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CASE REPORT

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Subclinical cardiac perforation caused by a Micra™ leadless pacemaker

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Abstract

A subclinical cardiac perforation by a device cup of the Micra™ transcatheter pacing system was suspected in a 78-year-old woman. During the procedure, the device cup was placed on the septum. The contrast media was injected before device deployment and remained outside of the myocardium. Later, a cardiac computed tomography scan visualized a protruded diverticular structure on the right ventricle. The contrast material remained in a pouch within the pericardium. To ensure the device is oriented away from the border between the right ventricular septum and the free wall, right anterior oblique view should be carefully reviewed before deployment.

KEYWORDS

cardiac effusion, cardiac perforation, leadless pacemaker, Micra, transcatheter pacing system

1 | INTRODUCTION

Recently, leadless pacing systems were developed to avoid pocket and lead-related complications. The incidence of cardiac perforation was about 1.5% in investigational trials.[1,2] The rate of major complications in the postapproval registry of a Micra™ transcatheter pacing system (TPS) (Medtronic, Minneapolis, MN, USA) trended lower than the investigational study.[1,3] However, cardiac perforation remains a major safety concern of this new technology.

2 | CASE

A 78-year-old woman (body mass index, 20.3 $kg \cdot m^{-2}$) presented with pocket hematoma. The patient had a significant cardiac history: pacemaker implant for complete atrioventricular block in 1994, percutaneous coronary intervention and coronary artery bypass graft after acute myocardial infarction in 2004, and combined aortic and mitral valve replacement in 2009. She also had a left ventricular aneurysm. A pocket hematoma was noted after generator change (Figure S1). The generator needed to be explanted before it eroded skin. The atrial pacing had been abandoned due to the high impedance. However, insertion of the additional atrial lead with generator replacement was avoided due to the bilateral mastectomy for breast cancer and the necessity of anticoagulation for mechanical valves. We decided to implant a TPS concurrently with the explant of the generator and hematoma.

The procedure was performed under therapeutic anticoagulation with warfarin. A delivery catheter was directed toward the right ventricular septum. We reviewed the left anterior oblique view to ensure that the device cup was placed on the septum (Figure 1). First, a small amount of contrast media was injected via the delivery catheter. Contrast media pooling was observed before the deployment of the TPS (Video S1 and Figure 1). We changed the implantation site. Finally, we deployed the tines of the TPS at the mid-septum, which yielded good electrical data. Although the contrast material was retained in the pericardial space, the patient remained hemodynamically stable, and no effusion was noted with echocardiogram.

Three days after the implant, a cardiac computed tomography scan was performed. A protruded diverticular structure on the right ventricle was observed, and the contrast material had remained in a pouch within the pericardium (Figure 2). The patient continued to

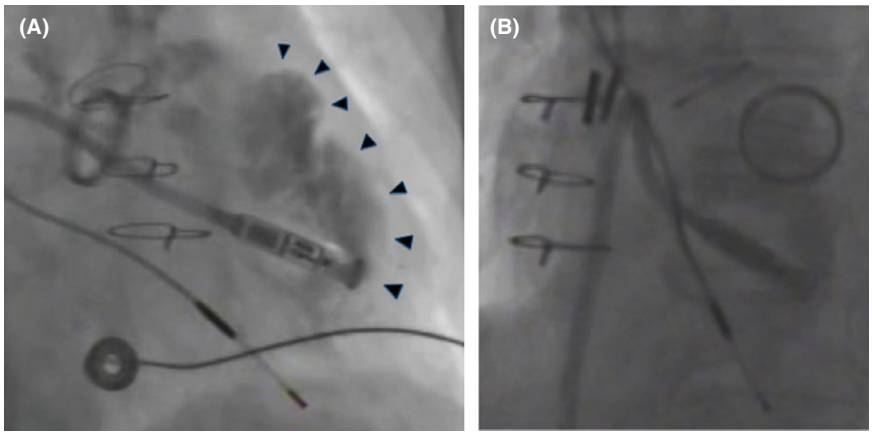

FIGURE 1 Fluoroscopic images during TPS implantation. A, Right and B, left anterior oblique view. Arrowheads indicate that the contrast material remained outside of the myocardium

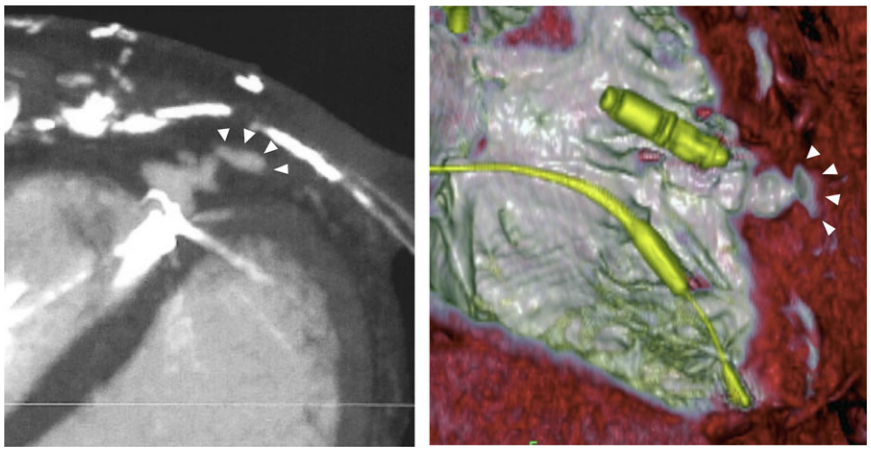

FIGURE 2 Images generated by cardiac computed tomography scan 3 d after the implant. A protruded diverticular structure was observed on the right ventricle. Arrowheads indicate that the contrast material remained inside a pouch within the pericardium

take warfarin. She was asymptomatic and discharged although subclinical cardiac perforation from the device cup of the TPS was suspected. The TPS showed normal functionality at 3 months after the implant.

3 | DISCUSSION

Cardiac perforation remains a major safety concern of TPS. Implant on the septal aspect of the right ventricle was recommended to prevent cardiac injury[3] although it is not necessarily achieved in all patients. In particular, the deployment in the septal location may be difficult in small hearts or cor pendulum (drop hearts) in smaller Japanese patients.[4] The risk factors for cardiac perforation in each patient should be carefully estimated before the TPS implant. Female sex, low body mass index, history of myocardial infarction, and lung diseases are known risk factors for cardiac perforation with a TPS implant.[1,3] Our patient exhibited the first three of these risk factors.

The edge of the device cup might have penetrated into the ventricular wall prior to the deployment of the TPS in our case. Adhesion of the pericardium due to open-heart surgery may have prevented cardiac tamponade. We reviewed the left anterior oblique view to ensure that the delivery catheter was directed toward the septum before implantation. However, single view may have not been sufficient to confirm the precise location of TPS. Furthermore, to make sure that the device is oriented away from the border between the right ventricular septum and the free wall, right anterior oblique view should be carefully reviewed before deployment.

CONFLICT OF INTEREST

All authors declare no conflict of interest related to this study.

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SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article.

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