

# Simultaneous sinoatrial exit block and atrioventricular block



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## Background

The presentation of simultaneous sinoatrial (SA) exit block and atrioventricular block (AVB) is exceedingly rare.<sup>1–3</sup> We present the case report of such a patient.

## Case report

A 60-year-old man with hypertension, diabetes, end-stage renal disease on hemodialysis, previous jaw osteomyelitis, and mastoiditis presented to the emergency room with ear and facial pain and was found to have recurrent mastoiditis. Antibiotic therapy was initiated and continued for 6 weeks.

Laboratory test results on admission were notable for high-sensitivity troponin of 179 ng/L (normal  $\leq 22$  ng/L), which downtrended thereafter. Initial electrocardiogram (ECG) showed normal sinus rhythm without acute ischemic changes. Transthoracic echocardiogram demonstrated normal left ventricular ejection fraction without wall motion abnormalities, mild diastolic dysfunction, and minimal valvular pathology. Thyroid-stimulating hormone level was within normal limits. His cardiac medications included apixaban for previous internal jugular thrombus and atorvastatin.

On telemetry, the patient was noted to have 2:1 AVB for 21 seconds overnight with a ventricular rate of 40–50 beats per minute. Further inspection of telemetry revealed simultaneous 4:1 Mobitz type II SA exit block (Figure 1). The patient experienced dizziness during the episode.

Given the episode of symptomatic AVB as well as increased infection risk from end-stage renal disease and recurrent mastoiditis, the patient underwent successful implantation of a leadless permanent pacemaker (Micra™ AV, Medtronic, Inc., Minneapolis, MN) on hospital day 3. He was discharged on hospital day 8 with outpatient electro-

## WHAT WE LEARNED FROM THIS CASE

- Recognizing the diagnosis and type of sinoatrial (SA) exit block can be challenging.
- Simultaneous SA exit block occurring with atrioventricular block is a rare occurrence.
- Selection of an appropriate device in this rare clinical scenario is important.

physiological monitoring and follow-up with the infectious diseases department.

## Discussion

Our patient presents with a rare case of simultaneous 4:1 Mobitz type II SA exit block with 2:1 AVB. Due to serendipitous timing, the ventricular rate remained regular. Two case reports described 2 patients with dengue fever and thyrotoxic crisis, respectively, each of whom had simultaneous SA exit block and AVB—both of whom had their conduction diseases resolve with treatment of their respective primary problems.<sup>1,2</sup> Another case report described a patient with recurrent syncope who presented with irreversible, simultaneous SA exit block and AVB and ultimately received a permanent pacemaker.<sup>3</sup> Similarly, our patient did not have any identifiable reversible cause of conduction disease. The coexistence of both of these arrhythmias is exceedingly rare.

Much like AVB, SA blocks are classified as first degree, second degree, or third degree.<sup>4</sup> Only second-degree SA block can be detected on surface ECG. Second-degree Mobitz type I SA block is characterized by progressive prolongation of SA nodal impulses depolarizing the atrial myocardium until the impulse no longer causes a depolarization, and thus the P wave “drops.” This arrhythmia manifests on ECG as shortening of the P-P interval before the dropped P wave and P-QRS grouping. Second-degree Mobitz type II SA block occurs when an intermittent SA nodal impulse does not depolarize the atrial myocardium, without changes in the P-P timing before and after the dropped P wave. Our patient’s

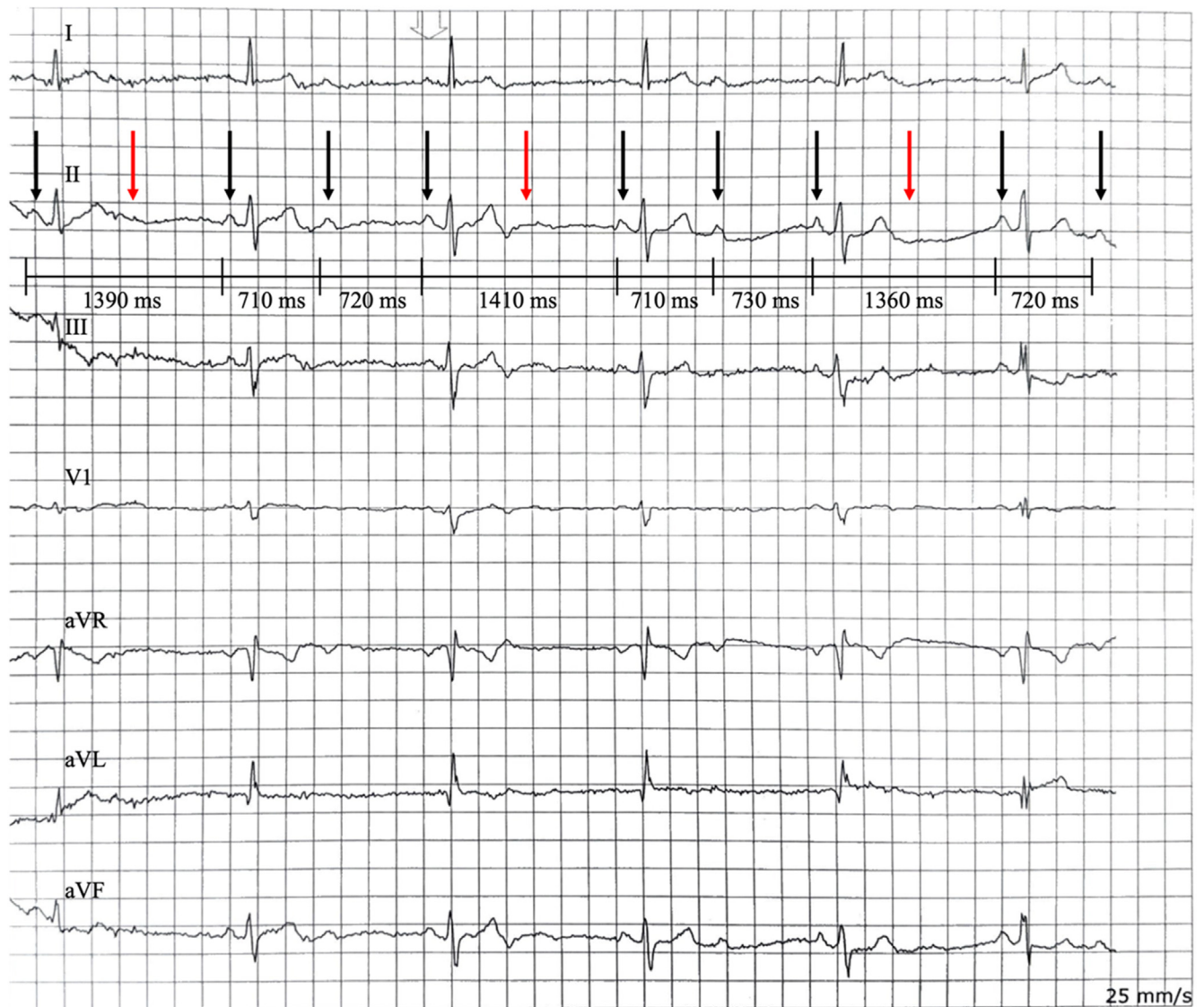
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telemetry strip shows P-P intervals that do not shorten before the dropped P waves (Figure 1). The slight variations are consistent with sinus arrhythmia, suggesting a Mobitz type II SA exit block. It is a possibility that what we believe to be dropped P waves are due to repetitive blocked premature atrial contractions (PACs). However, we feel this unlikely as the P wave morphologies and amplitudes of the sinus beats are normal, and, if PACs were present, we would expect a more visible P wave in at least one of the presented leads. In addition, if blocked PACs were present, it is unlikely that the return P wave cycle

length times out so closely with the sinus rate. Common causes of SA block include inferior myocardial infarction, medications (eg, beta-blockers, calcium channel blockers, digoxin, and amiodarone), sick sinus syndrome, increased vagal tone, and myocarditis.<sup>5</sup> Our patient had 4:1 Mobitz type II SA exit block without a clear etiology.

Ideally, a dual-chamber pacemaker would treat both the SA block and AVB.<sup>6</sup> However, due to his infectious risk, we decided to implant a Micra AV leadless pacemaker. This modality of pacing is ideal for AVB because it can track intrinsic P waves and maintain



**Figure 1** Simultaneous 4:1 sinoatrial exit block and 2:1 atrioventricular block with annotations of P waves (black arrows), dropped P waves (red arrows), and P-P cycle lengths (in milliseconds)

atrioventricular synchrony. However, the Micra AV leadless pacemaker will not allow for treatment of SA block. In SA block, when the P waves are dropped, ventricular pacing will ensue at the lower rate limit or sensor-driven rate, resulting in atrioventricular dyssynchrony. Although this is not ideal, the decreased infectious risk with the leadless pacemaker in a patient with chronic bacterial infections and end-stage renal disease on hemodialysis far outweighed this point.

## Conclusion

A 60-year-old man with recurrent infections had symptomatic 2:1 AVB with simultaneous 4:1 SA exit block.

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**Ethics Statement:** The research reported in this article adhered to CARE case report guidelines.

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