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Persistent Left Superior Vena Cava Identified During Central Line Placement: A Case Report

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Abstract

Introduction—A persistent left superior vena cava is found in 0.3–0.5% of the general population and in up to 10% of patients with a congenital cardiac anomaly. It is the most common thoracic venous anomaly and is usually asymptomatic. Being familiar with such anomaly could help clinicians avoid complications during placement of central lines, Swan-Ganz catheters, PICC lines, dialysis catheters, defibrillators, and pacemakers.

Case Presentation—We describe a case of persistent left superior vena cava that was noted after placement of a central line. Mr JJ is a 41 year old African American man who was hospitalized for evaluation and management of alcoholic necrotizing pancreatitis. He required multiple central lines placements. He was noted to have a persistent left superior vena cava that was not recognized initially and thus lead to an unnecessary extra central line placement.

Discussion—This anatomic variant may pose iatrogenic risks if it is not recognized by the clinician. A central catheter that tracks down the left mediastinal border may also be in the descending aorta, internal thoracic vein, superior intercostal vein, pericardiophrenic vein, pleura, pericardium, or mediastinum.

Conclusion—Our case is significant because the patient had two extra central venous catheter placements. This case strongly demonstrates the importance of knowing the thoracic venous anomalies.

Introduction

Central venous lines (CVL's) are commonly used for therapeutic (administration of fluids, blood products, medications, nutrition, dialysis, etc…) or diagnostic (e.g., central hemodynamic monitoring) purposes. Although the millions of CVL's placed in the United States annually are potentially life-saving, they are not without potentially fatal complications. Mechanical (bleeding, arterial punctures, arrhythmias, pneumothorax), thrombotic, and infectious processes are among the potential complications of a seemingly benign procedure (1).

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The incidence of these complications including delayed ones is estimated to be up to 33% of all placed CVL's (1). Although new technologies such as real-time ultrasound-guidance and the use of dressing patches containing agents such as Chlorhexidine have decreased the complications rate, CVL placements are still a significant contributor to patients' morbidity and occasionally mortality (2). The rate of CVL placement complications is typically higher in obese patients, those with a short neck, history of vasculopathy, prior CVL's placement, and less experienced physicians (2). In the presence of venous anatomic variants, the complications rate could be much higher (3). Thus, recognizing the different anatomic venous variants of the central vessels is of utmost importance to improve the safety of these procedures. One such variant is persistent left superior vena cava (PLSVC).

We present a case of PLSVC that was incidentally encountered during routine placement of a CVL, highlighting the radiologic findings and emphasizing the importance of familiarity to such an anomaly.

Case Presentation

JJ is a 41yo man with a history of alcohol abuse admitted to the intensive care unit with acute pancreatitis and alcohol withdrawal complicated by respiratory failure. A right internal jugular (IJ) line was placed for intravenous antibiotics and blood draws, and a second CVL was required for total parenteral nutrition (TPN). A left IJ was placed under real-time ultrasound guidance without immediate perceived complications. However it was noted on Chest X-Ray that it terminated in the left superior mediastinum (CXR, panel A). It was immediately removed because of concerns of carotid artery cannulation, despite having a transduced line pressure of +4/−3 (0) mmHg, and a blood gas sent from that line showing a pH of 7.26, pCO2 of 68 mmHg, and pO2 of 45 mmHg. A subsequent left subclavian line, with similar venous characteristics, tracked to the same location (CXR, panel B). An abdominal Computed Tomography (CT) scan later that day to evaluate the worsening necrotizing pancreatitis confirmed the central line was in a PLSVC draining into an enlarged coronary sinus (CT image). Because the coronary sinus is a low-flow system, TPN which typically requires a high-flow system was not initiated, and thus a third CVL was needed, now on the right side. JJ left the hospital in a stable condition and all CVL's were removed without an incident.

Discussion

This case is a reminder of this common anomaly. PLSVC is the most common thoracic venous anomaly and is found in 0.3–0.5% of the general population and in up to 10% of patients with a congenital cardiac anomaly (4). The cardinal veins in early embryonic development are symmetrical and bilateral, however in later embryonic stages the left cardinal venous system normally obliterates and a new vein (future left innominate vein) drains into a right cardinal vein (future right SVC). Disturbances to this embryonic developmental stage may result in a PLSVC (Figure 3).

In 70–90% of patients with PLSVC, there is also a right SVC which may or may not communicate with it (4). The PLSVC commonly drains into the coronary sinus, but in up to 8% of patients, it might drain into the left atrium (5). It is usually asymptomatic. Being familiar with such anomaly could help clinicians avoid complications during placement of central lines, Swan-Ganz catheters, peripherally-inserted central catheter (PICC) lines, dialysis catheters, defibrillators, and pacemakers (3,4).

A central catheter that tracks down the left mediastinal border may also be in the descending aorta, internal thoracic vein, superior intercostal vein, pericardiophrenic vein, pleura, pericardium, or mediastinum. A CXR along with a venous wave and a gas compatible with a

venous gas may be enough to make the diagnosis of PLSVC. Other diagnostic modalities include CT scan, MRI, and echo.

Conclusion

The CT scan confirmed the location of the central line in our patient. Our case is significant because the patient had two extra central venous catheter placements. In addition to the left internal jugular vein, both the left and right subclavian veins were cannulated before adequate TPN access was attained. This case strongly demonstrates the importance of knowing the common thoracic venous anomalies.

Abbreviations

PLSVC	persistent left superior vena cava
PICC	peripherally inserted central line
CVL	Central venous line
IJ	Internal jugular
CXR	Chest X-Ray
TPN	Total parenteral nutrition
CT	computed tomography

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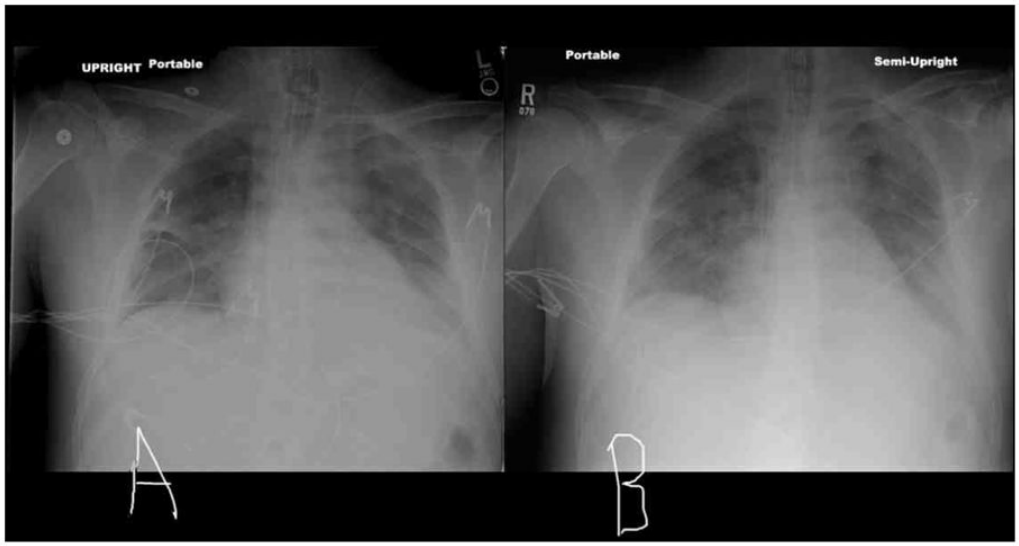

Figure 1.

(CXR). Panel A: AP view of a portable CXR showing a right IJ line terminating in the right atrium and a left IJ line coursing down the left mediastinum. ET and NG tubes are also noted.

Panel B: Portable CXR of the same patient after removing the left IJ line, and placing a left subclavian line, and subsequently a right subclavian line. The left subclavian line courses down the left mediastinum.

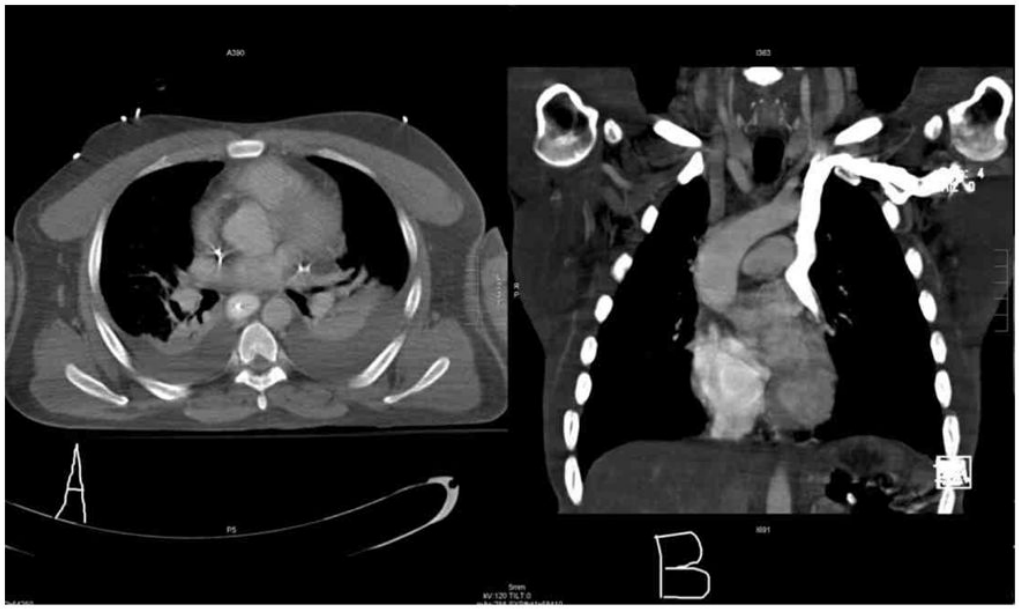

Figure 2.

(CT). Panel A: CT: A mediastinal transverse cut of CT abdomen showing the tip of the right IJ line terminating in the mid right atrium, and the tip of the left IJ line in the coronary sinus. Panel B: A coronal cut of a CT chest of a different patient with PLSVC with a venogram showing the course of the PLSVC coursing down the left mediastinum into the coronary sinus, and then posterior to the heart, with contrast showing in the right atrium.

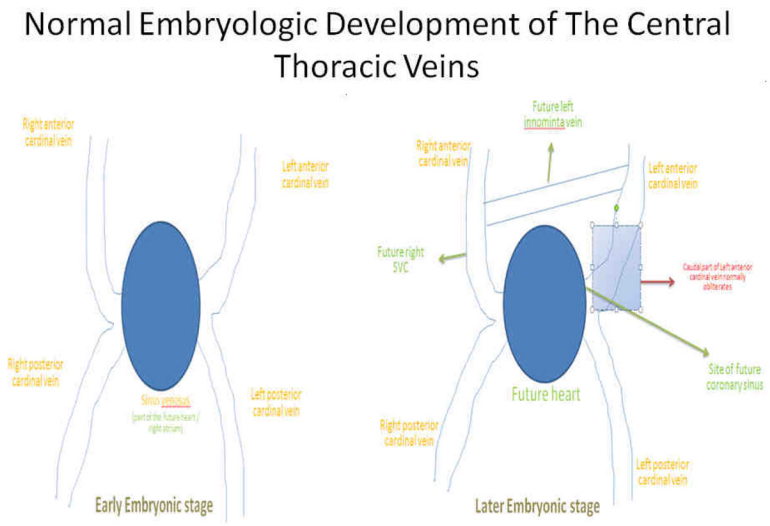

Figure 3.
Normal embryologic development of the central thoracic veins.