An Uncommon Position of Peripherally Inserted Central Catheter in a Preterm infant with persistent left superior vena cava (PLSVC): A Case Report

Said Al Balushi*, Ahmed Fawzy, Aya Samy and Radhiya Al Muktomi

Pediatric Department, Sohar Hospital,Sohar,Sultanate of Oman

Received:12 Apr 2025

Accepted: 29 May 2025

*Correspondence author: dr.saeed86@hotmail.com

DOI 10.5001/omj.2028.37

Abstract

Peripherally inserted central catheterization (PICC) insertion is one of routine procedures in neonatal intensive care unit. PICC insertion and proper tip location in neonates can be challenging, especially in cases of venous malpositions and anomalies.Here,we present a preterm infant with PLSVC which was diagnosed incidentally after the placement of PICC line. Actually, there have been rare case reports of PICC in neonates with PLSVC .PLSVC can also be a relatively safe final PICC tip position.Thus, this case highlights the importance of understanding thoracic venous anomalies in neonates, as well as the typical and atypical pathways of PICC.

Keywords: Newborn Infant; PICC Insertion; Cardiac Anomaly; NICU; PLSVC.

Introduction

Peripherally inserted central catheterization (PICC) insertion is a common procedure in neonatal intensive care unit for administration of fluids,medications, nutrition especially TPN for preterm and ill newborns.[1]

A newborn PICC can be placed at the patient's bedside and it can stay there for a few weeks .Neonatal PICC insertions are considered to be safe, and insertion success rates are generally high.A neonatal PICC line's distal tip should ideally be in the SVC or IVC, but it must be distinctly outside the silhouette of the heart. The tip of a PICC line inserted into a scalp or upper limb vein should be situated above T4 but inside the SVC. On the other hand, the tip of a PICC line placed in a lower limb should be located to the right of the spinal column, inside the IVC but below T9.[1,2]

Malpositions of neonatal PICC tip are a cause of concern due to increased risk of complications which can be fatal such as thrombosis,cardiac arrythemia,pericardical effusion and pericardial tempnade.Therefore,When the Catheters of PICC are Malpositioned, we usually take them out or move them to a midline position in order to minimize these risks.[2]It can be difficult to insert a PICC and make sure the tip is positioned correctly in infants with abnormal venous anatomy like with PLSVC. Those who regularly insert PICC lines should be knowledgeable about venous malpositions and abnormalities. Specifically, unlike the preferred position at the lower superior vena cava/Cavo atrial junction for a PICC in a typical right-sided superior vena cava, the presence of an unusual vein like PLSVC can also be a relatively safe final tip position. Therefore, understanding the anatomical variations of central vessels is crucial to enhance the safety of these procedures. One such variant is the persistent left superior vena cava (PLSVC),which can be also a relatively safe final tip position.

Here, we highlight the radiologic findings and emphasize the significance of being familiar of such an anomaly in a rare case of PLSVC in a preterm infant at Suhar NICU, Sultanate of Oman, which was incidentally found during the routine placement of a peripherally inserted central catheter (PICC) line.

Case Report

A Preterm male infant at 31-week-gestational age was born by an emergency lower segment cesarean section due to Prolonged premature rupture of membrane and suspected chorioamnionitis. The mother is 35 years old, had regular follow up antenatally to antenatal clinics without any abnormalities on antenatal scans.She is G6P5A1, and she doesn't have any medical illness. After delivery, the baby had a good cry,tone and increased work of breathing requiring continuous positive airway pressure non invasive ventilation. He didn't require any resuscitation and Apgar scores were 7 and 9 at 1minute and 5minutes, Therefore,he was admitted to the NICU with the administration of continuous positive airway pressure (CPAP). His growth parameters: weight of 1.54 kg (below the 10th percentile), length 39 cm (at 20th percentile), and head circumference 28.5 cm (at the 20th percentile). In the NICU, his increased respiratory effort improved then he was started on feeds. Unfortunately du to un availability of Expressed breast milk,he was started on preterm formula.Then,on Day 5 of life,he developed abdominal distension with melena,x ray showed features of necrotizing enterocolitis. Because of the need to be Null per mouth (NPO) for bowel rest, the need for total parental nutrition and Antibiotics with other medications, a peripherally inserted central catheter (PICC) was inserted in the left upper limb, and chest x ray was done to confirm the PICC position. Chest x ray [Figure 1] shows that the PICC is seen in the left side of the heart then going to Rt atrium,abnormal course, so a venous anomaly is suspected.

A pediatric cardiologist was consulted for echocardiography which shows a a dilated coronary sinus with persistent left superior vena cava draining into the coronary sinus [Figure 2 to 4] with a normal cardiac function. No other cardiac anomalies are noted. The PICC was pulled back as it was deep and kept at the level of LPSVC (at T4-T6). He stayed in the NICU for total 27 days and was discharged in good condition.After that,he was seen at pediatric cardiology and neonatology clinic in stable condition.

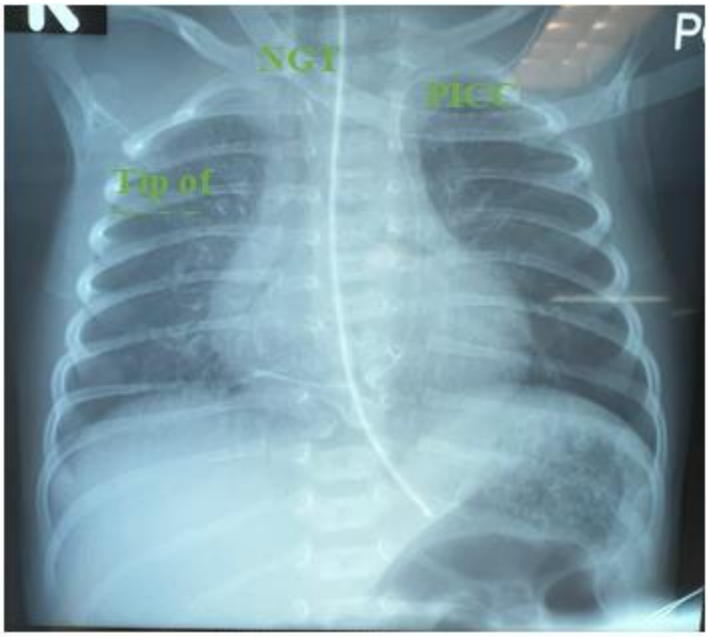

Figure 1: the chest and abdomen x ray done for positioning the peripherally inserted central catheter (PICC),which showed that the PICC was seen in the left side of the heart with uncommon site.

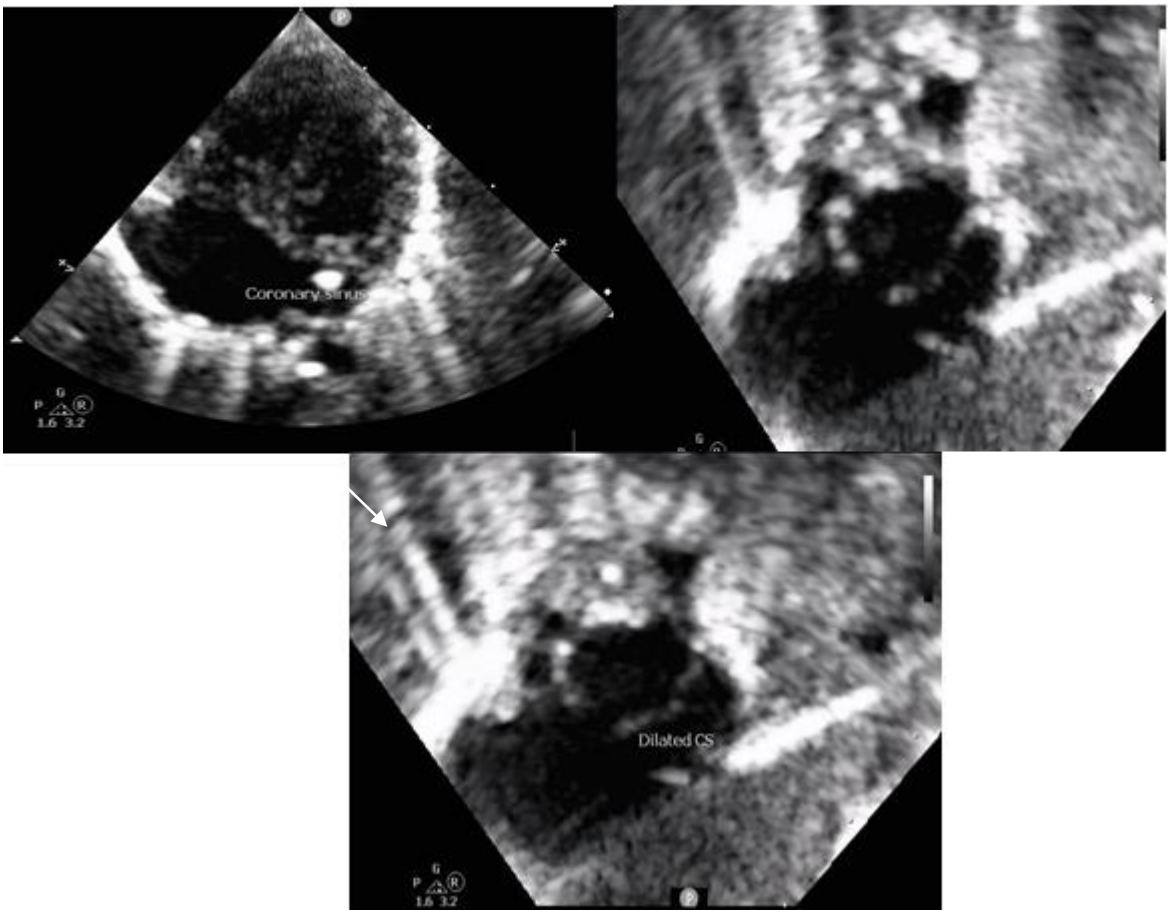

Figure 2: Echocardiograph, Subxiphoid short axis (sagittal) bicaval views showing dialted coronary sinus.

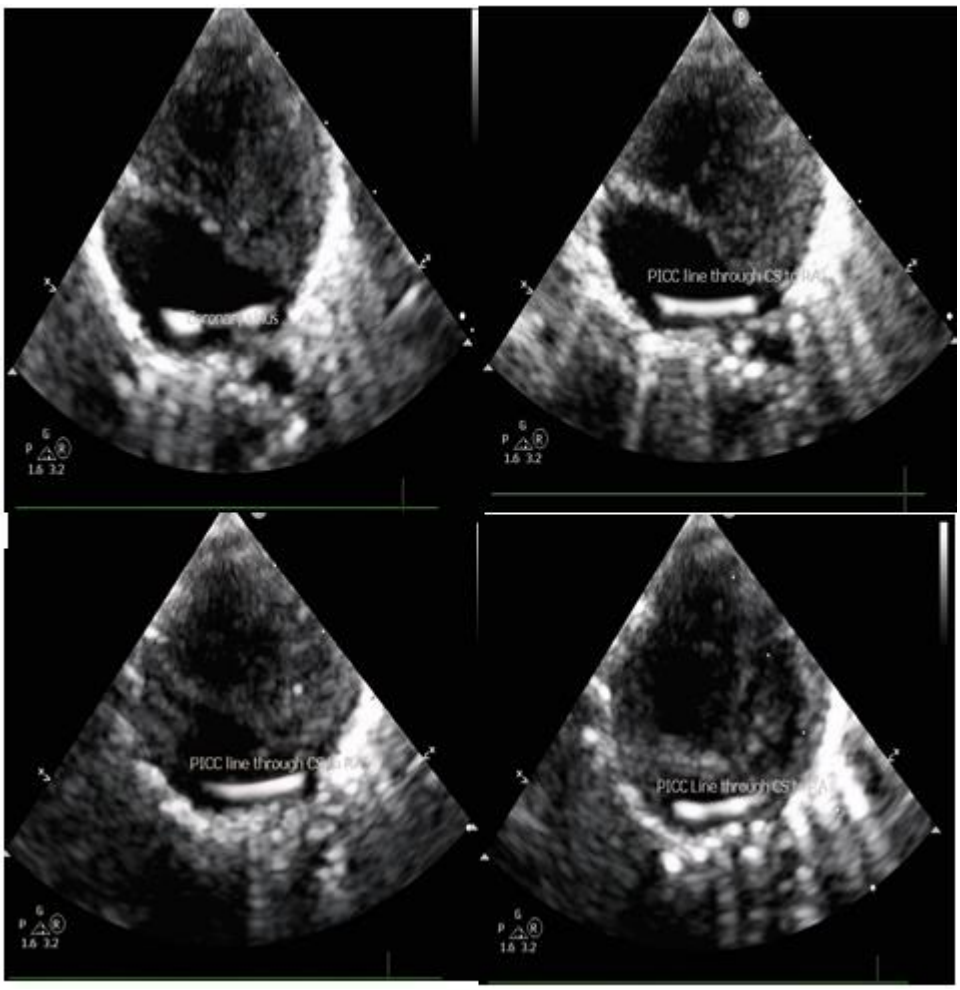

Figure 3: Echocardiograph:Apical four chamber views showing dilated coronary sinus and PICC which can be seen in the right atrium coming through the dialted coronary sinus.

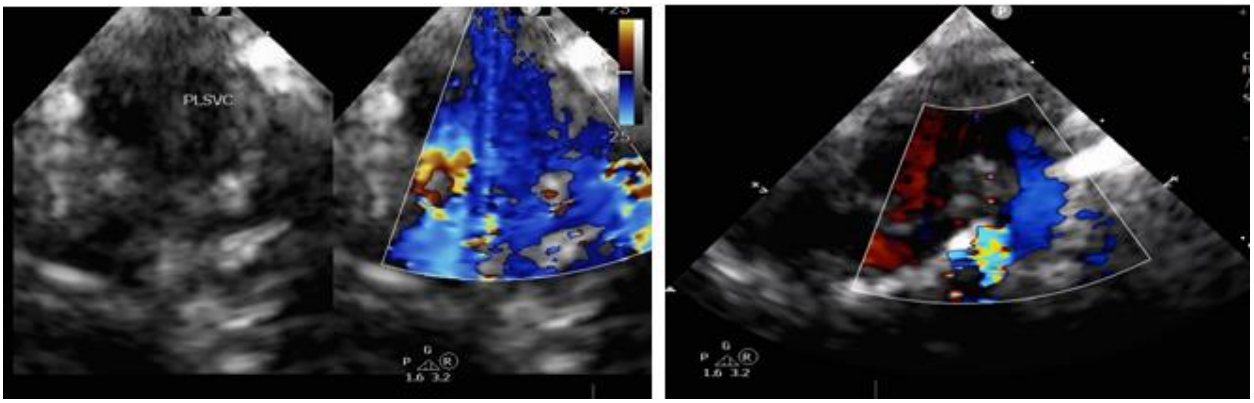

Figure 4: Echocardiograph:High parasternal (ductal) view showing lt superior vena cava (PLSVC).

Discussion

Persistent left superior vena cava (LSVC) is one of the most common thoracic venous anomalies, reported in 0.3% to 0.5% of the general healthy population.[3] Persistent LSVC can occur in isolation or be associated with other congenital heart diseases in up to 10%, such as heterotaxy (left and right isomerism), dextrocardia, double outlet right ventricle, atrioventricular septal defect, coarctation of the aorta, ventricular septal defect, bicuspid aortic valves, tetralogy of Fallot, and double aortic arch.[3] Also, the cases with persistent LSVC can be associated with genetic and chromosomal abnormalities [Table 1].[3]

Table 1: Genetic and chromosomal abnormalities Associated with Persistent Left Superior Vena Cava.

Genetic syndromes	**VACTRL, CHARGE, and Opitz G/BBB syndrome**
Chromosomal abnormalities	Trisomy 21; Turner syndrome; microdeletion 22q11.2

Isolated PLSVC is frequently discovered by accident during other medical and surgical procedures and is typically asymptomatic with few or no clinical features. But it can also be linked to other cardiac conditions,thus The importance of PLSVC in neonatal care settings lies in a greater association with chromosomal or congenital heart defects and how it impacts upon central line placement when using the left arm.

Thus, the finding of a PLSVC should alert the clinician to be aware about these association and the need for appropriate evaluations such as echocardiography looking for associated congenital defects.

Therefore, recognizing its favorable outcome when isolated and the need for a thorough examination to rule out other anomalies is very important.

In the early stages of embryonic development, around 3 to 4 weeks into gestation, blood from the arms and head returns to the right atrium via the right and left anterior cardinal veins. By the 8th week of gestation, the left anterior cardinal vein is expected to regress; if it does not, this results in PLSVC.[3,4]

Typically, PLSVC is asymptomatic and discovered by chance. The presence of PLSVC can complicate catheter placement on the right side of the heart when using a left subclavian approach for vascular access, during the insertion of percutaneous central venous catheters in newborns from the right upper limb, or when placing pacemakers or defibrillators for arrhythmia treatment. Sometimes PLSVS can be unexpectedly found during cardiac or thoracic surgical procedures. PLSVC can present in various anatomical forms, with the most common being the existence of both a right and left superior vena cava (accounting for about 80-90% of all PLSVC cases).

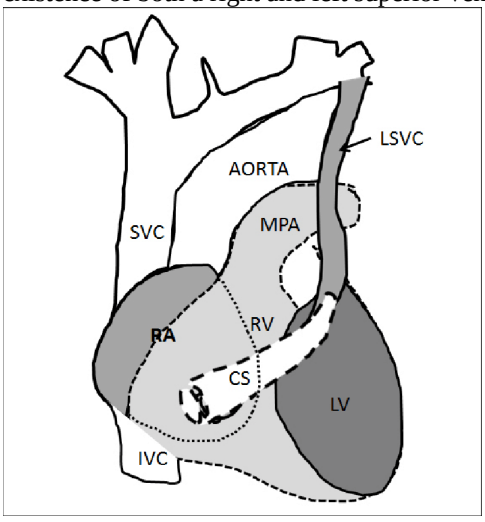

Figure 5: This figure is showing the persistent left superior vena cava (PLSVC) that is draining into the coronary sinus then into the RA. MPA=main pulmonary artery vessel, CS=coronary sinus

In 80% to 90% of cases, persistent left ventricular dilatation (LSVC) generally drains into the right atrium through the coronary sinus. [Figure 5] The coronary sinus may dilate as a result, which could lead to two outcomes: 1) cardiac arrhythmia due to stretching of the atrioventricular node and bundle of His; and 2) obstruction of the left atrioventricular flow due to partial occlusion of the mitral valve.[5] Also,10% to 20% may drain in the left atrium directly or via unroofed coronary sinus which may cause cyanosis due to

he remaining cases result in right to left side shunting and may produce cyanosis due to right to left side shunting.[6,7]

Reports on peripherally inserted central catheter (PICC) in neonates with persistent left superior vena cava (PLSVC) are uncommon. Most PLSVC patients do not exhibit clinical symptoms or hemodynamic changes, which are often identified during cardiac catheterization. However, in neonates with PLSVC, PICC final position placement can be challenging.

A PICC that is found in the left mediastinal border might be located in the PLSVC and could also be in the other position such as descending aorta, internal thoracic vein, superior intercostal vein, pericardiophrenic vein, pleura, pericardium, or mediastinum.

Therefore, if PLSVC is suspected during the placement of a PICC line, the inserter should confirm its presence rather than attempting a new PICC insertion. A chest X-ray may not suffice for diagnosing PLSVC. The diagnostic methods typically include echocardiography, fluoroscopy, computed tomography scan, and magnetic resonance imaging.

Conclusion

A persistent left superior vena cava (SVC) is one of the most common venous anomalies, and typically asymptomatic. Clinicians may be able to prevent complications if they are aware of such anomalies and avoid re insertion of another PICC.Always,in case of a PICC in an irregular course in left mediastinal border,there should be a high level of suspicion for PLSVC and echocardiography should be performed to follow the abnormal path and look for associated anomalies.

The case reported here strongly highlights the importance of being familiar with the most common thoracic venous abnormalities.

References

1. Mason-Wyckoff M, Sharpe EI. Peripherally inserted central catheters: guideline for practice. 3rd ed. National Association of Neonatal Nurses; Chicago (IL): 2015.

2. Hugill K, van Rens MF. Inserting central lines via the peripheral circulation in neonates. Br J Nurs 2020;29:S12-S18 .

3. Galal M, Ghoneem A, Hafeez M, El Bolkini M. Case 2: An Uncommon Peripherally Inserted Central Catheter Position with an Uncommon Diagnosis. Neoreviews 2020 Nov;21(11):e765-e767. .

4. Galindo A, Gutiérrez-Larraya F, Escribano D, Arbues J, Velasco JM. Clinical significance of persistent left superior vena cava diagnosed in fetal life. Ultrasound Obstet Gynecol 2007;30(2):152-161 .

5. Vydt T, Cools F, Rademakers FE. Absent right and persistent left superior vena cava. Acta Cardiol 2003;58:421-423 .

6. Soward A, ten Cate F, Fioretti P, Roelandt J, Serruys PW. An elusive persistent left superior vena cava draining into left atrium. Cardiology 1986;73(6):368-371 .

7. Vydt T, Cools F, Rademakers FE. Absent right and persistent left superior vena cava. Acta Cardiol 2003;58:421-423 .

8. Borde A, Ukirde V. Persistent Left Superior Vena Cava Identified during Peripherally Inserted Central Catheter Line Placement. International Journal of Recent Surgical and Medical Sciences. 2020;5. .

9. Bhardwaj A, Kushwaha D, Prabhakar A, Sharma P. Persistent Left SVC Draining to Right Atrium through Common Channel with Suprahepatic IVC: A Rare Finding. J Clin Interventional Radiol 2024;08. .