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Original Article

Very early screening for sleep-disordered breathing in acute coronary syndrome in patients without acute heart failure

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ABSTRACT

Background: Obstructive sleep apnea (OSA) is frequently associated with acute coronary syndrome (ACS). Screening of sleep-disordered breathing (SDB) has not been previously evaluated in ACS within 72 h in intensive care settings and its management could potentially enhance patients' prognosis. This pilot study assessed the feasibility of SDB screening at the early phase of ACS.
Methods: All consecutive patients admitted to the coronary care unit (CCU) for ACS without acute heart failure underwent one overnight-attended polysomnography (PSG) within 72 h after admission. A telemonitoring (TM) system was set up to remotely monitor the signals and repair faulty sensors. The 27 recordings were analyzed as respiratory polygraphy (RP) and as PSG, and the results were compared.
Results: The TM system allowed successful intervention in 48% of recordings, resulting in excellent quality PSG for 89% of cases. The prevalence of SDB [apnea–hypopnea index (AHI) ≥ 15/h] was 82% and mainly consisted of central SDB and periodic breathing, except three patients with OSA. Compared with PSG, RP underestimated AHI, probably due to the poor sleep efficiency, reduction of slow-wave sleep, and alteration of rapid eye movement sleep.
Conclusion: An early SDB screening by remote-attended PSG is feasible in ACS patients shortly after admission to CCU. The TM enhanced the quality of PSG. A high prevalence of central SDB was noticed, for which the etiology remains unknown. Further large-scale studies are needed to determine whether central SDB is an incidental finding in early ACS and whether the presence and severity of SDB have a prognostic impact.

1. Introduction

There is a close, reciprocal relationship between ischemic heart disease and sleep-disordered breathing (SDB) [1,2]. A high prevalence of obstructive sleep apnea syndrome (OSA) (from 43% to 66%) has been reported in the early phase of acute coronary syndrome (ACS) [3]. OSA increases the risk of a new coronary event after ACS [4,5]. Systematic screening for SDB at the acute phase of ACS is not recommended, as some studies have demonstrated that the prevalence of OSA tends to decrease over time after the initial event [6–8]. However, very early SDB screening within 72 h of ACS in intensive care settings has not been performed yet by attended polysomnography (PSG). Considerable progress has been made in the medical management of ACS with very early reperfusion therapy. However, despite optimization of medical management, mortality remains high in patients with comorbidities, particularly in patients with SDB [9]. Early detection and management of SDB could therefore potentially help decrease the morbidity and mortality of ACS [10,11]. Screening rather than case-finding based on patients' symptoms could be more appropriate in this specific population that does not complain from excessive daytime sleepiness [12,13]. This pilot study evaluated the feasibility of early SDB screening in a homogeneous population of patients without acute heart failure (HF) admitted to a coronary care unit (CCU) for ACS. The accuracy of two diagnostic procedures, PSG and respiratory polygraphy (RP), was

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compared, based on the assumption that the ideal screening tool remains controversial. As an early SDB diagnostic strategy in CCU implies an additional workload for the nursing team and is associated with a high risk of failure, a telemonitoring (TM) system was used for real-time monitoring of sleep recordings during the night.

2. Methods

2.1. Study design and patient population

This was a prospective observational study. Sleep recordings were performed on a convenience sample of consecutive patients with ACS admitted to the Groupe Hospitalier Pitié-Salpêtrière Coronary Care Unit (CCU) between September 2012 and December 2012, regardless of the presence of symptoms of excessive daytime sleepiness. Inclusion criteria were: aged ≥ 18 years, ACS defined by ischemic symptoms and electrocardiogram (ECG) repolarization abnormalities together with either serum troponin elevation above the upper limit of normal and/or significant coronary artery stenosis (≥70%). Patients with stable cardiac condition either with ST-elevation ACS or non-ST-elevation ACS were included. Patients with known SDB, hemodynamic instability, clinical acute HF (dyspnea, orthopnea or inspiratory crackles) or who were unable to provide their informed consent were excluded. The protocol was approved by the local research ethics committee "CPP Ile de France VI Pitié Salpêtrière" (file no. 71–12). All subjects provided their written informed consent.

2.2. Patient assessment

Clinical examination was performed and demographic characteristics, echocardiographic, and angiographic data were collected before PSG. Subjective daytime sleepiness was assessed by the Epworth Sleepiness Scale (ESS).

2.3. Respiratory polygraphy and polysomnography recordings

All patients underwent one overnight real-time remotely attended sleep test in their own room in the CCU. Sensor placement was performed by the same trained sleep physician at about 07:00, and the monitor was removed by the same physician the next morning (08:00). A battery-operated portable polysomnograph (Dream®, Medatec, Brussels, Belgium) was used to record chest and abdominal movements, airflow, pulse oximetry (Nonin®, Minneapolis, MN, USA), 5-channel electroencephalogram (EEG), two electrooculograms, submental electromyogram, anterior tibialis electromyogram, and ECG. A microphone recorded tracheal sounds and body position was assessed using a built-in position sensor (mercury gauge) with four different levels.

2.4. Telemonitoring (Fig. 1)

The Sleepbox® (Medatec) is a TM system allowing real-time remote PSG visualization from the sleep laboratory, previously assessed in a feasibility study [14]. The Sleepbox was placed in the patient's room. CCU nurses were carefully trained about the various parameters recorded and correct sensor placement so that they could replace sensors whenever necessary. The sleep laboratory was located in a different building from the CCU. The sleep laboratory nurse performed continuous remote monitoring of the recording during the night. When a defective oximetry, nasal pressure, or ground electrode signal was observed or when fewer than two EEG recordings became readable, the sleep laboratory nurse contacted the CCU nurse by phone to ask her to replace the faulty electrodes.

2.5. Scoring and analysis of sleep studies

PSG recordings were interpreted independently by two sleep physicians: the first physician analyzed only respiratory parameters and the second physician, blinded to the respiratory results, analyzed the PSG. Manual scoring of PSG was performed according to American Academy of Sleep Medicine guidelines [15].

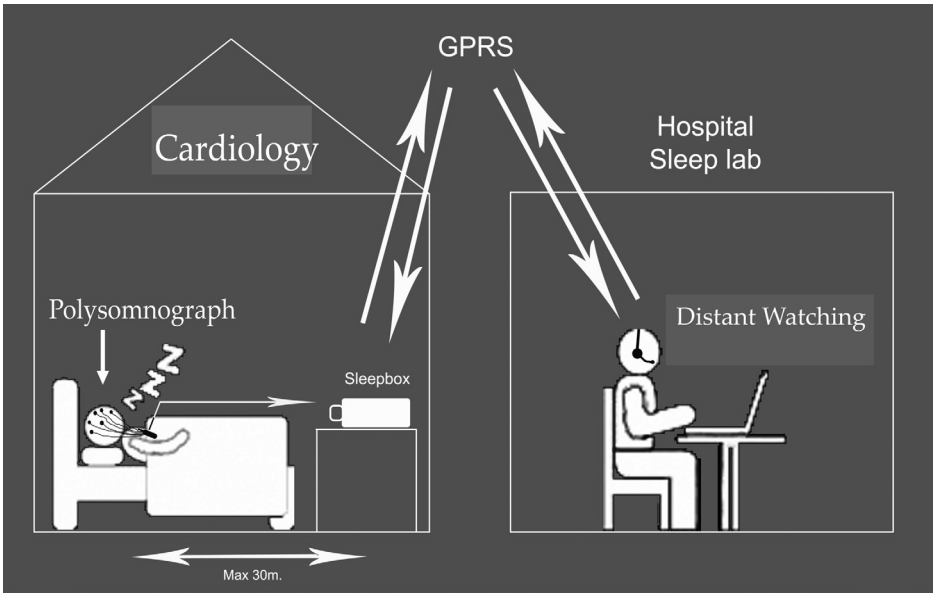

Fig. 1. Polysomnographic (PSG) telemonitoring protocol. The Sleepbox® is a telemonitoring system, using an internet communication (GPRS), allowing real-time remote PSG visualization from the sleep laboratory located in a different building from the coronary care unit (CCU). The sleep laboratory nurse performed continuous remote monitoring of the recording during the night. In case of defective signal, the sleep laboratory nurse contacted the CCU nurse by phone to ask her to replace the faulty electrodes.