OPEN ACCESS

Saudi Journal of Medicine
Abbreviated Key Title: Saudi J Med
ISSN 2518-3389 (Print) | ISSN 2518-3397 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Case Report

Challenging Persistent Left Superior Vena Cava for Cardiac Device Implantation: Two Case Reports and Literature Review

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DOI: 10.36348/sjm.2023.v08i03.002 | **Received:** 13.01.2023 | **Accepted:** 25.02.2023 | **Published:** 06.03.2023

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Abstract

Persistent Left Superior Vena Cava (PLSVC) is the most common congenital abnormality of the thoracic venous system, it is usually diagnosed as an unexpected finding during attempts to left-sided venous catheterisation for intracardiac lead placement which can make more challenging and time consuming. Patients with this congenital malformation are at increased risk of developing various cardiac arrhythmias. It affects approximately 0.5 - 2% of individuals with normal heart, and up to 10 % in the presence of an established congenital heart diseases. We present two different challenging cases of persistent left superior vena cava incidentally discovered during device implantation

Keywords: Persistent left superior vena cava, Pacemaker implantation, congenital malformation.

INTRODUCTION

Access to the right side of the heart through the left subclavian vein during permanent pacemaker placement may be challenging in the presence of anatomic variant involving the Superior veina cava. Persistent Left Superior Vena Cava (PLSVC) is the most common congenital abnormality of the thoracic venous return and it is usually diagnosed as an unexpected finding during attempts to left-sided venous catheterisation for intracardiac lead placement. It results of a persistent patency of an embryological vessel present during the eighth week of early embryonic life. It usually drains into the right atrium through a dilated coronary sinus.

Case 1

A 81 year old female patient with a past medical history of hyperparathyroidism and hypertension was admitted to ER reporting dizziness, fatigue and asthenia. A blood pressure at 167/80 mmHg and a regular bradycardia at 36 per minute were noted, the rest of the physical examination was otherwise normal. An ECG revealed a complete heart block with infrahissien ventricular escape. The patient was therefore referred to our department for implantation of a dual-chamber pacemaker.

The procedure was initially performed through the standard left subclavian approach adopted in our centre with a left pectoral incision under local anaesthesia. After left subclavian puncture, while attempting to advance the lead, resistance was encountered and the lead was withdrawn. A venogram was performed revealing a PLSVC draining into the right atrium via the coronary sinus, given the small size of the LSVC and its angle of emerging it was impossible to advance the pacemaker lead via this vein leading to a change of the approach to a contralateral lead insertion via the right subclavian vein (Figure 1). A chest X-ray showed optimal lead positioning with no pneumothorax (Figure 2). The patient was discharged next day.

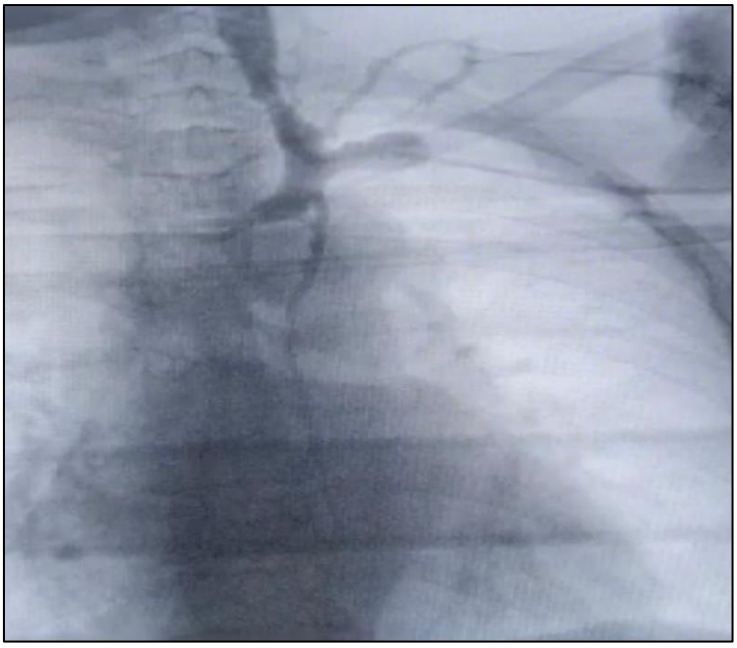

Figure 1: Venous angiogram showing contrast coursing through the Persistent Left Superior Vena (type IIIb)

Figure 2: Chest X-ray showing post-procedure implantation of a dual chamber pacemaker via the right subclavian vein

Case 2

A 61 year old man with a past history of non-ischemic dilated cardiomyopathy and refractory heart failure symptoms was admitted for cardiac resynchronization therapy.

His electrocardiograph (ECG) showed sinus rhythm with a left branch block (QRS = 172 milliseconds). A transthoracic echocardiography revealed a reduced ejection fraction (25 %). When attempting a standard transvenous approach to cardiac resynchronization, after left subclavian vein puncture, an abnormal trajectory of the guidewire was observed leading to the injection of a contrast dye to perform a veinogram as shown in Figure 3 which revealed a PLVC flowing into a dilated coronary sinus presenting a stenosis in its ostium which prevent its catheterization for the implant of the left lead. An attempt to insert the lead via the LSVC into the coronary sinus and to the left lateral vein was unsuccessful because of the acute angle by which the LSVC insert into the coronary sinus. After placing the right atrial and right ventricular lead via the communication between the two veina cava the patient was referred for minimally invasive left ventricular epicardial lead placement. The chest X-ray showed good lead positioning: Both trans-venous right leads and the left epicardial lead (Figure 4).

Figure 3: Venography of the Left Superior Vena Cava and Coronary Sinus ostium (type IIIA)

Figure 4: Chest X-ray showed transveinous leads and left epicardial lead [9]

DISCUSSION

Persistent Left Superior Vena Cava (PLSVC) is an uncommon structural vascular anomaly found in 0.5 – 2% of the general population with an increased incidence up to 10% in patients with congenital heart diseases [1]. Its most relevant clinical implication is the potential association to disturbances of cardiac rhythm, impulse formation and conduction. Zerbe *et al*., [2] reported 4 patients of 661 with PLSVC whereas Biffi and his team reported 6 of 1250 patients with this anatomical variant [3], in our experience such an anomaly was found in 2 patients among a total of 623 patients undergoing a cardiac device implantation during last four years.

W. Schummer *et al*., [4] described the embryogenesis and the anatomic variations of persistent LSVC according to the positioning of a central venous catheter on the chest radiograph: type I normal; type II only PLSVC; type IIIa right and left superior vena cava

with connection, as in case 2; type IIIb right and left superior vena cava without connection, as in case 1. Diagnosis of PLSVC is usually made as an incidental finding during cardiovascular imaging or surgery for unrelated reasons [5]. In both our cases, the anomaly was discovered incidentally during transvenous lead placement for cardiac devise implantation. The higher prevalence of PLSVC detection during pacemaker / defibrillator implantation is due to the fact that patients with congenital anomalous venous return are at an increased risk of arrythmias that may require such procedures [6]. Other methods that can help diagnose this venous anomaly include: Transthoracic echocardiography which can reveal a dilated coronary sinus and lead to the use of a saline contrast manoeuvre « bubble study » for confirmation [7]. Tomography, magnetic resonance imaging and angiography may be useful for the research and characterisation of this anatomical variation. PLSVC along with the associated venous anomaly may make challenging lead placement for cardiac device implantation and could lead to a change in the whole approach to intracardiac venous access, that's why one should be aware of this anomaly and its anatomic variants to be able to quickly adapt the strategy especially in the context of an emergency.

CONCLUSION

PLSVC usually comes as a surprise for the cardiologist during cardiac device implantation. Theses case reports emphasize the importance of its knowledge and how to manage it. although most right heart catheterization procedures can be safely performed in spite of this anomaly transvenous leads implantation can be challenging or even impossible in some cases.

Acknowledgments: None

Author Contributions

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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