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A Case of Duplicated Superior Vena Cava in Infusaport Insertion

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Abstract
Anatomical variations of the thoracic venous system such as duplicate SVCs may lead to challenges during routine procedures. They are generally described as a benign incidental finding but can have major implications in procedures such as pacemaker insertion and the Fontan's procedure. Case reports have described that central venous catheter insertion (via the left SVC) may lead to arrhythmia and thrombosis. We describe here a case of an infusaport insertion in a patient with duplicated SVCs via the left SVC without any immediate or delayed complications and safely performed.

Keywords
Infusaport, Port-a-cath , Central Line, Persistent Left SVC (PLSVC), Duplicate SVC

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I. Case Report

A 51-year-old lady diagnosed with T3N1 rectal cancer underwent an infusaport insertion for neoadjuvant treatment. An infusaport catheter was inserted via the left subclavian vein and the fluoroscopy demonstrated the superior vena cava (SVC) being more laterally displaced to the left than one would expect (Figure 1A). A non-contrast CT chest (Figure 1B-D) confirmed duplicated SVC and the position of the infusaport catheter inserted to the left SVC. The patient recovered from the operation without any issues and was discharged on the same day.

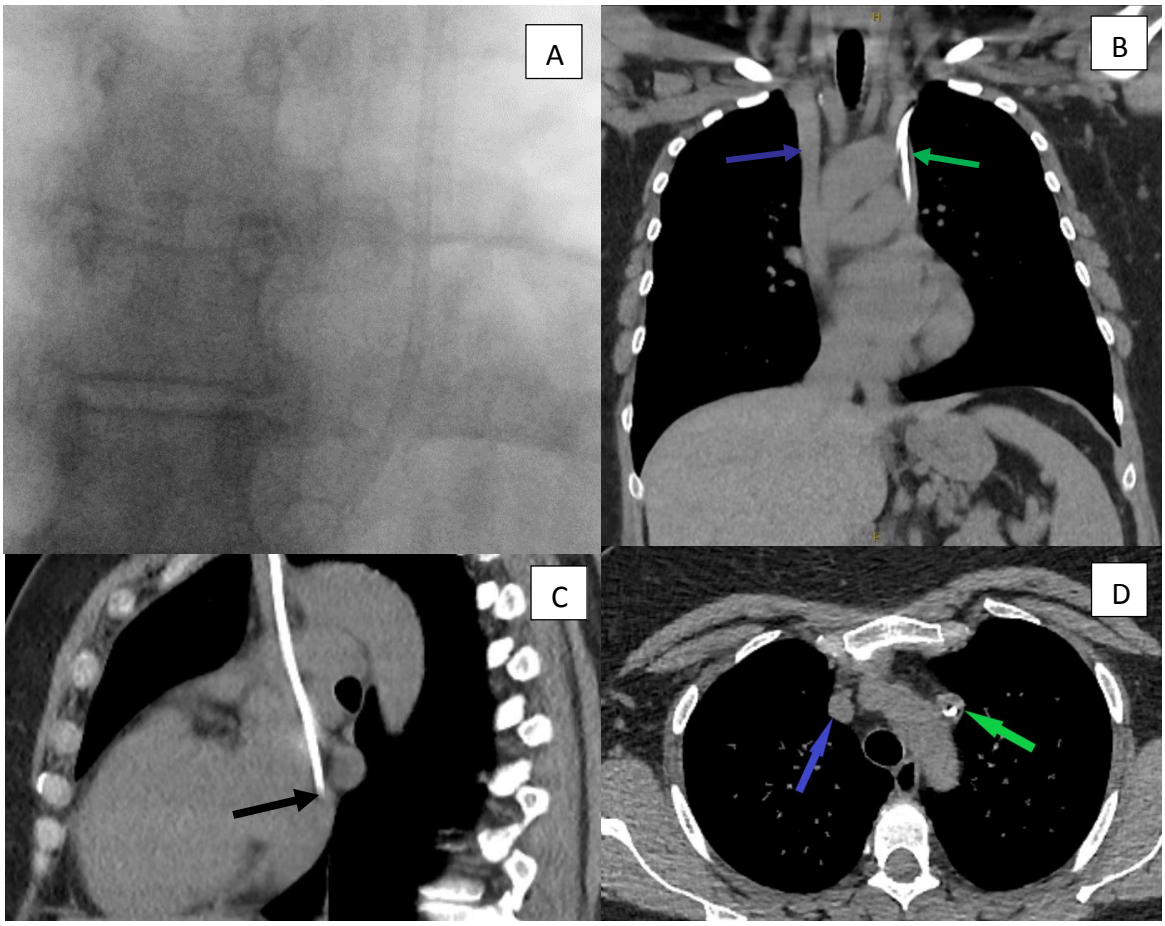

Figure 1.
Figure 1A is a fluoroscopy image demonstrating the position of the catheter which is displaced laterally than usual. Figure 1B and D are CT chest coronal and axial images respectively demonstrating the duplicated SVC with catheter inserted into the Left SVC. Figure 1C is a sagittal image showing the tip of the catheter draining into the coronary sinus/left atrium. (Right SVC-blue arrow. Left SVC- green arrow.)

II. Discussion

Anatomical variations of the venous system of the thorax and abdomen are rare, however they can involve vessels such as the superior vena cava (SVC), inferior vena cava (IVC) and the azygos system (1).

Anatomical variations of the venous system are usually secondary to the amalgamation and atrophy of the 3 main sets of veins during foetal growth: cardinal, umbilical and vitelline veins. In typical anatomy, the left anterior cardinal vein regresses and the right anterior cardinal vein forms the SVC. In a patient with duplicated SVC, the left anterior cardinal vein remains as the persistent left SVC (PLSVC) (1, 2)

Duplicate SVCs are a rare finding in less than 0.5% of the general population, however it is 8 times more common in patients with congenital heart disease (CHD). When present, the left SVC usually has a larger calibre than the right SVC in more than 50% of duplicated SVCs. In these scenarios, the left SVC usually drains into either the coronary sinus (in absence of CHD) or the left atrium which can be associated with CHD in some cases. (2)

Duplicate SVCs are generally described as benign incidental finding with minimal clinical significance (2, 3), however there are potential risks involved during cardiac procedures. Firstly, insertion of Swan-Ganz Catheter in patients with duplicate SVC may be difficult as they are usually inserted without radiology guidance at the bedside using the left subclavian vein for access via the right side of the heart. Furthermore, rare but significant complications including arrhythmia, tamponade and coronary sinus thrombosis have been described when pacemakers/catheters were inserted in patients with duplicate SVCs (4).

Furthermore, in paediatric procedures such as the Fontan procedure are performed in patients with a univentricular heart to direct systemic venous return away from the ventricular circulation via the pulmonary arteries (5). It is also important to point out that ostial atresia of the coronary sinus is associated with patients with duplicate SVC. In such situations, the coronary venous drainage flow from the cardiac veins into the left SVC before draining into the heart. Ligation of the left SVC in these patients can lead to severe acute coronary venous hypertension, heart failure and myocardial ischaemia and necrosis (6-8).

There is little described in the literature so far regarding duplicated SVC. A case report published in the American Journal for Case Reports described an uneventful central line insertion into the PLSVC in a patient involved in a motor vehicle accident. It was recommended in the report that patients with PLSVC should be investigated before placement of central lines; and if PLSVC is only discovered after the insertion of the central line, vascular access should be reattempted if the right sided SVC offers a more direct path into the right atrium (9). The rationale being that PLSVC can be associated with cardiac anomalies which may not have presented itself yet: it can be an arrhythmogenic source for atrial fibrillation (10).

Another case report published in 2019 reported a patient receiving chemotherapy who had an uneventful PICC line insertion via the PLSVC developing upper extremity deep venous thrombosis six days after insertion (11). It was suggested that in patients with PLSVC, central venous access via the right SVC is preferred due to potential risks of thrombus when a central line is malpositioned (12). However, it is unclear if having a central line in the PLSVC is categorised as a malposition; furthermore, the development of a thrombus could be associated with many different risk factors such as an active malignancy, history of previous thrombus and technical challenges during catheter insertion. Further studies exploring the risk of thrombosis in a patient with PLSVC will likely be beneficial.

Duplicate SVCs can be found incidentally on catheter insertion such as in our case described. At first instance, the intra-operative fluoroscopy (Figure 1) demonstrated a left para-mediastinal infusaport catheter which does not confirm the presence of a duplicate SVC. Differential diagnosis includes the catheter being inserted in vessels such as the left internal mammary vein, left pericardiophrenic vein or the left superior intercostal vein. To the novice it might appear that the left subclavian artery was cannulated. A blood gas could be performed intraoperatively to assess whether it is venous or arterial blood, and a CT scan would then further localise the position of the catheter (3).

We described here a case of an uncomplicated infusaport insertion in a patient with PLSVC. Our case has demonstrated that it is safe to insert an infusaport in a patient with PLSVC without the development of any cardiovascular symptoms.

Disclosure Statement:

All three authors are in agreement of the content of this manuscript and that there is no conflict of interest. I also declare that we have obtained informed consent from the patient. This manuscript has not been published previously and is not under consideration elsewhere. There are no financial support or relationships that may pose a conflict of interest.

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