

CASE REPORT

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Vascular perforation of umbilical venous catheter and awaiting it to be shallow

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ABSTRACT

The patient was a boy born at 23 weeks and 0 days of gestation weighed 401 g at birth. For treatment, an umbilical venous catheter was placed but the catheter perforated a blood vessel. We thought that prompt removal of the catheter would lead to massive bleeding, so we kept the catheter in place at the umbilicus, waited for weight gain, and removed it after confirming that the catheter tip had spontaneously become shallow and was in the umbilical vein. This procedure allowed us to handle the patient without major problems.

Keywords: umbilical catheter, vascular perforation, neonate

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INTRODUCTION

Umbilical arterial and venous catheter placement have become the standard of care in the neonatal intensive care unit.¹ Because they provide safe vascular access immediately after birth in high-risk newborns, umbilical venous catheters are commonly used in the neonatal intensive care unit. It serves as an immediate postnatal access for intravenous fluids or emergency medications, as well as for the administration of hypertonic fluids such as total parenteral nutrition. The use of umbilical venous catheters has been associated with multiple complications, including catheter-associated bloodstream infections, venous thrombosis, and peritoneal extravasation.²⁻⁴ In this report, we describe one way to respond when an umbilical venous catheter perforates a blood vessel.

CASE REPORT

The patient was a boy born at 23 weeks and 0 days of gestation due to chorioamnionitis. He weighed 401 g at birth. For treatment, an umbilical venous catheter was placed. The catheter was a 1.35-mm polyurethane double-lumen catheter (SMACTM Plus, Cardinal Health) (17 G). The catheter tip was found on the left side of the abdomen, according to X-ray (Figure 1a). Although

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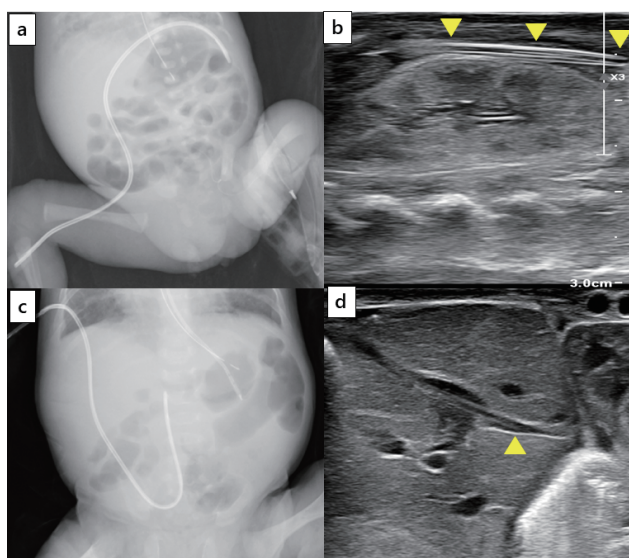


Fig. 1 X-ray and ultrasound images of the umbilical venous catheter

Fig. 1a: X-ray showing the tip of the catheter was on the left side of the abdomen.

Fig. 1b: Ultrasound image showing the catheter next to the left kidney.

Fig. 1c: X-ray showed the tip of the catheter was shallow to the umbilical vein.

Fig. 1d: Ultrasound image showing the tip of the catheter was shallow to the umbilical vein.

the catheter was visible in the umbilical vein on ultrasound, its location became unclear near the ductus venosus and the catheter tip located next to the left kidney (Figure 1b). Therefore, we can speculate that the vessel was punctured near the ductus venosus or after it. An ultrasound examination revealed a small amount of fluid retention in the abdominal cavity, but it did not increase over time. Based on these findings, it was assumed that the catheter had perforated a blood vessel and got into the abdominal cavity. On admission, the hemoglobin level was 16.3 g/dL, but it gradually decreased to 12.0 g/dL after the umbilical venous catheter was inserted, necessitating red blood cell transfusion on Day 1. After that, there was no further progression of anemia. There was no evidence of swelling or congestion in the lower extremities suggestive of impaired blood flow due to catheter placement. Because it was feared that removing the catheter at this point would result in massive bleeding, we decided to leave the catheter in place and monitor the patient's progress with explaining the situation and policy to the family and the department in charge of medical safety in the hospital. To prevent the umbilical venous catheter from slipping out, it was secured with film dressing materials and tapes. The catheter was filled with a heparin-laced saline solution (1IU/mL). Ultrasonography was continued about once every 1-2 weeks to check for thrombus formation around the catheter due to long-term indwelling. No obvious thrombus formation around the catheter was observed during the follow-up of this patient. During follow-up, there were no signs of infection associated with long-term catheterization, such as redness around the umbilicus or elevated inflammatory response in blood tests. The catheter tip was shallow into the umbilical vein based on the results of the X-ray (Figure 1c) and ultrasound examination (Figure 1d) at 103 days of age and 1496 g, and the catheter was removed. There was no thrombus around the catheter, and it was easily removed. Ultrasonography was used to monitor the progress of the catheter removal, but no fluid retention in the abdominal cavity was found. During catheter insertion, no catheter-related infections were observed.

DISCUSSION

There are no reports on the frequency of vascular perforation during umbilical venous catheter insertion, but there is one case report of intra-abdominal bleeding due to vascular perforation as a complication during umbilical venous catheter insertion in a preterm infant.⁵ In that case report, however, there is no description of how the umbilical venous catheter was removed. After determining that the umbilical venous catheter had perforated the vessel, we decided that immediate removal would result in massive bleeding, so planned removal was performed after confirming that the patient was large enough to allow the tip to naturally shallow into the umbilical vein. If a life-saving surgical procedure became necessary, such as massive intra-abdominal bleeding, the patient was scheduled for surgical catheter removal. We believe that the slow and natural shallowing of the catheter gradually closed the hole that perforated the vessel wall. Because the umbilical vein catheter is fixed by sewing it to the umbilical cord, the catheter in the body becomes relatively shallow as the newborn's weight increases from 400 g to 1400 g, more than three times larger. It is unique to the neonatal case that it was possible to keep the catheter fixed to the body surface so that the tip would slowly come out, as the body gradually grew larger. In adults, there is a case report that when a central venous catheter perforated a blood vessel, a patient who had the catheter removed promptly suffered massive bleeding, while a patient who left the catheter in place for about two weeks and waited for false lumen formation could remove the catheter without bleeding.⁶

The insertion of umbilical venous catheters under ultrasound observation has been reported to prevent vascular perforation of umbilical venous catheters,⁷ and should be considered for future umbilical venous catheter insertion. Complications, such as infection, calcification, and difficulty in catheter removal, may occur.⁴ In this case, we daily checked the peri-umbilical area for possible infection and checked elevated inflammatory response in blood tests about once every 1–2 weeks. We also checked for the presence of calcification around the catheter by ultrasonography about once every 1–2 weeks. Although in this case, there were no findings of complications associated with long-term catheterization, such as signs of infection or thrombus formation. It has been suggested that in adults, a false membrane forms in about 2 weeks and can be safely removed.⁶ However, in the present case, the catheter was removed after confirming that it was completely shallow, taking advantage of the neonate's characteristic of rapid body growth. If signs of infection or thrombus formation were observed, earlier removal might be considered.

The above method may be an approach to be taken when a large catheter perforates a blood vessel in a neonate. If a similar situation arises, the family and the department in charge of medical safety in the hospital should be informed of the current situation and the benefits of long-term indwelling, as well as possible complications such as infection and thrombus formation. There have been no similar neonatal cases reported to date. We hope this report will serve as a reference for medical professionals who will be responsible for neonatal care.

INFORMED CONSENT

Informed consent was obtained from the patient's parents to publish the details of his case.

DISCLOSURE STATEMENT

All authors declare no conflicts of interest.

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