

Case Report

Late Post-operative Perforation of the Right Ventricle by a Tined Pacing Lead—Report of a Case—

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Myocardial perforation by a pacing lead occurred 12 days after implantation. The lead was propelled into the myocardium of the anterior wall of ventricles without passing through the left ventricular cavity, and finally protruded into the pericardial cavity. Computed tomography of the chest was helpful for confirming the perforation by the pacing lead. (J Arrhythmia 2006; 22: 119–121)

Key words: Rare perforation, Right bundle branch block, Computed tomography

Introduction

Myocardial perforation of the right ventricular free wall by pacing leads is a catastrophic complication, which occurs during the implantation procedure in the operating room. We herein present a case of late perforation of right ventricular wall by a pacing lead which took an unusual course.

Case Report

An 83-year-old woman was admitted to our hospital due to dyspnea upon effort. A pacemaker was implanted for a third-degree atrioventricular block. For VDD mode ventricular pacing and atrial sensing, and a tined single-pass lead (SLX58/13B-P, BIOTRONIK, Germany) was implanted without incident into the right ventricular apex, through the right subclavian vein, under local anesthesia. Satisfactory pacemaker function was confirmed by

continuous electrocardiographic (ECG) monitoring. Serial 12-lead ECG showed a ventricular activation pattern with left bundle-branch morphology. A chest roentgenogram was obtained immediately after implantation and again the next morning and revealed no apparent displacement or redundant looping of the pacing lead (**Figure 1A**). The patient's postoperative course was uneventful. Although intermittent pacing failure was observed with the elevation of the ventricular stimulation threshold up to 4.8 V at 0.4 ms 4 days after implantation, no electrocardiogram or chest roentgenogram changes were detected, and the patient was discharged from the hospital after adjustment of the pacemaker's stimulation output.

Twelve days after implantation, the patient returned to the hospital complaining of an intermittent left pectoral pain. Intermittent pacing failure was also observed upon ECG monitoring. The QRS

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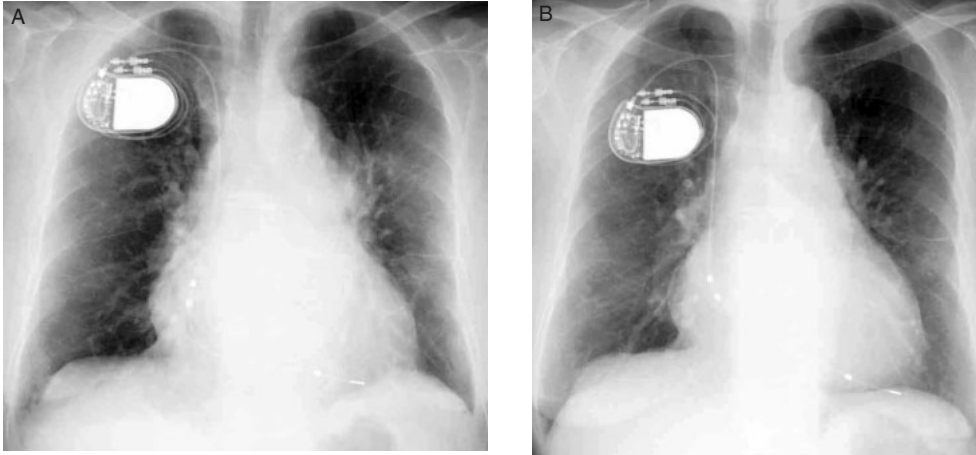


Figure 1 Chest roentgenogram on the next day of primary implantation, **A**, and 12 days after implantation, showing a migration of the lead tip, **B**.

complex on the serial 12-lead ECG showed a change to right bundle-branch block morphology which suggested left ventricle pacing (**Figure 2**). Although no enlargement of the cardiac silhouette was detected, the ventricular lead tip appeared to have moved toward the cardiac apex on the chest roentgenogram (**Figure 1B**). Mild pericardial effusion without cardiac tamponade was detected but neither perforation of the right ventricle nor interventricular septum was observed by transthoracic two-dimensional echocardiogram. Pericardial rub was not heard. However, an apparent perforation of the right ventricle by the pacing lead was observed via chest computed tomography (CT) (**Figure 3**).

Surgery was performed. When the pericardial sac was opened with median sternotomy, a small amount of venous blood was found pooling in the cavity. A 2 cm length of the pacing lead, including the proximal and distal electrodes, was observed protruding through the ventricular wall from the left side of the anterior descending coronary artery into the pericardial cavity. The ventricular pacing lead had contact with the epicardial surface of the left ventricle (**Figure 4**). The protruding lead was cut and totally removed through the right subclavian vein. The perforation site was repaired with mattress suture with felt pledgets. A new epicardial ventricular pacing system was successfully implanted. Including the perforation site, myocardium of both ventricles seemed to be totally normal. The patient's postoperative course was uneventful.

Discussion

At the present time, myocardial perforation by pacing leads is an uncommon complication because leads have become more flexible. The incidence has

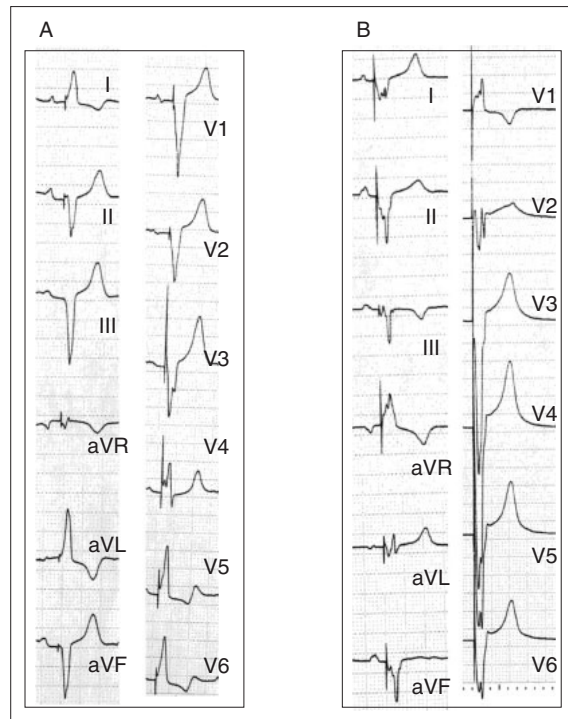


Figure 2 Serial 12-lead electrocardiograms at implantation show left bundle-branch morphology, **A**, changed to right bundle-branch morphology 12 days after implantation, **B**.

been reported to be only 0.7% by Kiviniemi et al.¹⁾ Most perforations are related to the impacting maneuvers peculiar to the manipulation of pacing leads and occur during the implantation procedure in the operating room. Late perforation of over 24 hours after implantation is quite rare.^{2,3)} Perforations mostly occur at the lateral wall of the right side of the heart. Stillman et al.⁴⁾ reported a case of perforation of the interventricular septum by a

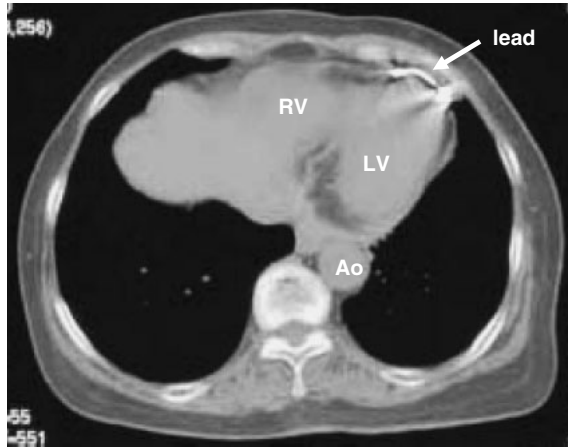


Figure 3 Computed tomography (CT) of the chest showing the tip of the pacing lead protruding from the heart into the pericardial cavity (arrow).

Ao: descending thoracic aorta, RV: right ventricle, LV: left ventricle.

transvenous pacemaker catheter. In the present case, although the pacing lead was protruding from the anterior wall of the left ventricle, the lead did not perforate the interventricular septum. The tined head of the lead which entered the myocardium during implantation likely received propulsive energy from myocardial contraction, which propelled it into the myocardium of the anterior walls of the right and left ventricles, but not through the left ventricular cavity, and finally caused it protrude into the pericardial cavity. Although the precise reasons for this remain unclear, the course which this lead took, and the late perforation, are both quite rare.

A diagnosis of right ventricular perforation is often difficult. Suspicion of perforation without tamponade may be aroused by an extreme distal location of the lead tip at the cardiac apex, or by the presence of a pericardial friction rub, chest pain, or a right bundle branch block ECG-pacing pattern.⁵⁾ Poor pacing and sensing thresholds may be seen. Yoshitaka et al. reported a case of perforation of the right ventricle which was confirmed by CT.⁶⁾ In the present case, chest pain, intermittent pacing failure, a change in the ECG-pacing pattern into right bundle branch block, and a small amount of pericardial effusion detected by two-dimensional echocardiogram suggested a perforation of the ventricle. More than anything else, the chest CT showed an apparent perforation of the ventricle by the pacing lead. Although CT often fails to demonstrate minor displacement,⁷⁾ in this case it helped to confirm the tip of the perforating lead protruding into the pericardial cavity.

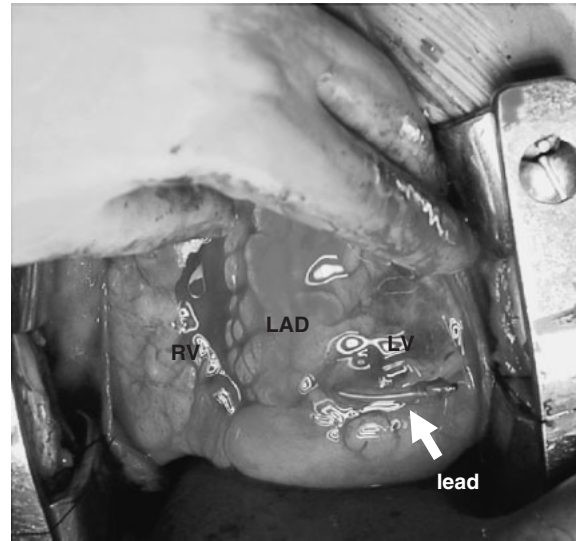


Figure 4 Intraoperative photograph showing the tip of the pacing lead with its two electrodes protruding from the anterior wall of the left ventricle (arrow).

RV: right ventricle, LV: left ventricle, LAD: left anterior descending branch of the coronary artery.

Although late perforation is generally a rare complication in patients with transvenous tined pacing leads, we should consider it if any symptoms related to the pacing system are observed. CT is helpful for confirming perforation.

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