Persistent left superior vena cava
draining into the left atrium
Published on 20.01.2003

DOI: 10.1594/EURORAD/CASE.1904
ISSN: 1563-4086
Section: Chest imaging
Imaging Technique: CT
Case Type: Clinical Cases
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Patient: 59 years, female

Clinical History:

Two-day history of dyspnoea at rest, mild hypoxaemia.

Imaging Findings:

The patient was admitted with dyspnoea at rest. The arterial blood gas analysis showed mild hypoxaemia. Chest X-ray demonstrated a light enlargement of the left ventricle and left superior mediastinum.

With a clinical suspicion of pulmonary embolism (PE), a CT was performed with injection of contrast medium from the left antecubital vein. Axial images showed the opacification of the left anonymous vein draining directly into the left superior vena cava and the subsequent opacification of the left atrium and the left ventricle. CT images also demonstrated mild opacification of the right atrium through a patent foramen ovale; no opacification of the pulmonary arteries was obtained. To rule out PE a contrast injection from the right antecubital vein was performed and no intraluminal defects into the pulmonary arteries were detected. A right SVC draining into the right atrium was also present.

Discussion:

The incidence of persistent left superior vena cava (PLSVC) is about 0.3% in the healthy population, reaching over 11% in patients with congenital heart disease. This anomaly results from failure of obliteration of the left anterior cardinal vein during foetal development.

In the majority of cases the PLSVC opens into the coronary sinus or into the right atrium directly, but in 8% of cases it drains into the left atrium, as in this case. PLSVC draining into the left atrium causes a right-to-left shunt and may appear in isolation or as a part of more complex cardiac anomalies. In this case it is associated with a mild patency of the foramen ovale demonstrated by CT. So, blood from the left upper extremity doesn't reach the pulmonary circulation, but the left-to-right shunt through the patent foramen ovale leads to only a mild hypoxaemia.

LSVC can be seen with or without the presence of right superior vena cava and may be associated with other vascular anomalies such as two azygos veins or the hemiazygos vein opening into the left superior vena cava.

LSVC may often be discovered incidentally or during catheterisation of the left jugular or subclavian veins. This anomaly may be completely asymptomatic if is not haemodynamically significant or not associated with other congenital cardiac anomalies; cyanosis and hypoxaemia may be present when the left superior vena cava drains into the left atrium. The most significant clinical implication of PLSVC associated with congenital heart disease is the
presence of alterations of cardiac impulse formation and conduction.

Spiral CT allows evaluation of the course and drainage of the LSVC if the contrast medium is injected into the left cubital or forearm veins. Furthermore multiplanar and three-dimensional reconstructions from the spiral CT data set can help not only radiologists but also clinicians and surgeons in therapeutic planning.

If the PLSVC represents a haemodynamically significant anomaly, surgical management and repair can be performed by one of four methods: 1) division and reimplantation of the LSVC to the right atrium; 2) an intraatrial baffle to divert flow from the LSVC to the right atrium; 3) simple ligation of the LSVC; 4) anastomosis of the LSVC to the left pulmonary artery.

**Differential Diagnosis List:** Persistent left superior vena cava draining into the left atrium

**Final Diagnosis:** Persistent left superior vena cava draining into the left atrium

**References:**


Gerber TC, Kuzo RS. Persistent left superior vena cava demonstrated with multislice spiral computed tomography. Circulation 2002 Apr 9;105(14):e79. (PMID: 11940557)
Description: Frontal chest X-ray demonstrating a slight enlargement of the left ventricle and left upper mediastinum (arrow); no evidence of parenchymal disease or pleural effusion. Origin:
**Figure 2**

*a*

**Description:** CT scan at the level of the aortic arch showing an opacified left superior vena cava (LSVC) after injection of contrast medium into the left antecubital vein; a non-opacified right superior vena cava is also present. **Origin:**

*b*

**Description:** Subsequent CT scan at the level of the main pulmonary arteries showing the opacification of the left atrial appendage; no opacification of the main pulmonary arteries is seen. **Origin:**
**Description:** Subsequent CT scan showing the opacification of the left atrium. **Origin:**

**Description:** CT scan showing a "jet" of contrast medium passing from the left atrium to the right atrium through a patent foramen ovale (arrow); a mild opacification of the right atrium is seen. **Origin:**