Atrioventricular Block During the Phasic Events of REM Sleep in a Patient with Severe Obstructive Sleep Apnea Syndrome

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Patients with obstructive sleep apnea syndrome (OSAS) sometimes have atrioventricular (AV) block during sleep. However, significant resolution of such AV block with treatment for OSAS has been reported. On the other hand, during rapid eye movement (REM) sleep, conduction disturbances not associated with the apnea event can be observed, particularly in young healthy subjects. We report the case of a 67-year-old man with severe OSAS and 2:1 AV block that occurred only during the phasic events of REM sleep; continuous positive airway pressure (CPAP) treatment did not result in resolution of the AV block. No specific abnormalities were found on cardiac evaluation. Based on the analysis of overnight heart rate variability, CPAP treatment resulted in a markedly reduced ratio of low-frequency to high-frequency power and an increased high-frequency power, though high-frequency power was not increased during REM sleep on CPAP.

Keywords: obstructive sleep apnea syndrome, heart rate variability, ratio of low frequency to high frequency, continuous positive airway pressure

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activity. In this case, each 2 minute of recording were used as a window for HRV analysis, and HRV showed a markedly reduced LF/HF ratio and an increased HF power on CPAP during awakening, total sleep, and non-REM sleep, whereas the HF power was not increased during REM sleep on CPAP (Figure 1c). The Holter electrocardiogram showed no episodes of A V block during the day, and the patient did not complain of any symptoms. Therefore, the patient was not given specific treatment for 2:1 A V block.

**DISCUSSION**

Although patients with OSAS sometimes have AV block during sleep in association with an apnea event, significant resolution of such AV block with treatment of the OSAS has been reported.\(^5,6\) On the other hand, during REM sleep, AV block can be observed, particularly in young healthy subjects.\(^1\) It was initially thought that the AV block seen in the present patient was primarily associated with OSAS, since the patient had severe OSAS and was not a young athlete. Therefore, as has been previously reported, one would have supposed that CPAP would have been an effective treatment for AV block.\(^5,6\) However, the patient’s 2:1 AV block during phasic events of REM sleep continued even on CPAP. The laboratory data and echocardiographic and electrophysiologic studies ruled out an electrolyte disorder and an abnormality of the cardiac conduction system. Therefore, this patient appeared to have REM-sleep–related AV block, quite similar to that reported by Osuna et al.\(^3\) They reported one case with mild OSAS who had complete AV block only during phasic events of REM sleep, and, as in the present case, the complete AV block did not improve with CPAP treatment. On the other hand, Janssens et al.\(^4\) have reported non-OSAS cases of REM-sleep–related bradyarrhythmia with decreased sympathetic tone and increased parasympathetic tone during REM sleep. In the present patient, both the LF/HF ratio and the HF power were greater during REM sleep than during non-REM sleep. In addition, the LF/HF ratio was reduced and the HF power was increased with the patient on CPAP during awakening, total sleep, and non-REM sleep. This may indicate that sympathetic tone was reduced and parasympathetic tone was increased during these periods with the patient on CPAP. However, the HF power was not increased during REM sleep on CPAP; this may indicate that parasympathetic tone was not increased during REM sleep with the patient on CPAP. These findings may indicate that AV block during REM sleep, which was observed even when the patient was on CPAP, was not provoked by enhanced parasympathetic tone. Although, the specific mechanisms for such AV block remain unclear, the present report highlights the existence of REM-related AV block that is not resolved by CPAP in nonathletic older patients with severe OSAS.

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**Figure 1a**—Representative raw waveform on initial polysomnogram. The 2:1 atrioventricular (AV) block (black arrow) was documented during the phasic events of rapid eye movement (REM) sleep in the initial phase of the apnea or hypopnea episodes without hypoxia. The white arrow indicates eye movement. The AV block occurred at the time of eye movement. The duration of this waveform is 30 seconds. L-EOG and R-EOG refer to left and right electrooculogram, respectively; EEG, electroencephalogram; ECG, electrocardiogram; SO\(_2\), oxyhemoglobin saturation; R-LM and L-LM, right and left leg movements, respectively.
Figure 1b—Representative raw waveform on polysomnogram during continuous positive airway pressure (CPAP) titration. The 2:1 AV block (black arrow) during the phasic events of REM sleep persisted with the patient on CPAP. The white arrow indicates eye movement. The AV block occurred at the time of eye movement, as had occurred during the diagnostic polysomnogram. The duration of this waveform is 30 seconds.

Figure 1c—Heart rate variability during diagnostic polysomnography and during polysomnography with the patient on CPAP. CPAP increased the high-frequency (HF) power during awake, non-REM, and the total night but not during REM sleep. However, CPAP reduced the low-frequency (LF)/HF ratio during REM sleep.

REFERENCES