Partial extravenous course of cardiac pacemaker leads. A major risk during device-assisted extraction

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Introduction

The intracardiac electronic device implantation rate has been constantly increasing for the last 20 years and is accompanied by an increasing lead extraction rate. Percutaneous extraction of transvenous leads of cardiovascular implantable electronic devices is mandatory in the case of pocket infection and/or system infection, resulting in valvular or lead endocarditis.[1] Lead extraction is also performed in the case of venous thrombosis or stenosis and nonfunctioning leads. When leads have been implanted for more than 1 year, device-assisted extraction may be necessary. Locking stylets and dissection sheaths are common extraction tools.

Case report

To the best of our knowledge, we report the first in vivo visualization of a partial extravascular course of 2 pacemaker leads (Figure 1).

The incidental finding of a partial extravascular course of these 2 leads was observed in a 43-year-old man with trisomy 21 who had been operated for atrioventricular septal defect at the age of 6 years. An epicardial pacemaker was implanted at that time owing to postoperative complete atrioventricular block. At the age of 18, he received his first endocardial DDD pacemaker and a fourth pacemaker replacement was performed at the age of 42. Pocket infection was observed 6 months later. Transvenous extraction was attempted for the 2 leads that had been inserted for 24 years with surgical backup. The ventricular lead (Celsa 1823M) and the atrial lead (Medtronic 6957J) were reinforced by 2 locking stylets. A 16F laser sheath (Spectranetics, Colorado Springs, CO) was introduced around the 2 leads, but was blocked in the innominate vein by what was thought to be very dense fibrosis or massive calcification. We did not use an outer telescopic sheath or mechanical tools. Transesophageal echocardiography did not show any pericardial effusion. Transvenous device-assisted lead extraction was abandoned and sternotomy was performed in order to remove the leads. After opening the pericardium, the surgeon observed that the 2 leads were partially located outside of the left innominate vein (Figure 1). Left innominate vein laceration would have occurred if the laser sheath had been advanced further along the extravascular course of the leads. Lead extraction was then performed under cardiopulmonary bypass (Figure 2) and a new pacemaker was inserted epicardially.

Discussion

Mechanical or powered (electrical or laser) dissection sheaths allow release of pacemaker leads from the fibrotic process. Strict intravascular sheath progression is guided by the course of the lead during sheath progression. Extraction sheaths also allow countertraction to limit the risk of myocardial tears. Nevertheless, with time, the fibrotic process worsens and may result in an "encapsulation" phenomenon.[2] After a number of years, leads may be included in the wall of the vein or the myocardium. Transvenous extraction of leads may be hazardous despite the use of specific tools. The mortality rate reported in the most recent series ranges between 0.3% and 1.86%.[3,4] Causes of deaths were reviewed in the study by Hauser et al.[5] Deaths were due to myocardial perforation and venous laceration (left innominate vein and superior vena cava) in 59% of cases. Surgical repair is associated with a mortality rate of 56%.[5] Cardiac perforation or vascular lacerations may be related to false passage of the sheath or wall dissection in the case of an encapsulated lead, justifying systematic surgical backup. In this case, sheath progression was blocked at the site of the extravenous course of the lead subsequently observed by the surgeon. Continuation of transvenous lead extraction without conversion to cardiac surgery could have been disastrous in the present case, although we cannot exclude the possibility of an uneventful outcome in case of local bleeding in a closed space. Forcible lead extraction using a powered dissection sheath should be avoided,

KEYWORDS Endovascular lead; Device-assisted extraction; Pacemaker infection

ABBREVIATIONS CT = computed tomography

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KEY TEACHING POINTS

- A partial extravenous course of device leads may be present in the case of longstanding pacemaker leads.
- Partial extravenous lead may represent a major risk of vascular perforation during transvenous device-assisted lead extraction.
- Methods for the detection of extravenous or extracardiac pacemaker lead before extraction are lacking.
- Forcible lead extraction using a powered dissection sheath should be avoided, especially in the case of a longstanding pacemaker lead. Conversion to cardiac surgery is preferable in such cases.
- Referral to highly experienced surgeons that perform a high volume of procedures is mandatory for all cases of lead extraction, together with systematic surgical backup.

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The extravenous course of the pacemaker leads was not visible on radiographs. Preoperative computed tomography (CT) scan was not performed in this patient. We do not know whether CT scan would have been useful. It is likely that the extravenous course of the 2 leads would not have been detected owing to metal-induced artefacts. Nevertheless, we intend to systematically perform cardiac CT scan in all future cases of longstanding lead extraction.

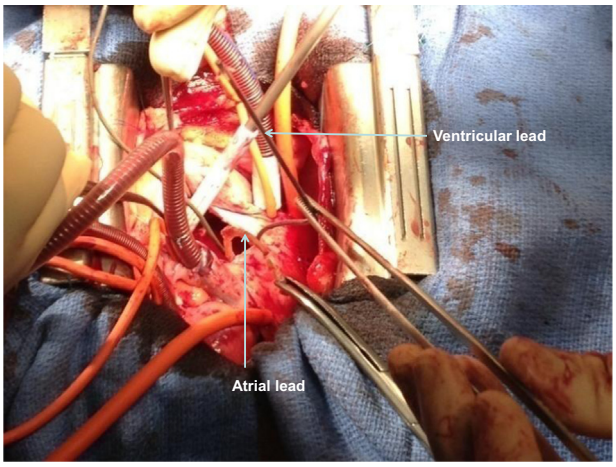

Figure 2 The right atrium was opened under cardiopulmonary bypass to remove the 2 leads.

Conclusion

A partial extravenous course of device leads may occur in the case of longstanding leads, which can explain cases of cardiac or vein perforation observed during transvenous lead extraction.

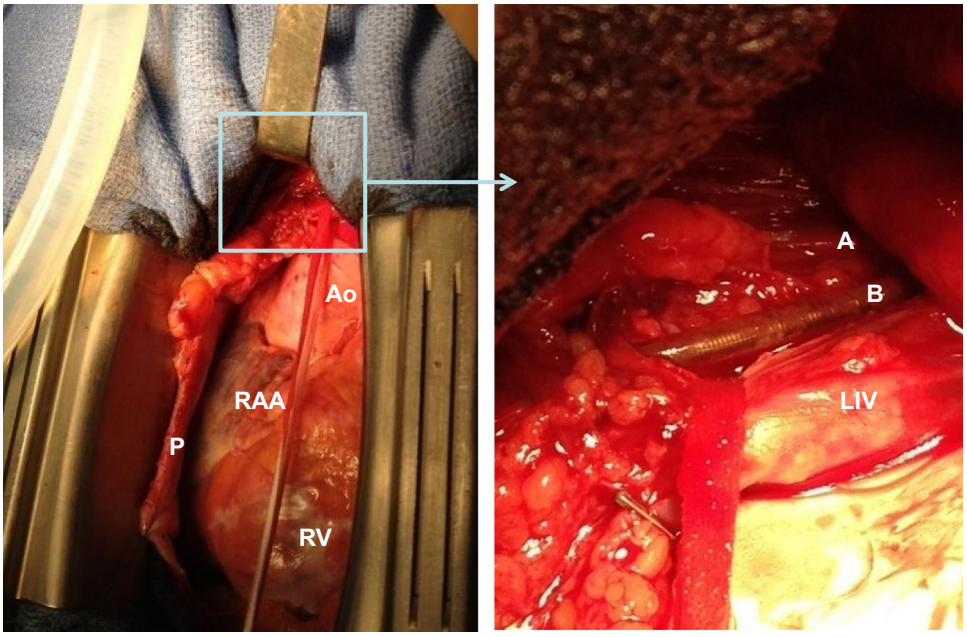

Figure 1 A and B indicate the 2 cardiac pacemaker leads. Their courses are located outside of the superior part of the left innominate vein (LIV) lumen. Ao = aorta; P = pericardium; RAA = right atrial appendage; RV = right ventricle.

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