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Point/Counterpoint

Should All Congestive Heart Failure Patients Have a Routine Sleep Apnea Screening? Pro

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See article by Li et al., pages 940-944 of this issue.

ABSTRACT

Sleep-disordered breathing (SDB) is highly prevalent in heart failure (HF) patients. These breathing disturbances are independent predictors of increased morbidity and comorbid conditions that improve with SDB treatment. Considering the overlap between SDB-related and HF clinical symptoms reported by patients, objective tests need to be conducted for a diagnosis to be firmly established and to determine the type and severity of SDB that will dictate treatment alternatives. Considering the high success rate and diagnostic value of ambulatory monitoring techniques, they represent a practical, cost-effective, and accurate alternative to diagnosing SDB in HF patients.

RÉSUMÉ

Les troubles respiratoires du sommeil (TRS) sont très répandus chez les patients atteints d'insuffisance cardiaque (IC). Ces perturbations respiratoires sont des prédicteurs indépendants de l'augmentation de la morbidité et des affections comorbides qui s'améliorent avec le traitement des TRS. Compte tenu du chevauchement entre les symptômes cliniques liés aux TRS et les symptômes cliniques de l'insuffisance cardiaque rapportés par les patients, il faut mener des tests objectifs pour établir un diagnostic ferme et pour déterminer le type et la gravité des TRS qui dicteront les options thérapeutiques. En raison de leur taux de réussite élevé et de leur valeur diagnostique, les techniques de surveillance ambulatoire représentent une option pratique, rentable et précise pour diagnostiquer les TRS chez les patients atteints d'IC.

Sleep-disordered breathing (SDB) is highly prevalent in heart failure (HF) patients. These breathing disturbances are independent predictors of comorbid conditions such as ventricular arrhythmia,[1] and cardiac readmission in a cardiology clinical unit.[2] The presence of sleep apnea (obstructive and/or central events, respectively, consecutive to upper airway closure and decrease in respiratory drive) significantly reduces life expectancy in these patients.[3-6] SDB is associated with an increased incidence of ventricular tachycardia[7] which might result in overuse of implantable cardioverter-defibrillators.[8] They represent an independent and elevated risk for readmission/mortality after decompensated HF.[9] In HF patients, treatment of obstructive sleep apnea with nasal continuous positive airway pressure (CPAP) improves numerous markers associated with poor prognosis of cardiovascular disease.[10,11] In obstructive sleep apnea patients with acute HF decompensation, an improvement in left ventricular ejection fraction (LVEF) is observed in the first days after initiation of CPAP therapy compared with optimal medical treatment alone.[12] In an observational study conducted in 106 HF patients with obstructive sleep apnea, the rate of hospital readmission or consultation to the emergency department after a cardiac event was 0% in those who used CPAP $>$ 4 hours per night for 70% of nights compared with 29% in those who did not use CPAP ($P = 0.025$).[13] A post hoc analysis of the results of the Canadian Positive Airway Pressure for Patients with Central Sleep Apnea and Heart Failure (CANPAP) trial found that patients with predominant nonobstructive sleep apnea whose SDB improved during the first months of CPAP therapy also improved LVEF and heart transplantation-free survival.[14] In the same group of patients, adaptive servoventilation has been found to improve LVEF, muscle sympathetic activity,[15] and N-terminal pro-brain natriuretic peptide.[16] These effects are thought to contribute to the improvement in mortality that has been reported with positive airway pressure treatment (CPAP, bilevel positive airway pressure, or adaptive servoventilation) in severe sleep apnea patients in an observational study.[17,18] More robust information is expected to come from the results of 2 major randomized clinical trials that are presently conducted to establish the effect of adaptive servoventilation on mortality in HF.

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Table 1. Main rationales that justify the for the need to identify the presence of sleep disturbances in CHF patients

SDB-associated risks in CHF patients	• Ventricular arythmia[1,7,8] • Increase in cardiac readmission in a cardiology clinical unit[2] • Reduced life expectancy[3-6,9]
Benefits of treatment of SDB in CHF patients	• Improvement in left ventricular ejection fraction[12] • Improvement in mortality[14] • Decrease in the rate of hospital readmission or consultation to emergency department after a cardiac event[13]

CHF, congestive heart failure; SDB, sleep-disordered breathing.

Therefore, diagnosis and treatment of SDB are important steps in the management of HF disease especially in patients with severe nocturnal breathing abnormalities.

Is There a Need to Routinely Assess for the Presence of SDB in Congestive HF?

An important feature of SDB in HF patients is that common complaints associated with sleep apnea are frequently lacking[19,20] or are difficult to distinguish from nonspecific symptoms such as fatigue.[21] Comorbid conditions such as refractory hypertension,[19] absence of arterial pressure nocturnal dipping, atrial fibrillation,[22] diastolic dysfunction,[23] and hypocapnia[24] are associated with an increase in the risk of SDB but are not sufficient to establish a diagnosis on their own. Therefore, objective tests need to be conducted for a diagnosis to be firmly established and to determine the type and severity of SDB that will dictate treatment alternatives.[25] Polysomnography (PSG) is the gold standard for confirming the presence of SDB, identification of type predominance, and quantification of consequences on sleep architecture, cardiac rhythm, and oxygenation, to establish its severity. However, PSG is costly and time-consuming, accounting for an excessively long delay for the completion of these tests.[26] This justified the development of ambulatory abbreviated cardiorespiratory recording techniques and establishment of guidelines for the use of these devices.[27] The main concerns regarding the use of ambulatory monitoring consist of the absence of quantification of total sleep time (that is replaced by total recording time), the impossibility of scoring arousals (that are part of the definition of breathing disorders such as hypopneas), and the risk of data loss. As a consequence of the huge technological developments of the apparatus, and considering the increasing prevalence of SDB in modern societies, these concerns were not strong enough to strengthen the use of ambulatory monitoring in the investigation of patients with suspected sleep apnea.[28,29] The main rationales to justify the need to identify the presence of sleep disturbances in congestive HF (CHF) patients are presented in Table 1. This goes with important considerations regarding the differences in diagnostic value attached with each category of apparatus.[30]

Is Ambulatory Monitoring an Appropriate Tool to Diagnose Sleep Apnea in HF?

Different types of ambulatory devices are available that are classified according to the type and number of variable data that are collected during the night.[26] The methods that can be used to identify the presence of SDB, their advantages, and disadvantages are summarized in Table 2. Level IV devices are the simplest ones. They have up to 2 channels that are most often used to record transcutaneous arterial saturation and cardiac frequency. Level III recorders include additional measurements of nasal flow, respiratory efforts, body position, electrocardiogram, and eventually actigraphy (recording of wrist movements to estimate sleep period). Level III monitoring has been found to reduce the cost of diagnosis of sleep apnea by 18% compared with conventional PSG.[31] Recording of arterial tonometry is available in specific devices. It is to be noticed that the frequency of breathing abnormalities and the obstructive or central nature of these events identified using ambulatory recordings are highly reproducible in CHF patients.[32,33] Level II devices allow recording of the same variables as PSG but are used without technician attendance outside of the sleep laboratory. Level III and IV represent the most available techniques of ambulatory monitoring. Level II recording is not commonly used, thus justifying our choice not to include it in this review.

Level IV ambulatory monitoring

We evaluated the diagnostic accuracy of nocturnal oximetry (level IV) in 50 patients who were approached to participate in the CANPAP trial regardless of symptoms of SDB. An oximetry recording was completed during the in-laboratory PSG recording and at home in random order. Interpretable oximetry data were obtained in 94% of home recordings.[34] The prevalence of SDB in the studied population was 72% (central sleep apnea in 66% of patients). We found the diagnostic value of home oximetry to be very good with an 85% sensitivity and 93% specificity, corresponding to a 97% likelihood of SDB with a positive home oximetry recording and 5.8% with a negative home oximetry recording. Because obstructive and nonobstructive SDB can

Table 2. Advantages and disadvantages of various ambulatory recording methods to identify SDB disturbances

Recording system	Recorded parameters	Advantages	Disadvantages
Level IV	Up to 2 channels (usually transcutaneous SaO_2 and cardiac frequency)	Ease of use, low cost	No information on the type of SDB, no recording of sleep variables
Level III	Level IV parameters and nasal flow, respiratory efforts, body position, ECG, and eventually actigraphy	Assessment of respiratory flow and efforts	More cumbersome, risk for loss of signal(s), no recording of sleep variables
Level II	Level III parameters and EEG, EMG, EOG	Same information than a conventional in-lab polysomnography	More expensive and cumbersome, risk for loss of signals

ECG, electrocardiogram; EEG, electroencephalogram; EMG, electromyogram; EOG, electroculogram; SaO_2, arterial saturation; SDB, sleep-related breathing.