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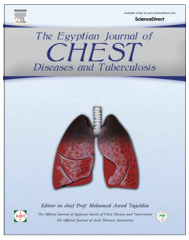

ORIGINAL ARTICLE

Efficacy of split night CPAP titration in moderate and severe obstructive sleep apnea syndrome patients

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KEYWORDS

CPAP titration;
Split night;
OSAS

Abstract *Background:* Split-night polysomnography was introduced to obtain diagnosis and determine an effective CPAP on a single night that would be convenient and cost effective.

Aim of the study: To evaluate the efficacy of split night CPAP titration in comparison with conventional full night titration in patients with moderate and severe OSAS.

Patients and methods: Matched patients for age, sex, body mass index and disease severity were enrolled in the study and classified into two groups either split night or full night group.

Results: Sixty matched patients in each group (full night and split night group) were included in the study. Regarding sleep parameters, sleep efficiency (75.9 ± 15.7 vs. 81.5 ± 10.5, $p = 0.024$) was significantly shorter, stage 1% was significantly higher (22.3 ± 14 vs. 17.9 ± 15.8, $p = 0.013$) and REM % (23.9 ± 18.7 vs. 31.3 ± 14.8, $p = 0.019$) was significantly lower during split night CPAP titration compared to full night titration study. Unsuccessful CPAP titration was significantly higher in split night group than the full night group (30 (50%) vs. 16 (35.5%), $p = 0.025$). Apnea hypopnea index >36.4 during diagnostic part and total sleep time at least 2.45 h during CPAP part of split night titration were identified as the optimum cut off for successful titration with 73.5% sensitivity, 43.3% specificity and 74% sensitivity, 70% specificity respectively.

Conclusion: Split night sleep study is more commonly associated with unsuccessful CPAP titration than full night titration but successful titration could be obtained during split night titration in patients with severe AHI >36.5 event/h.

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Introduction

Obstructive sleep apnea syndrome (OSAS) is the most common type of sleep-related breathing disorders, its prevalence ranges from 2% to 4% of the middle-aged population [1]. OSA is a very important diagnosis for physicians to consider because of its strong association with potential cause of the

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most debilitating medical conditions, including hypertension, cardiovascular disease, coronary artery disease, insulin-resistance diabetes, depression, and sleepiness-related accidents. However despite being a common disease, OSAS is under recognized by most primary care physicians [2]. In most laboratories, patients with sleep apnea are evaluated for an entire diagnostic night followed by a continuous positive airway pressure (CPAP) titration night. Due to the presence of financial restrictions and waiting lists, sleep centers could solve this problem by investigating and treating patients using split night studies whereby diagnostic polysomnography and continuous positive airway pressure (CPAP) titration are accomplished on the same night rather than the standard two nights polysomnography [3].

In 1997, the American academy of sleep medicine recommended apnea/hypopnea index (AHI) threshold of 40 events/h or from 20 to 40 events/h in the presence of clinical symptoms and marked desaturations that give permission to undergo split night titration [4]. However new techniques for measuring and scoring sleep disordered breathing events have been administered which may greatly influence the severity of AHI [5,6], thus the threshold of AHI needed for CPAP titration, also may not be considered accurate for doing split–night titration.

Furthermore, it is of concern that split-night polysomnography cannot accurately assess sleep architecture and sleep disorder severity, and also may not be adequate for optimum titration while rapid eye movement (REM) sleep may not be present adequately in a split-night protocol [7,8]. There are few studies regarding the efficacy of CPAP titration during split night sleep study.

Aim of the study

To evaluate the efficacy of split night CPAP titration in comparison with conventional full night titration in patients with moderate and severe OSAS.

Patients and methods

This randomized parallel study was carried at the sleep laboratory of the Chest department of Assiut University hospital. An informed written consent was obtained from all the patients enrolled in the study. The study was approved by the Faculty of Medicine Ethics Committee, Assiut University.

Patient selection

We included adult patients with moderate and severe OSAS (diagnosed by polysomnography as total AHI $\geqslant$15). OSAS patients associated with other pulmonary diseases or patients who developed claustrophobia or with technical error during CPAP titration were excluded from the study.

Study design

Over a two year period, we assessed patients coming for polysomnography clinically, radiologically by chest X-ray and functionally (by spirometry and arterial blood gases). Patients matched with the inclusion criteria were enrolled in the study. Patients were then randomized to either undergo titration in the same diagnostic night or prepared for second full night attended CPAP titration sleep study. Patients were matched for sex, age ($\pm$10 yrs), body mass index (BMI) ($\pm$5 kg/m^{-2}), and severity. Matched patients were enrolled in the study and classified into two groups either split night or full night group.

Polysomnography and CPAP titration

Patients included in the study underwent polysomnography (Sleep Lab Pro, Jaeger, VIASYS Healthcare Hoechberg, Germany). The polysomnogram in each group monitored electroencephalogram (C3-A2, C4-A1), electro-oculogram, electromyogram of the chin, electrocardiogram, nasal and oral airflow (using oronasal flow thermistor in the diagnostic study and a piezoelectric pressure sensor to record mask pressure in the therapeutic study), thoracic and abdominal effort (using piezoelectric belts), limb movements (by means of EMG on anterior tibialis muscle), pulse oximetry, body position (recorded by a position sensor) and snoring sound level (by means of a microphone placed externally to the trachea). On CPAP titration, all patients received CPAP via an oronasal mask which was selected individually. The auto mode of CPAP device (Resmed, Autoset spirit™) with a pressure range of 4–20 cm H_2O was used for automatic titration in either of the study groups.

Polysomnography scoring

The polysomnograms were scored manually according to American academy of sleep medicine [5]. Obstructive apnea was reported as a complete cessation of airflow for at least 10 s with a preserved respiratory effort. Hypopnea required an event of at least 10 s duration in association with a $\geqslant$30% drop in the baseline amplitude and a $\geqslant$4% desaturation from the baseline saturation. The AHI was calculated as the number of apnea and hypopnea events per hour of sleep. Desaturation was detected by drop of at least 4% below baseline. An arousal was defined as an abrupt change in the EEG frequency to alpha, theta, or faster frequency in non-rapid eye movement (NREM) sleep with an increase in submental EMG as well as in rapid eye movement (REM) lasting at least 3 s [9].

After manual scoring of the different previous variables, a polysomnographic report was printed including data of sleep [Total seep time (TST) in hours, sleep efficiency, sleep stages %], respiratory [total, NREM and REM AHI and oxygen indices (Desaturation index (DI), average oxygen level, minimum oxygen level, time spent below 90% (T90)] parameters. In CPAP titration report, data about different CPAP pressures applied during the study were detected. The effective CPAP pressure (Peff) was determined as the pressure that alleviated apnoeas and hypopnea (AHI < 5). We considered titration to be successful if the Peff could be obtained together with adequate REM duration of at least 10 min [10].

Statistical analysis

Statistical Package for the Social Sciences (SPSS-version 16) software was used for analysis of results. Results in this study were presented in mean ± standard deviation or number and

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