EP CASE REPORT

Optimal technique for right ventricular lead implantation in isolated persistent left superior vena cava

Stefanos Archontakis[1], Elias Sanidas[2], Konstantinos Sideris[1], Petros Arsenos [3], Konstantinos Gatzoulis[3], and Skevos Sideris [1]*

[1]Department of Cardiology, Hippokration General Hospital, 114 Vasilisis Sofias str, Athens, Greece; [2]Department of Cardiology, Laikon General Hospital, Ag Thoma sq, Athens, Greece; and [3]Department of Cardiology, First Cardiology Division, University of Athens, Medical School, Hippokration General Hospital, 114 Vasilisis Sofias str, Athens, Greece

* Corresponding author. Tel:+306974730110; fax:+302107754676. *E-mail address*: skevos1@otenet.gr

Persistent left superior vena cava (PLSVC), is an uncommon, congenital abnormality presenting with an incidence of 0.1–0.5%, that results from failure of the left anterior cardinal vein to regress during embryonic development.[1] Persistent left superior vena cava is occasionally incidentally diagnosed during pacemaker implantation.[2] In 10–20% of the cases, it is accompanied by the absence of the normally positioned superior vena cava (SVC), a condition described as isolated PLSVC.[1]

We report the case of a 75-year-old male with a history of multiple episodes of syncope, who was diagnosed with sick sinus syndrome and was referred for permanent pacemaker implantation. Ambulatory 24-h electrocardiographic monitoring demonstrated a 4.2 s sinus-arrest pause, prolonged periods of bradycardia, multiple paroxysmal atrial fibrillation episodes, and a baseline heart rate of 55 beats per minute.

Venous access through the left subclavian vein was achieved, followed by introduction of an 8-Fr sheath. However, during fluoroscopy, an unusual trajectory of the guidewire along the left cardiac border, compatible with the presence of PLSVC was demonstrated. Venography confirmed the diagnosis of PLSVC, draining in a dilated coronary sinus (CS) (*Figure 1A*). We decided to use the right subclavian vein access for implantation, however, a similar course of the guidewire was observed (*Figure 1B*). Venography revealed absence of SVC on the right side, confirming the diagnosis of isolated PLSVC.

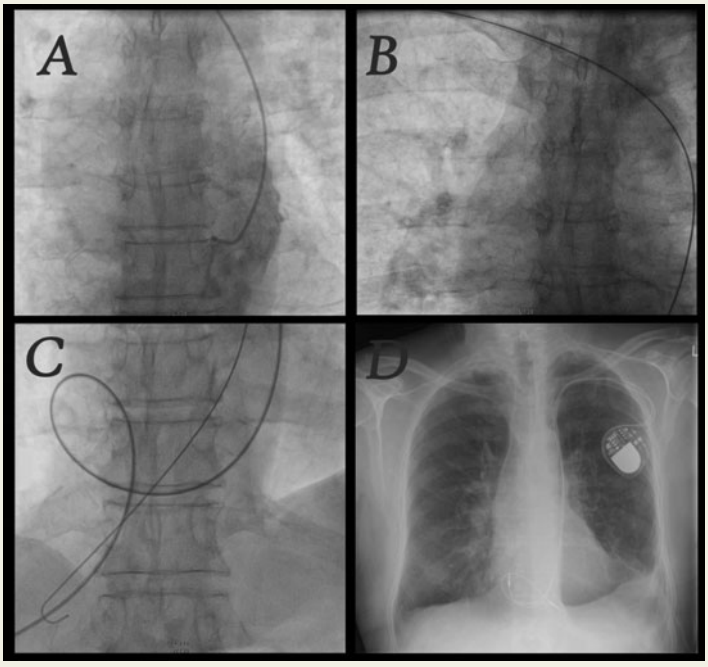

Figure 1 (A) Venography of PLSVC (Persistent Left Superior Vena Cava), draining in the dilated coronary sinus (left subclavian vein access). (B) Course of the guidewire in the right subclavian vein, indicating the presence of PLSVC. (C) Implantation of a long ventricular lead, introduced through the left Superior Vena Cava and the Coronary Sinus to the right atrium, and subsequently advanced to the Hepatic vein. (D) Chest X-ray demonstrating the characteristic course of the leads in PLSVC.

A long (65 cm) ventricular lead was subsequently introduced through the left SVC and the CS to the right atrium, and afterwards further advanced to the Hepatic vein (*Figure 1C*). Next, the lead was retracted back to the right atrium, while the stylet was slightly withdrawn resulting in angulation of the lead tip. At that point, we advanced the curved lead towards the tricuspid valve. The lead easily crossed the tricuspid orifice, the stylet was advanced in the lumen and, eventually, actively affixed at the right ventricular apex. Next, a right screw-in 58 cm lead was advanced through the CS, clockwise rotated, and implanted in the right atrial appendage.

Post-procedurally, pacemaker sensing and pacing were appropriate. Chest X-ray demonstrated a course of implanted leads characteristic for patients with PLSVC and was otherwise insignificant (*Figure 1D*). A thorough transthoracic echocardiographic assessment, performed due to the association of PLSVC with a variety of other congenital malformations of the cardiovascular system (such as atrial septal defect, bicuspid aortic valve, etc.), was also insignificant. The patient was discharged 24 h post-implantation. On a 6-month follow-up, he remains asymptomatic with stable pacing parameters.

Published on behalf of the European Society of Cardiology. All rights reserved. © The Author(s) 2021. For permissions, please email: journals.permissions@oup.com.

Pacemaker implantation in patients with isolated PLSVC may, occasionally, be technically challenging due to the indirect drainage in the right atrium through the CS and the acute angle between the CS ostium and the tricuspid valve.[2,3] Lead introduction in the right ventricle may be facilitated by the 'wide loop' technique; however, this manoeuvre may be ineffective or time consuming.[2,3] Implantation by introducing the lead initially in the hepatic vein, is easier, has a higher success rate, and reduces fluoroscopy time. Nowadays, however, optimal treatment is probably the implantation of a leadless (VDD-mode) device that provides atrioventricular synchronous pacing, avoiding potential complications related to transvenous leads.

Conflict of interest: none declared.

References

1. Tak T, Crouch E, Drake GB. Persistent left superior vena cava: incidence, significance and clinical correlates. *Int J Cardiol* 2002;**82**:91–3.
2. Biffi M, Boriani G, Frabetti L, Bronzetti G, Branzi A. Left superior vena cava persistence in patients undergoing pacemaker or cardioverter-defibrillator implantation: a 10-year experience. *Chest* 2001;**120**:139–44.
3. Dilaveris P, Sideris S, Stefanadis C. Pacing difficulties due to persistent left superior vena cava. *Europace* 2011;**13**:2.