

# Left superior vena cava: a vascular abnormality discovered following pulmonary artery catheterization

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**Purpose:** This report deals with the case of a patient who presented persistence of left superior vena cava (LSVC). This disorder was discovered following placement of a catheter in pulmonary artery via the left subclavian vein.

**Clinical features:** The patient was a 67-yr-old woman who, while in the intensive care unit after undergoing coronary revascularization with extracorporeal circulation, required pulmonary artery catheterization to guide resuscitation. Placement of the catheter proved to be difficult as the advance of the catheter was impeded. A normal pulmonary artery pressure wave was eventually detected at a distance of approximately 70 cm. Chest x-ray showed a catheter route suggestive of persistent LSVC.

**Conclusion:** A diagnosis of persistent LSVC should be considered whenever there appears to be some obstacle to central venous or pulmonary artery catheterization, especially in patients with congenital heart disease, since this disorder can have important clinical consequences.

**Objectif:** Cette observation décrit la persistance de la veine cave supérieure gauche (VCSG). L'anomalie a été découverte pendant l'installation d'un cathéter dans l'artère pulmonaire par ponction de la veine sous-clavière gauche.

**Caractéristiques cliniques:** Il s'agissait d'une patiente de 67 ans déjà admise à l'unité de soins intensifs après une chirurgie de revascularisation coronarienne sous CEC chez qui la réanimation nécessitait une cathétérisation de l'artère pulmonaire. L'installation s'est avérée laborieuse suite à l'arrêt de la progression du cathéter. Un courbe de pression

artérielle pulmonaire a été décelée éventuellement après un trajet d'environ 70 cm. La radiographie pulmonaire était compatible avec la persistance de la VCSG.

**Conclusion:** Un diagnostic de persistance de VCSG doit être envisagé chaque fois qu'on rencontre un obstacle à la progression d'un cathéter veineux central ou artériel pulmonaire, surtout chez les porteurs d'anomalies cardiaques congénitales à cause des conséquences sérieuses que cette anomalie peut entraîner.

Persistence of the left superior vena cava (LSVC) is an uncommon congenital disorder, which is normally asymptomatic. Nevertheless, it can create difficulty during central venous and pulmonary artery catheterization.<sup>1</sup>

We present a patient with LSVC that was discovered upon radiological confirmation of the correct placement of a pulmonary artery catheter.

## Case report

The patient was a 67-yr-old woman with a history of arterial hypertension and postero-inferior myocardial infarction, who was being treated with nitrites, beta-blockers and angiotensin converting enzyme inhibitors. On arrival in the emergency room, she presented with arrhythmias and dyspnoea with vegetative signs. Presyncope and a rhythm disorder, attributed to an overdose of beta-blockers, were initially suspected. During her hospital stay, ECG confirmed the diagnosis of angina with anteroseptal ischaemia. Catheterization disclosed the presence of a lesion involving the circumflex artery, anterior descending artery and the middle third of the right coronary artery. She was scheduled to undergo myocardial revascularization with extracorporeal circulation (ECC).

In the operating room, central venous pressure was easily monitored via the right internal jugular vein. During surgery, the right atrium and aorta were cannulated and cardioplegia was administered through the

## Key words

EQUIPMENT: catheters, pulmonary artery, Swan-Ganz;  
HEART: congenital.

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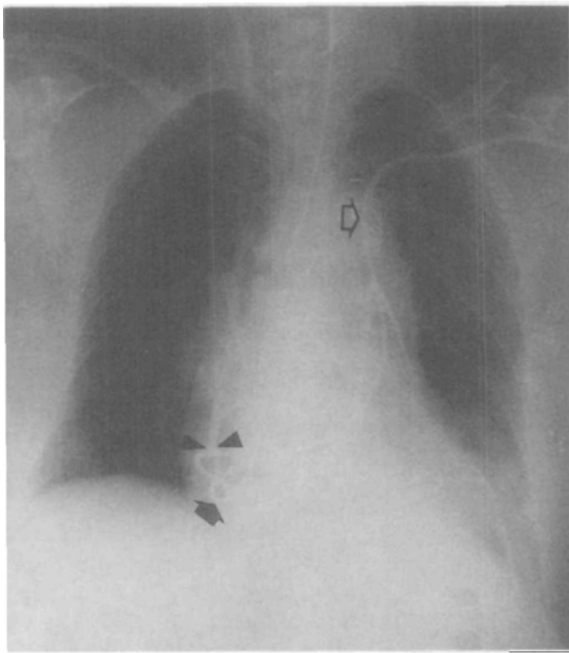


FIGURE Right internal jugular CVC with a normal course in the right atrium (arrow head). Left subclavian PAC passing through a persistent LSVC (white arrow) into the right atrium where it forms a loop (black arrow), into the right ventricle and then into the pulmonary artery.

aortic root. Triple aortocoronary bypass was performed. Disconnection from ECC provoked haemodynamic changes (hypotension: MAP = 40 mmHg) and high-dose catecholamines were required to maintain the arterial pressure within the normal range.

Once in the recovery room, the patient developed severe hypotension (MAP = 45 mmHg) and ventricular tachycardia that progressed to ventricular fibrillation. She required a 200 w electric shock to return to sinus rhythm. It was decided to introduce a counterpulsation balloon and a pulmonary artery catheter. The latter was inserted via the left subclavian vein, because the catheter in right internal jugular vein was necessary to administer fluids and catecholamines. After several attempts, in which resistance to the advance of the catheter was noted, catheterization of the pulmonary artery was successful. Advancing the catheter to 70 cm, resulted in a normal wedge pressure wave.

Chest x-ray confirmed the apparently normal path of a catheter through the right superior vena cava and that of the pulmonary artery catheter through the left subclavian vein, continuing along the left paracardiac margin and finally into the right atrium, presumably through the coronary sinus (Figure). Since the pressure readings

were valid, the catheter was not removed. Two days later, when the haemodynamic situation had improved, it was withdrawn without problems.

### Discussion

The most common anomaly involving venous return is persistent left superior vena cava. Its incidence ranges from 0.3% in healthy individuals to 4.3% in patients with congenital heart disease the most frequent of which is atrial septal defect.<sup>2</sup>

During the embryonic period, the venous blood of the upper half of the body drains by way of two cardinal veins within the common atrium, through the coronary sinus. Towards the eighth week of gestation, the brachiocephalic vein connects the upper portion of the cardinal veins, while the most distal portion of the left cardinal vein remains permeable, resulting in a persistent LSVC.<sup>2</sup>

In 92% of cases, the LSVC drains into the right atrium through the coronary sinus,<sup>1</sup> but in the remaining 8%, it drains into the left atrium, regardless of whether the coronary sinus is normal, creating a right-to-left shunt.<sup>3</sup>

Individuals with LSVC usually possess a normal right superior vena cava, as in this subject, which may explain why the condition is detected in only a limited number of cases.<sup>1,2</sup> On the other hand, LSVC does not provoke symptoms or other clinical signs except in rare instances of direct drainage of LSVC into left atrium. Some reports suggest a greater prevalence of arrhythmias in patients with this venous drainage abnormality.<sup>4</sup>

The main problems in these patients are technical and occur when an attempt is made to introduce a catheter through the narrow opening of the coronary sinus to reach the right atrium. In our patient, it was very difficult to advance the catheter since we encountered considerable resistance. Serious complications have also been detected during catheterization in adults with LSVC (shock, cardiac arrest, angina), probably as a result of manipulation of the catheter in the coronary sinus rather than due to the catheter itself. The abnormality can also make correct placement of a pacemaker lead or the performance of transjugular liver biopsy difficult, or impossible.<sup>5</sup>

During ECC, if the superior and inferior vena cava are cannulated, the presence of LSVC can provoke distension of the right heart cavities due to increased venous return via coronary artery. Poor myocardial preservation may also be produced when the retrograde route is used for cardioplegia administration since the cardioplegic solution is rerouted, via the coronary sinus, towards the LSVC. In all these cases, the LSVC should be cannulated separately or else clamped or ligated.

The diagnosis is not easy. Certain clinical and radiological signs<sup>6</sup> that reportedly indicate the presence of a LSVC, such as abnormal pulse in left jugular vein and, on chest *x*-ray, widening of the aortic shadow together with paramediastinal bulging under the aortic arch or a low-density line along the upper left margin of the heart. The retrospective analysis of preoperative chest *x*-rays done in this patient revealed none of these findings.

Persistence of a LSVC should be considered, especially when central venous catheterization via the left subclavian or internal jugular vein is difficult, since this abnormality can have important clinical consequence.

### References

- 1 *Leibowitz AB, Halpern NA, Lee M-H, Iberti TJ.* Left-sided superior vena cava: a not-so-unusual vascular anomaly discovered during central venous and pulmonary artery catheterization. *Crit Care Med* 1992; 20: 1119–22.
- 2 *Page Y, Tardy B, Comtet C, Bertrand M, Bertrand JC.* Cathétérisme veineux et anomalies congénitales de la veine cave supérieure. *Ann Fr Anesth Réanim* 1990; 9: 450–5.
- 3 *Wiles HB.* Two cases of left superior vena cava draining directly to a left atrium with a normal coronary sinus. *Br Heart J* 1991; 65: 158–60.
- 4 *Huang SK.* Persistent left superior vena cava in a man with ventricular fibrillation. *Chest* 1986; 89: 155–7.
- 5 *Schelling G, Briegel J, Eichinger K, Raum W, Forst H.* Pulmonary artery catheter placement and temporary cardiac pacing in a patient with a persistent left superior vena cava (Letter). *Intensive Care Med* 1991; 17: 507–8.
- 6 *Cha EM, Khoury GH.* Persistent left superior vena cava. Radiologic and clinical significance. *Radiology* 1972; 103: 375–81.