Umbilical Venous Catheterization in neonate causing pleural effusion

Suresh Kotinatot*
Al Jalila Children's Specialty Hospital Dubai, United Arab Emirates

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*Corresponding author: drsureshk06@gmail.com
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Abstract

Pleural effusion is extremely rare complication in a neonate after Umbilical Venous Catheterization which can present with respiratory distress, a neonatal emergency. It needs timely intervention to reduce the respiratory distress. We report an interesting and rare case, where a term newborn developed right sided plural effusion after Umbilical venous catheter (UVC) insertion and starting on Total parenteral Nutrition (TPN). Pleural Effusion was confirmed by X ray and Ultra Sound, treated with Intercostal drainage (ICD). Aspirated fluid was TPN as evidenced by pleural fluid analysis. Pleural effusion resolved after removing UVC.

Key words: Pleural effusion, Umbilical Venous Catheter, Respiratory Distress

Introduction:
Although chylothorax is most common form of pleural effusion in neonates [1], chylous effusion following Umbilical Venous Catheter (UVC) is extremely rare entity. It can result in significant respiratory compromise if not diagnosed and treated in timely manner. In a neonate with respiratory distress following UVC insertion, pleural effusion should be considered as a possibility. Although few cases have been reported in the western literature, no similar cases are available from the middle-east. Hence a case report.
Case Presentation:

A 2650 grams male baby born at 37 weeks of gestation to G4 PO A3 mother by normal vaginal delivery with normal Apgar scores was referred to us at 22 hours of life on mechanical ventilation. Antenatal period was complicated by gestational diabetes mellitus. The prenatal ECHO was suggestive of hypoplastic left heart. Shortly after birth baby was taken to NICU, placed on non-invasive respiratory support due to hypoxemia and bradypnea. Post-natal ECHO showed hypoplastic right heart with single ventricle physiology for which baby was started on PGE1 infusion and IV fluids. UVC French five was inserted at referring hospital and was fixed at 8.5 cm length at umbilical stump level. Position was confirmed by chest X ray.

Physical examination after admission to our unit revealed decreased air entry on right side with respiratory distress. Chest radiograph showed complete haziness of the right lung filed. Ultrasound chest repeated same time showed massive pleural effusion on right side with UVC tip in situ (fig.1). UVC catheter tip was in appropriate position at the junction of inferior vena cava and right atrium during the ECHO study done for cardiac disease evaluation. Fifty ml of serous fluid was drained (fig 1a) and Inter Costal Drain (ICD) was inserted (fig 1b) to prevent recollection as the baby was on high ventilator parameters and cause for pleural effusion was not known during ICD insertion. In anticipation of baby needs to be kept nil per oral for longer duration of time, baby was started on Total Parenteral Nutrition (TPN) with lipids and proteins on day two as two septic screens done 18 hours apart were negative. ICD drain became milky similar in appearance to TPN, after starting TPN and 160 ml of milky fluid drained. Pleural fluid analysis revealed 112 cell counts with lymphocytic predominance (70%), 200/mm3 RBCs, Gram stain-no organism seen, lactate dehydrogenase of 45U/L, triglyceride of 980mg/dL and glucose of 780mg/dl. Pleural fluid to serum LDH ratio was less than 0.6. Pleural fluid culture was sterile. TPN fluid analysis was sent
and it also showed the similar composition as pleural effusion. We suspected possibly the UVC has migrated to pleural cavity, as no blood was aspirated through UVC. Immediately after the suspicion and laboratory findings, UVC was removed and PICC line was inserted and TPN continued. Baby remained asymptomatic after UVC removal and drain decreased drastically to less than 10 ml over next 24 hours and became serous again. ICD was clamped and then removed later as there was no recollection. There was no recurrence of pleural effusion as evidenced by chest X ray (fig 2) done 24 hours later after removal of ICD. Baby was extubated after ICD removal and subsequently baby was taken for cardiac surgery on day five of life. During cardiac surgery there was no associated vascular anomaly found and baby was discharged post operatively from cardiac intensive care unit.

**Discussion:**

Chronology of events, drainage of milky fluid from the pleural cavities, no recurrence of pleural collection after removal of umbilical venous line, high triglycerides in the pleural fluid support an association of umbilical vein catheter with pleural effusion in our infant on parenteral nutrition. The most common complication of UVC is the malposition. On the other hand, pleural or pericardial effusions rarely occur. Two possible explanations for umbilical line induced pleural effusions are, line migration and hyperosmolar endothelial damage which may be the reason in our case. Anatomical relation of IVC and pleuro-pericardial cavities (fig 3) can explain the reasons for pleuro-pericardial collections. Migration of catheter tip may occur because of movement of head and extremities and flushing of umbilical venous catheter. In two reported cases, UVCs were in proper position, but still both were complicated by pleural and pericardial effusions. Pabalan, et al reported right sided pleural effusion in a 28 week preterm infant following umbilical venous catheterization. The complication developed nearly 40 hours after the
line insertion. Chest X-ray revealed normal tip position of the catheter. Drainage and catheter removal helped in complete resolution of the pleural effusion. Hong, et al[7] reported umbilical venous line related pleural and pericardial effusion in a 34 week preterm infant. In their case, the newborn was started on parenteral nutrition on day 2 of life, developed pleural effusion 5 days and pericardial effusion 8 days after insertion of umbilical venous catheter. The symptoms cleared only after removal of catheter on day 13 of life. The catheter position and tip was always appropriate and there was no evidence of line migration. Srinivas et al also have reported bilateral pleural effusion following UVC which resolved after removal of catheter[8]. Sezin et al also have reported a similar case of pleural and pericardial effusion as a complication of properly placed UVC[9]. The verification of catheter tip is important both at placement and during follow-up. Even though we excluded malposition of catheter tip by X-ray and also during echocardiography, the presented case showed that proper positioning does not avoid complications. It is remarkable that, isolated pericardial effusions were mostly reported due to mal-positioned UVCs, whereas pleural effusions were mostly reported with properly placed UVCs[10].

**Conclusion:**

The UVCs have considerable benefits in neonates though complications might arise in up to 20% of patients. Although malposition is most common complication, pleural effusion can occur rarely. This can present with worsening respiratory distress in an apparently normal baby. Hence in a neonate developing respiratory distress following UVCs, clinicians should always keep the possibility of pleural effusion.

**Recommendations:**

In case of any neonate with pleural effusion with indwelling umbilical venous catheters, pleural effusion secondary to umbilical venous catheter should be suspected, even if position of UVC is
appropriate. UVC should be aspirated to see if any back flow and laboratory analysis of pleural fluid and infusate should be done. UVC should be removed promptly in such cases, which in all the cases will act as a therapeutic intervention.

References

Legends for Illustrations

Fig. 1a and 1b: Chest radiograph shows right-sided pleural effusion with catheter tip in correct position (1a) and Intercostal drain on right side (1b).

Fig 2: Chest radiograph after right thoracentesis. Catheter was removed. Lung fields were clear.

Fig. 3: Site where the intrathoracic extra pericardial portion of the inferior vena cava comes in contact with the right pleura \(^3\).
Fig 3