

Percutaneous Inserted Central Catheter (PICC) Line Migration in Extremely Preterm Neonate, Case Report. The Value of PICC Line Positions Follow Up

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Abstract

We report a case of extremely preterm male neonate born at 24+6 weeks with gradual migration of the right leg inserted PICC line. The line was initially positioned at the preferred location but later on migrated down to lower position which necessitates its removal. The close follow up of the PICC line position is mandated to avoid the complications related to its migration and misplaced position.

Keywords: PICC Line; Migration; Complications

Introduction

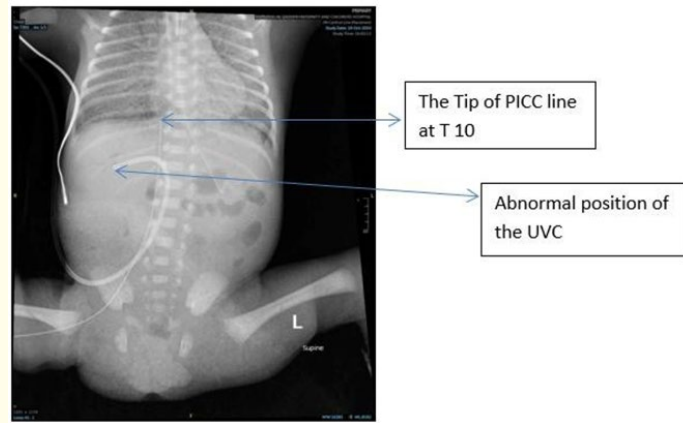
The survival of an increasing number of extremely preterm and critically ill neonates increases the need for parenteral nutrition to support growth, as well as reliable vascular access for administration of additional intravenous fluids and medications. Hence, it is continually being challenged to improve the methods by which we provide safe and consistent vascular access for those vulnerable populations. Among other central venous access lines such as umbilical lines and central venous lines, A peripherally inserted central catheter (PICC) is a device inserted into a peripheral vein and threaded into the central venous circulation with the tip of the PICC should reside in the superior vena cava (lower 1/2 to 1/3) for upper-body insertions and the thoracic inferior vena cava for lower-extremity insertions. However, the PICC line insertion is without complications related to it including central line-associated bloodstream infection (CLABSI), phlebitis, migration, malposition, leakage, and even others deadly events such as perforation with cardiac tamponade and thrombosis. We report a case of twin 1 extremely preterm male baby conceived by *in vitro* fertilization born at 24+6 weeks gestation with PICC line related migration complications and its timely removal.

Case Report

A 24 weeks +6 days twin 1, DCDA, extremely preterm male baby was born after *in vitro* fertilization to 42 years old mother with ominous obstetric history. Mother is G6P0 with no living issue (3 abortions and 2 ectopic pregnancies), her serology including HIV, RPR, HBsAg was negative. mother is known to have hypertension on methyl dopa and had type 2 diabetes on combined metformin and insulin.

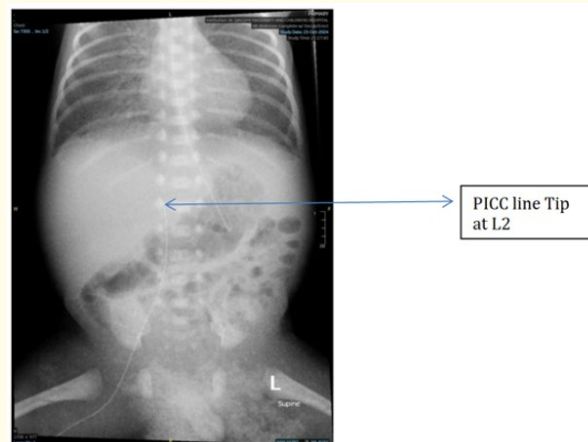
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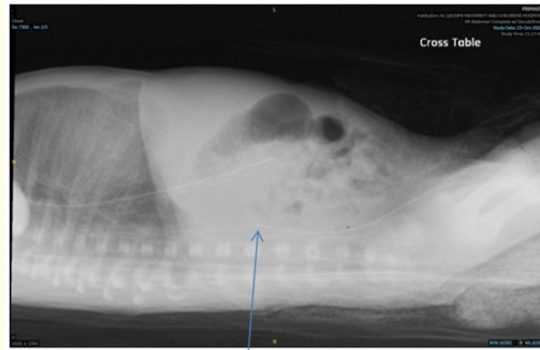
After delivery, the baby was kept in plastic bag for thermal regulation among other golden hour steps. He was intubated in view of poor respiratory efforts and transferred to NICU on portable ventilator. Initially umbilical lines were inserted, started on penicillin and gentamicin, kept on intraventricular haemorrhage (IVH) bundle of care for the prevention of intracranial bleeding, he had severe respiratory distress syndrome and needed 3 doses of surfactant. According to our unit policy, the IVH bundle of care is continued for 3 days and the umbilical lines to be kept in place for 3 days. The umbilical lines were removed after the insertion of the PICC line which was inserted in the right long saphenous vein on the 4th day of life (DOL). The initial position of the PICC line was verified by x ray which delineate its proper position just above the diaphragm at Thoracic 10 (T10) (X ray No. 1).



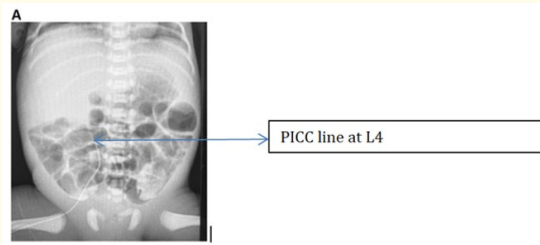
X Ray No 1

2 days later on the 6th DOL, X ray was followed up in view of the feed intolerance and the need of increasing respiratory support to high frequency ventilation, showed that the PICC line had moved down to the level of Lumbar 2 (L2) and cross table X ray showed the line run parallel and anterior to the vertebral bodies. In view of the need of the PICC line as the baby was very edematous, it was decided to pull it back to the level of Lumbar 4 (L4) (X rays No. 2).





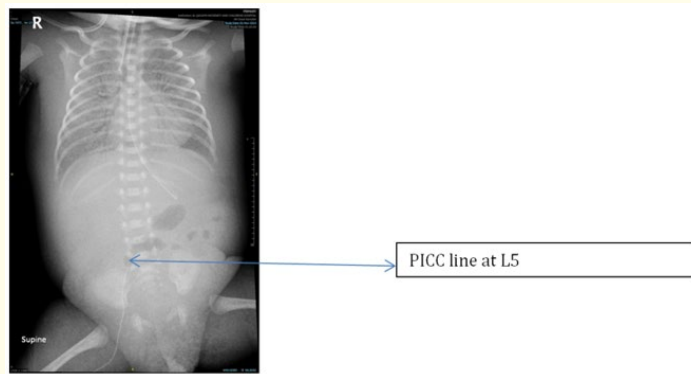
Cross table view showed that the PICC line run parallel and anterior to vertebrae



PICC line at L4

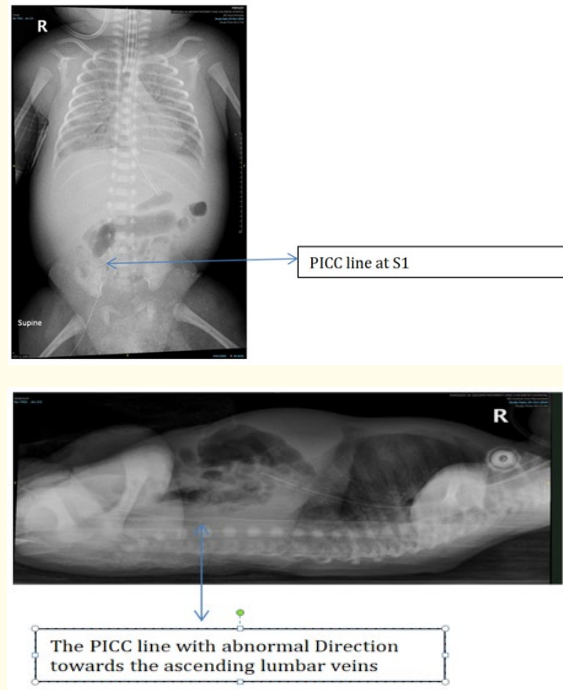
X Ray No 2

Few days later, close follow up X ray showed that the PICC moved to lumbar 5 (L5) and Sacral 1 (S1), at that stage, the PICC line started to show evidence of phlebitis with redness and cord like feeling along the PICC line which necessitates its removal. In the cross table X ray view, the direction of the PICC line was directed backward indicating abnormal track (X ray No. 3 and 4).



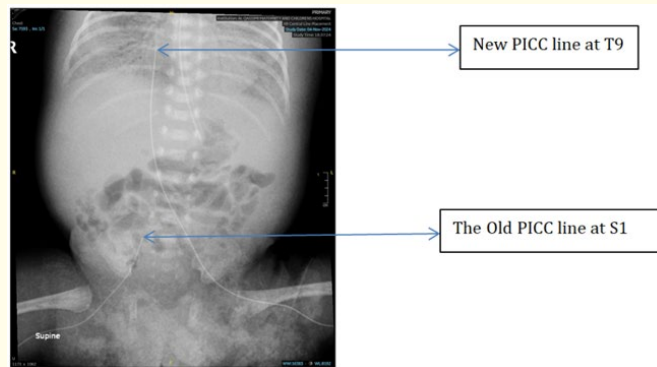
PICC line at L5

X Ray No 3



X Ray No 4

Reinsertion of another PICC line on the left long saphenous vein with confirmed preferred position at the level just above the diaphragm at Thoracic 9 (T9) (X ray No. 5).



X Ray No 5

Discussion

Peripherally inserted central catheters (PICCs) are being placed with increasing frequency in neonates to enhance the delivery of care for such vulnerable population. In 1973, Shaw described a novel technique for inserting a silicone catheter into the central veins of neonates. Since then, the practice of inserting PICCs has been optimized because of improvements in catheter technology and insertion devices [1].

In our case report the PICC line was in optimal position at T 10. However, in view of repeat X ray that showed the line migrated down to the level of L2 and it was anterior and parallel to the vertebral bodies it was decided to withdraw it back to L4 level. This was followed up closely and the PICC line showed more migration downward to L5 and S1. At L5 and S1 position it was noticed that the PICC line on cross table X ray was directed backward suggesting possible inadvertent position in the anterior spinal venous plexus (ascending lumbar venous plexus) which warrant its removal. It was also noticed the line started to show evidence of phlebitis with edema, erythema and cord like sensation along its course. The explanation for such catheter migration in our tiny baby may be due to excessive movements due to the sudden onset of neonatal seizures (due to IVH grade IV), being on HFV and possible loose fixation plaster all of which may lead to catheter migration.

For lower limb PICC line insertion length, it is traditionally measured from insertion site to the groin and then diagonally to the xiphisternum although different formulas are being used to determine the length [2].

For lower limb PICC position, tip should be within IVC, outside the cardiac chamber, showing straight course, below thoracic (T) 9 and lie to the right side of the spinal column. Lower positions may be used but avoid renal veins at lumbar (L) 2 and should be above L4 and 5. For the left lower limb the PICC line must cross the midline to the right side to be in the optimal position [3].

The catheter tip location usually verified by X-ray on insertion. However other methods such as point of care ultrasound scan (POCUS) or US and/or intracavitary electrocardiogram (IC-ECG) are used to determine the tip location [4].

PICC line migration can be either in peripheral or central location direction, PICC lines placed in the head, neck or upper limbs are more likely to migrate. Nadroo and his associates documented a change in PICC tip location of up to 1.5 cm with shoulder/elbow movement, depending on the vein used for insertion [5].

Lower limbs PICC lines position must be in its correct position to avoid any complications. When taking the X ray or doing the POCUS ensure patient is supine, the legs must be in neutral adducted position (slightly bent at the hip and knee). It is also mandatory to obtain lateral view X ray to avoid abnormal position in the spinal venous plexus as if inadvertently placed in these veins may be associated with central nervous system complications [3].

The timing of doing X ray for PICC must be directly after insertion, if ≥ 1 cm adjustments, within 12 - 24 hours of insertion. Then every 2 weeks to assess for migration and when an x-ray is obtained for any purpose where PICC tip may be visualized, the radiographic analysis should always include a description of tip location [6].

Hadaway 2005, proposed that the Risk factors for migration might include increased intrathoracic pressure, high frequency ventilation, frequent vomiting, severe coughing, and extreme physical activity, rapid infusion of fluid or forceful flushing. In our patient he was kept on the high frequency ventilation (HFV) due to the development of pulmonary interstitial emphysema [7].

The mechanisms of PICC Line migration may occur spontaneously or as the result of excessive patient movement or non-secured dressing [8].

The PICC lines are without complications that may lead to arrays of detrimental effects such as infection, phlebitis, migration, extravasations, perforation in important places such as pericardium, pleural and mediastinum. Always consider the possibility of pericardial effusion/cardiac tamponade in any neonate with a long line/central venous catheter *in-situ* who collapses unexpectedly [9].

Complications associated with the migration of PICC might include: Thrombosis [10], dysrhythmias, vascular perforation or extravasation [11], myocardial perforation, effusion, tamponade [12], pleural effusion, neurologic abnormalities, catheter knotting, looping and pain [13].

PICC line migration may be asymptomatic and the sole indication could be a change in amount of catheter visible at insertion site. However, it may be symptomatic with pain and irritability based on the catheter location and infusate, erythema or edema, change in catheter function with difficulty flushing, symptoms specific to a particular complication (i.e. dysrhythmias due to catheter migration into the heart or pericardial or pleural effusion) [14].

Prevention of PICC migration may be unavoidable due to dynamic forces within the body. Strategies that minimize the risk of migration include: maintaining the security of the catheter with intact dressing, verifying the catheter tip location upon insertion, minimizing the movement with proper nesting of the neonate using neonatal nests and snugles [15].

Treatment of PICC migration can be accomplished by:

- Patient repositioning maneuvers have been shown to successfully adjust PICCs in some instances.
- Remove the catheter.
- Pulling the tip back into an acceptable location and using it as a midline or peripheral IV also may be an option.
- If the catheter is retracted to a midline tip location only solutions and medications that can safely be infused into a peripheral vein should be used.

Our unit practice still with the use of X ray to delineate the PICC line position but with the more and widespread utilization of POCUS technique to locate the PICC line it will avoid the unnecessary exposure to radiation for such tiny neonates. The use of POCUS is considered as a safe, effective, and efficient approach for localizing PICC tip positions in neonatal patients [16].

Conclusion

The PICC line is used as a long-term vascular access to deliver medications and nutrition. The position of PICC line must be closely verified to confirm its place and avoid its migration. The migration of PICC line can be associated with myriad of complications which may affect the whole outcome of the neonates in NICU. Always check and record the line tip position on subsequent x-rays whilst the line is *in situ*.

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