Left Ventricular Pacing in the Presence of Persistent Left Superior Vena Cava Anomaly by Active Lead Fixation

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ABSTRACT. The presence of persistent left superior vena cava is associated with several technical difficulties for the implantation of a permanent pacemaker. This requires physicians to innovate novel methods to overcome these technical challenges.

KEYWORDS. active fixation, biventricular pacing, persistent left superior vena cava.

Introduction

Failure to obliterate the left anterior cardinal vein results in the formation of persistent left superior vena cava (PLSVC) anomaly. PLSVC usually drains into the right atrium via the coronary sinus. The first permanent pacemaker (PPM) implantation in a patient with PLSVC was reported in 1971. Unusual coronary sinus (CS) anatomy causes difficulties in biventricular pacemaker implantation in this clinical setting. Such limitations require physicians to innovate novel methods to implant a CS lead in the correct position. This report presents biventricular pacemaker implantation using active fixation of a conventional lead in a patient with PLSVC without any CS venous side branches.

Case presentation

The presented case is a 58-year-old woman presenting with the complaint of dyspnea on exertion NYHA class III. Physical examination revealed grade III systolic murmur on the apex, S3 gallop, and a prominent jugular venous pulse. Echocardiographic findings included a left ventricle (LV) ejection fraction of 20%, severely enlarged LV, global hypokinesia, and paradoxical septal motion. Electrocardiogram showed sinus rhythm, and left bundle branch pattern with QRS complex with a width of 140 ms. There was no evidence of perfusion defect on the myocardial perfusion scan. The patient was scheduled for biventricular pacemaker implantation. The procedure was started using the transvenous subclavian approach. The passage of the guides demonstrated the presence of PLSVC. At first, a 58-cm Medtronic (Minneapolis, MN) lead was implanted in the right ventricular (RV) apex with a pacing threshold of 0.75 V at 0.4 ms, and R-wave amplitude of 6.7 mV. Then, a CS venogram was performed, which revealed a large CS without any venous side branches (Figure 1). Since it was impossible to implant a CS designed lead in this situation, we decided to advance a conventional 58 cm Medtronic lead by a J-shape stylet and implant the lead by active fixation in the main CS trunk with a pacing threshold of 0.75 V at 0.4 ms, and R-wave amplitude of 6.7 mV. Finally, a 52-cm Medtronic lead was implanted in the right atrium lateral wall with a pacing threshold of 0.5 V at 0.4 ms, and R-wave amplitude of 2.5 mV. Six months after implantation, LV lead analysis showed a pacing threshold of 4.5 V at 0.6 ms, and R-wave amplitude 2.2 mV (Figure 2).

Discussion

CS lead implantation is a challenging task in the presence of PLSVC. Common presentations include a dilated CS trunk and few tributaries with abnormal angulations. These limitations cause difficulties for placing a dedicated CS lead and introducing system in a suitable CS side branch. In some of such cases, this aim is better
Figure 1: CS venogram reveals a large CS body without any venous side branches.
achieved by applying conventional leads, as previously reported, by implantation of a standard passive lead (RV lead). In the present report, we introduced LV pacing in a case of PLSVC with a large CS without any tributaries, using active fixation of the conventional lead system. These technical difficulties necessitated a sophisticated echocardiographic evaluation before the procedure, in order to verify the existence of a PLSVC anomaly. Then, a magnetic resonance venogram of CS was performed to find a suitable side branch.

References