


CASE REPORT

Biventricular pacemaker implantation via a persistent left superior vena cava after removal of an infected device from the right side

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Abstract

Persistent left superior vena cava (PLSVC) is a congenital anomaly that poses a unique challenge when implanting cardiac implantable electronic devices (CIEDs) from the left side. To date, only a few isolated case reports are available regarding biventricular pacemaker implantation via PLSVC. These reports lack procedural details and tips to overcome difficulties faced by the physician when performing this technically demanding procedure. In the present report, we describe a patient who successfully underwent biventricular pacemaker implantation via a PLSVC after transvenous extraction of an infected device from the contralateral side, and discuss the technical implications.

KEYWORDS

cardiac pacemaker, cardiac resynchronization therapy device, congenital heart defect, heart failure, implantable defibrillator

1 | INTRODUCTION

When patients with known persistent left superior vena cava (PLSVC) and an absent innominate vein develop conditions requiring implantation of cardiac implantable electronic devices (CIEDs), implantation from the right superior vena cava (SVC) is preferable from the viewpoint of procedural complexity. However, some patients with PLSVC lack a right SVC, while others might develop conditions favoring a left-sided approach in the presence of right SVC, such as venous occlusion or infection of previously implanted devices. Herein, we describe a patient who underwent biventricular pacemaker implantation via a PLSVC after removal of an infected device from the right side.

2 | CASE DESCRIPTION

An 82-year-old man was referred to our hospital for the removal of an infected cardiac resynchronization therapy device with defibrillator

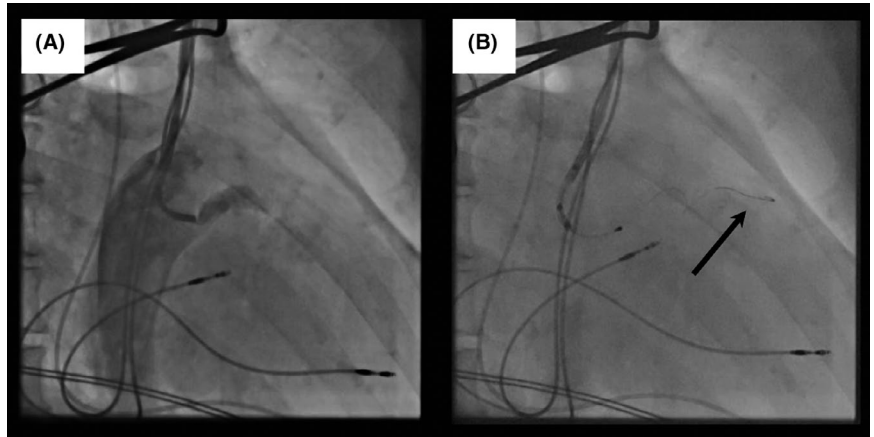
(CRT-D). He first underwent permanent pacemaker implantation for atrial fibrillation with bradycardia 14 years before the presentation. Four years ago he developed nonischemic cardiomyopathy with ejection fraction (EF) of 25% and received a pacing system upgrade to CRT-D. The devices were implanted from the right side, because of known PLSVC and an absent innominate vein. One month prior to the referral, he developed tenderness and swelling of the CRT-D pocket, which then progressed to overt skin erosion.

After admission, the entire CRT-D system and abandoned right ventricular (RV) pacing lead were successfully removed using excimer laser sheaths. After a week of treatment with antibiotics, we attempted to implant a new device from the contralateral side, via PLSVC, to avoid recurrent infection. As appropriate discharge was not obtained since the previous CRT-D implantation, and considering his advanced age, we decided to implant a biventricular pacemaker without a defibrillator. Atrial and RV pacing leads were placed in the right atrial appendage and RV apex, respectively, using manually shaped stylets. Then left

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FIGURE 1 A, Baseline coronary sinus (CS) venogram revealed severe enlargement of the CS and a lateral tributary that formed an acute angle with it. B, Despite the use of multiple guiding and subselection catheters, wiring this lateral branch remained challenging because of a weak backup support of the guiding catheters inside the enlarged coronary sinus, difficulty in obtaining coaxial alignment with the target vessel, and the tortuous course of the vessel. The arrow indicates the tip of the guidewire



ventricular (LV) lead placement was attempted. After a coronary sinus (CS) cannulation catheter (ATTAIN COMMAND, Medtronic) was advanced into the PLSVC, venography was performed by direct contrast injection through this catheter, demonstrating an enlarged CS with a lateral vein that formed an acute angle at the confluence with the CS (Figure 1). We used a subselection catheter (ATTAIN SELECT II, Medtronic) inside the cannulation catheter and tried to place the LV lead in this lateral vein. However, it was difficult to advance the lead along its tortuous course. This was partly because the guiding catheter could not be stabilized, as the CS was severely enlarged, and the backup force of the guiding catheter was poor. Moreover, the relatively sharp angle

of the confluence between the lateral vein and CS precluded the coaxial alignment of the system. We eventually abandoned placing an LV lead in this procedure.

He underwent a redo procedure a week later (Figure 2). This time, we used a 5-Fr coronary arterial diagnostic catheter (AL1, Terumo) inside the subselection catheter (ATTAIN SELECT II, Medtronic). The 5-Fr AL1 could be smoothly engaged to the ostium of the lateral vein. A 0.014-inch wire (Sion, ASAHI) was advanced into the vessel. Subsequently, the subselection and cannulation catheters were advanced deeply into the distal part of the vein. A quadripolar LV lead (QUARTET 1458QL-86) was placed. After the implantation, the patient responded well.

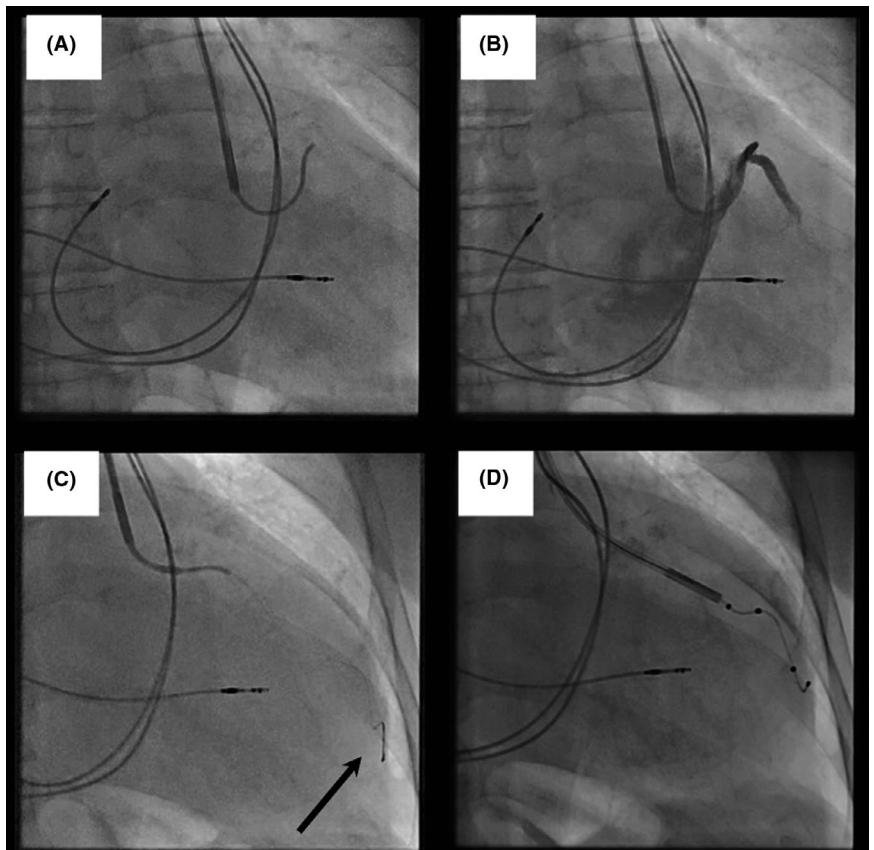


FIGURE 2 A, An Amplatz left coronary diagnostic catheter inside the subselection catheter facilitated the engagement of the system coaxial to the ostium of the vein. B, Venography before wiring. C, With the backup support of this system, a guidewire (arrow) could be advanced to the distal part of the vessel. D, After wiring, guiding and subselection catheters could be advanced distally, and a quadripolar left ventricular (LV) lead was placed

3 | DISCUSSION

Persistent left superior vena cava is a congenital anomaly that is present in 0.47% of patients undergoing CIED implantation.¹ It was reported that 33% of patients with PLSVC who underwent CIED implantation lacked a right SVC, requiring implantation via PLSVC (1). Moreover, even in the presence of a right SVC, patients may develop conditions that hinder implantation from the right side, such as venous occlusion or infection of previously implanted devices. Pacemaker and implantable cardioverter-defibrillator implantation via PLSVC have been reported.¹ Use of manually shaped stylets with large curves and active fixation leads were reported to be useful in these settings.

Regarding biventricular pacemaker or CRT-D implantation via PLSVC, only a few isolated cases have been published to date.²⁻⁴ Difficulty in obtaining a stable position and coaxial alignment of the guiding catheter in the enlarged CS may be a challenge when implanting an LV lead from the PLSVC. The 5-Fr AL1 coronary diagnostic catheter inside the subselection catheter was the key component in our system. It facilitated the engagement of the system to the lateral vein, provided additional backup support, and achieved coaxial alignment of the catheters.

If the second procedure failed, surgical implantation of an epicardial LV lead might have been an alternative for this patient. However, considering his severely depressed EF and poor functional status, he would not have been an ideal candidate for a surgery under general anesthesia. Pacing of His bundle via the PLSVC in lieu of biventricular pacing could have been another option, but this was deemed to be technically unfeasible.

We acknowledge that our approach has limited generalizability because the CS anatomy varies from patient to patient. Nevertheless, we believe that our experience is an important addition to the literature, given the paucity of reports on the practical aspect of this procedure.

CONFLICT OF INTERESTS

Authors declare no conflict of interests for this article.

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