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Persistent Left Superior Vena Cava and Coronary Sinus Dilatation in A 49-Year-Old Woman: A Case Report

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Abstract | **Case Report**

Persistent left superior vena cava (PLSVC) is a rare congenital malformation, generally benign and most often asymptomatic. In the majority of cases, it is discovered incidentally during radiological or echocardiographic investigations performed for other reasons. We report the case of an adult female patient in whom this anomaly was identified during the etiological workup of bradycardia. Mrs. *K. F.*, a 49-year-old woman with no history of surgery or known cardiovascular risk factors, was admitted for persistent fatigue. Clinical examination revealed marked bradycardia at 39 beats per minute, with no other notable clinical signs. The electrocardiogram confirmed sinus bradycardia. Chest X-ray showed an enlarged mediastinal silhouette. Transthoracic echocardiography (TTE) revealed a dilated coronary sinus, associated with moderate dilatation of the pulmonary artery and its branches. Given these findings, a thoracic CT angiography was performed, which confirmed the presence of a persistent left superior vena cava. The thoracic aorta appeared morphologically and dimensionally normal across all its segments.

Keywords: Persistent left superior vena cava, chest CT angiography, coronary sinus.

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INTRODUCTION

Persistent left superior vena cava (PLSVC) is a rare and benign congenital vascular anomaly. It is usually asymptomatic and is most often discovered incidentally. Although PLSVC is relatively uncommon among vascular anomalies, it is the most common thoracic venous anomaly. In most cases, PLSVC is asymptomatic and is incidentally detected during diagnostic or therapeutic examinations performed for various indications. However, it may also be associated with complex congenital heart disease and can lead to significant complications, including cardiac arrhythmias. Several imaging modalities can be used to evaluate PLSVC, including prenatal echocardiography, multidetector computed tomography (MDCT), magnetic resonance imaging (MRI), and invasive angiography [1].

CASE REPORT

We report the case of an adult woman in whom persistent left superior vena cava (PLSVC) was discovered during an etiological work-up for bradycardia. A 49-year-old woman, Mrs. *K. F.*, with no history of surgery or known cardiovascular risk factors, was admitted for persistent fatigue that had been evolving for several weeks. She was the mother of two children, with no significant obstetric history. She had no chest wall deformity, cyanosis, or digital clubbing.

On admission, physical examination revealed marked bradycardia at 39 beats per minute, without signs of right- or left-sided heart failure. Cardiovascular auscultation was normal, with no audible murmur. Pulmonary examination was unremarkable. Abdominal examination revealed no hepatomegaly, hepatojugular reflux, or lower-limb edema. Neurological examination was normal. The remainder of the clinical examination was unremarkable.

Routine laboratory tests, including complete blood count, blood glucose, renal function, and liver function tests, were within normal limits. HIV serology was negative.

Electrocardiography revealed sinus bradycardia at 39 beats per minute, with no associated conduction abnormalities.

Chest radiography (Figure 1) showed slight widening of the upper mediastinum, without evidence of pulmonary congestion.



Figure 1: Frontal chest radiograph showing widening of the upper mediastinum

Transthoracic echocardiography demonstrated dilatation of the coronary sinus, associated with moderate dilatation of the pulmonary artery and its branches. The cardiac chambers were normal in size, with preserved systolic and diastolic function and no significant valvular disease.

A contrast-enhanced chest CT angiography study was performed with a bolus injection of contrast material (Figure 2) as part of the etiological work-up of the coronary sinus dilatation. The examination revealed a thoracic venous configuration consistent with an anatomical variant: persistent left superior vena cava (PLSVC).

More specifically, the left internal jugular vein and left subclavian vein converged to form a single venous trunk coursing along the left cardiac border, passing posterior to the left ventricle before draining directly into the right atrium. On the right side, the right internal jugular vein and right subclavian vein also formed a common trunk, which joined a dilated azygos vein before draining into the right atrium.

In addition, the hepatic veins drained directly into the right atrium. Moderate dilatation of the ascending aorta was also noted. No pleural or pericardial effusion was detected. No osseous abnormalities were identified within the limits of the scanned field.

CT conclusion: Findings consistent with an anatomical variant of the thoracic systemic venous return, corresponding to persistent left superior vena cava.

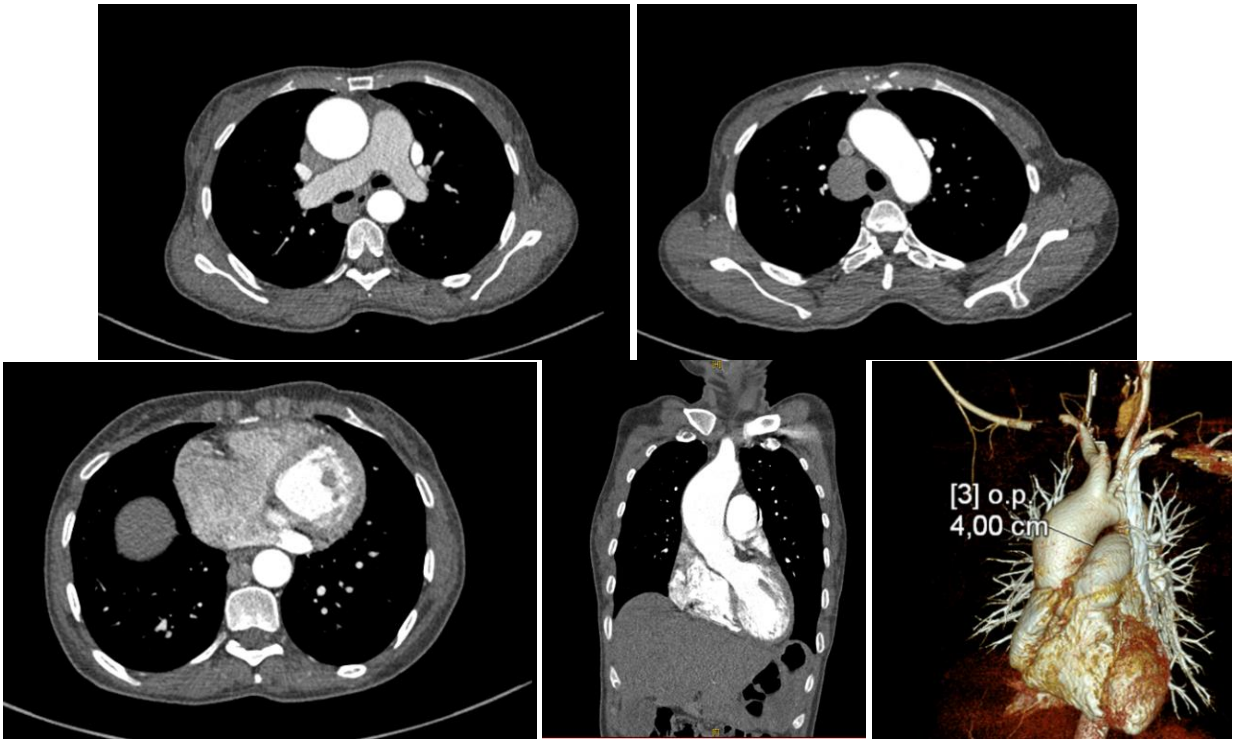


Figure 2: Chest CT angiography showing a persistent left superior vena cava draining into a dilated coronary sinus

DISCUSSION

Persistent left superior vena cava (PLSVC) is the most common congenital anomaly of the thoracic venous return, with an estimated prevalence of 0.3% to 0.5% in the general population, and up to 12% in patients with congenital heart disease [2]. It represents a persistent congenital remnant of the left superior cardinal vein, which constitutes the embryological counterpart of the superior vena cava (SVC) during early development. Failure of regression of this vein during embryogenesis results in venous drainage into the right atrium (RA), most commonly through the connection between the PLSVC and the coronary sinus (Figure 3) [3].

This anomaly may occur as an isolated finding or, more commonly, in association with congenital heart disease [3].

In the absence of associated congenital or underlying cardiac disease, patients with this malformation are usually asymptomatic [4].

In some cases, PLSVC may result in cyanosis, particularly when it drains directly into the left atrium, thereby increasing the risk of paradoxical embolism [5].

Kamel A. et al. [3] reported a case of PLSVC in a 9-year-old child with no significant medical history who was admitted following a brief episode of loss of consciousness, without abnormal tonic or clonic movements. Physical examination and ECG were normal. Chest radiography showed a double contour of the left middle mediastinal arch. Transthoracic echocardiography revealed marked dilatation of the coronary sinus, without associated congenital heart disease. The diagnosis of PLSVC was confirmed by cardiac magnetic resonance angiography.

Sohns et al. [2] reported a case of PLSVC in a 60-year-old patient with acute myeloid leukemia, in whom placement of a central venous catheter through the left jugular vein revealed an unusual catheter position on chest radiography. CT demonstrated an isolated PLSVC draining into a dilated coronary sinus, with no right superior vena cava.

PLSVC may be suspected on a frontal chest radiograph, where it may appear as widening of the aortic shadow, a paramediastinal bulge, a paramedian band, or a low-density line along the upper left cardiac border.

Transthoracic echocardiography (TTE) is the first-line imaging modality for the diagnosis of PLSVC. It is readily available, non-invasive, and inexpensive, and allows not only diagnosis but also assessment for associated cardiac abnormalities. However, TTE has limitations in accurately determining the precise drainage site of the PLSVC. In most cases, the PLSVC drains into a dilated coronary sinus, which can be confirmed by injection of agitated saline through a left brachial vein. The initial appearance of microbubbles within the coronary sinus, before their passage into the right atrium, confirms the diagnosis.

Contrast-enhanced chest CT is a complementary imaging modality of choice for detailed assessment of the thoracic venous anatomy [6]. In our case, CT confirmed the presence of a persistent left superior vena cava, with a left paracardiac course passing posterior to the left ventricle before draining into the right atrium. It also demonstrated an unusual configuration of the right-sided venous return, with a dilated azygos vein receiving the common venous trunk formed by the right internal jugular and right subclavian veins. In addition, the hepatic veins drained directly into the right atrium.

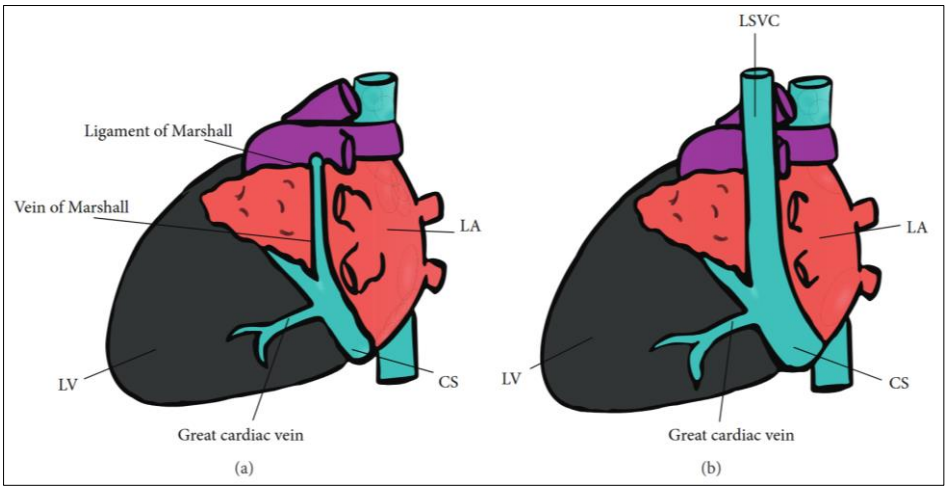


Figure 3: (a) Diagram illustrating normal venous return to the right atrium. The left superior cardinal vein regresses during embryological development, forming the ligament of Marshall
(b) Diagram illustrating a persistent left superior vena cava (PLSVC) draining into a dilated coronary sinus. PLSVC results from failure of regression of the left superior cardinal vein during embryological development

CONCLUSION

Persistent left superior vena cava (PLSVC) is a rare anomaly of systemic venous return that is most often asymptomatic. However, contrary to common belief, it may be associated with significant clinical manifestations, even in the absence of structural cardiac abnormalities. Furthermore, this anatomical variant may have important implications for therapeutic management in certain situations, such as heart transplantation, surgery for complex congenital heart disease, and catheter-based ablation procedures for cardiac arrhythmias.

PLSVC should be suspected in the presence of unexplained coronary sinus dilatation on transthoracic echocardiography and confirmed by cross-sectional imaging, particularly contrast-enhanced chest CT angiography or cardiac magnetic resonance angiography.

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