIH group (CIH + MSgroup), the MS model administration GW501516 group (MS + GW501516 group), the CIH model administration GW501516 group (CIH + GW501516 group), the MS model exposed to CIH administration GW501516 group (CIH + MS + GW501516 group). Isometric contractile and endurance properties of isolated rat sternohyoid muscle bundles were examined in vitro. Stress-frequency relationship was determined in response to electrical stimulation (10–100 Hz in increments of 10–20 Hz, train duration: 300 ms). Muscle performance was also assessed during repetitive muscle stimulation (40 Hz, 300 ms every 2 s for 2.5 min). ATPase staining was performed to determine the percent fiber-type distribution and to measure the cross-sectional area (CSA) of muscle fibers. Myosin heavy chain phenotypes were determined by gel electrophoresis. Real-time RT-PCR and western blotting were performed to determine the expression of IκB kinaseα (IKK-α: a key kinase in the alternative NF-κB pathway), peroxisome proliferator-activated receptor (PPAR)-γ coactivator (PGC) molecules PGC-1α, slow myosin heavy chain isoforms I and IIA in the sternohyoid muscle.

Results: Sternohyoid muscle force and endurance decreased significantly in CIH + MS group when compared with control group, CIH group and MS group ($p < 0.05$, $p < 0.05$, $p < 0.05$). The CSA of type IIA fibers and the proportion of myosin heavy chain IIA in CIH + MS group were significantly lower than those in control group, CIH group and MS group ($p < 0.05$, $p < 0.05$, $p < 0.05$). The expression of both IKK-α protein and IKK-α mRNA in CIH + MS group were significantly higher than those in control group, CIH group and MS group ($p < 0.05$, $p < 0.05$, $p < 0.05$). The mRNA level of peroxisome proliferator-activated receptor (PPAR)-γ coactivator (PGC) molecules PGC-1α, slow myosin heavy chain isoforms I and IIA in the sternohyoid muscle decreased significantly in CIH + MS group when compared with control group, CIH group and MS group ($p < 0.05$, $p < 0.05$, $p < 0.05$). However, GW501516 can partially reverse the effects of CIH, MS and CIH + MS on muscle force and endurance, fiber-type distribution, cross-sectional area (CSA) of muscle fibers and myosin heavy chain phenotypes, the expression of IKK-α, PGC-1α, slow myosin heavy chain isoforms I and IIA in sternohyoid muscle.

Conclusion: CIH associated with MS may produce more significant effects on upper airway muscle dysfunction induced by alterations in the structure due to decrease in mitochondrial biogenesis, via NF-κB pathway than either CIH or MS, contributing to OSA; GW501516 may partially reverse the above effects to improve OSA.

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Short night sleep duration is associated with type 2 diabetes in a case control study

M. Al-Abri, S. Al-Sinani, D. Jaju, K. Al-Hashmi, M. Hassan,

A. Al-Mamari, S. Al-Yahyai, S. Al-Barwani, R. Biyomi

Sultan Qaboos University Hospital, Oman

Introduction: Sleep is very vital for glycaemic control in humans. Sleep deprivation is associated with impaired glycaemic control but it has not been studied among diabetics. The aim of the study was to evaluate the association of short nocturnal sleep in the development of type 2 diabetes mellitus (T2DM).

Materials and methods: This was a case control study conducted between January 2010 and May 2012 in Sultan Qaboos University Hospital (Oman Diabetes study). Diabetic patients were recruited and consented from diabetic clinic. Patients were matched with age–sex healthy controls. All participants were asked to answer Berlin questionnaire and Epworth Sleepiness Scale (ESS). They were also asked to fill in a diary about their sleep timing and habits. Blood tests including fasting glucose, HbA1C, lipid profile were also collected from patients and controls.

Results: The total number of participants was 591 (241 patients and 350 controls, 325 women and 266 men). The mean age of the study population was $51 \pm \text{SD } 10$ with mean BMI of $30 \text{ SD } \pm 7$ with no significant difference between diabetic and control ($p > 0.05$). There was significant association between type 2 diabetes mellitus and nocturnal sleep of less than 5 hours ($p = 0.01$) with significant difference between patients ($6.4 \pm 1.2 \text{ h}$) and controls (6 ± 1.5) ($p = 0.01$). There was no significant association between daytime napping and diabetes ($p = 0.08$), neither with ESS score ($p = 0.3$).

Conclusion: The study showed that short night sleep is associated with impaired glycaemic control and consequently development of T2DM.

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The effect of a modest delay in school start time on Hong Kong adolescent sleep and daytime functioning

N. Chan, M. Yu, C. Tsang, S. Lam, J. Zhang, Y. Wing
Department of Psychiatry, Faculty of Medicine, The Chinese University of Hong Kong, Hong Kong

Introduction: During adolescence, teens experience a circadian phase shift, presenting with later bedtime and wakeup time. However, early school schedule is in direct conflict with the delayed circadian. Current study aims to examine the effect of a modest delay in school start time on adolescent sleep and health.

Materials and methods: We recruited study subjects from a educational public secondary school in Taipo, Hong Kong. A total of 674 students (response rate: 93.3%; boys: 56%; mean \pm SD: 14.8 ± 1.63) participated in this study. The school start time was delayed by 15 minutes from 7:45 am to 8:00 am after the baseline assessment. Students' sleep–wake pattern, daytime behaviors and attention were assessed via sleep-related questionnaire and computerized continuous performance task before and after the intervention.

Results: After school delayed their start time, there was a significant delay in students' school day wakeup time ($6:38 \pm 0:24$ vs $6:47 \pm 0:26$; $p < 0.001$) but also a slight delay in their bedtime ($23:13 \pm 0:56$ vs $23:18 \pm 0:56$; $p < 0.05$). Consequently, there was no significant difference in the overall weekday sleep duration ($7.42 \text{ h} \pm 0.98$ vs $7.47 \text{ h} \pm 0.98$, $p > 0.05$). Nonetheless, the percentage of students rated themselves as having sufficient sleep increased from 29.3% to 37.3% ($p < 0.001$). They also reported shorter sleep onset latency ($p < 0.05$) and lesser problem with falling asleep (6.3% vs 3.5% , $p < 0.05$). In addition, tardiness rate (late for school) was also reduced compared with baseline data ($p < 0.05$).

Conclusion: Later school start was associated with improvement in student perception toward sleep sufficiency, better sleep quality, and improved school punctuality. Current findings have significant implications toward the education policy, suggesting that school administrators and policy makers should consider delaying school start time to promote well-being and functioning of growing adolescents.

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Sleep duration in 45- to 69-year-old population in Russia

V. Gafarov¹, I. Gagulin¹, E. Gromova², D. Panov², A. Gafarova²

¹ Collaborative Laboratory of Cardiovascular Diseases Epidemiology SB RAMS, Novosibirsk, Russia

² FSBI Institute of Internal and Preventive Medicine SB RAMS, Novosibirsk, Russia

Introduction: Purpose of our study was to elucidate the characteristics of the sleep duration in 45- to 69-year-old male population of the city of Novosibirsk (Siberia, Russia).

Materials and methods: A study included a randomized representative sample of 45- to 69-year-old male population ($n = 556$). The sleep disturbances were studied via test designed by C. D. Jenkins et al. by using the four-item Jenkins Sleep Questionnaire (JSQ). Respondents were asked to answer the test questions: questions 1–4 were designed to evaluate the quality of sleep; question 5 was designed to assess the duration of sleep.

Results: Sleep duration of less than 5 hours per night was found in 5% of population; sleep duration of more than 10 hours per night was detected in less than 2% of population. Extreme and pronounced abnormalities in the sleep duration were found in 61% of population. Data showed high prevalence of the sleep disturbances associated with a high level of psychosocial factors in the study population. The study demonstrated a great demand in prevention of the sleep disturbances in 45- to 69-year old men population.

Conclusion: In 45- to 69-year-old male population in Russia, high prevalence of sleep disturbances in the categories of sleep duration was associated with high prevalence of psychosocial factors.

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Effects of chronic caffeine administration at two different times of the day on sleep in rat

J. Ji-Young¹, R. Mootaeak¹, L. Ho-Won², S. Kyoungho¹,

H. Jeoung Hee¹, L. Maan-Gee¹

¹ Department of Pharmacology, School of Medicine and Brain Science and Engineering Institute, Kyungpook National University, Daegu, South Korea

² Department of Neurology, School of Medicine, Brain Science and Engineering Institute, Kyungpook National University, Daegu, South Korea

Introduction: We compared the effects on sleep parameters of chronic caffeine administration in the morning and in the evening to determine whether sleep disturbances are differentially affected by caffeine administration at different times of the day, in the morning and in the evening.

Materials and methods: Fifteen male Sprague-Dawley rats were divided into two groups: the morning group ($n = 7$) had received caffeine (5 mg/kg, i.p.) at 09:00 of the day of recording, and the evening group ($n = 8$) had received at 19:00 the day before recording. Rats had received caffeine daily for 15 days. Electroencephalogram (EEG) and vibration were recorded for 8 hours (from 09:30 to 17:30; which

was divided into four 2-hour segments) before caffeine administration (d0), the days after the 1st (d1), 2nd (d2) and 15th (d15) injections, and on the subsequent day (d16). Sleep–wake cycles, wake (W), slow-wave sleep (S) and paradoxical or rapid-eye movement sleep (P), were scored every 10-s epoch by EEG and vibration patterns. Sleep parameters, total duration, mean duration and number of episode, and latencies to S and P were derived. Delta power (0.5–4 Hz), a marker of sleep depth, was calculated by EEG spectral analysis.

Results: A few sleep parameters were changed after chronic caffeine administration. Total S duration was significantly higher in the morning group than in the evening group. Other total durations were not different between the groups. Number of W episode was significantly higher in the morning group than in the evening group. Numbers of other episodes were not different between the groups. Frontal delta activity was lower only in the last fourth segment of the recording in the morning group than in the evening group. Parietal delta activity was lower in the third and fourth segments of the recording in the morning group than in the evening group.

Conclusion: These results indicate that chronic caffeine administration at the beginning of rest period affects normal sleep–wake cycle.

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The association between sleep duration and obesity in Korean adolescents: 2010–2012 Korean National Health and Nutrition Examination Survey

Y. Jeong¹, J. Lee¹, K. Han², B. Choi¹, W. Seo¹

¹ Department of Pediatrics, Ansan Hospital, Korea University Medical Center, South Korea

² Department of Biostatistics, College of Medicine, Catholic University, South Korea

Introduction: Sleep and obesity have become major health problem, especially for children because sleep affect children's growth and development and childhood obesity is an important risk factor for multiple medical consequences in adulthood.

The aim of this study was the association between obesity and sleep duration in Korean adolescents.

Materials and methods: We investigated the association between self-reported sleep duration and obesity among 1965 Korean boys and girls aged 10–18 years, who participated in the Korean National Health and Nutrition Examination Survey in 2010, 2012 (KNHANES IV).

Association between sleep duration and body mass index (BMI) and waist circumference (WC) were examined by ANCOVA with adjustment for covariates. (age, smoke, drink, exercise).

Results: One thousand sixty-three males and 902 females aged 12–18 years and older were selected in all the 16 administrative districts of South Korea. Mean ages was 15.1 ± 0.1 (SE). Mean self-reported sleep duration was 7.1 hours.

There was an inverse graded relationship between sleep duration and BMI and WC in boys. They showed that mean BMI of ≥ 9 hours sleep was 20.5 ± 0.36 , while mean of < 5 hours sleep was 21.81 ± 0.53 (p for trend = 0.057). And mean WC of ≥ 9 hours sleep was 70.28 ± 0.93 , while mean of < 5 hours sleep was 73.97 ± 1.4 (p for trend = 0.0014).

In girls, the only significant differences association between sleep duration and BMI.

Conclusion: To our knowledge, this is the first study to examine the relationship between sleep duration and WC in Korean adolescents. In boys, short sleep is associated with high BMI.

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