


Pacemaker implantation using the SelectSecure system for a patient with persistent left superior vena cava and absent right superior vena cava: Insights into techniques for stable lead fixation

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1 | INTRODUCTION

Persistent left superior vena cava (PLSVC) with absent right superior vena cava (RSVC) is a rare cardiovascular anomaly. The techniques for successful pacemaker implantation via the PLSVC with the SelectSecure system (Medtronic, Minneapolis, Minnesota, USA) are unknown. The SelectSecure system consists of a fixed-shaped catheter delivery sheath (Model C315, Medtronic) and a SelectSecure 3830 lead, a lumenless 4.1-Fr diameter pacing lead (Model 3830, Medtronic). SelectSecure 3830 leads are smaller diameter leads compared with the stylet delivery pacing leads, reducing the risk of venous stenosis.

2 | CASE REPORT

A 65-year-old man with cardiac sarcoidosis was referred to our institute with a complaint of exertional dyspnea. Electrocardiogram showed sinus rhythm, first-degree atrioventricular block, left axis deviation, complete right bundle branch block, and ventricular premature contractions (Figure 1A). Holter electrocardiogram revealed 2:1 atrioventricular block (Figure 1B). Left ventricular ejection fraction was 51% in echocardiography. Computed tomography

demonstrated PLSVC with absent RSVC (Figure 1C). The patient had the possibility of upgrading to cardiac resynchronization therapy in the future. Therefore, we implanted a pacemaker via the PLSVC using the SelectSecure system to avoid venous stenosis.

First, we implanted a right ventricle (RV) pacing lead through the left axillary vein. A catheter delivery sheath (Model C315-S10, Medtronic), designed for the outflow tract or septum of the RV (Figure 2A), was delivered into the right atrium (RA) through the PLSVC and the coronary sinus (CS). However, we failed to introduce the sheath into the RV after several attempts because of the acute angle between the CS ostium and tricuspid valve. Consequently, we positioned the sheath along the lateral wall of the RA and formed a loop to redirect the sheath toward the tricuspid valve (ie, a "loop technique"). We successfully navigated and screwed only the SelectSecure 3830 lead to the low septum of the RV, maintaining the coaxiality of the sheath and the SelectSecure 3830 lead. The sensing and capture thresholds were acceptable (sensed R wave 11.3 mV, threshold 0.5 V/0.4 ms). Next, we delivered a catheter delivery sheath (Model C315-J, Medtronic), designed for the right atrial appendage, lateral free wall, or septum of the RA (Figure 2B), into the RA. However, we could not introduce the sheath close enough to the target right atrial appendage. We positioned the sheath at the bottom of the RA and screwed a SelectSecure 3830 lead alone

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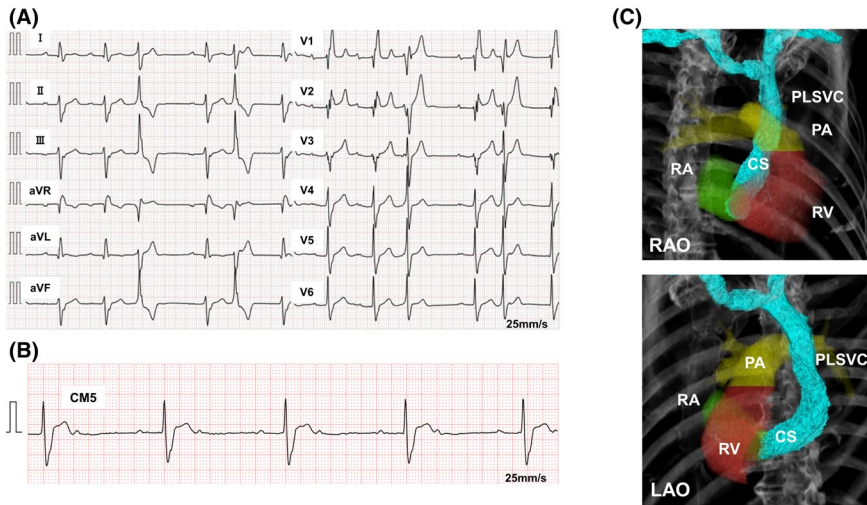


FIGURE 1 A, Electrocardiogram. B, Holter electrocardiogram revealed 2:1 atrioventricular block. C, Computed tomography demonstrated persistent left superior vena cava (PLSVC) with absent right superior vena cava. CS, coronary sinus; LAO, left anterior oblique; PA, pulmonary artery; RA, right atrium; RAO, right anterior oblique; RV, right ventricle

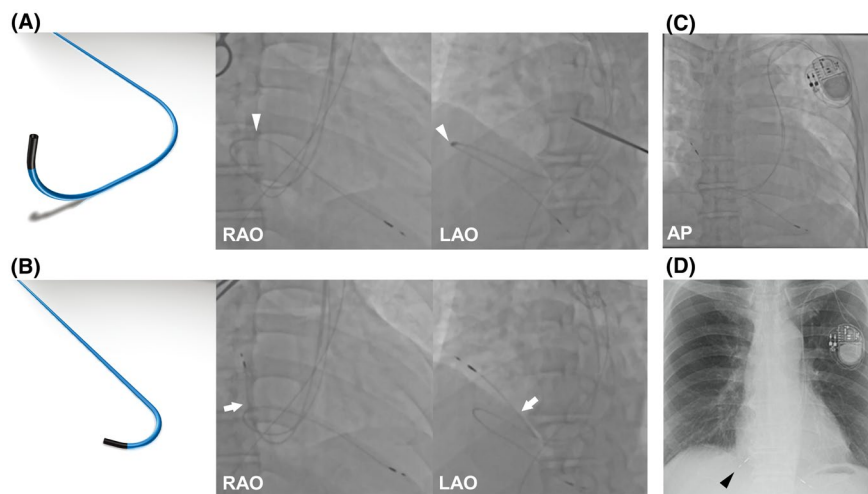


FIGURE 2 A, Model C315-S10 (left) and the tip of Model C315-S10 (white arrowhead) in the fixation of the right ventricle pacing lead in the right anterior oblique (RAO) view (middle) and left anterior oblique (LAO) view (right). Model C315-S10 formed a loop in the right atrium. B, Model C315-J (left) and the tip of Model C315-J (white arrow) in the fixation of the right atrium pacing lead in RAO view (middle) and LAO view (right). C, Chest X-ray at the end of the initial procedure. D, Chest X-ray on the seventh day after pacemaker implantation. The black arrowhead represents the tip of the dislodged right atrium lead. The photos of Model C315-S10 and Model C315-J were reproduced with permission from Medtronic Inc. AP, anterior-posterior



FIGURE 3 A, Model C315-H40 (left) and the tip of Model C315-H40 (white arrowhead) in the fixation of the right atrium lead in the right anterior oblique (RAO) view (middle) and left anterior oblique (LAO) view (right). B, Chest X-ray at the end of the second procedure. The photo of Model C315-H40 was reproduced with permission from Medtronic Inc.

to the right atrial appendage. The sensing and capture thresholds were acceptable (sensed P wave 1.4 mV, threshold 0.5 V / 0.4 ms). Both leads were connected to a pacemaker generator (Azure XT DR, Medtronic) (Figure 2C).

However, the patient complained of chest discomfort 7 days after the procedure. We confirmed the dislodged RA pacing lead on chest X-ray (Figure 2D) and scheduled refixation of the lead. We selected another longer catheter delivery sheath (Model C315-H40,

Medtronic), designed for the RV apex or triangle of Koch (Figure 3A). The sheath was successfully advanced close to the right atrial appendage. The RA pacing lead was screwed in with enough supporting force. The lead showed acceptable sensing and capture thresholds (sensed P wave 2.4 mV, threshold 1 V/0.4 ms) and was fixed with sufficient slack (Figure 3B). Those leads remained stable 3 months after the second procedure.

3 | DISCUSSION

The pacemaker leads were implanted using the catheter delivery system in the current case with PLSVC and absent RSVC. This case revealed the following technically important points in pacemaker implantation via the PLSVC using the SelectSecure system: (i) selection of an appropriate fixed-shaped catheter delivery sheath according to the individual anatomy, (ii) screw-in of SelectSecure 3830 leads under sufficient back-up by the sheath positioned close to the target site, and (iii) advanced techniques (ie, a “loop technique” in the right

atrium for navigation of an RV pacing lead to the target site) in case of a failure to position a sheath close to the RV. The development of a new catheter delivery sheath specialized for patients with PLSVC is also expected.

CONFLICT OF INTEREST

Authors declare no conflict of interests for this article.

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