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ORIGINAL ARTICLE

Obstructive sleep apnoea syndrome: Comparison between polysomnography and portable sleep monitoring based on jaw recordings

Apnée obstructive du sommeil : comparaison polysomnographie et système portable avec enregistrement de mouvements mandibulaires

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Polygraphic recordings

Summary
Introduction. — Obstructive sleep apnoea syndrome (OSAS) constitutes a new major public health problem because of its several pathophysiologic consequences such as cognitive disorders, excessive daytime sleepiness with risks of traffic accidents, cardiovascular implications, and decrease of quality of life. The necessity of a gold-standard polysomnography to ensure an accurate diagnosis implies an expensive, technical and time-consuming examination. Thus, it seems logical to develop new systems so as to diagnose SAS and to make it possible to detect apnoeas/hypopnoeas easily during sleep even at home.
Aim of the study. — To assess a novel type-3 portable monitoring (PM) device, the Somnolter, and dedicated automatic analysis of several signals, one of which is the mandibular movement signal.
Method. — We studied patients suffering from OSAS. For all the patients, a nocturnal diagnosis polysomnography (PSG) was recorded in hospital settings, based on six EEG channels, two EOG channels, chin EMG channel, EKG, and respiratory parameters. At the same time, the Somnolter PM device recorded the physiological parameters from its own nasal prongs, thoracic belt, pulse oxymeter, body position, and jaw movement sensors. A visual analysis of PSG recordings was made leading to the detection of apnoea/hypopnoea index (AHI-PSG) and an automatic

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analysis of the Somnolter traces was performed to get automatic apnoea/hypopnoea index (AHI-A). The added value of the mandible movement signals was the particular jaw movements related to arousals, to respiratory efforts and to sleep/wake state. A comparison was made between the automatic and gold AHIs standard and the correlation was calculated between them.

Results. — Ninety patients, aged between 47 and 70 years (mean age: 55.4 ± 8.7) took part in the study. The linear regression and the correlation coefficient between AHI-PSG and AHI-A showed the good reliability of the automatic method. The Bland Altman analysis shows a correlation of 0.95 with a sensitivity of 83.6 and specificity of 81.8.

Conclusion. — The dedicated automatic analysis based on mandibular movements presents a good potential for the diagnosis of OSAS. The AHI computed by the automatic method is correlated with the AHI-PSG and the Somnolter could easily be used both in hospital, and in ambulatory settings.

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MOTS CLÉS
Troubles du sommeil ;
Troubles respiratoires du sommeil ;
Syndrome d'apnée obstructive du sommeil ;
Mouvements mandibulaires ;
Somnolter ;
Polysomnographie ;
Polygraphie

Résumé

Introduction. — Le syndrome d'apnées obstructives du sommeil (SAOS) avec toutes ses conséquences physiopathologiques : troubles attentionnels, somnolence, impact cardiovasculaire, constitue un important facteur de risque d'accidents de circulation et/ou de travail et devient un sérieux problème de santé publique. L'augmentation régulière de cette pathologie incite à développer des systèmes d'enregistrement simplifiés au domicile du patient permettant un dépistage précoce et une prise en charge rapide du SAOS.

Objectifs. — Nous avons utilisé un nouveau système portable ambulatoire de type 3 (Somnolter) de détection des apnées/hypopnées sur la base de l'enregistrement de mouvements mandibulaires avec analyse automatique associant la mesure des mouvements mandibulaires à celle des paramètres respiratoires : capteur nasal, ceintures thoracoabdominales et oxymétrie du pouls. Nous avons comparé les résultats obtenus par ce système à ceux de la polysomnographie.

Méthode. — Nous avons étudié les patients présentant des signes cliniques de syndrome d'apnée obstructive du sommeil. Tous ont eu de façon systématique une polysomnographie (PSG) nocturne comportant l'enregistrement des voies EEG, EOG, EMG, ECG et des paramètres respiratoires avec simultanément un enregistrement Somnolter permettant l'acquisition de signaux respiratoires propres et des mouvements de fermeture-ouverture de la bouche par capteur mandibulaire. L'index d'apnées/hypopnées par heure de sommeil a été calculé chez chaque patient à partir de la polysomnographie (IAH-PSG) et comparé à celui obtenu par le système Somnolter (IAH-A).

Resultats. — Nonante patients âgés de 47 à 70 ans (âge moyen : 55,4 ± 8,7) sont entrés dans cette étude. L'index d'apnées/hypopnées est comparable dans les deux systèmes et le calcul de la corrélation indique un coefficient significatif. L'analyse par Bland-Altman montre une corrélation de 0,95, avec seuil de sensibilité à 83,6 et de spécificité à 81,8.

Conclusion. — La corrélation entre IAH-A et IAH-PSG (*gold standard*) est significative. L'analyse automatique par Somnolter basée sur les mouvements mandibulaires constitue une méthode utile dans le diagnostic du syndrome d'apnée obstructif du sommeil aussi bien en milieu hospitalier qu'en ambulatoire.

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Introduction

Polysomnography is considered the gold standard for the diagnosis of obstructive sleep apnoea syndrome (OSAS), both in adults and children. However, access to polysomnography is restricted due to its cost and limited availability [2,30]. Although the diagnosis of OSAS is first suspected on clinical grounds, such as excessive daytime sleepiness and snoring, confirmation of the diagnosis requires overnight studies and the use of techniques to assess sleep and wakefulness.

Sleep apnoea syndrome is constantly increasing and affects a very large population but the possibility to diagnose it is often small. Thus, in the Wisconsin Sleep Cohort Study, the prevalence of an apnoea/hypopnoea index (AHI) ≥ 5 was 24% in men and 9% in women aged 30—60 [31], while 93% of women and 82% of men with moderate-to-severe sleep apnoea did not receive any diagnosis [32]. OSAS now constitutes a major public health problem because of its frequency and numerous pathophysiological consequences such as excessive daytime sleepiness with risks of traffic accidents [8], cardiovascular disorders [16,22], cognitive disorders, decrease in work performance, impairment of executive functions and attention, and decreased quality of life [9]. Therefore, it seems important to develop new systems to diagnose OSAS and to make it possible to detect easily apnoeas/hypopnoeas during sleep, even at home.

Many authors developed ambulatory systems to detect apnoeas/hypopnoeas without EEG recording [7]. Since polysomnography is expensive and not readily available,

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