



Single Chamber Pacemaker Implantation in a Patient with Persistent Left Superior Vena Cava and Right Superior Vena Cava Occlusion: A Technical Challenge Solved with a Particular Right Ventricular Lead

Patrizio Mazzone^{1,*}, Fabrizio Guarracini², Andrea Radinovic¹, Silvio Romano², Federico Migliore³, Maria Penco², Paolo Della Bella¹

¹ Arrhythmia Unit and Electrophysiology Laboratories, San Raffaele Scientific Institute Hospital, Università Vita-Salute, Milan, Italy

² Cardiology Department, University of L'Aquila, L'Aquila, Italy

³ Department of Cardiac Thoracic and Vascular Sciences, University of Padua Medical School, Padua, Italy

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ABSTRACT

Persistent Left Superior Vena Cava (PLSV) may be found incidentally during pacemaker or implantable cardioverter defibrillator implantation, making the procedure challenging. Herein, we reported the first case of PM implantation via PLSV in a patient with right superior vena cava occlusion, using a coronary sinus delivery system and a long (85 cm) active fixation right ventricular pacing lead.

► Implication for health policy/practice/research/medical education:

Persistent left superior vena cava (PLSV) and right superior vena cava occlusion may be found incidentally during pacemaker or implantable cardioverter defibrillator implantation, making the procedure challenging. We reported successful pacemaker implantation via PLSV and occluded right superior vena cava using a coronary sinus delivery system and a long (85 cm) active fixation right ventricular pacing lead after a failed attempt with conventional tools.

1. Introduction

Persistent Left Superior Vena Cava (PLSV) and Right Superior Vena Cava (RSVC) occlusion may be found incidentally during pacemaker or implantable cardioverter defibrillator implantation, making the procedure challenging (1, 2). Standard leads are successfully positioned in the majority of cases. However, sometimes alternative approaches are necessary to overcome anatomical variations (3). Herein, we report a successful pacemaker implantation via PLSV after a failed attempt with conventional tools, using a coronary sinus delivery system and a long (85 cm) active fixation right ventricular pacing lead.

2. Case Presentation

A 45-year-old male patient affected by hypertension, permanent atrial fibrillation, and previous surgical prosthetic aortic valve replacement was brought to the Emergency Department of our hospital after a syncopal episode. At arrival, hemodynamic parameters were stable (BP 120/78 mmHg) and ECG showed atrial fibrillation at 60 bpm.

The patient was referred to our clinical department and during continual ECG monitoring, episodes of paroxysmal atrioventricular block with a junctional escape rhythm of 35 beats per minute was recorded. At echocardiographic evaluation, prosthetic aortic valve gradients were normal and ejection fraction was preserved. He was scheduled for a single-chamber pacemaker implantation.

Implantation of the right ventricular lead was attempted

*Corresponding author: Patrizio Mazzone, Arrhythmia Unit and Electrophysiology Laboratories, Department of Cardiology and Cardiothoracic Surgery, Ospedale San Raffaele via Olgettina 60, Milan, Italy, Tel: +39-02-26437369, Fax: +39-02-26437326, E-mail: mazzone.patrizio@hsr.it

from the left subclavian vein. The patient was found to have PLSV confirmed by contrast venography, showing the absence of RSVC and of an innominate bridging vein with drainage into the right atrium via the coronary sinus. Despite several attempts, advancement of the lead via this route was impossible because of the presence of an acute angle of the PLSV (Figure 1-A). Injection of contrast into the right subclavian vein revealed an unexpected occlusion of the RSVC (Figure 1-B). A coronary sinus delivery sheath (9F, Attain Command 6250-MB2, 45 cm, Medtronic) was successfully advanced through PLSV into the coronary sinus and then into the right atrium. Stable ventricular position

could not be achieved using a standard lead (Capsurefix Novus 5076, 58 cm, Medtronic), because it was too short for this route and the target position was not reached despite several attempts. Therefore, a long (85 cm) active fixation lead (Capsurefix Novus 5076, Medtronic) was advanced inside the same coronary sinus delivery sheath and was manipulated to enter the right ventricle by the use of a U-shaped stylet. The lead was fixed in the right ventricle apex (Figure 2 C and D). Optimal measurements were obtained during lead testing as follows: R-wave 11 mV, impedance 483 Ohms, and right ventricle threshold 0.5V at 0.4 msec. There were no periprocedural complications. Follow-up measurements

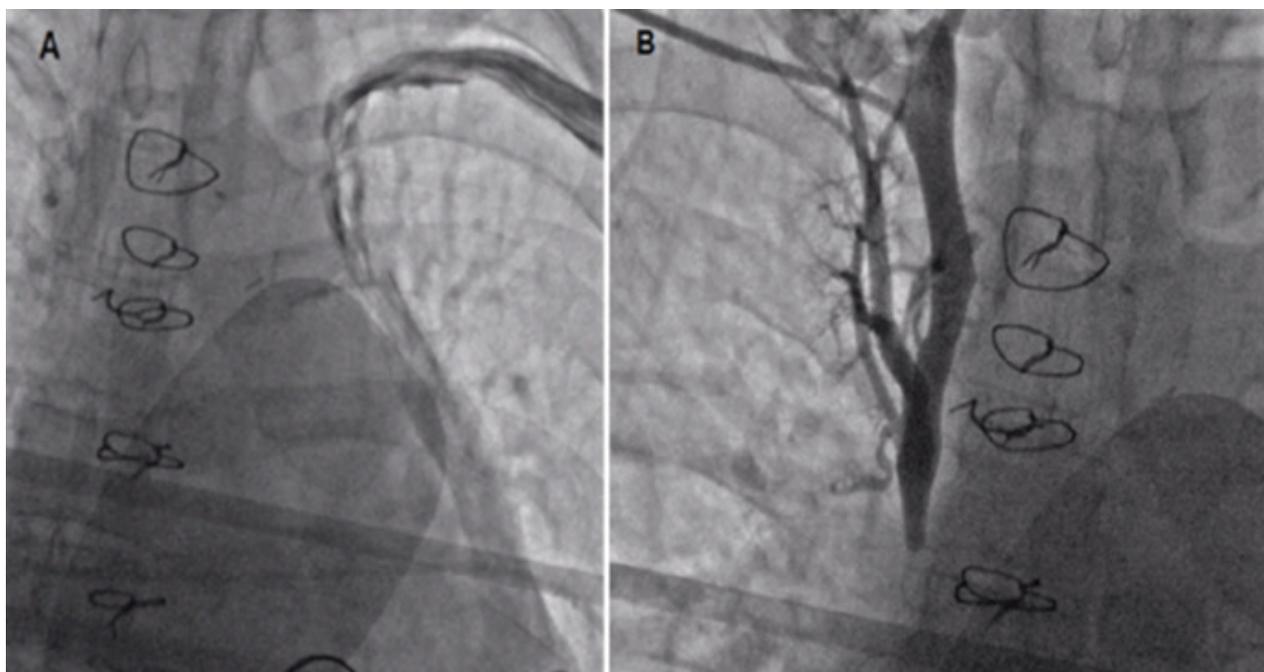


Figure 1. Contrast Venography Showing Persistent Left Superior Vena Cava with an Acute Angle (A). Injection of Contrast Medium into the Right Subclavian Vein Showing Occlusion of the Right Superior Vena Cava (B)

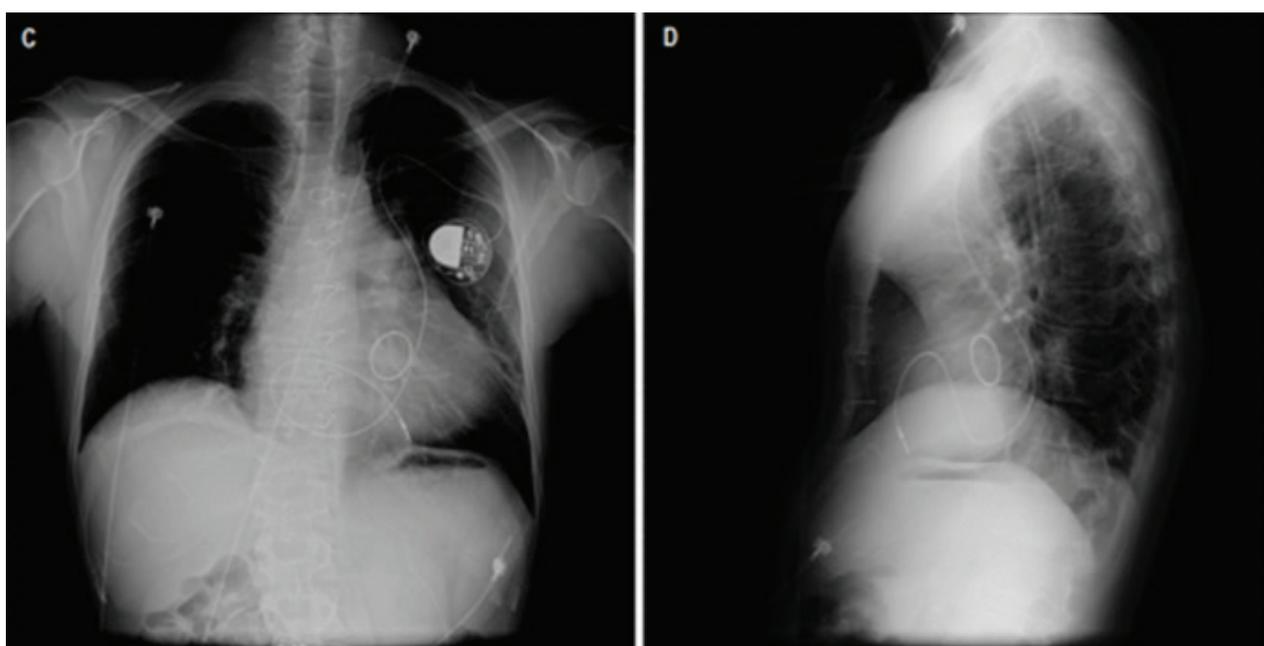


Figure 2. Chest X-ray (Posteroanterior View, C and lateral view, D) Showing the Final Lead Location in the Right Ventricle

were also stable after 6 and 12 months.

3. Discussion

PLSV and RSVC are rare venous anomalies and may be found incidentally during pacemaker or implantable cardioverter defibrillator implantation. Various techniques, including U-shaped stylets, steerable stylets, coronary sinus delivery systems, and different ventricular lead positions in the left ventricular branch of the coronary sinus, have been reported for reaching a feasible site of pacing (4). To the best of our knowledge, we described the first case of successful pacemaker implantation via PLSV and occluded RSVC using a long (85 cm) active fixation right ventricular pacing lead (5). In our case, the anatomical variation rendered the procedure challenging considering the difficulty to advance standard leads in the right ventricle that resulted shortly in reaching the right ventricular apex. Furthermore, the longer route made the use of a long pacing lead necessary in order to reach the desired site and the coronary sinus delivery sheath allowed us to efficiently manipulate the long active fixation lead.

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Authors' Contribution

Study concept and design: Patrizio Mazzone; Acquisition of data: Federico Migliore; Analysis and interpretation of data:

Fabrizio Guarracini; Drafting of the manuscript: Fabrizio Guarracini, Silvio Romano; Critical revision of the manuscript for important intellectual content: Patrizio MAzzone; Statistical analysis: Andrea Radinovic; Administrative, technical, and material support: Fabrizio Guarracini; Study supervision: Maria Penco, Paolo Della Bella

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