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Transvenous extraction of a five year-old ventricular lead inadvertently implanted in the left ventricle

Przezżylne usunięcie elektrody przypadkowo wszczepionej do lewej komory 5 lat wcześniej

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Abstract

Inadvertent lead implantation into the left ventricle (LV) is a rare but serious complication of permanent pacing and should be diagnosed as soon as possible. We report a case of a patient with a pacemaker pocket infection with sepsis and two ventricular leads — one old electrode abandoned in the right ventricle and another one unintentionally implanted via patent foramen ovale into the LV. Both leads were extracted percutaneously, although the procedure was complicated by a minor ischaemic stroke.

Key words: malposition of ventricular pacing lead, left ventricle, stroke

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INTRODUCTION

Inadvertent implantation of a pacing lead into the left ventricle (LV) is a rare but serious complication of permanent cardiac pacing [1–4]. In patients with delayed diagnosis, permanent anticoagulation or antiplatelet therapy is usually used [5–7]. If embolic complications occur, open-chest cardiac surgery is performed [8, 9]. Current guidelines do not recommend the percutaneous extraction of such leads (class 3 indication) [4]. Nevertheless, there are several case reports describing percutaneous LV lead extraction [2, 3, 9, 10]. In our national reference centre for lead extraction, we have percutaneously extracted chronically implanted leads from four patients without complications. Here, we present a patient who underwent percutaneous extraction of a five year-old LV lead due to severe pocket infection with sepsis.

CASE REPORT

A 52 year-old male patient received, 21 years ago, a VVI pacing system with passive, unipolar ventricular lead due to sinus bradycardia, right bundle branch block and II degree (Mobitz) atrioventricular (AV) block. The pacemaker was replaced nine years later, but due to chronic local pocket infection with skin rupture was shifted into a new pocket at the same chest side.

Five years ago, during another unit replacement, damage to a lead in the pocket region prompted a new system implantation (VDD) and the old right ventricular (RV) lead was abandoned in the RV. The X-ray and ECG (Fig. 1) were suggestive of erroneous lead positioning into the LV, but this was not acknowledged by the operating team. The patient did not receive anticoagulation and suffered a minor stroke, confirmed by computed tomography. Conservative treatment of the recurrence of chronic pocket infection several months ago resulted in sepsis. Staphyloccus aureus coagulase-negative was cultured from blood and from the pocket. The patient was scheduled (in another center) for lead extraction. However, echocardiography showed vegetations attached to the leads and pacing lead placement in the LV. The patient was transferred to our centre.

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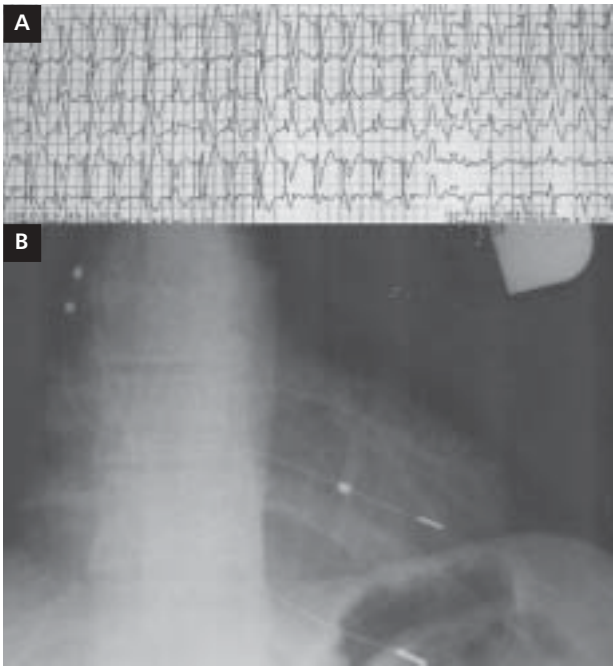

Figure 1. A. ECG with typical pattern of left ventricular pacing; **B.** X-ray examination with very atypical intracardiac course of VDD lead (upper lead) and abandonned old right ventricular lead (lower lead)

Echocardiography confirmed LV placement of active ventricular lead (Fig. 2) and an old RV lead that was thickened but without obvious vegetations. The LV lead was passing through a patent foramen ovale into the left atrium, mitral valve and was inserted in LV.

The patient was transferred to the operating theatre. The team (an invasive electrocardiologist, a cardiac surgeon, an interventional radiologist and an echocardiographer) decided that percutaneous removal of the whole system could be performed, and the patient preferred this option rather than a surgical approach. Due to the possible risk of stroke, a temporary protection of the cerebral circulation was used. As a first step, the pacemaker was explanted and the remainder of the abscessed pocket was extracted. For both leads extraction, a mechanical system (polypropylene white Byrd dilators Cook®) was used. The RV lead was extracted without any problem. After performing the baseline angiography, the Filter-Wirer EZ (Boston Scientific) was placed in the distal straight segment of the extracranial internal carotid arteries to capture masses (potential substance of embolus) that might be dislodged.

Then, the patient received one quarter of a standard dose of intravenous heparin. Due to unstable escape ventricular rhythm, a screw-in lead was inserted for prolonged temporary pacing. Next, the LV lead was extracted without major difficulties — only connecting tissue scars in the venous and right heart lead course were encountered. The procedure was guided and monitored by transoesophageal echocardiography (TEE). The fluoroscopic images of consecutive steps of the procedure are shown in Figure 3. The wound was closed and suction active drainage was engaged to prevent heparin-related haematoma. The control TEE showed a lack of fluid in the pericardium. After ten minutes of observation, the protective device was removed. A small amount of embolic material was found in the device. The extracted leads and protection device are shown in Figure 4.

Due to a tendency to bleeding from the remnants of the infected pocket and possible trauma to the venous walls during RV lead extraction, the patient did not receive heparin after the procedure. Unfortunately, five hours later, he suffered a new stroke with transient left haemiplegia. Computer tomography showed signs of the old stroke and fresh ischaemic focus. Standard management including heparinisation was introduced.

The patient received anticoagulation after two days, and a new DDD pacing system was implanted at the right side of the chest three weeks later. One week later, he was dischar-

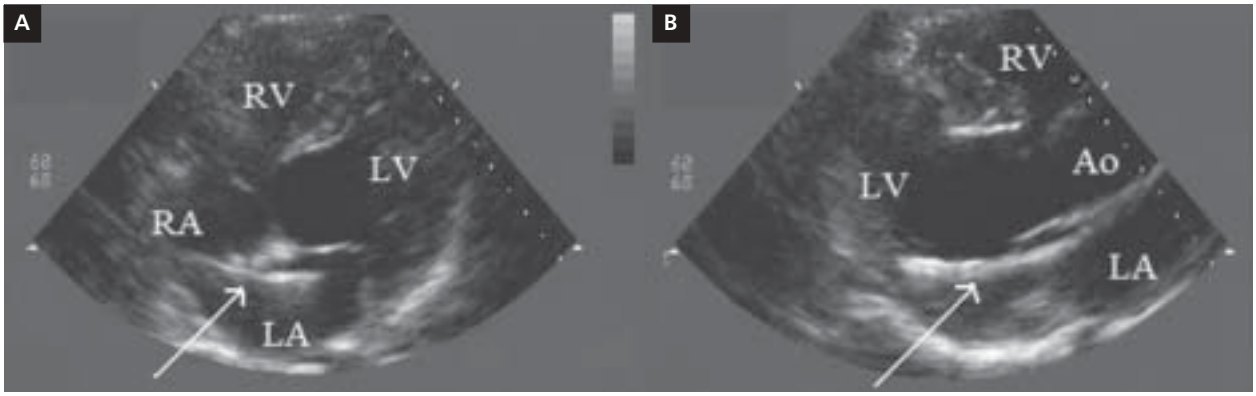

Figure 2A, B. Preoperative ECHO examination. The VDD lead is visible (arrows), passing patent foramen ovale (PFO) to left atrium (LA) with its distal end in left ventricle (LV); RV — right ventricle; RA — right atrium; Ao — aorta

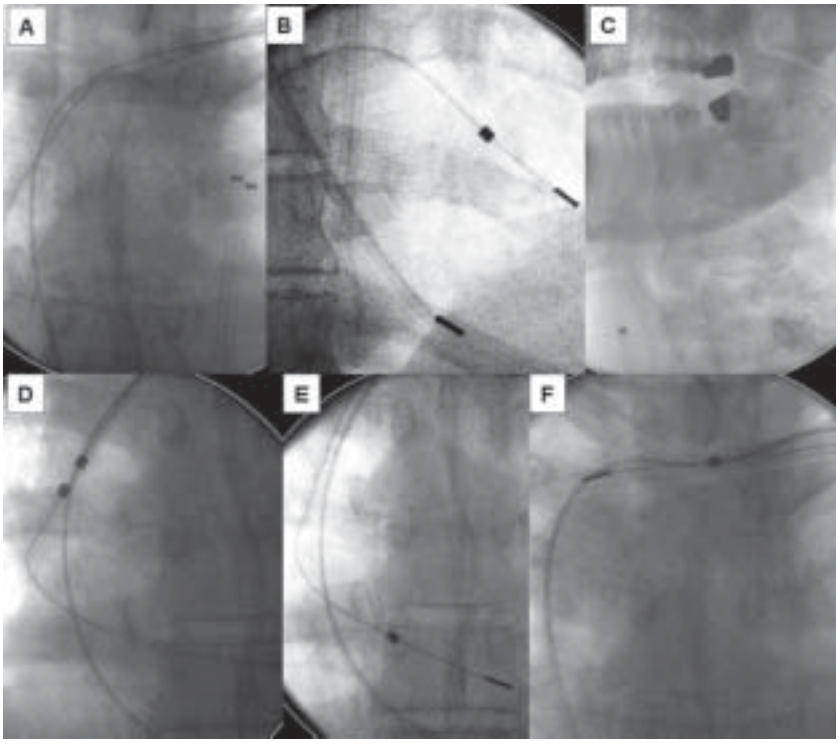

Figure 3. Lead extraction procedure. Preparation for cerebral circulation protection; two sheaths under aortic arch (**A**), the older one, abandoned right ventricular apex lead extraction (**B**), opening of filters in both internal jugular arteries (**C**), left ventricular (VDD) lead liberation from connecting tissue scar in right atrium (**D, E**). The tension of lead necessary for its separation from the atrial wall cleared the lead from left ventricular scars, and permitted lead removal without introduction of the Byrd dilator into the left atrium and left ventricular cavities (**D**, **E**, **F**)

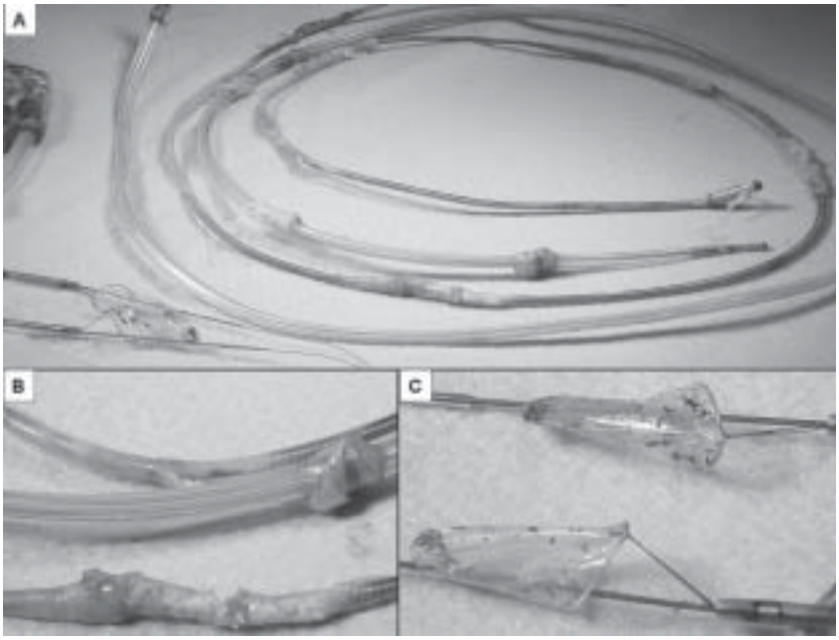

Figure 4. Landscape after the battle (**A**). Strong, hard connecting tissue scars mainly in atrial parts of both leads (and at rings region) are seen (**A**, **B**) with beginning of calcification of older, unipolar lead (**B**). Two Filter-Wirer EZ (Boston Scientific) removed from both internal jugular arteries; inside filters, some small fragments of white tissue and some blood clot are present (**D**)

ged home in a stable condition, with very minor neurological symptoms.

DISCUSSION

Erroneous ventricular lead implantation into LV via an atrial septal defect or a foramen ovale is a known complication of permanent pacing [1–4]. It carries a high risk of systemic embolisation, mainly in the form of recurrent cerebral stroke [1–3, 8, 9]. Permanent anticoagulation has been shown to reduce this risk [5, 7, 10].

The recommendations for the management of patients in cases of severe infective complications such as chronic pocket infection or lead-dependent infective endocarditis are not unequivocal. The main therapeutic option remains lead removal via open-chest surgery, using extracorporeal circulation. This procedure is not easy, because the ventricular lead can be strongly ingrown into ventricular wall, right atrial wall or venous system. In the HRS guidelines published in 2009, percutaneous lead extraction from the LV is not indicated (class III) in such patients, and additional techniques including surgical back-up may be used if the clinical scenario is compelling [5]. We decided to perform percutaneous extraction, which is less invasive than open-chest cardiac surgery, with a stand-by surgical back-up.

After this procedure, we found in the removed jugular filters a very small amount of potential embolic substances. In macroscopic view, this showed up as connective tissue strands, with small blood clots. These findings support the routine use of cerebral protection devices during LV lead extraction. The post-procedural episode of stroke is a serious and stressful complication. It is possible that in our case it could have been prevented by immediate post-operative heparin administration.

CONCLUSIONS

1. Early diagnosis of erroneous ventricular pacing lead in LV, using ECG, X-ray or echocardiography, is very important in view of future complications.
2. It seems that in selected cases, LV leads can be extracted percutaneously, especially in patients with an increased operative risk or those who refuse open-chest cardiac surgery.
3. Intra- and post-operative heparin use if an LV lead is being extracted seems to be mandatory, regardless of the risk of haemorrhagic complications.

Conflict of interest: *none declared*

References

1. Sharifi M, Sorkin R, Sharifi V, Lakier JB. Inadvertent malposition of a transvenous-inserted pacing lead in the left ventricular chamber. Am J Cardiol, 1995; 76: 92–95.
2. Agnelli D, Ferrari A, Saltafossi D, Falcone C. A cardiac embolic stroke due to malposition of the pacemaker lead in the left ventricle. A case report. Ital Heart J Suppl, 2000; 1: 122–125.
3. Van Gelder BM, Bracke FA, Oto A et al. Diagnosis and management of inadvertently placed pacing and ICD leads in the left ventricle: a multicenter experience and review of the literature. Pacing Clin Electrophysiol, 2000; 23: 877–883.
4. Wilkoff BL, Love CJ, Byrd CL et al.; Heart Rhythm Society; American Heart Association. Transvenous lead extraction: Heart Rhythm Society expert consensus on facilities, training, indications, and patient management: this document was endorsed by the American Heart Association (AHA). Heart Rhythm, 2009; 6: 1085–1104.
5. Paravolidakis KE, Hamodraka ES, Kolettis TM, Psychari SN, Apostolou TS. Management of inadvertent left ventricular permanent pacing. J Interv Card Electrophysiol, 2004; 10: 237–240.
6. Vanhercke D, Heytens W, Verloove H. Eight years of left ventricle pacing due to inadvertent malposition of a transvenous pacemaker lead in the left ventricle. Eur J Echocardiogr, 2008; 9: 825–827.
7. Ciolli A, Trambaiolo P, Lo Sardo G, Sasdelli M, Palamara A. Asymptomatic malposition of a pacing lead in the left ventricle: the case of a woman untreated with anticoagulant therapy for eight years. Ital Heart J, 2003; 4: 562–564.
8. Liebold A, Aebert H, Muscholl M, Birnbaum DE. Cerebral embolism due to left ventricular pacemaker lead: removal with cardiopulmonary bypass. Pacing Clin Electrophysiol, 1994; 17: 2353–2355.
9. Reising S, Safford R, Castello R, Bosworth V, Freeman W, Kusumoto F. A stroke of bad luck: left ventricular pacemaker malposition. J Am Soc Echocardiogr, 2007; 20: 1316.
10. de Cock CC, van Campen CM, Kamp O, Visser CA. Successful percutaneous extraction of an inadvertently placed left ventricular pacing lead. Europace, 2003; 5: 195–197.