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Case Report

Persistent left-sided SVC: An incidental finding during Port-A-Cath placement ☆

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ABSTRACT

Port-A-Cath (port), a single-lumen, tunneled catheter, is routinely placed into the superior vena cava (SVC) for cancer patients undergoing chemotherapy. We present a case of a port placement in which variant anatomy was discovered during the fluoroscopy-guided procedure and confirmed by venogram of a persistent left-sided SVC (PLSVC). Upon further investigation into the patient's previous computed tomography (CT) scans, the diagnosis was further confirmed. Patients with PLSVC are typically asymptomatic; however, some are associated with increased congenital heart defects (CHD), which increase the risk for complications during invasive procedures. Diagnosing PLSVCs and knowing the clinical implications/complications can improve patient care; by not removing catheters unnecessarily and being prepared to treat/minimize complications.

Introduction

Port-A-Cath (port) placement is a routine procedure for patients undergoing chemotherapy and is typically placed in a thoracic central vein and sits outside the right atrium. Recognizing the correct anatomical catheter position is crucial for minimizing complications and catheter malplacment. A potential risk for complications to occur is variant anatomy. A rare vascular deviation is having a persistent left-sided superior vena cava (PLSVC), seen in 0.3% of the population [1]. Many patients with PLSVC are asymptomatic, and this variant

Abbreviations: SVC, superior vena cava; Port, Port-A-Cath; US, ultrasound; ER+, Estrogen Receptor positive; PR-, progesterone receptor negative, CT, computed tomography, MRI, magnetic resonance imaging, PLSVC, persistent left sided superior vena cava, CHD, congenital heart defects, ASD, atrial septal defect, LIJV, left internal jugular vein, HER2+, human epidermal growth factor two positive, DCIS, ductal carcinoma in situ.

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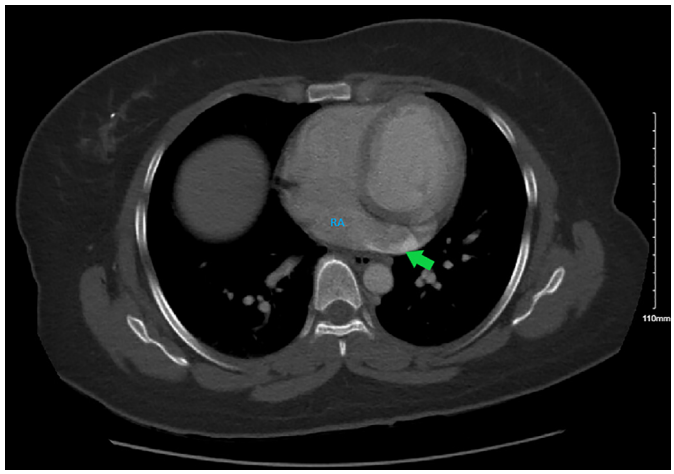

Fig. 1 – Axial view, CT angiogram of the thorax, vertebrae window, demonstrating the PLSCV (green arrow) draining into the right atrium (RA).

is found incidentally. However, depending on the insertion of the PLSVC into the heart, the patients can be at an increased risk for hypotension, arrhythmias, myocardial ischemia, and arrest [2].

In this case report, we reveal a case of a patient that received Port-A-Cath and was discovered to have a PLSVC. How the PLSVC was diagnosed and the complications that can arise from this diagnosis will be discussed.

Case report

A 33-year-old female presented for mammography and was discovered to have a 3.4 cm spiculated mass in her right breast, confirmed by biopsy to be infiltrating ductal carcinoma (IDC). The patient elected to have a radical right mastectomy before beginning chemotherapy. Surgical pathology confirmed the diagnosis of estrogen receptor-positive (ER+), progesterone receptor negative (PR-), and human epidermal growth factor two positive (HER2+) IDC carcinoma associated with ductal carcinoma in situ (DCIS).

Before the initiation of chemotherapy, the patient was scheduled to receive a Port-A-Cath. The left internal jugular vein (LIJV) was used as access for the port; under ultrasound (US) and fluoroscopic guidance, the wire did not traverse its standard path from the left internal jugular vein to the brachiocephalic vein to the SVC; instead, the wire took an indirect path to the right atrium. A venogram was performed, demonstrating contrast flowing into the coronary sinus through the left SVC into the right atrium, which was seen on the prior CT scans (Fig. 1). The port was successfully placed with the tip of the catheter at the left SVC/RA junction, confirmed by fluoroscopy (Fig. 2).

After eight months of port use, it was found that blood could not be aspirated from the port. The port was assessed using sterile technique and under fluoroscopic guidance. The catheter tip was no longer at the left SVC/RA junction, and the

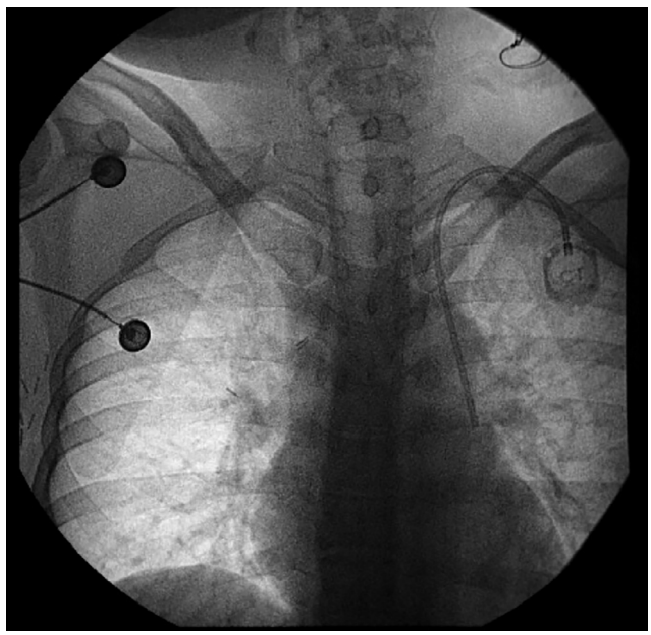

Fig. 2 – Fluoroscopy of thorax, placement of Port-A-Cath into PLSCV, the catheter tip is placed at the left SVC/RA junction.

catheter demonstrated irregular tortuosity (Fig. 3). The port was then removed, and chemotherapy was given using peripheral veins.

Discussion

Tunneled central catheters (i.e., Port-A-Cath) are typically placed by inserting a needle into a central vein like the IJV or subclavian vein. The goal is to use these veins as an entry point to advance a catheter using the Seldinger technique

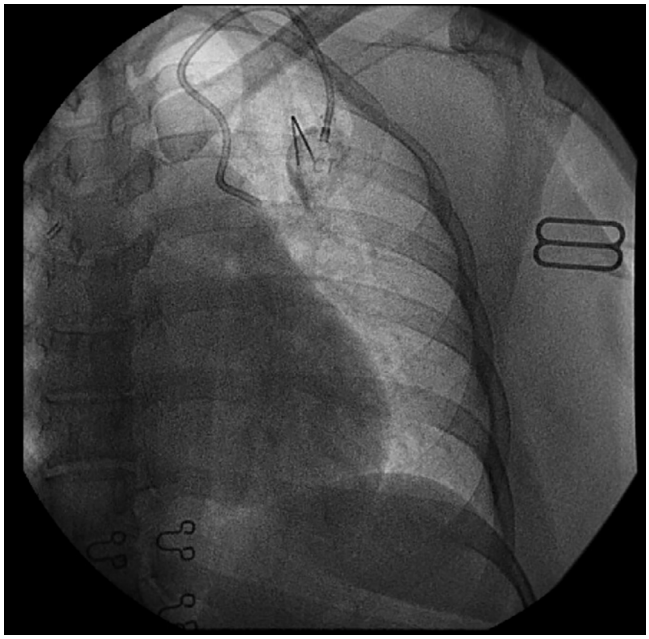

Fig. 3 – Fluoroscopy of thorax, tortuous catheter which failed to aspirate, unknown position before removal.

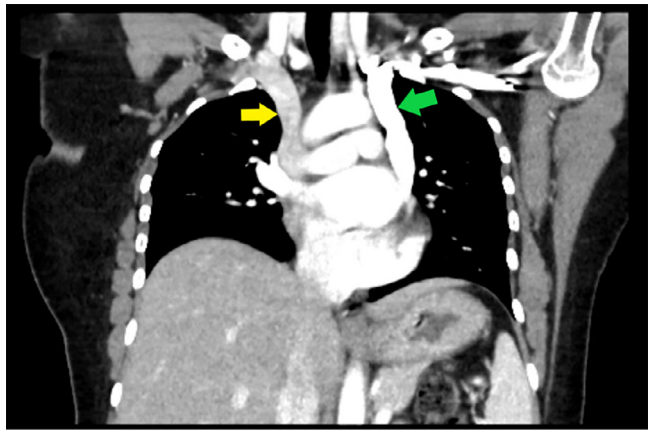

Fig. 4 – Coronal view, CT angiogram of the thorax, demonstrating both the right SVC (yellow arrow) and PLSVC (green arrow) inserting into the right atrium.

to rest in the SVC or inferior vena cava (IVC) just outside the pericardiac sac [3]. The most commonly encountered distance of the SVC is 7 cm; it starts where the right and left brachiocephalic veins come together at the level of the right first costal cartilage [4]. The SVC ends as it delivers blood to the sinus venarum in the right atrium at the level of the 3rd costal cartilage [4]. The course of a PLSVC begins where the LIJV and left brachiocephalic vein converge; then crosses the mediastinum lateral to the aortic arch, then passes in front of the left hilum and follows the course of ligament of Marshall to drain into the right coronary sinus [5].

The pathological reason for this persistence is embryological; when the left superior cardinal vein fails to regress, it leaves a PLSVC [6]. A few variants of PLSVC are PLSVC with absent right SVC, PLSVC in association with congenital heart disease (CHD) and left superior vena cava in situs inversus [7]. The most common presentation is asymptomatic PLSVC, with a prevalence of 0.5%, and the second most common is PLSVC with CHD, with a prevalence of 10% in patients with CHD [7].

The diagnosis of PLSVC can be confirmed by venogram, TTE/TEE (dilation of the coronary sinus normal <1 cm in diameter), computed tomography (CT), or magnetic resonance imaging (MRI) [8]. It is essential to recognize PLSVC to appreciate the clinical implications and complications that can arise. In many cases, port placement will leave no complications and can be safely inserted. Complications have been witnessed based upon the type of PLSVC (mentioned above), anatomic locations of where the PLSVC drains into the heart, and whether CHD is present. The most common type of PLSVC is where both the left and right SVC drain into the right atrium, which may lead to dilation of the coronary sinus, causing stretching of the AV node and bundle of His [8]. Manipulation of the dilated coronary sinus during invasive procedures can precipitate arrhythmias, hypotension, cardiac ischemia, and cardiac arrest [2]. On the contrary, depending on the location of the PLSVC insertion into the heart, it may cause anatomic restriction of the coronary sinus, decreasing its size, making the placement of catheters, pacemakers, and defibrillator leads strenuous [8]. A PLSVC draining into the left atrium has similar complications as a PLSVC with CHD (specifically an atrial septal defect). This drainage pattern creates a right-to-left shunt, which increases the risk of air emboli or any type of emboli entering systemic circulation, potentially causing a cerebrovascular accident or ischemia in other downstream systemic arteries. If a central line placement is not done under fluoroscopic guidance with a patient who has an undiagnosed PLSVC, complications include angina, hypotension, and myocardial perforation [9].

During an endovascular procedure, like port placement, and the catheter fails to cross the midline visualized on fluoroscopy of the thorax, a PLSVC should be considered. The drainage can be assessed by fluoroscopy during the same procedure. In our case, a venogram was performed, and contrast was visualized, flowing into the right atrium. The diagnosis can be confirmed as described above and during the venogram if the origin site and drainage site are identified in relation to the other structures in the mediastinum. Differential diagnoses to consider are vertical vein, levoatriocardinal vein, left superior intercostal vein, aberrant left brachiocephalic vein, pericardiophrenic vein, and vascular structures secondary to surgery [9]. Reviewing patients' prior imaging studies before endovascular procedures can identify variant anatomy before the procedure begins. Cancer patients typically have baseline CT scans, which can be used to determine if PLSVC is present, as seen in this case (Figs. 1,4,5).

In conclusion, PLSVC was discovered during a routine port placement. PLSVC is rare, and many patients are asymptomatic. When patients with PLSVC undergo endovascular procedures, there are risks and complications that can occur based on the type of PLSVC, where it drains, and whether CHD

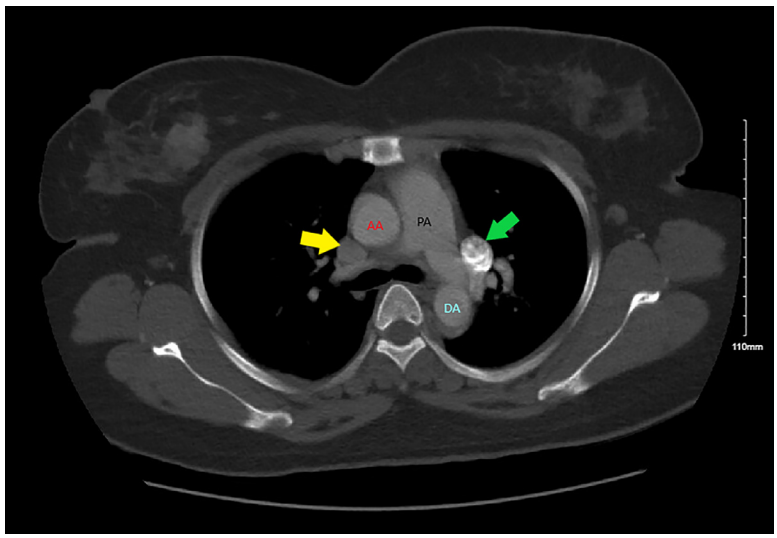

Fig. 5 – Axial view, CT angiogram of the thorax, vertebrae window, demonstrating the PLSVC (green arrow), right SVC (yellow arrow), ascending thoracic aorta (AA), descending thoracic aorta (DA) and pulmonary artery (PA).

is present. A review of the patient's prior imaging of the thorax with CT or MRI can help identify these variants and mitigate complications.

Patient consent

Written informed consent was acquired from the patient for the publication of this case report and all accompanying images.

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