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Case Report

Cardiac Resynchronization Therapy in a Patient with Persistent Left Superior Vena Cava Draining into the Coronary Sinus and Absent Innominate Vein: A Case Report and Review of Literature

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Abstract

Introduction: Persistent left superior vena cava (PLSVC) is a rare congenital anomaly of the superior venous system that may be discovered at the time of cardiac implantable electronic device (CIED) implantation.

Methods and Results: We present a subject who needed cardiac resynchronization therapy (CRT)-CIED implantation and was discovered to have PLSVC with absent innominate vein during the implant procedure. We were able to successfully implant a CRT-CIED using a right-sided approach via the right superior vena cava (SVC). We present a description of our implant technique and a brief review of the different aspects of CIED implantation in subjects with variants of PLSVC.

Conclusions: Superior venous anomalies such as PLSVC can make CIED implantation technically challenging. However, with increasing operator experience, cardiac imaging and appropriate tools successful CIED implantation is possible in almost all cases.

Key words: Cardiac Resynchronization Therapy, Persistent Left Superior Vena Cava, Coronary Sinus, Absent Innominate Vein

Introduction

Persistent left superior vena cava (PLSVC) is a congenital venous developmental abnormality of the sinus venosus with an incidence of 0.47% in patients undergoing cardiac implantable electronic devices. The two variants include a double superior vena cava (right and left SVC, with or without an innominate vein connecting the two) or a single left sided SVC (without a right SVC) [1]. Implantation of cardiac implantable electronic devices (CIED), especially cardiac resynchronization therapy (CRT), may be challenging in the presence of PLSVC [2]. We present our approach to CRT-CIED implantation in a subject with no previous documentation of systemic superior venous anomalies or congenital heart disease.

Case Report

A 59-years old gentleman with non-ischemic dilated cardiomyopathy, severe LV systolic dysfunction (left ventricular ejection fraction = 25%), LBBB (QRS width 180 ms), NYHA class III symptoms (on optimal medical management) and morbid obesity (body weight 160 kg) was referred to our service for CRT-CIED insertion. The procedure was performed under general anesthesia and full therapeutic anticoagulation as the subject had a history of paroxysmal atrial fibrillation with CHADS2 score of 3. A left superior venogram performed to guide left subclavian venous access revealed the presence of a PLSVC draining into the proximal segment of the coronary sinus (CS). The combined PLSVC and CS confluence drained into the right atrium. The venogram also revealed the absence of an innominate vein connecting the PLSVC to the right SVC. A venogram performed from the right side demonstrated the presence of a right SVC draining into the right atrium (**Figure 1**).

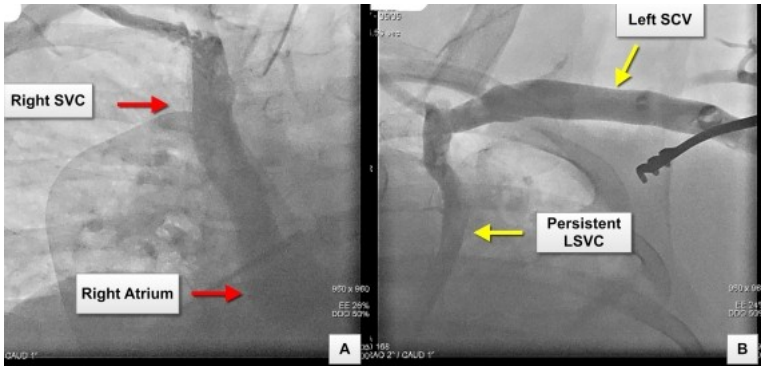

Figure 1: Panel A: Venogram showing the course of the right superior vena cava (SVC) draining into the right atrium Panel B: Venogram showing the left subclavian vein (SCV) draining into a persistent left superior vena cava (PLSVC). The venogram also demonstrates the absence of the innominate vein

The left subclavian vein was accessed using the Seldinger technique and a CS sub-selector catheter (Medtronic Attain Select soft-tipped guide catheterTM) was introduced over a guide wire to cannulate the coronary sinus, distal to its confluence with the PLSVC. The selective coronary sinus venogram demonstrated a suitable lateral tributary for coronary sinus pacing lead insertion (**Figure 2**). However, we felt that a left sided approach to implant three pacing leads, especially in the presence of acute angulation between the PLSVC and the CS, would be technically challenging and associated with a high risk of lead dislodgement. In addition the presence of a right-sided SVC draining into the right atrium prompted us to attempt device implantation using a right-sided approach.

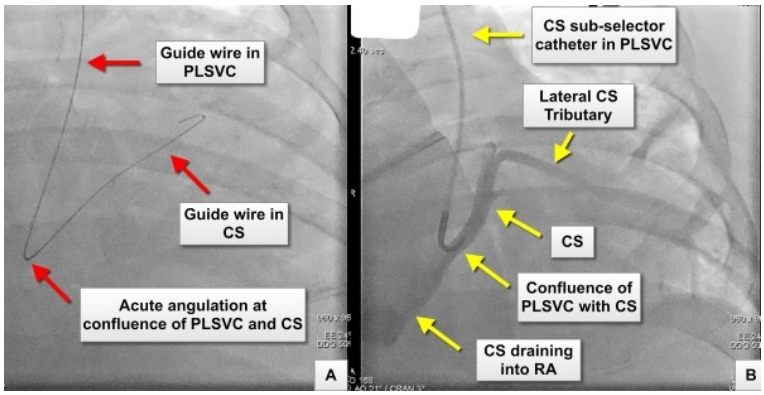

Figure 2: Panel A: Image showing the course of a J-tip 0.032" hydrophilic guide wire through the persistent left superior vena cava (PLSVC) into the coronary sinus (CS). The acute angulation of the coronary guide wire at the confluence of the PLSVC and CS is shown. This anatomical feature may make cannulation and delivery of a CS pacing lead technically challenging Panel B: Venography using a CS sub-selector catheter, positioned at the confluence of the PLSVC with the CS, demonstrate the anatomy of the CS and the presence of a lateral CS tributary suitable for pacing lead placement