101. Technology, screening and questionnaires in OSA

Positional obstructive sleep apnea (OSA) and automatic positive airway pressure (APAP) therapy
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Introduction: Recent studies have shown that respiratory events that occur during sleep in supine position have a high prevalence in mild and moderate OSA patients.

Objectives: To determine the prevalence of positional OSA in patients with mild to moderate OSA; Compare biometric characteristics and response to APAP between positional and nonpositional OSA patients.

Methods: 404 polysomnographies (Embla S7000) were analyzed by an experienced technician.
Positional OSA was considered when AHI normalized in the nonsupine position (AHI ≤ 5 events per hour of sleep). Patients who adapted APAP were evaluated one month after starting treatment.

Results: We studied 126 patients, 65% male, with a mean age of 53±11.7 years and a mean RDI of 14.3±6.1 respiratory events/hour.
Prevalence of positional OSA was 53.2% in the total group (56.8% in mild patients and 48% in moderate patients).
Thirty four out of 66 patients with positional OSA adapted APAP, 22 (64.7%) had no compliance to therapy and 12 (35.3%) had a mean compliance rate of more than 4.5 hours.
Correlation of TST by SWA and NPSG, in a population with and without OSA. Correlation coefficient for TST were determined between SW A and NPSG. Calculation of TST could improve the accuracy of a level 3 diagnostic device.

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Nocturnal polysomnography (PSG) is the gold standard for SAHS diagnosis. Despite its high diagnostic performance, PSG presents some drawbacks since it is complex, expensive and time-consuming. Simplified diagnostic techniques are desirable. This study proposes a novel method to estimate the AHI based on automated analysis of oxygen saturation data using signal-processing methods as multivariate adaptive regression splines (MARS).

Patients and methods: 240 patients were included in the study. The patients were randomly divided into a training set (86%) and 20% test set for all subjects and in the OSA subgroups. The determination of TST by SWA in a population with severe OSA is likely to be unreliable. NPSG remains the gold standard for determination of TST.

The highest accuracy of both algorithms was achieved for a decision threshold of 30 h-1, which represents a more conservative definition of SAHS. The MARS model achieved a decision threshold of 93.75% (97.70 – 89.80) whereas the MSLR model achieved 90.28 (95.12 – 85.44).Fig. 1 show Bland-Altman plots for MSLR and MLP models.

Conclusions: The proposed MLP based model could be used as an accurate method for SAHS diagnosis. Our results indicate a high agreement between actual and predicted AHI by MARS.

P901
Correlation of total sleep time (TST) by SenseWear Armband (SWA) and nocturnal polysomnography (NPSG), in a population with and without OSA


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Portable devices that determine TST may act as an adjunct to level 3 diagnostic tests for OSA. The SWA is such and measures TST using a proprietary algorithm. Calculation of TST could improve the accuracy of a level 3 diagnostic device.

Aim: Correlation of TST by SWA and NPSG, in a population with and without sleep apnoea.

Methods: 89 consecutive patients undergoing NPSG because of a suspicion of OSA were an SWA on the same night. Patients were stratified by the presence and severity of OSA. Correlation coefficient for TST were determined between SWA and NPSG for all subjects and in the OSA subgroups.

The prevalence of a normal PSG, mild moderate and severe OSA was 22 (24.7%), 31 (34.8%), 12 (13.4%) and 24 (26.9%) of 89 subjects. and the respective correlation coefficients were r=0.68, 0.74, 0.85 and 0.25. Clinically important differences are presented with Bland-Altman plots (Fig. 1 & 2).

Correlation of TST between the two methods was weakest in those with severe OSA. The determination of TST by SWA in a population with severe OSA is likely to be unreliable. NPSG remains the gold standard for determination of TST.

P902
The ‘Sleep-Disordered Breathing in Patients with Neuromuscular Disease’ questionnaire (SINQ-5) – Clinical usefulness in a tertiary referral centre

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Introduction: Patients with neuromuscular disease (NMD) are at risk of developing sleep-disordered breathing (SDB) with hypercapnic respiratory failure. We hypothesised that the SINQ-5 score may be useful to assess patients who are ventilated for NMD with SDB.

Methods: We screened patients attending a tertiary referral centre for investigation of SDB, administering the SINQ-5 (range 0-10 points, lower scores indicating fewer symptoms). The questionnaire contains five questions related to breathlessness, sleep and posture (Steier et al. Eur Respir J. 2011): 236 (105 female) patients had complete data sets. Treatment was defined as either continuous positive airway pressure (CPAP) or non-invasive ventilation (NIV). Results were compared using the Mann-Whitney U independent t-test.

Results: 141 patients had obstructive sleep apnoea and obesity hyperventilation syndrome (score 4.1 (2.7)), 51 had NMD (3.5 (2.8)), 16 had chronic obstructive pulmonary disease (COPD, 4.3 (2.6)) and 6 had chronic heart failure (CHF, 5.7 (2.8)). 52 patients had no evidence of SDB (4.4 (2.7)). 28 patients had NMD with SDB; 26 of those were treated for SDB with a total score of 2.9 (2.5) points; 2 were untreated, scoring 4.0 (0.0) points. Patients with NMD without SDB did not differ from those with SDB as they were controlled on treatment (p=0.3) or from Snorers without SDB (p=0.53).

Conclusion: NMD patients with controlled SDB are likely to score similarly to those without SDB and lower than other groups. In order to further address its clinical usefulness it is necessary to follow up and correlate clinical outcomes to the SINQ-5 scores changes associated with treatment.

P903
Validation of the Greek version of Pittsburg sleep quality questionnaire in a sleep lab population

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The Pittsburg Sleep Quality Index (PSQI) is a widely used questionnaire which evaluates subjective sleep quality over the previous month. The purpose of this study was the validation of the Greek version (PSQI-GR) of the questionnaire both in subjects with or without sleep apnea syndrome (SAS).

Patients and methods: PSQI includes 19 self-report questions in 7 clinically derived domains of sleep difficulties, scored as a single factor with a cut-off <5. We used the PSQI-GR of the questionnaire in 494 subjects with suspected SAS. Three hundred and fifty seven patients were diagnosed as SAS (AHI 41.6±27.5), and 137 with AHI <5 were considered as control group (AHI 2.9± 2.1). In all participants daily sleepiness was assessed by ESS.

Results: For the SAS patients the PSQI-GR global score was 8.2±3.3 and for the control group 4.9±2.3. The ESS was 10.0±9.6 in SAS patients and 4.7±4.2 in the control group. A statistically significant difference was found between the two groups in the global score of PSQI-GR, (p=0.00) and the components of Subjective Sleep Quality (SSQ, p= 0.00), Sleep Latency (SL, p=0.003), Sleep Duration (SD, p=0.00), Habitual Sleep Efficiency (HSE, p= 0.00), Sleep Disturbances (SD, p=0.00), Sleep Medication (SM, p=0.00) and Daytime Dysfunction (DD, p=0.00) but not for the ESS. In the group with SAS a correlation was found between ESS and global score of PSQI-GR (r = 0.20 p= 0.001) and with some of its components SSQ (r = 0.15 p= 0.012), SD (r= 0.25 p=0.00) and DD (r = 0.274 p= 0.000).

Conclusion: PSQI-GR is high in patients with SAS and within the normal range for healthy individuals. The Greek version is a valuable tool both for clinical use and research purposes.

P904
Screening of sleep apnea-hypopnea syndrome in patients with type 2 diabetes

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Introduction: Some studies point to the likelihood of a significant relationship between the type 2 diabetes (DM2) and the sleep apnea-hypopnea syndrome (SAHS). These conditions are considered important public health issues for their morbimortality and high prevalence.

Objectives: Prospective analysis of the prevalence of SAHS in patients with diagnosis of DM2 followed in outpatient primary care (PC).

0.274 p= 0.000). A correlation was found between the two groups. A statistically significant difference was found between the two groups in the global score of PSQI-GR, (p=0.00) and the components of Subjective Sleep Quality (SSQ, p= 0.00), Sleep Latency (SL, p=0.003), Sleep Duration (SD, p=0.00), Habitual Sleep Efficiency (HSE, p= 0.00), Sleep Disturbances (SD, p=0.00), Sleep Medication (SM, p=0.00) and Daytime Dysfunction (DD, p=0.00) but not for the ESS. In the group with SAS a correlation was found between ESS and global score of PSQI-GR (r = 0.20 p= 0.001) and with some of its components SSQ (r = 0.15 p= 0.012), SD (r= 0.25 p=0.00) and DD (r = 0.274 p= 0.000).

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Objectives: Prospective analysis of the prevalence of SAHS in patients with diagnosis of DM2 followed in outpatient primary care (PC).
Obstructive sleep apnoea (OSA) is associated in 80% of the cases with more and longer apnoea/hypopnoea in the supine position. Some effort has been made to find an effective treatment that improves OSA by correcting the sleep position. So far, the most used treatment is avoidance of sleeping supine, although there is a lack of evidence that sleep-disordered breathing due to snoring, and others researchers recently investigated the effect of the head/neck position on OSA. One study found an improvement of the apnoea/hypopnoea index (AHI) and sleep quality after promoting neck extension with a custom fitted cervical pillow (Kushida, C.A. et al. Sleep and Breathing 2001; 5(2): 71-78).

The objective of this study was to assess the effect of cervical positioning on OSA through the use of an adaptive bedding system which promotes neck extension in the supine position. Seven male OSA patients were studied. The group included 2 mild, 3 moderate and 2 severe patients. They spent 3 nights in a sleep center an adaptation, a night of the shoulder-neck region of the bed was automatically adapted to promote neck extension when detecting a supine position of the subject. Sleep and breathing parameters were obtained by means of questionnaires and PSG.

Overall, subjects showed no significant improvement in AHI between the reference (24.1±14.3) and sleeping night (25.4±15.5; p=0.866). However, detailed evaluation identified an improvement in the apnoea index during supine positions in the supine position (REF: 5.3±4.5; AS: 1.3±1.8; p<0.05).

These preliminary findings indicate that the bedding system might improve supine-related AHI, but further experiments are needed.

Impact of continuous, non-invasive blood pressure (BP) measurement on sleep quality during polysomnography (PSG)

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Background: The use of bispectral index (BIS) is a parameter which reflects brain electrical activity (EEG) in a range of values between 0 and 100 as minimum value, no EEG, and 100 as maximum value. We aimed to assess whether the bispectral index (BIS) can be used for identifying sleep and the difference between its stages. Methods: The study was conducted in 14 patients being investigated for sleep apnea/hypopnea syndrome (OSA). A full polysomnography through a night’s sleep was recorded and analyzed manually according to standard criteria for sleep staging. Throughout the process, from initial waking up to awakening, a continuous record of the BIS time-synchronized with the manual analysis of the PSG was performed. The average BIS value every minute was used as the dependent variable in the analysis.

Results: Thirteen patients were diagnosed from OSA, with an apnea/hypopnoea index (AHI) of 53.6±26.1. We analyzed a total of 5.579 minutes with synchronized measurements of BIS and PSG data. Overall, 91% of all EEG records corresponded to sleep period, representing 5.4% of stage 1, 68.9% of stage 2, 15.7% of stage 3-4 and 9.9% REM sleep. The mean BIS value was 88.9±9.5 (mean ± SD) in wakeful state, 84.9±12.4 in stage 1, 77.7±11.4 in stage 2, 96.1±13.4 in stages 3-4 and 76.6±17.7 in REM sleep. Significant differences were observed between wakefulness and in any stage (p<0.001, all). By ROC curve analysis it was identified that a BIS index value of 70 had a sensitivity of 81% and a specificity of 81% for detecting deep sleep stages (3-4).

Conclusions: BIS values decrease during sleep and change according to its stages. BIS values below 70 have a high sensitivity and specificity for detecting deep sleep stages.

Effectiveness of sequential automatic-manual home respiratory polygraphy scoring Juan F. Masa, Jaime Corral, Ricardo Pereira, Joaquín Durán-Cantolla, Marta Caballo, Luis Hernández-Blasco, Carmen Monasterio, Alberto Alonso-Fernandez, Eusebi Chiner, Francisco-José Vázquez-Polo, Jose M. Montserrat. Pulmonology, CIBER de Enfermedades Respiratorias (Ciberes), Pulmonology, General Universitary Hospital, Alicante, Spain

Introduction: The main reason for discontinuing home respiratory polygraphy (HRP) scoring is the potential to confirm the diagnosis of sleep apnea/hypopnea syndrome (SAHS) could be confirmed the diagnostic of sleep apnea/hypopnea syndrome (SAHS)
The negative predictive value was high only in patients with moderate and severe OSA.

P912

Overnight pulse propagation time derived from oximetry is associated with daytime blood pressure in patients with sleep apnea

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Introduction: The state of sleep is characterized by unloading of the autonomic nervous system and represents an opportunity to investigate the properties of the cardiovascular (CV) system. We investigated overnight pulse propagation time (PPT) as an indirect measure of vascular stiffness during sleep and its association with daytime blood pressure (BP).

Methods: The digital pulse wave, derived from finger oximetry, was recorded during sleep in 495 subjects (169 females, age 54±12 y, BMI 30±6 kg/m², AHI 19±2.3/h) referred to five sleep centers. Office BP and established CV risk factors were assessed. PPT was calculated as the time between the top and the subsequent dicrotic notch of the digital pulse wave. Mean PPT across the entire sleep period was calculated.

Results: PPT was associated with age, systolic BP, diastolic BP, the number of apneas and hypoxic events during sleep (r=0.54, 0.19, 0.13, and 0.11, p<0.01 respectively). PPT was lower in patients with hypertension compared to normotensive (160±34 ms vs. 178±67 ms, p<0.001). In a multivariate analysis, PPT was independently associated with age, height, waist, smoking, hypertension (AHI), and diabetes but not sleep apnea severity (AHI).

Conclusions: PPT determined by overnight oximetry reflects daytime BP and presence of hypertension. Assessment of PPT during sleep may be a useful tool for classification of overall CV function and risk.

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P911

STOP-Bang questionnaire as a preoperative screening tool for obstructive sleep apnea in bariatric surgery patients

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Introduction: Excessive daytime sleepiness (EDS) is a common problem with serious consequences for health and social activities of the patients. There is no simple method to reliably quantify sleepiness, and objective methods (Multiple Sleep Latency Test, MSLT; Maintenance of Wakefulness Test, MWT) and subjective ones (Epworth Sleepiness Scale, ESS) are poorly correlated.

Aim: To develop and validate a new sleepiness scale for clinical use in OSA.

Methods: Generation of items: 30 consecutive patients with OSA and their partners were interviewed using focus group techniques and cognitive interviews generating a preliminary list of sleepiness items. This list was reduced to 16 common situations considering the frequency of response and a homogeneous representation of the sleepiness severity. Validation: 30 consecutive patients complaining of snoring or apneas with and without EDS were evaluated with MSLT, MWT, ESS and the list of sleepiness items. A composite of MSLT and MWT was calculated as an objective criterion of sleepiness. Exhaustive regression analysis of all the subsets of the list was performed. Mallows’s Cp minimization was used to choose the best item combination.

Results: Two items (In the morning, when I get relaxed & In the afternoon, while standing in a line) achieved the minimum Cp score and comprised the BSS. The correlation between the BSS and the composite score of MSLT and MWT was 0.51, much higher than that found with ESS (0.23).

Conclusion: Our data suggest that the BSS, a simple sleepiness scale of 2 items, shows the best correlations with objective tests. Support by B0703118.

P914

The role of desaturation index evaluated by nocturnal pulse oximetry in recognition of sleep apnea syndrome in patients with morbid obesity

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Background: The nocturnal pulse oximetry is used as a validated screening method in the diagnostic approach of Sleep Apnea Syndrome (SAS).

Thematic Poster Session
SUNDAY, SEPTEMBER 2ND 2012
Halle A-21 - 12:50 - 14:40

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Aim: To assess the role of nocturnal pulse oximetry as a screening method in subjects with morbid obesity (BMI > 40 kg/m²), knowing that the basal nocturnal saturation is lower in this patients due to hypoventilation in supine position during sleep.

Method: 87 obese (BMI > 40 kg/m²) patients with high pre-test clinical suspicion of SAS (Epworth sleepiness scale > 10, snoring, witnessed apneas) were prospectively evaluated by respiratory polygraphy (pulse oximetry, nasal airflow, thoraco-abdominal movements, body position and snoring). We assessed the correlation between the values of Desaturation Index (DI) and Apnea Hypopnea Index (AHI). The cut-off for independent desaturation was 3%.

Results: 82 patients (94.2%) were diagnosed with SAS (AHI > 5/hour); mean age: 53.1 ± 11.5 years (range 28-79 years); mean BMI: 45.07 ± 5.1 kg/m² (range 40-68 kg/m²). The mean DI was 45.2 ± 26.4/hour and the mean AHI: 44.2 ± 26.1/hour. Mean lowest SaO2 was 67.8 ± 13% and mean average SaO2 was 87.9 ± 7.1%.

There was a significant correlation between DI and AHI (p < 0.001). Also, DI was correlated with lowest SaO2 (p < 0.001) and average SaO2 (p = 0.02).

Conclusion: Desaturation Index assessed by nocturnal oximetry maintains its utility in the recognition of SAS in morbid obese patients with high clinical pre-test suspicion.

P915
The diagnostic value of self-reported symptoms for the detection of sleep apnea syndrome in stroke patients
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Introduction: Sleep apnea syndrome (SAS) is a common sleep disorder in stroke patients and associated with decreased functional recovery, increased risk of recurrent stroke and mortality. Despite the high prevalence and poor functional outcome no guidelines for SAS screening in stroke rehabilitation are available.

Objective: This study evaluated the predictive value of a self-report symptom questionnaire, socio-demographic and clinical variables for detection of stroke patients with a high risk of SAS.

Methods: 306 stroke patients were screened with pulse-oximetry to determine their oxygen desaturation index (ODI). An ODI ≥ 15 was classified as a high risk of SAS. Potential predictors included socio-demographic variables, disease characteristics and self-reported symptoms (snoring, apneas, restless legs, morning headaches, waking up feeling unrefreshed, daytime sleepiness, falling asleep during daytime, fatigue, concentration loss, irritability and mood changes). With univariate logistic regression analysis, the associations between potential prognostic indicators and the primary outcome of ODI ≥ 15 were examined. Significant variables (p-value ≤ 0.20) were selected for a backward multivariate logistic regression and checked for co-linearity.

Results: A high risk of SAS was predicted by gender, body mass index, systolic blood pressure and the presence of the self-reported symptoms apneas, falling asleep during daytime and concentration loss.

Conclusion: The diagnostic value of self-reported SAS symptoms alone is very low in stroke patients. Therefore, socio-demographic and clinical variables should be included in the screening of SAS in stroke rehabilitation.