A NOVEL TECHNIQUE OF PLACING RIGHT VENTRICLE LEADS IN PATIENTS WITH PERSISTENT LEFT SUPERIOR VENA CAVA

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Abstract

Background: Persistent left superior vena cava is the most common thoracic venous anomaly. It is usually asymptomatic, but it can make it difficult to implant intracardiac devices . *Case presentation*: We present a novel technique to facilitate right ventricular lead implantation in two patients with persistent left superior vena cava and the absence of the right superior vena cava. We used a fixed-curve Selectra 3D sheath (Biotronik), orienting the sheath towards the tricuspid valve by rotating it in a counter-clockwise direction. During follow-up, the electrodes remained stable. *Discussion*: Our technique was safe, simple and feasible for patients with this complex venous anatomy.

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Abstract

Background : Persistent left superior vena cava is the most common thoracic venous anomaly. It is usually asymptomatic, but it can make it difficult to implant intracardiac devices .

Case presentation : We present a novel technique to facilitate right ventricular lead implantation in two patients with persistent left superior vena cava and the absence of the right superior vena cava. We used a fixed-curve Selectra 3D sheath (Biotronik), orienting the sheath towards the tricuspid valve by rotating it in a counter-clockwise direction. During follow-up, the electrodes remained stable.

Discussion : Our technique was safe, simple and feasible for patients with this complex venous anatomy.

Keywords: Persistent left superior vena cava; Intracardiac device; Selectra 3D Sheath; Left bundle branch area pacing.

Abbreviations:

PLSVC: persistent left superior vena cava.

RSVC: right superior vena cava.

RV: right ventricle.

ICD: implantable cardioverter-defibrillator.

RA: right atrium.

CS: coronary sinus.

TV: tricuspid valve.

Background

Persistent left superior vena cava (PLSVC) is the most common thoracic venous anomaly, being present in 0.3-0.5% of the general population[1]. Most patients also have a right superior vena cava (RSVC), which is usually connected to the PLSVC via a left brachiocephalic vein[2]. However, in 18% of cases the VCSD is absent[2]. Patients with PLSVC are usually asymptomatic. The condition is generally discovered incidentally in imaging techniques, or during central venous cannulation procedures[1,2].

Clinical experience on intracardiac device implantation in patients with PLSVC is scant and limited to isolated case reports[3,4,5]. In this paper, we present two cases of PLSVC with the absence of RSVC, wherein we performed intracardiac device implantation using a novel technique to introduce and place the leads into the right ventricle (RV).

Case 1

We present the case of a 70-year-old man with a history of chronic coronary syndrome, who was admitted due to recurrent syncope. The ECG showed sinus rhythm with right bundle branch block. A cardiac magnetic resonance imaging was requested, which reported a dilated cardiomyopathy of ischemic origin with moderate ventricular dysfunction. As an incidental finding, a PLSVC with agenesis of RSVC was observed, draining into a dilated coronary sinus (CS). Therefore, an implantable cardioverter-defibrillator (ICD) was indicated. Due to the absence of RSVC, left axillary vein puncture was performed without incident. Several attempts were made to introduce the ICD lead into the RV apex through different modifications of the curve of the stylet; however, it was repeatedly directed towards the RV outflow tract possibly due to coil stiffness. Finally, we decided to use a Selectra 3D 65cm sheath (Biotronik, SE&Co), commonly used for left bundle branch area pacing. With a 0.375mm guidewire, we reached the right atrium (RA) through the CS, and then we advanced the sheath through it. Once in RA, by counter-clockwise rotation, we were able to orient the tip of the sheath towards the tricuspid valve (TV) and cross into the RV without difficulty. We subsequently removed the guidewire and advanced a Durata 7122-Q 65cm lead (Abbott Medical S.A.) up to the RV apex. After confirming adequate detection and stimulation parameters, the sheath was removed using the usual peel-away technique. The lead in RA was placed in the right appendage, without requiring the use of a sheath. All parameters remained stable during follow-up, with no complications (Figure 1).

Case 2

A 51-year-old man with a history of mild rheumatic mitral stenosis was admitted to a secondary hospital due to a symptomatic third-degree atrioventricular block with an escape rhythm of 40 bpm. It was decided to implant a pacemaker; however, during the procedure the implanters presented difficulties in advancing the guidewire. Venography was performed, which evidenced a PLSVC with drainage in the CS, and absence of RSVC. Our centre was contacted after these findings. Left axillary venous access was performed, and due to our previous experience, a Selectra 3D 65cm sheath (Biotronik, SE&Co) was used from the beginning to facilitate the advancement of the lead to the RV. As in the previous case, we accessed RA through the CS and performed a counter-clockwise rotation to orient the sheath towards the TV and advance the guidewire through it. The baseline ECG showed a left bundle branch block, so we decided to pace the left bundle branch area. Using counter-clockwise rotation, we supported the sheath against the interventricular septum and inserted a Solia S60 electrode (Biotronik) in the usual way. To check the optimal position and depth of the lead, left and right anterior oblique projections were made after contrast injection. The RA electrode was implanted without difficulty in the right appendage. The values of impedance, threshold, and R-wave amplitude were verified during the procedure. The ECG after implantation showed QRS narrowing up to 140ms with a QR pattern in V1. During follow-up, the leads remained stable, with no complications (Figures 2 and 3).

Discussion

The presence of PLSVC associated with the absence of RSVC is rare, and its appearance is related to alterations in the development of the venous system during pregnancy[6]. It is usually asymptomatic but may complicate the implantation of intracardiac devices. The main problem is the presence of an acute angle between the CS ostium and the TV, preventing adequate orientation of the lead towards the RV[7]. This is partially resolved by right venous access through the RSVC. However, in patients with no RSVC in whom the RV cannot be accessed by left venous access, an epicardial approach and subsequent tunnelling should be used[5]. To avoid epicardial access and facilitate implantation, several methods have been proposed. The most common technique consists of curving the stylets at different angles[8]. However, it is not always effective as it requires considerable operator experience and skill, in addition to the risk of RA perforation with electrode manipulation[7]. Subsequently, two alternative methods have been described, using a sheath for CS cannulation during cardiac resynchronization therapy[9], or a Medtronic C315-S10 sheath frequently used for implantation of leads in the area of His or the left bundle branch area[7], allowing both to orient and advance the electrodes towards the RV apex.

We present two patients diagnosed with PLSVC and the absence of RSVC who required the implantation of an intracardiac device. In both, a novel technique was used, involving the use of Selectra 3D sheath (Biotronik, SE&Co) to facilitate the advancement of the lead to the RV by performing a counter-clockwise rotation. In addition, in one of the cases, lead implantation was achieved in the left bundle branch area, with adequate electrocardiographic and pacing parameters that were maintained at follow-up.

This paper presents the initial report on the use of this sheath and the insertion of a lead in the left bundle branch area in patients with PLSVC. This is a safe and easy technique to perform, and we consider it an option to be considered in patients with complex venous anatomy, saving procedural and fluoroscopy time.

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Figures

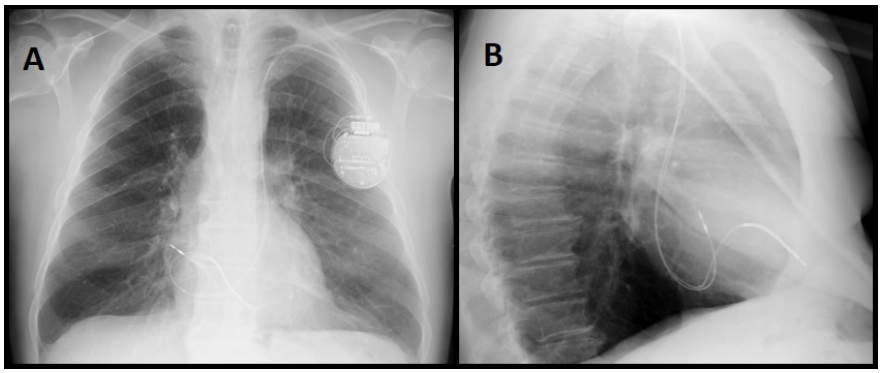

Figure 1. Chest radiograph after ICD implantation (A: posteroanterior view; B: lateral view). The ICD lead is located in the apex of the right ventricle, and the atrial lead in the right appendage.

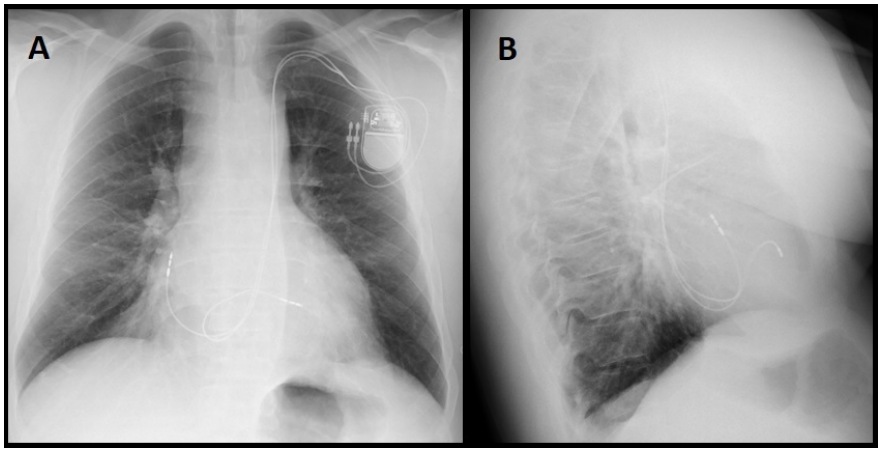

Figure 2. Chest X-ray 3 months postimplantation (A: posteroanterior view; B: lateral view), with ventricular lead in the the left bundle branch area, and the atrial lead in the right appendage.

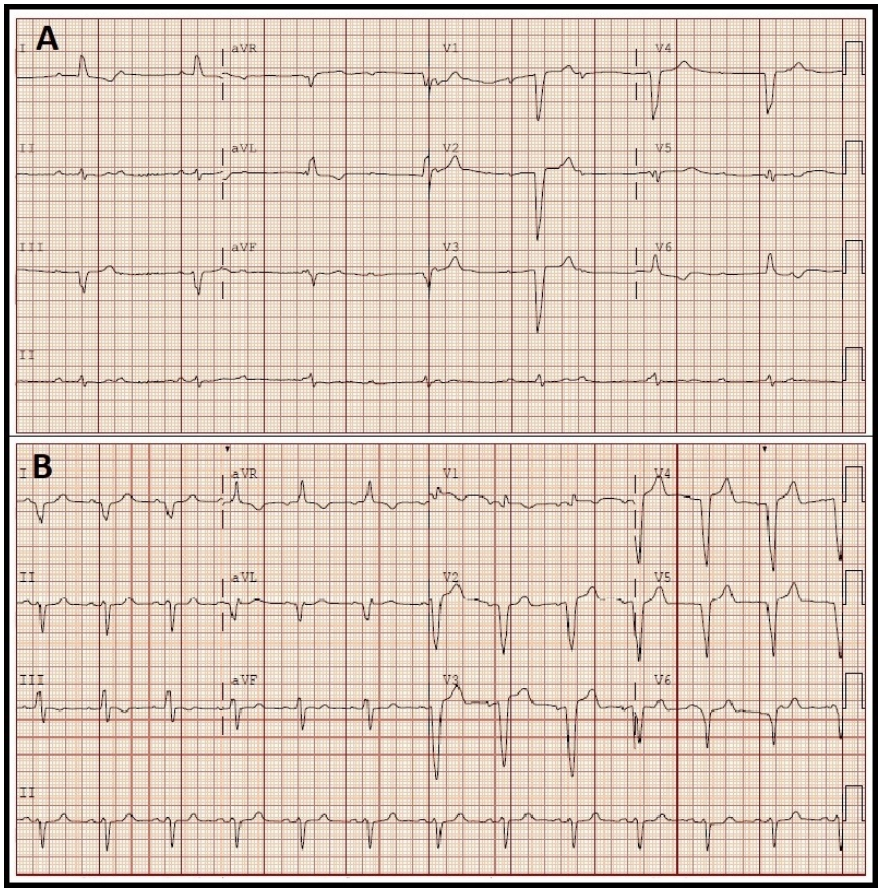

Figure 3. A: ECG on admission, with third-degree atrioventricular block and escape rhythm with left bundle branch block morphology. B: Post-implantation ECG with QRS narrowing of up to 140ms and a QS pattern in V1.