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EDITORIAL

Implications of revised AASM rules on scoring apneic and hypopneic respiratory events in heart failure patients with nocturnal Cheyne-Stokes respiration

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Sleep-disordered breathing (SDB) is a common, under-recognized comorbidity in patients with chronic heart failure (CHF) associated with a worse prognosis in these patients. The prevalence of SDB may be as high as 75 % among all patients with CHF and may be even higher among patients with acute decompensated heart failure [1, 2]. While in the general population, obstructive sleep apnea (OSA) is more common; more than half of patients with heart failure suffer from central sleep apnea (CSA) with Cheyne-Stokes breathing (CSB). CSB-CSA due to systolic CHF is probably the most common cause of CSA seen today.

Patients with CHF with clinically significant SDB may have minimal symptoms. The absence of the typical symptoms of sleep apnea such as disturbed sleep or daytime sleepiness makes diagnosis and treatment difficult in patients with CHF. Nocturnal sleep complaints are often assumed to be secondary to CHF rather than to comorbid sleep apnea. Several investigators tried to assess specific symptoms of sleep apnea in patients with CHF. Bitter et al. [3] showed, in a large-scale cohort study in patients with chronic CHF, that fatigue and witnessed apneas predispose patients to have CSA; however, they concluded that clinical symptoms do not sufficiently predict SDB. Although the majority of patients with CSB-CSA do not complain of subjective excessive daytime sleepiness, successful treatment improves sleep quality and objective daytime sleepiness [4]. Thus, a high index of suspicion is needed to suspect the presence of CSB.

The classification of respiratory events especially hypopneas remains cumbersome requiring a quantitative assessment of respiratory effort. The gold standard method for distinguishing central from obstructive hypopneas is esophageal manometry, a method that cannot be used in daily clinical practice. This may be the reason why the 2007 American Academy of Sleep Medicine (AASM) criteria do not recommend the distinction of hypopneas into central and obstructive adding only a note that summarizes all abovementioned difficulties. On the other hand, the 2012 AASM criteria offer for the first time the opportunity to score hypopneas as obstructive and central using criteria from methods that can be applied in clinical practice (snoring, flattening of nasal pressure device flow signal, and thoracoabdominal paradox). The hypopnea scoring was always problematic, and further changes are expected in updates of the AASM criteria. Actually, this is the scope of the AASM scoring manual, namely to continue to advance the field of sleep medicine and to improve the quality of care of patients with sleep disorders.

In this issue of Sleep and Breathing, Dr. Heinrich and colleagues tried to examine the differences on the apnea-hypopnea index (AHI) and on SDB diagnosis using AASM 2007 compared with AASM 2012 scoring rules in a cohort of 91 CHF patients with CSB-CSA. They found that the diagnosis of CSB-CSA was made in a greater number of patients with CHF when hypopneas were scored using the AASM 2012 rule requiring an associated ≥3 % oxygen desaturation compared with the 2007 AASM "alternative" rule requiring an associated ≥3 % oxygen desaturation or electroencephalographic (EEG) arousal and with the more conservative recommended hypopnea definition requiring a corroborative ≥4 % oxygen desaturation [5]. Hypopnea scoring rules significantly influenced the AHI and diagnosis of sleep-disordered breathing in CHF, but do not alter the classification of obstructive sleep apnea or central sleep apnea. Furthermore, given the new AASM criteria for CSB, the authors noted a

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decrease in CSB duration, which is interesting as CSB duration is probably linked with the severity of heart failure. The authors concluded that differences between the versions of the AASM scoring rules need to be taken into account when comparing data from different time periods.

The study certainly has clinical importance, as the AHI is the gold standard measurement, and it must be absolutely clear how it is scored. Different scoring techniques change the AHI substantively, and the impact on AHI is dependent on the hypopnea definition used. However, the readers should bear in mind that the authors used portable cardiorespiratory polygraphy in the assessment of SDB in heart failure patients. Although these polygraphs are much cheaper than the portable polysomnography (PSG), there is a lack of sleep staging and arousal scoring, resulting in underestimation of AHI, which quantifies the severity of SDB. Such underestimation might be particularly relevant in patients with heart failure, owing to their reduced sleep efficiency. Nevertheless, recently, Pinna et al. [6] found a high degree of agreement between the AHIs obtained from the two scoring methods, thus suggesting that cardiorespiratory polygraphy may be used as an alternative to portable PSG in the assessment of SDB in heart failure patients. Furthermore, the authors did not address other factors potentially involved in measured AHI, such as patients that can vary in the percentage of central events overnight or from night to night [7, 8]. Therefore, taking into account the effects of both respiratory scoring criteria and night-to-night variability on the measured AHI, the use of a strict AHI cutoff of ≥15/h in patients with CHF may be too restrictive, leading to the treatment for SDB not being offered to some who may benefit.

In the literature, a number of criteria have been used to score hypopnea in patients with CHF. In accordance with the data of Dr. Heinrich, Ward et al. [9] found that the diagnosis of SDB was significantly greater in patients with CHF when hypopneas were scored using the 2007 AASM "alternative" rule compared with the recommended hypopnea definition, whereas classification of SDB as OSA or CSA was not significantly altered by hypopnea scoring rules. Therefore, the question that arises is why the treatment of sleep apnea should be based only on the AHI. It must be recognized that central events are less likely to result in oxygen desaturation compared to obstructive events, especially in the usually non-obese CHF patients. Therefore, significant respiratory events may be unrecognized and the degree of SDB underestimated. On the other hand, according to Punjabi et al. [10], if AHI is a better predictor of cardiovascular disease when hypopneas are defined with a ≥4 % oxygen desaturation criterion, it is possible that hypopneas without accompanying oxygen desaturation are pathophysiologically less significant. However, it is difficult to find the most suitable definition of hypopnea in order to describe sleep apnea in patients with CHF. The role of diagnostic methods such as standard PSG, portable PSG, or cardiorespiratory polygraphy in patients with CHF and SDB is to give an accurate answer to the main question: Is the predominant part central or obstructive? This information is crucial in order to decide the most effective therapy in this patient group. CPAP is effective when the obstructive part predominates, while adaptive servoventilation (SV) is the most effective way to abolish central events and CSB. The never autoSV devices are probably equally effective for both central and obstructive events in CHF patients. Chronic heart failure has a well-known worse prognosis, and the role of sleep physicians is not to treat AHI numbers, but patients.

In summary, the study of Dr. Heinrich and colleagues further emphasizes the significance of identifying and managing SDB, in particular CSA, in patients with CHF. It has been clear that SDB is not only associated with adverse cardiovascular outcomes and mortality but also its treatment can improve heart failure-related outcomes and quality of life. Understanding the effect of scoring criteria is important in the diagnosis of SDB and the need for treatment. To decide which patients should be screened for SDB is a more crucial decision to make in CHF patients, and large studies are needed to investigate whether the treatment of sleep apnea, especially central sleep apnea, will beneficially influence the clinical course of heart failure.

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