

## CASE REPORT

## REGIONAL ANESTHESIA

# Incidental finding of left sided superior vena cava in a patient for tunneled central venous line insertion and review of literature

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## Abstract

Left sided superior vena cava (SVC) is a rare anatomic variant of the normal anatomy of the heart and the venous system that has clinical implications. The presence of this variant is relevant to central venous catheter placement, cardioverter defibrillator placement, coronary artery bypass grafting, and numerous other medical procedures. In this report, we describe a rare case of left sided SVC, which was diagnosed during central venous catheter insertion. We also discuss the vascular and anesthetic considerations for individuals with this uncommon variant.

**Key words:** Superior vena cava; Anatomical anomaly; Central venous catheter

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## 1. Introduction

Left-sided superior vena cava (SVC) is an anatomic variant that has been reported in 0.3% of the general population and in up to 4.3% of the patients with other cardiac abnormalities.<sup>1,2</sup> This is the result of an aberrant growth from the left anterior cardinal vein and the left common cardinal vein during embryogenesis.<sup>3</sup> In most of the individuals, this abnormal growth pattern results in a left-sided SVC connecting to a dilated coronary sinus in the heart.

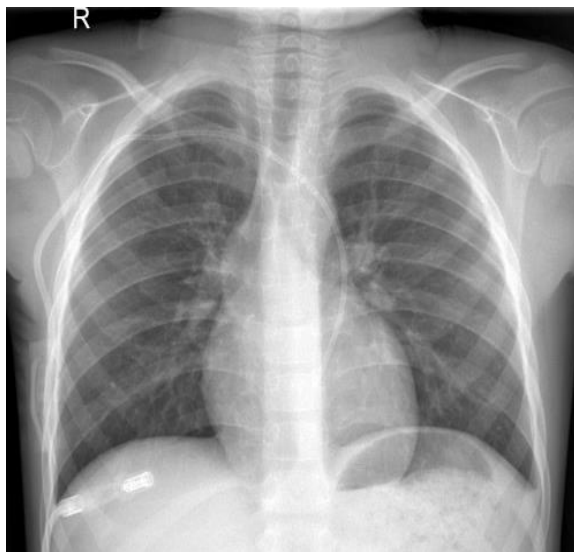
Left sided SVC can become problematic in central venous line placement and cannulation of the heart due to relatively tortuous course. It can also cause confusion with arterial placement due to its appearance on chest X-ray. Manipulation of the guide-wire due to the proximity to the coronary sinus can cause hemodynamic instability, arrhythmias, perforation of the heart, and even tamponade. We

present a case of left sided SVC diagnosed during central venous catheter (CVC) placement.

## 2. Case report

A 6 year old male patient with primary diagnosis of Burkett's lymphoma (right pelvic mass) was scheduled for placement of tunneled CVC under general anesthesia for chemotherapy. Before coming to operating room, the patient had a staging CT scan. Pre-operative anesthesia and surgical assessment were unremarkable. Intravenous induction was done using propofol (2 mg/kg) and nalbuphine (0.1 mg/kg). Airway was secured with LMA Classic size 2.5. Under aseptic measures ultrasound guided right internal jugular vein was cannulated in first attempt and guide wire was passed easily; however, on fluoroscopic imaging the guide wire was seen being tilted towards left side. Moreover, on subsequent attempts guide wire

took same left sided course. Therefore the procedure was stopped. Fluoroscopic and previous CT chest images were discussed with radiologist and diagnosis of anatomical anomaly of left sided SVC was confirmed. Opinion from second anesthetist was taken and decided to proceed with line placement via right subclavian approach and the tunnel was made lateral to the ipsilateral nipple. At the end of the procedure the catheter tip position was again confirmed with fluoroscopic images. A transducer was attached which showed venous trace. Adequate back flow and forward flow was confirmed through both of the CVC ports, flushed with normal saline and locked with 50 units of heparin. A chest X-ray was done in post-anesthesia care unit, and it was unremarkable, with no evidence of hemothorax or pneumothorax.



**Figure 1:** X-ray chest PA view, final position of brovaic line tip.

### 3. Discussion

#### 3.1. Embryology

During embryological development right and left cardinal veins drain in to primitive sinoatrial chamber. Normally SVC is formed by obliteration of left cardinal and persistence of right cardinal vein. Failure of obliteration of left cardinal vein leads to a 'persistent' left-sided SVC.<sup>4</sup>

#### 3.2. Course of left SVC

The left SVC usually descends vertically, anterior, and to the left of the aortic arch and main pulmonary artery. It runs adjacent to the left atrium before turning

medially, piercing the pericardium to run in the posterior atrioventricular (AV) groove.<sup>5</sup> In about 90% of cases, it drains into the coronary sinus (CS); alternative sites include the inferior vena cava, hepatic vein, and left atrium. The entry into left atrium is invariably associated with an atrial septal defect.<sup>6</sup> In our case the course of left SVC on X-ray chest appeared similar to arterial placement in ascending aorta.

#### 3.3. Diagnosis

Diagnosis of left SVC is usually made as an incidental finding during CVC placement, radiographic imaging and echocardiography. Transthoracic echocardiography reveals dilated coronary sinus and diagnosis can be confirmed by use of saline contrast echocardiography as left sided SVC is not the only cause of a dilated coronary sinus. In our case the diagnosis was made on fluoroscopy after insertion of guide wire due to left sided course of guide wire. Almost 40% of patients with left sided SVC can have a variety of associated cardiac anomalies such as atrial septal defect, bicuspid aortic valve and coarctation of aorta. The left sided SVC has also been associated with anatomical abnormalities of the sinus node and conducting tissues. Our patient did not show any other abnormality on transthoracic echocardiography.

#### 3.4. Clinical implications

Left sided SVC has various practical implications. It has a tortuous course making central venous access difficult. It is in close proximity to coronary sinus which can cause hemodynamic instability, arrhythmias, perforation of heart and tamponade. In addition in case of central line placement it can cause confusion as it appears that CVC is placed in artery with a course in ascending aorta and the tip in left ventricle.

### 4. Conclusion

Left-sided course of guide wire or catheter during placement of central venous line should alert the clinician towards the possibility of left sided superior vena cava. The diagnosis should be confirmed by MRI scan or saline contrast echocardiography. A left sided superior vena cava certainly presents technical difficulties with central venous access and right heart access via the left subclavian although it does not preclude insertion of catheters.

## 5. Conflict of interests

None declared by the authors

## 6. Author contribution

DI: Manuscript writing, IRB Approval

SS: Manuscript Editing

SUR: Concept, Manuscript Editing, Overall supervision

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