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CASE REPORT

Atrial Undersensing-Associated Premature Atrial Contractions: A Case Report

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Abstract

Atrial undersensing is defined as the inability of the pacemaker to detect spontaneous atrial activity. A case of premature atrial contractions associated with atrial undersensing is presented. A 33-year-old woman presented with irregular heartbeat and general weakness. A single atrial stimulation (AAI) pacemaker was implanted seven years earlier for recurrent syncope associated with sinus arrest. Ambulatory ECG monitoring revealed multiple episodes of atrial undersensing resulting in premature atrial contractions (PACs). Occasionally, blocked PACs or PACs with aberrancy associated with atrial undersensing were seen. After improvement of atrial sensing, no episodes of undersensing were found and the complaints disappeared.

Key words: Artificial pacemaker; Atrial premature complexes; Heart block; Heart conduction systems.

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Introduction

Undersensing is defined as the inability of the pacemaker to detect spontaneous myocardial depolarisation.[1] The prevalence of atrial undersensing ranges from 2.9 % to 20.7 % in patients with implanted pacemakers.[2, 3] It's believed that atrial undersensing of < 10 % doesn't affect patients' functional ability and quality of life, whereas atrial undersensing of > 10 % is associated with a decrease in exercise tolerance and worse quality of life.[4] In addition, intermittent atrial undersensing in patients with VDD pacemakers is a possible mechanism of life-threatening ventricular arrhythmias.[5] Despite the large number of reported cases of undersensing, no association between undersensing and premature atrial or ventricular contraction has been reported.

A case of intermittent atrial undersensing in young patient with a single atrial stimulation (AAI) pacemaker resulting in premature atrial contractions (PACs) is described.

Case history

A 33-year-old female patient presented to a doctor with complaints of irregular heartbeat and general weakness. These complaints occurred about 6 months ago and progressed gradually. Medical history: single atrial stimulation (AAI) pacemaker implanted seven years ago for recur-

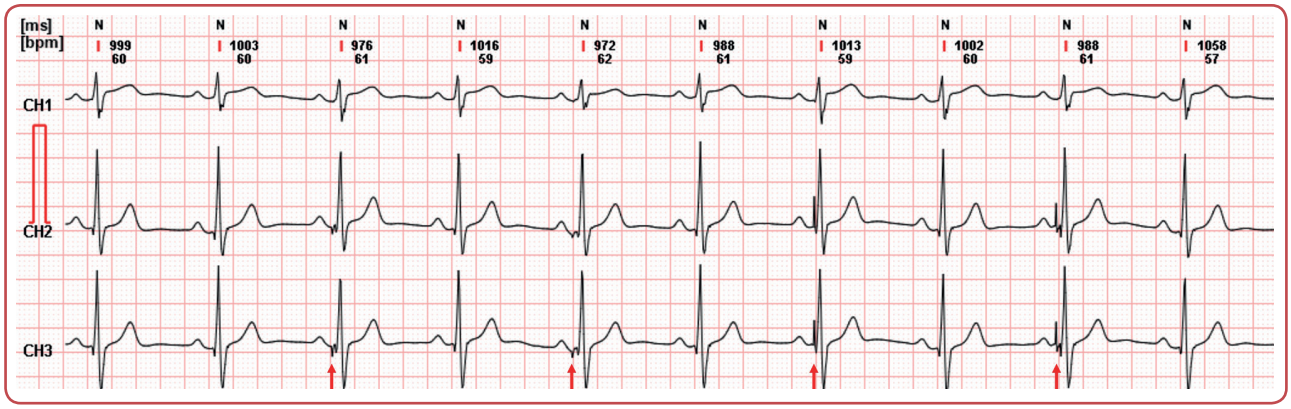

Figure 1: Atrial undersensing

Pacing spikes (arrowed) are seen after P waves.

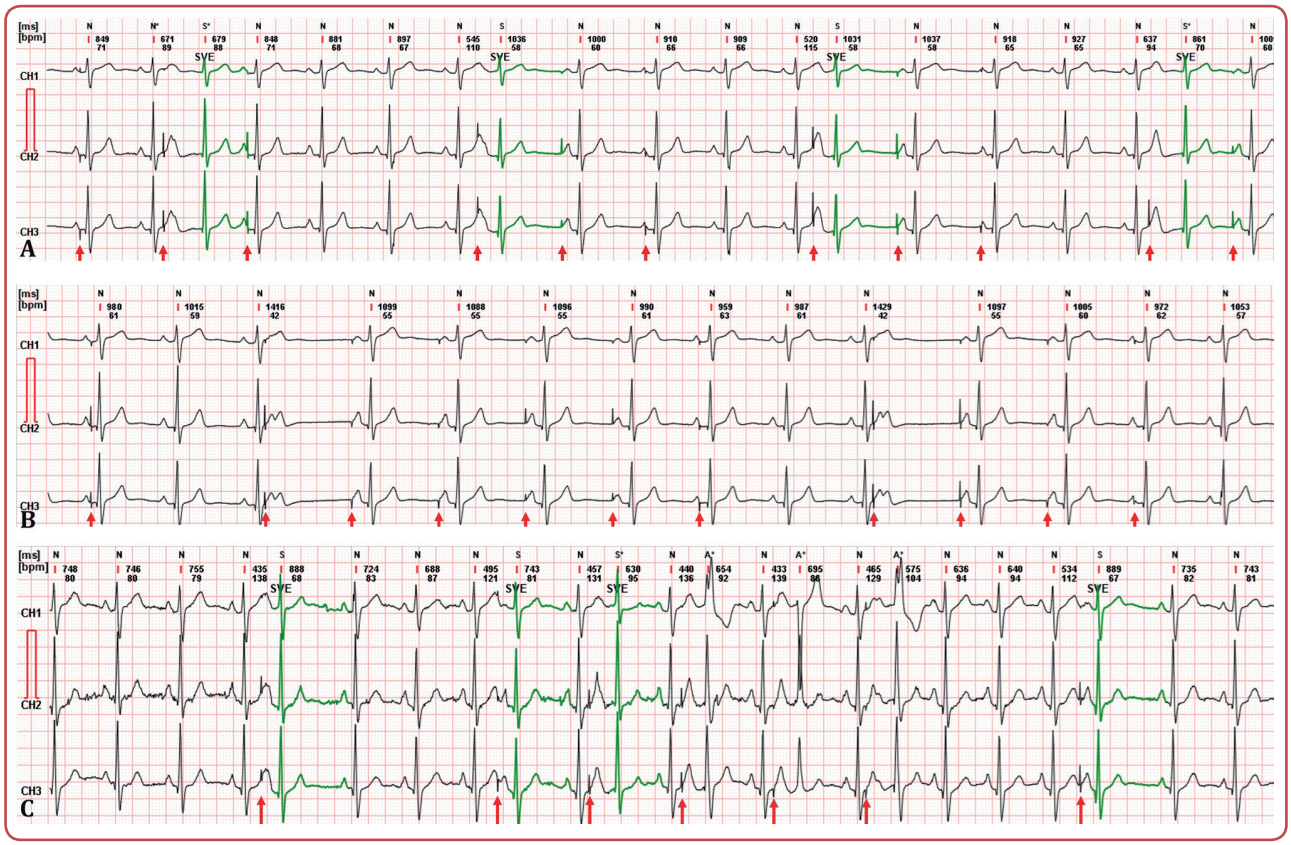

Figure 2: Atrial undersensing: A) resulting in premature atrial contractions (PACs); B) resulting in blocked PACs; C) resulting in PACs with aberrancy

Pacing spikes are arrowed.

rent syncope associated with sinus arrest. Ambulatory electrocardiographic (ECG) monitoring was performed.

Ambulatory ECG monitoring revealed multiple episodes of undersensing (Figure 1), often resulting in premature atrial contractions (PACs) (Figure 2A). Occasionally, blocked PACs (Figure 2B) or PACs with aberrancy (Figure 2C) associated with atrial undersensing were seen. Eight thousand two hundred twenty-one PACs (including 738 PACs with aberrancy) were detected. Each PAC was thought to be associated with atrial undersensing.

The patient was referred for the pacemaker check. The sensitivity of the atrial activity was increased (sensitivity threshold was decreased form 2.5 mV to 2.0 mV). Ambulatory ECG monitoring was performed after correction of atrial

sensing. Only 1 PAC (not related to undersensing) per day was found. In addition, complaints of irregular heartbeat and general weakness disappeared and there was a marked improvement in quality of life.

Discussion

Presented patient was implanted AAI pacemaker due to a symptomatic episodes of sinus arrest. A DDD pacemaker with atrioventricular delay management is preferred for most patients, but young age may be a reason to avoid two leads and implant a single-chamber pacemaker.[6]

Atrial undersensing is one of the most common pacemaker malfunctions. It may be associated with irregular heartbeet due to PACs. In addition, PACs associated with atrial undersensing may be blocked (not conducted to the ventricles) or with aberrant conduction (right or left bundle branch block). The response of the atria and ventricles to atrial pacing in atrial undersensing depends on the timing of the atrial pacing spike. If the atrial pacing spike occurs very early after the P wave (before, during or just after the QRS complex), atrial depolarisation (and the P wave) doesn't occur due to the refractory period in the atria. If the atrial pacing spike appears when the atria come out of their refractory period but during the refractory period of the atrioventricular node, the ECG shows a P wave without a QRS complex (blocked PAC). If the atrial pacing spike occurs later, a P wave followed by a QRS complex is seen. If the impulse spread to the ventricles during the refractory period in the one of the bundle branches, aberrantly conducted PAC is seen.

Atrial undersensing should be suspected in any patient with an implanted pacemaker (with an atrial lead) and PACs, as the pacing spike is sometimes poorly visible. Correction of atrial sensing is essential for patients with this condition.

Conclusion

Atrial undersensing may result in symptomatic PACs. Improvement of atrial sensing may completely eliminate atrial undersensing and the patients' symptoms.

Ethics

Our institution does not require ethics approval for reporting individual cases or case series. A written informed consent for anonymised patient information to be published has been obtained from the patient.

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Conflicts of interest

The authors declare that there is no conflict of interest.

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Data access

The data that support the findings of this study are available from the corresponding author upon reasonable individual request.

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