Fellow Column: Catheter-Related Ascites in a Preterm Infant

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Abstract:

We are reporting a case of neonatal ascites secondary to misplacement of umbilical venous catheter. The case is supported by the literature review.

Case:

A female infant was delivered via cesarean section at 25 weeks of gestation (25 (0/7)) to a 33-year-old G2 P1011 (Gravida 2, Para 1, Term 0, Preterm 1, Abortion 1, Living 1) female. Obstetric history was significant for short cervix and previous classical c-section. At birth, the Apgar score was 1 and 6 at 1 and 5 minutes respectively. Infant was intubated in the delivery room and surfactant was given. On arrival to the NICU, she was placed on High-Frequency Oscillatory Ventilator (HFOV) with FiO2 of 0.4. The birth weight was 640 grams. Umbilical lines were placed. A 3.5 Fr Umbilical Arterial Catheter (UAC) was placed at 11 cm, and a double-lumen 5 Fr Umbilical Venous Catheter (UVC) was placed at 5.5 cm. A chest/abdomen x-ray was obtained, documenting the UAC tip at the level of T6 vertebrae and the tip of the UVC just inferior to the diaphragm (Figure 1A-B). Total parenteral nutrition (TPN) was started on day 1 of life at 80ml/kg/day. Ampicillin at 50 mg/kg every12 hours and Gentamicin at 5 mg/kg every 48 hours was started along with prophylactic Fluconazole (3mg/kg) as per unit policy.

On admission to NICU, the vital signs were stable with a temperature of 96.8F, heart rate ranging from 150-160/min, mean blood pressure ranged from 27-29 mm Hg. Initial blood glucose was 54 mg/dl. The respiratory exam was significant for mild subcostal/intercostal retractions with spontaneous respiratory effort. The abdominal exam was insignificant with a flat abdomen, normal bowel sounds in all four quadrants, and no organomegaly.

On day 2 of life, the infant was started on phototherapy for bilirubin of 5.2. The infant remained NPO on TPN. On day 3, the infant was extubated to NIMV. Packed red cell transfusion was provided for hemoglobin of 10.5 g/dL. On examination, the abdomen was noted to be distended (Figure 2 A). The infant was made NPO. An X-ray showed a gasless abdomen (Figure 3 A). Blood culture was obtained, and the infant was started on vancomycin and piperacillin-tazobactam. The infant was intubated and placed back to HFOV. On x-ray (Figure 3 A), due to concerns of low UVC, the line was removed, and a PICC was placed. Head ultrasound showed mild grade 2 IVH. An echocardiogram was significant for PDA. A significant amount of fluid under the diaphragm and around the liver was noted, which was confirmed by the abdominal US (Figure 4).

The infant underwent exploratory laparotomy. A large amount of yellow/purulent fluid was obtained. No bowel necrosis was identified in the small intestine, and no perforation was seen. The right colon appeared to have adhered to the abdominal wall, suspected of isolated walled-off colonic perforation. As the gut looked healthy, no ostomy was performed, but an abdominal drain was placed (Figure 2B and 3C). Peritoneal fluid was sent for culture. On post-operative day 2, the infant was successfully extubated. At the time of this report, the infant remained stable on non-invasive

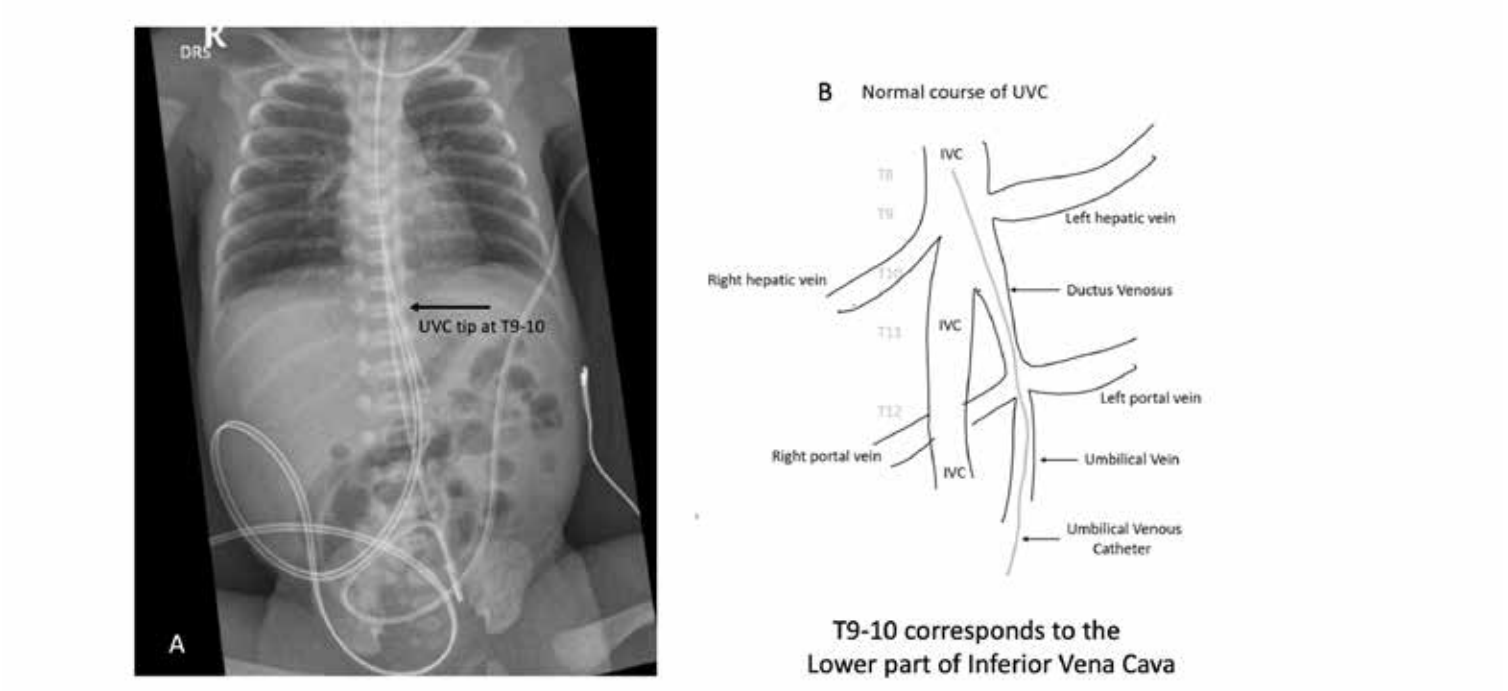

Figure 1-A : X-ray showing the tip of Umbilical Venous Catheter (UVC) at T9-10.

Figure 1-B : Animation showing the course of Umbilical Venous Catheter (UVC).

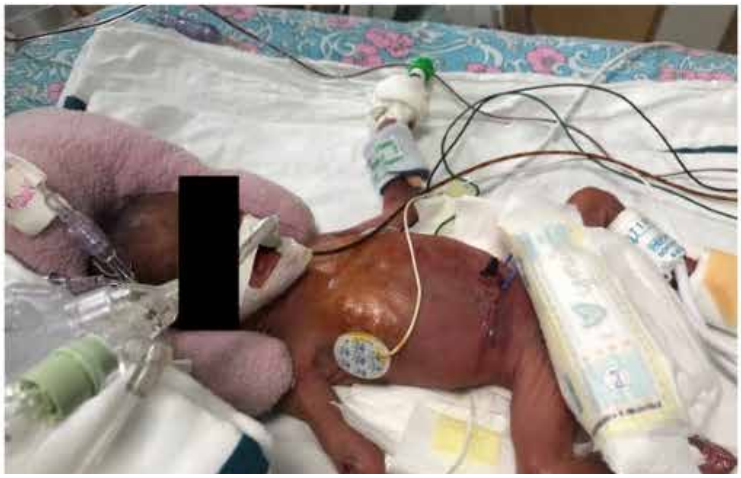

Figure 2-A : Distended shining abdomen, suspicious of ileus / peritonitis/ ascites (Pre-op picture)
Figure 2-B : Resolved abdominal distension (Post-op picture)

respiratory support.

> ***" As noted in the case description, no definite perforation was found. Also, the peritoneal fluid did not grow any organism."***

Discussion:

As noted in the case description, no definite perforation was found. Also, the peritoneal fluid did not grow any organism. By 48 hours, the neonatal gut is colonized with bacteria. Thus, having a sterile fluid excluded the intestinal perforation as a cause of infective ascites or peritonitis. We did not have a fluid analysis report to know if it was exudate or transudate. However, abdominal US confirmed the diagnosis of intraabdominal fluid (Figure 4). As depicted in Figure 3 B, the UVC was noted to have moved down to T11. We speculated that as a cause for ascites.

The possible mechanism of ascites secondary to malpositioned

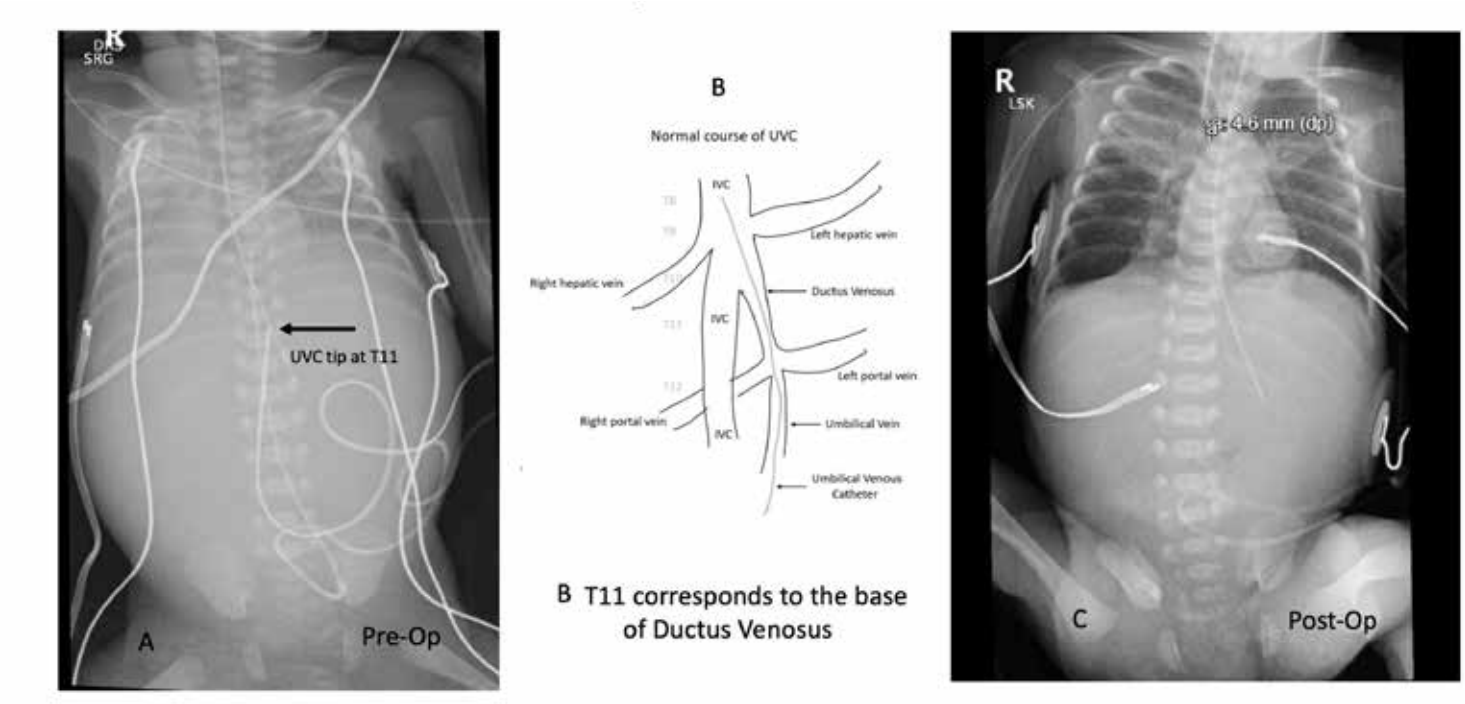

Figure 3-A : Gasless abdomen, suspicious of ileus / peritonitis/ ascites (Pre-op film)
Figure 3-B : Animation showing the course of Umbilical Venous Catheter (UVC).

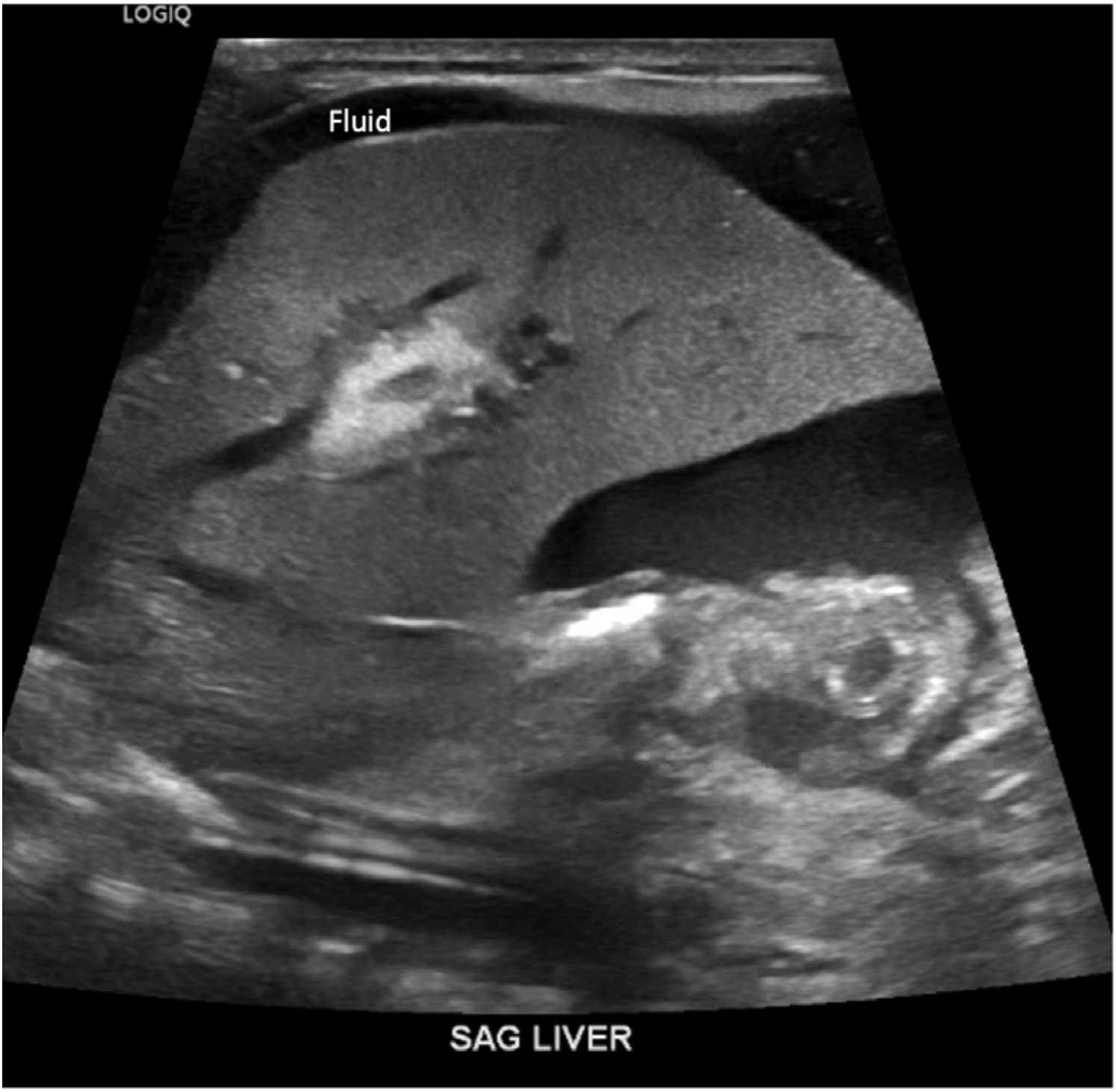

Figure 4 : Liver Ultrasound showing fluid under the diaphragm

UVC could be explained by the findings of Hargitai et al.(1) They suggested the wedged UVC caused the micro injury to the vessel wall within the ductus venosus. As depicted in Figure 3 B, the UVC tip corresponds to the base of ductus venosus.

As noted in the case description, the infant required two back-to-back blood transfusions. Therefore another possibility could be the perforation of peritoneum and intra-abdominal hemorrhage, as described by Kanto et al.(2)However, operative findings of yellow fluid rejected the perforation and bleeding as the cause of ascites.

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The other possible mechanism of ascites is explained by Pegu et al.(3) They suggested intraperitoneal spillage and ascites from TPN extravasation secondary to hyperosmolar characteristics of the infused fluid. In the case described, the infant did receive TPN from the UVC. Similar cases have been reported by Shareena et al. (4)and Panetta et al. (5)

Liver necrosis and renal failure have been reported in association with neonatal ascites with the malposition of UVC. (6-8) Fortunately, no liver necrosis was noted as liver US and liver enzymes, AST and ALT, were normal. Also, the infant had good urine output, and serum creatinine was normal.

In conclusion, whenever there is acute abdominal distension with an umbilical catheter in place, catheter-related complications must be considered. A lateral x-ray film should be obtained whenever there is a doubt about the position of the catheter. An urgent removal of the catheter is warranted.

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