400. Metabolic and cardiovascular consequences of OSA II

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Usefulness of SD-101 for screening of sleep apnea syndrome

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Objective: The SD-101 is a sheet-like device for screening of sleep apnea syndrome (SAS). It examines sleep disordered breathing by sensing the alterations of body loading corresponding to respiratory movement. Polysomnography (PSG) is the essential monitor for the diagnosis of SAS. However, PSG is not suitable for screening device for all people suspected of SAS. A simple and easy device is needed for screening of many SAS patients. For evaluation of the usefulness of SD-101 in more detail, the accurateness of SD-101 was examined about detection of hypopnea and apnea.
Subjects and methods: Forty four hospitalized patients were enrolled (aged 61.0±13.8, 37 males, Body mass index (BMI) 26.0±4.69kg/m^2). They were examined by both PSG and SD-101. They were classified into two group, hypopnea group (Group H, 17 patients) and apnea group (Group A, 27 patients). Group H had hypopnea index accounted for more than 50% of Apnea Hypopnea Index (AHI). Group A had apnea index accounted for more than 50% and equal of AHI. We evaluated correlation between AHI of PSG with respiratory disturbance index (RDI) of SD-101 in each group.
Result: RDI of SD-101 had very close correlation with AHI of PSG (r 0.886 $p<0.001$). The sensitivity and specificity of the examination using SD-101 were 80% and 100%, respectively. RDI of SD-101 in Group H had lower correlation with AHI of PSG than RDI of SD-101 in Group A. Group H (r 0.548 $p<0.05$), Group A (r 0.886 $p<0.001$) The sensitivity of Group H (66.6%) was lower than that of Group A (88.0%).
Conclusion: RDI of SD-101 has very close correlation with AHI of PSG, however SD-101 may not detect hypopnea exactly in hypopnea predominant patients.

P3864

Effect of CPAP treatment on blood pressure levels in resistant hypertension. A multicenter randomized study from the Spanish sleep network (NCT00616265)

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Background: Only very few small studies have analyzed the role of CPAP treatment on blood pressure (BP) levels in patients with resistant hypertension (RH)
Objective: To evaluate the effect of CPAP treatment on BP levels in patients with RH

Methods: Multicenter-randomized study. 210 patients with RH (BP>130/80 mmHg despite 3 antihypertensive drugs) of unknown etiology, confirmed by 24h-ambulatory monitorization [AMPA], and sleep apnea (AHI>15) were randomized to usual control plus CPAP (n=105) or only usual control (n=105) both for three months. Variables derived from AMPA including daytime and night-time BP values and nocturnal patterns were compared intra- and inter- randomized groups. Good adherence to CPAP was considerated as ≥4 hours/day.
Results: Mean age 57.9 (68% males). Mean AHI 40.4. 24h-mean systolic/diastolic blood pressure (SBP/DBP):143/82.5 mmHg. 75% with non-dipper pattern. Patients with good adherence to CPAP (mean use: 5.9 h/d) have a net decrease of -5.5 mmHg in SBP (p<0.001) and -4.2 mmHg in DBP (p<0.001), especially in nocturnal SBP (-7.5 mmHg; p<0.001). There is a positive correlation between the increase used of CPAP in hours/d and the decrease in BP levels (r=0.25; p=0.014). 28% of patients in CPAP group vs 17.5% in control group normalized their BP levels; p=0.045). More patients in CPAP group significantly recovered their dipper pattern, compared with control group (p=0.008)
Conclusions: CPAP treatment significantly decrease SBP and DBP levels and allowed the recovering of normal dipper pattern in patients with RH and sleep apnea. The magnitude of these effects correlate with the number of hours of CPAP use.

P3865
Association between sleep apnoea and cancer mortality. Longitudinal muticenter study in 5,467 patients from the Spanish cohort
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Background: Wisconsin Sleep Cohort recently found an association between sleep apnea (SA) and cancer mortality in a community-based study.
Objective: To investigate whether SA is associated with increased cancer mortality in a large clinic cohort.
Methods: Multicenter study of 5,618 patients referred to 7 Spanish Sleep Clinics for suspected SA. Apnea-hypopnea index (AHI) and percent sleep time spent with 02sat<90% (hypoxemia index [HI]) were used as a surrogate of SA severity, both as quantitative values or divided into tertiles (first tertile as a reference risk value). Cox proportional hazards model was used to calculate full-adjusted (age, gender, alcohol intake, body mass index and smoke habit) OR [95%CI] p value- for cancer mortality.
Results: 5,467 patients were analyzed. Mean age 55.2 yrs; 65% males; median follow-up: 4.5 years with 375 deaths (92 from cancer). A greater tertile of HI (>14%), but not of AHI, was associated with increased full-adjusted cancer mortality: OR 1.94, [1.001 to 3.75]; p=0.049. This association was stronger in the 3,232 patients without CPAP treatment or poor compliance (<4 hrs/day): OR 2.56 [1.08 to 6.06], p=0.032. When stratified by gender and age (cut-off 65 years), only men (OR 2.56 [1.08 to 6.06], p=0.032) and younger patients (OR 7.3 [1.6 to 33], p=0.01) for greater HI tertiles and AHI as a quantitative value (only in younger patients, OR 1.02 [1 to 1.02], p=0.047) were associated with an increased risk of cancer mortality.
Conclusions: Sleep apnea severity was associated with increased cancer mortality. This association seems stronger in males and younger patients.

P3866
One-year adherence to CPAP treatment in cardiac patients with non-sleepy sleep apnoea in the RICCADSA trial
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The RICCADSA study is an on-going randomized controlled trial started in December 2005 addressing the impact of continuous positive airway pressure (CPAP) in revascularized coronary artery disease (CAD) patients with Obstructive Sleep Apnoea (OSA) without significant daytime sleepiness (Epworth Sleepiness Scale [ESS] <10). The primary end-point is the combined rate of new revascularization, myocardial infarction, stroke and cardiovascular mortality over a period of 2 to 7 years by December 2012. Sleepy OSA patients (ESS≥10) treated with CPAP as well as patients without OSA are also included in the study. In the current report, we aimed to address 1-yr adherence to CPAP treatment.
Among 662 patients undergoing sleep study, 511 were included in the trial, and 277 (122 non-sleepy OSA vs 155 sleepy OSA) started auto-CPAP (S8®or S9® ResMed) at baseline. In non-sleepy OSA randomized to CPAP, 77 (63.1%) were still using the device compared to 117 (75.5%) sleepy OSA patients at 1-yr follow-up (p=0.026). Average daily CPAP use was 5.8 h in the non-sleepy group (average 271 days) vs 5.7 h (average 281 days) in the sleepy OSA patients, respectively (n.s). We conclude that 1-yr adherence to auto-CPAP in a revascularized cardiac clinic population with non-sleepy OSA was slightly lower than that in the sleepy OSA patients, which in turn was not much different from the adherence ratios generally reported from the sleep clinic cohorts.
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P3867
Association of cardiovascular diseases, metabolic syndrome and obstructive sleep apnea: Data from 1,000 Japanease PSG cases
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Background: Obstructive sleep apnea (OSA) is usually associated with cardiovascular diseases and also metabolic syndrome including diabetes, lipid metabolism
Objectives: The aim of the study was to evaluate the prevalence of hypertension (HT), diabetes mellitus (DM), hyperlipidemia (HL), and cardiovascular diseases (CVD) in the Japanease with proven OSA.
Methods: We retrospectively analyzed the data accrued in 1,000 patients who underwent the first time polysomnography (PSG) in our hospital from June 2001. They were 836 males and 164 females, the mean age of 54.5 years, the mean body mass index (BMI) of 26.0kg/m^2, and the mean apnea-hypopnea index (AHI) of 38.0. We examined the association between OSA and cardiovascular diseases, metabolic syndrome.
Results: 938 between 1,000 patients were diagnosed with OSA. 41.2% of patients with OSA had HT compared with 21.0% of patients with non-OSA. And the OSA patients had 18.6% of DM, 45.3% of HL, 25.2% of liver dysfunction, 7.6% of CVD, comparing with 6.5% of DM, 29.0% of HL, 19.4% of liver dysfunction, and 3.3% of CVD in the non-OSA patients. In addition, the OSA patients treated with continuous positive airway pressure (CPAP) had 69.7% of HT, 23.8% of DM, 77.1% of HL, 40.7% of Liver dysfunction, and 21.2% of CVD. The blood pressure was reduced significantly by CPAP.
Conclusions: The risk of HT, DM, and CVD in OSA patients was almost two times more than those of non-OSA patients. We suggested that the OSA patients with higher severity OSA patients tended with a higher rate of complications.

P3868
Cystatin C and albuminuria as markers of kidney and cardiovascular diseases in obstructive sleep apnoea syndrome (OSAS)
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Obstructive sleep apnea (OSA) increases the risk of cardiovascular diseases and has been reported to be associated with a chronic kidney disease (CKD). The aim of our study was to assess the relations between indices of renal function (cystatin C, microalbuminuria, creatinine) and OSA severity and obesity.
We studied 238 OSA pts who had AHI ≥5/h in polysomnography: mean age 56.9±9.9y, AHI 38.9±21.7/h, ODI 44.85±27.85/h, BMI 33.5±5.8 kg/m^2. Serum cystatin C levels were measured in all patients, normal values were: under 50y old; CysC<0.92mg/L, over 50y old; CysC<1.02mg/L. CKD was diagnosed when plasma creatinine level was above 1.2 mg/dl.

Variable	Normal CysC N=141 (59%)	Elevated CysC N=97 (41%)	p
Age (years)	56±9.4	58.2±10.6	NS
BMI (kg/m^2)	32.6±5.4	34.4±6.4	0.04
AHI (n/h)	38.8±21.5	39.2±22.1	NS
ODI (n/h)	44.1±26.8	45.9±29.4	NS
Microalbuminuria (n/%)	19 (22.35%)	9 (16.36)	NS
CKD (n/%)	3 (2.17%)	13 (13.4)	<0.001

Logistic regression analysis (LRA) revealed that increased CysC level was associated with elevated creatinine (OR=7.6; 95%CL=1.5-39.5, p<0.001) and obesity (OR 2.6; 95%CL 1.4-5.9, p=0.04) but not with AHI (OR=1,09, 95%CL=0.3-3.6, p=0.89). CKD was associated with severe OSA, AHI>30/h (OR=7.97, 95%CL=1.5-41.6, p=0.013) and obesity (OR=3.1, 95%CL=1.2-8.1, p=0.016).
Conclusions: CysC should be considered as a biomarker that reflects clinically latent renal dysfunction. The chronic kidney disease was more frequent in obese subjects with severe OSA.

P3870

Heart rate variability by sleep stage at different parts of the night in obstructive sleep apnea

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Obstructive sleep apnea (OSA) is a respiratory disorder characterized by recurrent airflow obstruction caused by total or partial collapse of the upper airway. It is well known that HRV are diminished in patients with OSA. However, the analysis of different parts of the night and of the evolution within sleep stages in OSA patients has not yet been investigated.
Objectives: Evaluate and compare HRV in 3 intervals of each sleep stage in overnight polysomnographies in OSA and matched healthy controls.
We studied overnight polysomnographies of 6 untreated OSA patients (mean age 50±14 yr, apnea-hypopnea index [AHI] = 9.4±6 events per/hour) and 6 matched healthy controls. Time and non-linear analysis of R-R intervals (RRi) was performed of the minimum of 3 central 5-minute sample of stage II, III and REM sleep that was free of stage shifts, artifacts, arousals and apneas. Subsequently, we analyzed the average of these stages between OSA and controls.
Results: Comparing the 3 parts of each stage, we did not observed any difference intragroup ($P>0.05$). In addition, we only observed significant difference of RMSSD index between OSA and controls ($P<]0.001$) in the first REM stage. In contrast, when compared the average of 3 central 5-minute samples, we observed significant differences of mean RRi, RR tri index, TINN (ms), SD1 and SD2 between OSA and controls ($P<0.05$) in all stages.
Conclusion: The preliminary results showed that despite of any change in the HRV evolution through 3 intervals of each stage, the number of samples analyzed during the night may influence the results of HRV in overnight polysomnography.
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P3871

Diabetes mellitus and obstructivesleep apnea syndrome in primary care

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Introduction: Obstructive Sleep Apnea Syndrome (OSAS) is a risk factor for insulin resistance and type 2 Diabetes Mellitus and its prevalence is higher on these. An adequate screening instrument for primary care units would be valuable.
Objective: Evaluate Epworth Scale (ES) and Berlin Questionnaire (BQ), as screening instruments of diurnal hypersomnolence (DH) and increased OSAS risk in the diabetic population of a primary care unit.
Methods: Observational, transversal, descriptive study, through the filling of a clinical characterization form and application of ES, BQ and cardiorespiratory polisomnography (CRP), on a randomized sample of the diabetic population of a primary care unit.
Results: 117 patients, 48% male, mean age 65±8 years. The CRP revealed AHI≥5/h in 86 (73.5%) pts, 47 (40%) with AHI between 5-14, 20 (17%) with AHI 15-29 and 19 (16%) with ≥30 events/h. ES sensitivity's and specificity's was 20% and 91% for a cut-off≥10 and of 1.1 and 100% for a cut-off≥16. The NPV was 29.6% and 26.7% for those cut-offs. It couldn't identify DH on 72% of pts with AHI>15. The BQ classified 76 (65%) pts in high-risk group for OSAS. Roncopathy, diurnal somnolence and hypertension/obesity categories were positive on 72%, 17% and 83% respectively. For an AIH≥5/h, It's sensitivity and specificity was 71% and 52%, the PPV 80% and the NPV 39%. For an AHI≥15/h, the same statistical measures were 87, 46, 45 and 88%. For an AHI≥30/h, the results were 90, 40, 22 and 95%.
Conclusion: ES showed low sensitivity and NPV as an HS screening test. The BQ had moderate sensitivity, low specificity and NPV, making it unreliable for application in this population. Reporting to a single unit these results may not be representative.

P3872

Resistant arterial hypertension and obstructive sleep apnea syndrome

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Background: Resistant arterial hypertension is frequently paired with subclinical target-organ damage and additional higher cardiovascular risk. Several studies have confirmed the association between Obstructive Sleep Apnea Syndrome (OSAS) and resistant hypertension.
Objective: Analyze the relationship between OSAS and resistant arterial hypertension.
Methods: Resistant hypertension was defined as a daytime blood pressure of at least 140 mm Hg systolic or at least 90 mm Hg diastolic, despite stable use of a combination of 3 or more antihypertensive agents. The patients identified at the Internal Medicine department were referred to our Sleep Unit. A home respiratory polygraphy was then performed to study OSAS in all patients
Results: A total of 21 patients were studied (11 men and 10 women), mean age 56±3 years and mean body mass index 32.9±1,5 kg/m^2. The mean systolic and diastolic pressures measured by the 24h-Ambulatory Blood Pressure Monitoring were of 140.8±15.3/86.4±2,4 mm Hg. Seventeen patients (80,9%) had OSAS and 47,6% had severe OSAS (AHI ≥ 30/h). The mean CT90 was 13,0±3,8 and the mean AHI was 26,2±4,3. The AHI was not correlated with the mean systolic or diastolic pressure. There were no differences in terms of mean systolic and diastolic pressures between the patients with severe OSAS and the patients with an AHI≤30. The presence of nondipping pattern was not associated with a higher prevalence of severe OSAS neither with a higher CT90.
Conclusions: In accordance to previous studies, our results showed a high prevalence of OSAS (80,9%) in patients with resistant hypertension. This reinforces the need to screen these patients for OSAS since treatment with CPAP could improve blood pressure control.

P3873

Urinary excretion of erythropoietin in sleep apnea-hypopnea syndrome

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Background: Synthesis of erythropoietin (EPO) is stimulated by tissue hypoxia. Sleep apnea- hypopnea syndrome (OSA) is characterized by the presence of repeated episodes of hypoxemia.
Aim: The objective of this study is to investigate whether hypoxemia induced by OSA could be a stimulus to increase EPO production.
Methods: The study was conducted in 24 patients being investigated for OSA. A full polysomnography through a night's sleep was recorded and analyzed manually according to standard criteria. We determined the EPO levels in samples of first morning urine (sandwich ELISA technique). Serum creatinine, hematocrit and hemoglobin levels were additionally determined.
Results: Of the 24 patients studied, 18 were diagnosed from OSA (AHI> 10) with the following results (mean ± SD): apnea/hypopnea index (AHI) 30.8±23.1, desaturation index (HDI) 27±16.9, CT90% 5.7±7.8, mean length of nocturnal desaturation 25.7±10.5 sec., average nocturnal SatO2 93.9±1.6. Creatinine was within normal limits for all patients. Hemoglobin and EPO were higher in the OSA group than in the non-OSA group (14.2±1.3 g/dl vs 13.2±0.8) ($p <0.03$) and 0.65±0.5 vs 0.30±0.3 ($p <0.05$), respectively. There was no dose-response relationship between the severity of the alterations of the PSG and the titles of EPO. In fact, no significant correlations (linear) were found between the levels of EPO in urine and AHI, HDI, length of desaturation, CT90% or average nocturnal saturation.
Conclusions: OSA patients show increased urinary excretion of EPO and hemoglobin. Changes in EPO concentration are of low magnitude and non-linear. This response could be a protective mechanism against tissue hypoxia caused by OSA.

P3874

Left ventricular function assessment in patients with obstructive sleep apnea syndrome

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Background: There are conflicting data on the effect of obstructive sleep apnea syndrome (OSAS) on the cardiac structure and function in human subjects.
Aim: To assess the left ventricular functions and document prevalence of left ventricular dysfunction in patients with OSAS, and its relation to OSAS severity.
Patients and Methods: Forty patients with OSAS, diagnosed by complete polysomnography, underwent ECG and echocardiography using conventional mode and doppler tissue imaging to assess the function of the left ventricle.
Results: 11 patients had mild OSAS, 11 patients had moderate OSAS and 18 patients had severe OSAS. The three groups were matched in age, gender, BMI and incidence of systemic hypertension. Severe OSAS had significantly higher AHI, lowest oxygen saturation, average oxygen saturation, and desaturation time % of total sleep time (<90%). Pulmonary hypertension and left ventricular diastolic dysfunction were significantly higher in moderate and severe OSAS groups. No difference between groups was found in LV systolic function. Diastolic dysfunction parameters were better correlated with AHI and lowest oxygen saturation during sleep.
Conclusion: Assessment of left ventricular function is mandatory in OSAS patients even if they have no cardiac symptoms. Severer obstructive sleep apnoea syndrome may result in left ventricular diastolic dysfunction. Doppler tissue imaging is a better echocardiographic tool for assessment of left ventricular diastolic dysfunction. Severity of left ventricular diastolic dysfunction is correlated with AHI and lowest O2 saturation during sleep.

P3875

Cardiovascular regulation effects of CPAP therapy in obstructive sleep apnea patients with and without hypertension during daytime

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Obstructive sleep apnea can cause changes in cardiovascular regulation during the night and during daytime. Altered regulation may not be visible in absolute values of heart rate and blood pressure but in a changed coupling between the heart beat and the respiration. In a controlled randomized study we investigated effects of CPAP therapy on daytime cardiovascular regulation.

Twenty-eight patients with OSA in total, thereof 18 with arterial hypertension and 10 with normal blood pressure, were studied at baseline and at a follow up date with three months of CPAP. Ten age and sex matched healthy control subjects were investigated using the same protocol. All subjects underwent cardiorespiratory polysomnography. In addition we recorded 20 minutes quiet breathing at rest and a bicycle ergometry with ECG and blood pressure (Portapres). Cardiorespiratory coupling was investigated using symbolic coupling traces, a new developed technique which can reveal causality between signals.

The stress test showed a significant reduction of the diastolic blood pressure at a work load of 50W and 100W ($p<0.05$ and $p<0.01$, respectively) and a decrease of the heart rate recovery time after the stress test ($p<0.05$).

The results indicate a reduction of vascular resistance and sympathetic activity during daytime. The coupling analysis of the resting periods by means of symbolic coupling traces approach indicated an effect of the CPAP therapy on the baroreflex reaction in hypertensive patients where influences of the systolic blood pressure on the heart rate changed from pathological patterns to adaptive mechanisms of the normotensive patients ($p<0.05$).

P3876

Increased risk of obstructive sleep apnoea in patients with non-alcoholic fatty liver disease

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Background: Increasing prevalence of Obstructive Sleep Apnoea (OSA) and Non-alcoholic Fatty Liver Disease (NAFLD) are linked through the epidemic of obesity and metabolic syndrome. Patients with NAFLD often present with fatigue and daytime sleepiness and it has been postulated that intermittent hypoxia in OSA may accelerate liver cirrhosis in this group.

Aims: We hypothesised that OSA would be prevalent in patients with NAFLD. We aimed to determine whether those with OSA had different clinical or biochemical characteristics to the rest of the cohort.

Methods: We conducted a retrospective database and case note review of patients with known NAFLD. The database was reviewed for detailed liver investigations and notes examined for any clinical referral for sleep investigations and outcome.

Results: Liver database and case notes of 385 patients with biopsy proven NAFLD were examined. Forty-seven patients were referred to sleep services on clinical grounds (12%); 38 were found to have OSA, 10% of the whole cohort but 86% of those referred. Analysis of variance showed no difference between groups (those with OSA, those without OSA and those with no previous sleep investigations) in: baseline liver function, diabetes, body mass index, liver biopsy scores or any other marker of metabolic syndrome. Patients referred for sleep studies had higher ESS than those not referred (mean 13 vs.7, $p=0.004$) but there was no difference in ESS between those with or without OSA.

Conclusions: In a well-defined population of biopsy-proven NAFLD patients, OSA is common and mostly undiagnosed. There are no differences in the clinical characteristics of those referred for sleep studies and those not, other than ESS.