Case Report

Inadvertent transarterial pacemaker lead placement

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1. Introduction

Malposition of right ventricular (RV) lead into the left ventricle (LV) is a rare, underreported complication with unpublished rates. Etiologies include improper puncture of the subclavian artery, passage of the RV lead through a patent foramen ovale, an atrial septal defect, traumatic puncture of the intra-atrial septum, or through a ventricular septal defect.1,2 The majority of patients are asymptomatic at the time of diagnosis, which is made from 0 to 17 years after lead insertion.2–4 Complications of LV lead malposition include thromboembolic events, valvular and coronary ostial damage, and vascular complications from arterial access.5 Current guidelines recommend RV lead extraction when thromboembolic events are related to lead thrombus, but are against lead removal in anomalous cardiac structures.5 In most cases, management is not straightforward and the decision is lead reposition versus medical management with anticoagulation. We present a case of a large middle cerebral artery stroke secondary to unrecognized, accidental LV lead placement through a punctured subclavian artery.

2. Case report

A 73 year-old male was transferred to our facility for bioprosthetic aortic valve endocarditis. He underwent pericardial tissue aortic valve replacement complicated by pericardial tamponade requiring surgical drainage within 24 hours. His post-operative course was complicated by respiratory failure, renal failure, and hemodynamically significant heart block. He was temporary pacer dependent with alternating complete heart block, right-bundle branch block (RBBB), and left-bundle...
branch block (LBBB). After medical stabilization, he was taken for permanent single chamber RV pacemaker insertion five days later.

The procedure was technically challenging and complicated by significant back-bleeding requiring multiple hemostatic, larger French sheaths. Positioning of the RV lead was difficult given tortuous path and constant “kick back” into the right atrium. With the RV lead in satisfactory position, the paced QRS complex was negative in lead I (Fig. 1), raising concern of left ventricle (LV) pacemaker malposition. Post-insertion electrocardiogram (ECG) showed a RBBB pattern in leads V1, V2 and chest X-ray showed an abnormal lead path (Fig. 2A, B). Intra-operative transthoracic echocardiogram could not visualize lead pathway due to limited acoustic windows. LV lead malposition was not suspected and the patient was discharged.

Four months later, the patient presented with acute left-sided hemiparesis and radiographic confirmation of an acute ischemic middle cerebral artery stroke. A formal transthoracic echocardiogram showed a pacemaker lead in the LV crossing the aortic valve with attached echodensities suggestive of macrothrombi. A CT chest revealed LV pacemaker malposition entering the left subclavian artery, passing through the aortic arch, LV, and prosthetic aortic valve (Fig. 2C). Consideration for surgical removal and lead reimplantation was made in consultation with electrophysiology, cardiovascular surgery, and neurology teams. Given the presence of lead thrombus, arterialized lead path, potential third re-do sternotomy, and recent large stroke, it was decided that percutaneous or surgical lead removal and/or repositioning carried a high risk. In keeping with the patients preferences as well, therapeutic Warfarin anticoagulation with a target INR between 2.5 and 3.5 offered the patient the best outcome and stroke prophylaxis.

3. Discussion

Previous case reports of pacemaker lead malposition discuss technically difficult procedures, elevated right-sided pressures, paced RBBB patterns, and the absence of confirmatory lateral fluoroscopic views. Lead thresholds are not helpful in the diagnosis. RV apical pacing is expected to produce a LBBB pattern.
pattern; the presence of a RBBB pattern may suggest LV lead malposition, coronary sinus implantation, lead perforation, or a “pseudo RBBB” seen in RV lead placement. Klein described the disappearance of the RBBB pattern when leads V1, V2 are recorded from a lower intercostal space. Chest X-ray may reveal a high, superior, or posterior lead position, or an abnormal, tortuous lead path. Transthoracic echocardiography is the diagnostic test of choice to confirm lead position, with further information obtained from transesophageal echocardiography and computed tomography.

The majority of patients are asymptomatic at the time of diagnosis, which varies from 0 to 17 years after lead implantation. Complications of LV lead malposition include thromboembolic events, valvular and coronary ostial damage, and vascular complications from arterial access. Timing of implantation, thrombus burden, comorbidities, lead path, and cardiovascular surgery backup determine therapeutic action. Sixty percent of cases published have been managed with either surgical or percutaneous lead revision, with successful use of laser lead extraction, covered stents, and embolic filters. Five-year outcomes seem to be comparable between medical and lead reposition management.

In our case, the technically difficult procedure, a paced RBBB pattern, and abnormal lead path on chest X-ray, all were signs of lead malposition. Unfortunately, these were not recognized and lead malposition was only suspected when the patient presented with a cerebral thromboembolic event. Although surgical or percutaneously lead removal offers definitive stroke prophylaxis, therapeutic anticoagulation can be an alternative in high surgical risk patients. For the reasons mentioned above, our patient was deemed high risk for perioperative complications and was therefore managed medically. Given the risk of further embolism and vascular complications, it was felt that the patient would be best managed with therapeutic anticoagulation.

In the presence of a paced RBBB pattern, LV malposition must be suspected and effectively ruled out. Procedural maneuvers such as passing equipment subdiaphragmatic as well as distal in the RV outflow tract are routinely performed by some operators to ensure venous and RV access. Others will apply a magnet post-insertion to force analysis of paced QRS morphology. Lateral fluoroscopic images are essential in visualizing anterior/posterior lead position. Consideration should be given to mandatory, early echocardiography to visualize lead position with careful scrutiny of chest X-ray findings when a paced RBBB pattern exists. A Klein maneuver and implementation of RBBB paced algorithm can help identify a pseudo RBBB, which should remain a diagnosis of exclusion.

Conflicts of interest

All authors have none to declare.

REFERENCES