CASE REPORT

A Rare Cause of Pacemaker Failure: Interatrial Block

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Pacemaker and implantable cardioverter defibrillators (ICD) systems are useful in detection and differentiation of many symptomatic and asymptomatic arrhythmias. In this report, we described a rare condition that caused by failure in detection of a clinical tachyarrhythmia by a dual chamber pacemaker that implanted because of intermittent atrioventricular (AV) block and sinus node disease in a 46-year-old patient. In our case, bidirectional interatrial block was demonstrated; and the symptoms associated with high ventricular rate caused by left atrial tachyarrhythmias relieved after AV node ablation.

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Pacemaker and implantable cardioverter defibrillators (ICD) have important role in treatment of many cardiac disorders associated with conduction abnormalities. In addition, these devices especially ICDs are useful in detection and differentiation of many symptomatic or asymptomatic arrhythmias. Failures in detection of atrial and ventricular arrhythmias by devices are mostly due to the problems in pacemaker systems and programming. In this case, we discussed a very rare condition in a patient with an atrial arrhythmia that could not be detected by pacemaker.

CASE REPORT

A 46-year-old patient who underwent a dual chamber pacemaker implantation 4 years ago because of paroxysmal atrial fibrillation (AF), sick sinus syndrome, intermittent atrioventricular (AV) block, and syncope, was admitted with recent progressive reduction in exercise capacity, dyspnea, and sustained palpitations. He was under amiodarone and warfarin treatment because of both AF and regular supraventricular tachycardia. His blood pressure and pulse were 120/80 mmHg, 120/min, respectively. Tachycardia, a 2/6 degree apical systolic murmur and minimal pretibial edema were found in physical examination. A pacemaker rhythm with a rate of 120/min was seen

on ECG (Fig. 1). Transthoracic echocardiography (GE Vingmed Ultrasound A/S, Horten, Norway) showed moderate left ventricular dysfunction (ejection fraction: 40%, normal left ventricular end diastolic and end systolic dimensions, left atrial dilatation [44 mm]), 2/4 degree mitral regurgitation, and pacemaker related dyssynchrony. Ventricular pacing (Vp) ratio was 80% and atrial rate was 80/min. In addition; there were variable As-Vp and As-Vs. The patient was taken to electrophysiology laboratory for electrophysiological study (EPS). A quadripolar diagnostic catheter (Marinr, Medtronic Inc., Minneapolis, MN, USA) to high right atrium (HRA) and ablation catheter (RF Marinr, Medtronic Inc.) into coronary sinus (CS) were placed. Baseline recordings showed that cycle lengths of right atrial and left atrial electrograms were different (Fig. 2). A high degree AV block was formed after intravenous metoprolol infusion; at the same time, two different atrial rhythms were demonstrated in ECG recording (Fig. 1). His recordings, in the meantime, showed that ventricular rate was directed by left atrial rhythm (Fig. 2). High rate pacing from the HRA catheter confirmed the right atrium to left atrium and right atrium to ventricular block (Fig. 2). Because the patient was still under anticoagulation, had high ventricular pacing, and inability to control of high ventricular rate caused by left atrial origin, therefore, a complete his

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Figure 1. Twelve-lead ECG of patient on admission (A) and with advanced atrioventricular block after intravenous metoprolol during electrophysiological study (B). V¹ ECG lead showing right atrial rhythm (sinus rhythm). V² ECG lead showing both of right atrial (sinus rhythm) and left atrial rhythm (atrial tachycardia) (B).

block was made by RF ablation method. A ventricular response associated with right atrial sinus rhythm was achieved by pacemaker in follow-up (Fig. 1). The patient's clinical condition was improved by oral anticoagulation, lisinopril, carvedilol, and furosemide treatment.

DISCUSSION

Monitorized atrial electrograms recorded by pacemakers and ICDs help in diagnosis and treatment of many atrial tachyarrhythmias. In this case report, we discussed the diagnosis and treatment approach to a left atrial tachyarrhythmia that could not be detected by pacemaker check, but, diagnosed in EPS performed because of clinical suspicion. Bidirectional interatrial block, isolated left atrial tachyarrhythmia, and associated high ventricular rate were demonstrated and clinical symptoms of patient improved after AV node ablation.

Pacemaker and ICD devices are useful in detection and differentiation of symptomatic or asymptomatic arrhythmias. Atrial arrhythmias detected by long-term Holter recording, were found to be detectable from the pacemaker recordings with 98.1% sensitivity and 100% specificity in a study of 40 patients with dual chamber pacemaker.¹ Therefore, implanted devices are frequently used in clinical trials to monitor atrial arrhythmias.²

As in our case, one of the rare situations in which pacemakers could not detect arrhythmias is conduction disturbance between two atria. Previously presented similar case was treated with the ablation of a focus in the left atrium.³ In our case, we ablated the AV node to control heart rate and follow the patient with oral anticoagulation for left atrial tachycardia. Because of the clinical improvement, we did not perform the left atrial tachycardia ablation.

Interatrial conduction is provided by three different conduction pathways: through the CS musculature, fossa ovalis, and Bachman's bundle.⁴ Ablation, transseptal punctures, or surgical procedures in this region can disrupt the conduction. Thus, cavotricuspid isthmus had been ablated in the case similar to our patient.⁴ In our case, a pacemaker was implanted because of previously present conduction disturbances. The presence of AV block associated to right atrial activation and better AV conduction through the left atrial activation

shows that anterior entrance through AV node was damaged.⁵ Rapid ventricular response to LA tachycardia in our patient could be explained in this way.

Interatrial block is characterized by prolongation of P-wave duration (≥ 110 ms). It is classified as partial or advanced according to the split or biphasic P wave.⁶ Although, presence of the IAB is often interpreted as left atrial dilatation (left atrial dilatation was found in 80% of IAB patients), interatrial conduction delay can be seen, regardless of atrial size. The most important clinical aspect of interatrial conduction disturbance is that being a predictor for development of AF.⁷

The conditions in which the right and left atrial rhythms are dissociated because of the high degree interatrial block are very rare. In such a case treated with pacemaker or ICD, atrial lead might be unable to detect electrical variations in other atrium. Usually when there was AF in one atrium, a more regular rhythm (sinus or atrial flutter) in other had been reported in published cases.⁸ As in our case, there were other cases in whom the right atrium had a normal sinus rhythm, whereas a regular tachycardia in left atrium could not be detected by pacemaker.³

In conclusion, conditions in which clinical symptoms were present, but tachycardia could not be determined by a pacemaker, the possibility of interatrial block or dissociation should be considered in patients with pacemakers or ICD's, electrocardiographic monitoring should be done for diagnosis of suspected arrhythmia.

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