CASE REPORT

Treatment of tachycardia: bradycardia syndrome in a patient with obstructive sleep apnoea

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SUMMARY

Obstructive sleep apnoea (OSAS) affects 4% of men and 2% of women aged 30–65 years. It is diagnosed in the presence of excessive daytime sleepiness and an apnoea–hypopnoea index (AHI) of ≥5 on polysomnography. Rhythm disturbances are common in OSAS and continuous positive airway pressure (CPAP) has been shown to be beneficial. We present a case of a patient with obesity, atrial fibrillation with fast ventricular response, significant nocturnal pauses (3.9 s) and tachycardiomyopathy. A polysomnography confirmed severe OSAS (AHI=64.25). CPAP improved bradycardia and allowed for the introduction of β-blockers. Subsequent Holter monitoring revealed better rate control with the longest pause of 2 s and the patient's left ventricular systolic function improved. CPAP prevented our patient from invasive treatment, allowed for rate control and improvement of tachycardiomyopathy. With such a high prevalence of OSAS, clinicians should be aware that CPAP may aid arrhythmia control.

BACKGROUND

Obstructive sleep apnoea syndrome (OSAS) is characterised by a coexistence of excessive daytime sleepiness and irregular breathing at night[1] due to intermittent episodes of upper airway obstruction.[2] The reported risk factors for OSAS include obesity, male gender, age, craniofacial abnormalities,[2] having a short neck with a low hairline[3] and a neck circumference of more than 17 inches,[1] the use of sedative drugs, smoking and alcohol consumption.[1] A subjective assessment of daytime sleepiness can be performed using Epworth Sleepiness Scale (ESS), which subdivides patients into: normal range (ESS <11 points), mild (ESS 11–14 points), moderate (ESS 15–18 points) and severe subjective daytime sleepiness (ESS >18 points).[1] Diagnosis is confirmed by polysomnography studies using an apnoea–hypopnoea index (AHI), which is defined as the frequency of apnoea and hypopnoea episodes per hour.[1] AHI 5–14/min constitutes mild OSAS, AHI 15–30/h moderate and AHI >30 h severe.[1] It is estimated that OSAS affects 4% of men and 2% of women aged 30–65 years, which is comparable to the prevalence of type 1 diabetes mellitus.[2] Rhythm disturbances are common in OSAS.[2] These include tachyarrhythmias[2 4] and bradyarrhythmias.[5] Treatment with continuous positive airway pressure (CPAP) has been shown to be beneficial in arrhythmic control,[2 5] which is crucial, as different forms of uncontrolled tachyarrhythmias have been shown to cause heart failure known as 'tachycardiomyopathy'.[6]

CASE PRESENTATION

We present a case of a 46-year-old man with a history of diabetes mellitus, hypertension and obesity (body mass index 51.5 kg/m^2), who presented to the cardiology clinic with a new onset of atrial fibrillation (AF) with rapid ventricular response (heart rate between 19 and 217 bpm) and asymptomatic prolonged nocturnal pauses of up to 3.95 s (figure 1, upper rhythm strip) on Holter monitoring performed in the community.

INVESTIGATIONS

The patient's echocardiogram revealed a severe left ventricular systolic dysfunction with ejection fraction of 27% (modified Simpsons), a dilated left ventricle, a normal sized right ventricle with impaired function and dilated atria. Pulmonary artery systolic pressure was not elevated. Our patient had a history of AF with rapid ventricular response and no other cause to explain his heart failure and, as such, a provisional diagnosis of tachycardiomyopathy was made. He was referred for an urgent sleep apnoea study because of a history of daytime sleepiness and obesity, and a severe OSAS was confirmed (AHI=64.25/min).

TREATMENT

Diuretics and ACE inhibitors were started immediately during the first clinic appointment. Rate-limiting therapy was contraindicated due to nocturnal pauses. The patient underwent a direct current electrical cardioversion (DCCV), which failed. The main treatment option at this stage was to implant a permanent pacemaker to allow for aggressive rate control. However, once severe OSAS was diagnosed on sleep studies, CPAP was promptly initiated.

OUTCOME AND FOLLOW-UP

Treatment with CPAP improved the severity of bradycardic episodes and allowed for the introduction of β-blockers. Subsequent Holter monitoring, 2 months after initiation of CPAP while on 7.5 mg of bisoprolol, showed an improvement in the patient's nocturnal pauses with the longest pause of up to 1.6 s (figure 1, lower rhythm strip) and a final Holter monitoring, 6 months after starting CPAP and on the maximum bisoprolol dose, showed non-significant pauses (longest 2.08 s) and an average heart rate of 86 bpm. A repeat echocardiogram 6 months after the initial one showed a

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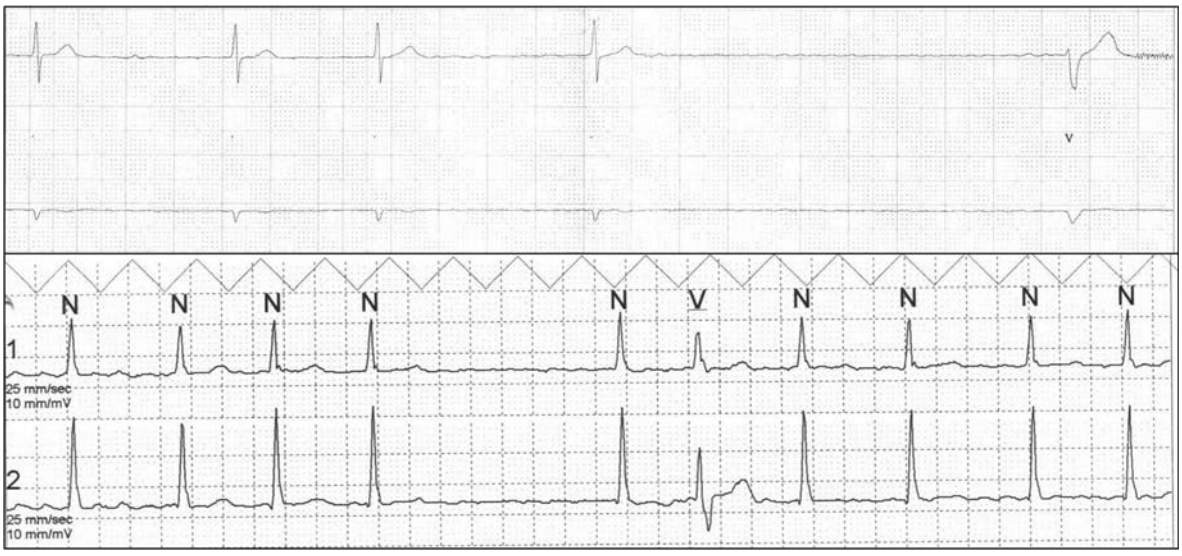

Figure 1 Upper rhythm strip—atrial fibrillation with the longest pause of 3.95 s. Lower rhythm strip—atrial fibrillation with the longest pause of 1.6 s, while on continuous positive airway pressure and taking 7.5 mg of bisoprolol.

non-dilated right and left ventricle with ejection fraction of 51% (teichholz). A change in ejection fraction from initial 27% to 51% has proven that the tachycardiomyopathy has vastly improved.

DISCUSSION

Apnoeic and hypoxic episodes in OSAS can cause cardiac vagal activation reflex, which is responsible for bradyarrhythmias.[2] A persistent increase in sympathetic tone due to oxygen desaturations and increases in arterial carbon dioxide levels can lead to electrical remodelling of atria facilitating supraventricular tachyarrhytmias.[2] In such patients, treatment of OSAS may improve rhythm disturbances,[2 5] and it has been reported in the literature that CPAP therapy in tachycardia–bradycardia syndrome has been beneficial.[7] In our patient, who failed DCCV and had evidence of heart failure presumably due to uncontrolled AF, the only choice of therapy would have been to implant a pacemaker and either embark on a medical rate control or perform an atrioventricular node ablation. The treatment of underlying OSAS with CPAP improved bradycardia and facilitated the introduction of β-blockers, which, in turn, resulted in the improvement of tachycardiomyopathy, thus avoiding major invasive therapy in a young patient. Knowledge of high prevalence of OSAS in the community and its association with rhythm disturbances[2] should prompt clinicians to identify such cases where CPAP could help control rhythm disturbances.

Learning points

- It is estimated that obstructive sleep apnoea syndrome (OSAS) affects 4% of men and 2% of women aged between 30 and 65 years, which is comparable to the prevalence of type 1 diabetes mellitus.
- OSAS is associated with bradyarrhythmias and tachyarrhythmias.
- The treatment of OSAS with continuous positive airway pressure (CPAP) has been shown to be beneficial in arrhythmia control.
- In our patient, who had tachycardia–bradycardia syndrome and tachycardiomyopathy, CPAP prevented permanent pacemaker insertion, allowed for medical rate control and the improvement of left ventricular systolic function.

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Competing interests None.

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