Free Communications: Abstract 1

Use of telemonitoring in the introduction and follow up of treatment by CPAP in obstructive sleep apnoea syndrome

Farhad BAHARLOO, Natasha GUSBIN, Laurent HUBIN, Bassam CHAKAR

CHR Citadelle, Liège

Background: Telemedicine has been available for the purposes of patient follow up as well as in diagnostic and occasionally therapeutic procedures for some years. The advent of the Internet has widened the scope of this technique by providing the possibility of real-time interactions. In our prospective trial we compared the introduction and initial follow up of treatment by continuous positive airway pressure in patients suffering from obstructive sleep apnoea, using two different types of telemonitoring devices with the traditional approach, in order to reveal any possible impact of the former on patient care, in our specific setting.

Methods: We carried out a prospective, controlled, non-blinded trial. Patients with an apnoea-hypopnoea index of more than 20 and micro-arousal plus arousal index of more than 30, were randomly allocated to three groups of 15 patients; patients in group A, received AirSense 10 CPAP, equipped with the inbuilt telemonitoring device AirView (ResMed) which also allows distant parameter change. Patients in group N received AirSense plus Nowapi (Vitalair), a universal CPAP telemonitoring device that can be inserted at the exit of a CPAP. Patients in group C received AirSense but with the AirView inactivated. CPAPs were delivered to the patients during a collective information session. Patients in the telemonitoring groups received in addition, the relevant complementary information. The data received from the AirView devices were subjected to regular monitoring and those from the Nowapi were reviewed at fixed intervals and patients were contacted by telephone if so required. Likewise all patients were asked to contact the sleep laboratory if they encountered a problem with their treatment. They were then invited to present to the sleep laboratory if the problem could not be resolved by telephone. Patients in the control group only, were systematically received in the sleep department for a routine visit six weeks after the start of the treatment, asthe usual procedure in our department requires. Two patients handed back their CPAP prior to titration night and were thus excluded from the study.

Results: Baseline biometrics as well as diagnostic and titration sleep polygraphy, characteristics and pressure settings of patients in the three groups did not differ excepting a significantly higher proportion of male subjects in the control group. The overall rate of dropouts was 6,7%. One patient in the control group abandoned treatment versus none in both telemonitored groups. The compliance was slightly better in telemonitored patients but the differences were not statistically significant. The total amount of time spent by the staff on each patient, making telephone calls, consulting the websites or managing onsite consultations, did not differ significantly. However, the number of times patients had to make a trip to the hospital was reduced to half in the telemonitored groups as compared with the control group. The rate at which the monitoring websites were reviewed dwindled and proved redundant after the third month of treatment.

Conclusion: The nursing staff adapted rapidly and well to the telemonitoring technology and retained a favourable opinion of it. The study failed to show improved patient compliance. Nor did it prove, in our specific setting, time saving for the staff. However, it was a viable alternative to our intermediary six-weeks visit and thus markedly saved time and trouble for the patients. Telemonitrong, likely will reduce workload for a staff with experience in the use of such devices. Furthermore, our study suggests that this technology is useful during the first three months of treatment.

Free Communications: Abstract 2

Evaluation of the clinical effectiveness of a sleep position trainer in patients with positional sleep apnea

J. Beyers[a], M. Dieltjens[a, b], C. Kastoer[a, b], I. De Volder[c,d], A. Van Gastel[c,d], J.A. Verbraecken[b, c, e], W.A. De Backer[b, c, e], P.H. Van de Heyning[a, b], M.J. Braem[b,f], O.M. Vanderveken[a, b, c]

[a]Department of Otorhinolaryngology, Head and Neck Surgery, Antwerp University Hospital, Edegem, Belgium
[b]Faculty of Medicine and Health Sciences, University of Antwerp, Antwerp, Belgium
[c]Multidisciplinary Sleep Disorders Centre, Antwerp University Hospital, Edegem, Antwerp, Belgium
[d]Department of Psychiatry, Antwerp University Hospital, Edegem, Antwerp, Belgium
[e]Department of Pulmonary Medicine, Antwerp University Hospital, Edegem, Antwerp, Belgium
[f]Department of Special Care Dentistry, Antwerp University Hospital, Edegem, Antwerp, Belgium

Study Objectives. The objective of this clinical trial was to assess the overall clinical effectiveness of a chest-worn sleep position trainer (SPT) in patients with positional obstructive sleep apnea (POSA). In addition, the aim was to evaluate how many patients were willing to purchase the device after a trial period of one month.

Material & methods. The SPT (NightBalance™, the Netherlands, Delft), evaluated in this clinical trial, is a small chest-worn device that vibrates when the patient is in supine position. Patients with an established diagnosis of POSA based on a type 1 sleep study, polysomnography in hospital setting, underwent a 1-month trial period with the SPT. Type 3 portable sleep monitoring was performed at baseline in order to confirm POSA and during the SPT trial period. Data are presented as median (quartile 1, quartile 3) or as mean ± standard deviation.

Results. Two hundred patients were included in the study. Fifty-four patients were diagnosed with positional snoring while POSA could be confirmed in 101 participants. Seventy-nine patients (81% male; mean age 52 ± 12 years; median body mass index 27 (25, 28) kg/m2; baseline apnea/hypopnea index (AHI) 11 (8, 16) events/h) completed the study protocol. A significant reduction in the overall AHI to 5 (3, 10) events/h was observed with the SPT as compared to baseline ($p < 0.001$). The median percentage of supine sleep decreased significantly from 27 (20, 48)% at baseline to 7 (2, 20)% with SPT ($p < 0.001$). Adjusted adherence (the percentage of the SPT use in hours per night divided by the total sleep time derived from polysomnography) was found to be 95 ± 8%. The overall clinical effectiveness in terms of mean disease alleviation (MDA) in the responder group of 45 patients (AHI reduction ≥ 50%) was 68% for reduction in AHI and 72% for reduction in supine position. Forty-four patients (56% out of the 79 patients that completed the study; 22 responders and 22 non-responders) decided to continue treatment and purchased the SPT. The most important reasons for not purchasing the SPT were insufficient objective results, intolerance for the vibrations, the cost price of the device, persistent daytime sleepiness or the fact that the patients preferred other treatment.

Conclusions. In the reported trial, treatment with the SPT came with high adherence rates and was effective in reducing AHI and supine position. In addition, a trial period with the SPT is of utmost importance, in order to avoid that patients who do not benefit from the therapy purchase the SPT. Further research on the long-term effectiveness of the SPT, including the evaluation of subjective symptoms such as excessive daytime sleepiness and sleep quality, is currently ongoing.

Free Communications: Abstract 3

Objective drowsiness monitoring for assessing the ability of an operator to perform a task

Clémentine François[1,2], Jérôme Wertz[2], Thomas Hoyoux[1,2], Thomas Langohr[1,2], Jacques G. Verly[1,2]

[1]Laboratory for signal and image exploitation, department of electrical engineering and computer science, University of Liège, Belgium

[2]Phasya S.A., Angleur, Belgium

The involvement of drowsiness in a large number of accidents, whether in private or professional activities, makes its comprehension and its detection a major societal issue to improve public health and safety.

We have thus developed an objective, automatic, and real-time drowsiness monitoring system based on the physiological state of a subject. This system uses ocular parameters extracted from images of an eye to determine a level of drowsiness on a numerical scale.

In order to validate our system, we compared, for a number of subjects, the level of drowsiness obtained by our system to two references: (1) the level of drowsiness obtained by analyzing polysomnographic signals, and (2) the performance of these subjects in the accomplishment of a task. We thus conducted two experiments. In experiment A, 27 healthy volunteers performed three visual Psychomotor Vigilance Tasks (PVT) under increasing sleep deprivation over 2 days. In experiment B, 12 healthy volunteers performed three driving sessions in a simulator. During each experiment, we recorded images of the eye and polysomnographic signals from which we computed respectively, for each minute, a level of drowsiness using our system and a level of drowsiness using the Karolinska Drowsiness Score (KDS). We also computed reaction times for experiment A, and the standard deviation of the lateral position of the vehicle on the road (SDLP) for experiment B.

Results show that our system is well correlated with the physiological and the performance references. It has thus significant potential for reliably quantifying the level of drowsiness of subjects accomplishing a task in a variety of applications ranging from medical (i.e. detection of excessive daytime sleepiness) to safety (accident prevention).

Free Communications: Abstract 4

Age-related differences in the dynamics of cortical excitability and cognitive inhibition during prolonged wakefulness

G. Gaggioni, S. L. Chellappa, J. Q. M. Ly, D. Coppieters't Wallant, Tillo Delfosse, Romain Dumont, Amaury Vanvinckenroye, F. Collette, P. Maquet1, C. Phillips, C. Schmidt, G. Vandewalle

GIGA-Research, Cyclotron Research Centre – In Vivo Imaging Unit, University of Liège, Liège, Belgium
Walloon excellence in life sciences and biotechnology (WELBIO, Belgium)

Objective. The regulation of human wakefulness by sleep homeostasis and circadian processes changes with age. Cortical excitability, i.e. cortical neuron responsiveness to stimulations, is regulated by sleep homeostasis and the circadian clock. Here, we explored age-related change in cortical excitability dynamics and its relation to cognitive performance modulation.

Methods. 13 healthy young (23 mean age; 5 women) and 13 elderly participants (63 mean age; 7 women) followed a 36h sleep deprivation protocol under constant routine conditions, during which they underwent 9 EEG recordings of TMS-evoked potentials. Cortical excitability was inferred from the amplitude and slope of the first component of TMS-evoked potentials over the supplementary motor area (SMA), a frontal brain region sensible to sleep loss. Every two hours, participants performed an inhibitory Go/Nogo task. The percentage of false positive answers to Nogo trials was used to estimate motor response inhibition. Interpolated inhibitory and cortical excitability measures were then correlated.

Results. Cortical excitability showed a main effect of phase (p=.0001) and a significant phase*group interaction (p=.04). Nogo false positive answers showed a main effect of phase (p=.0004), a tendency for a main effect of group (p=.06) and a significant phase*group interaction (p=.002). Furthermore, cortical excitability significantly correlated with Nogo false positive answers (r=.15; p=.02, irrespective of phase and group).

Conclusion. Data indicate that aging affects the dynamics of cortical excitability and inhibitory cognitive processes during prolonged wakefulness. Results further show that these changes are partly correlated, suggesting a link between cognition and underlying cortical function.

Free Communications: Abstract 5

Can positional therapy be simple, inexpensive, and well-tolerated all together?

Prospective study on the effectiveness and compliance for the use of a sleep positioning pillow in the treatment of positional sleep related breathing disorders

Johan Newell

Brugmann University Hospital - Free University of Brussels (U.L.B. / V.U.B.) Sleep Laboratory & Unit for Chronobiology U78 Psychiatrist – Somnologist, Arthur Van Gehuchten Square - 1020 Brussels

Introduction: Continuous positive airway pressure (CPAP) remains a first choice treatment for both moderate and severe obstructive sleep apnea (OSA). Till present, there is however no clear consensus on optimal treatment interventions for milder sleep-related breathing disorders (SRBD) in general or for positional SRBD (pSRBD) in particular. While several therapeutic options are either relatively invasive and/or expensive (ex. oral appliance therapy, surgical treatment, electrical stimulation), positional therapy (PT) may still present as a valuable first-line intervention for pSRBD.

Methods: 20 patients, free from any sleep interfering drug treatment or substance abuse, without any major physical or mental co-morbid condition, presenting with pSRBD, underwent three nights of full polysomnographic (PSG) recording in an academic sleep lab. Inclusion criteria were based on the first night's PSG. During the second consecutive night, a sleep positioning pillow (Posiform®) was administered. A third PSG was performed after one month of usage of the pillow at home. After 6 months, a follow-up questionnaire was sent by mail.

Results: Significant immediate treatment effects ($p<.05$) after one night and significantly sustained effects after one month were observed in our sample. Significant reductions of sleep time in supine position (TST-S), respiratory-related sleep fragmentation (Arl Resp), apnea/ hypopnea index (AHI), respiratory distress index (RDI) and oxygen desaturation index (ODI) were observed. In addition, we obtained remitted sleep quality impairment as measured by the Pittsburgh Sleep Quality Index (PSQI). Daytime sleepiness (Epworth Sleepiness Scale - ESS) and the Function Outcomes of Sleep Questionnaire (FOSQ) also showed significant improvements after PT. No particular treatment effects were observed on sleep architecture.

Conclusions: The combined and significant improvement on both sleep-related respiratory variables and symptom scales were observed after treatment initiation as well as one month follow-up of usage of a sleep positioning pillow. Furthermore, reported compliance and overall satisfaction appeared to be highly concordant both at one month and six months follow-up.

Free Communications: Abstract 6

Predicting the effect of treatment in paediatric OSA by clinical examination and functional imaging

Slaats Monique A., MD[1,2]; Vos Wim, PhD[3]; Van Holsbeke Cedric, PhD[3]; De Backer Jan, PhD[3]; Loterman Dieter, MSc[3]; De Backer Wilfried, MD, PhD[2,5]; Boudewyns An, MD, PhD[4]; Verhulst Stijn L., MD, PhD[1,2]

[1]University Hospital of Antwerp, Wilrijkstraat 10 2650 Edegem, Belgium

[2]Laboratory of Experimental Medicine and Pediatrics (LEMP), University of Antwerp, Universiteitsplein 1, 2610 Antwerp, Belgium

[3]FLUIDDA, Groeningenlei 132, 2550 Kontich, Belgium

Introduction: Obstructive sleep apnea(OSA) is the most severe manifestation of sleep-disordered breathing. OSA may affect up to 4% of the children in the general population. Untreated OSA is associated with significant comorbidities and therefore it needs to be correctly treated. Although enlargement of the adenoids and/or tonsils is the main cause of OSA in children, OSA is a multifactorial condition. The role of other factors beyond adenotonsillar enlargement may explain the high incidence of residual OSA after adenotonsillectomy(ATE) (23-51%). Therefore, it seems worthwhile to identify anatomical abnormalities in an individual child to select the most appropriate treatment and minimize the risk of persisting OSA. Functional respiratory imaging(FRI) can give additional functional information about the upper airway. Studies on the clinical usefulness of FRI in children with OSA without underlying comorbidity are limited. Preliminary data in this study also showed that FRI could identify differences in the UA of children with residual OSA.

Aim of the study: The aim of this study was to investigate whether functional respiratory imaging (FRI) or clinical examination could predict treatment outcome for obstructive sleep apnea (OSA) in normal-weight, non-syndromic children.

Methods: Normal weight children diagnosed with OSA by polysomnography were prospectively included. All children got a thorough evaluation and an ultra-low dose computed tomography scan of the upper airway (UA). A 3-D reconstruction was built combined with computational fluid dynamics for FRI. Decisions on the need and type of surgery were based upon findings during drug-induced sleep endoscopy. A second polysomnography was performed 3-12 months after surgery.

Results: Ninety-one children were included: 62 boys, 5.0±2.7 years, BMI z-score of -0.1±1.2 and obstructive apnea/hypopnea index (oAHI) 2.1-124/hour. Children with more severe OSA had a smaller volume of the overlap region between the adenoids and tonsils. Nineteen out of 60 patients had persistent OSA (oAHI >2/hr). A lower conductance in the UA and a higher tonsil score predicted successful treatment.

Conclusions: A less constricted airway, as characterized by both FRI and a lower tonsil score, was associated with a less favorable response to (adeno)tonsillectomy. Further studies after treatment using FRI and DISE are warranted to further characterize the UA of these subjects.