Umbilical venous catheter retrieval in a 970 gm neonate by a novel technique

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ABSTRACT

Umbilical venous catheterization is a necessity for the advanced care of very low birth weight neonates. Even with utmost care, few complications cannot be avoided. Fractured and retained catheter fragments are one of them. Endoluminal retrieval of such a catheter is an uncommon and challenging procedure for the interventionist. The only alternative is an open exploration of these patients. Various techniques have been described for retrieval of such foreign bodies. We describe a novel technique for percutaneous retrieval of an embolized umbilical venous catheter from a very low birth weight neonate.

Keywords: Balloon technique, retrieval, umbilical venous catheter

INTRODUCTION

Umbilical venous catheters (UVC) are commonly used in neonates and particularly in premature very low birth weight babies. They are crucial in enabling parenteral nutrition, intravenous medications, and blood sampling. Although these lines are generally safe and effective, complications may occur. These complications include thrombus formation, infection, and fractured catheter fragments.[1] All of these mandate catheter removal from the body. In the first two scenarios, the catheter can be readily removed, but in the case of fractured catheter fragments, surgical or percutaneous retrieval is needed. The risks of leaving catheter fragments in the patient include pulmonary embolism, sepsis, arrhythmias, and cardiac perforation.[2] We report a case of accidental transection of an umbilical venous catheter and its endoluminal retrieval by a novel technique.

CASE REPORT

A three-day-old 970-g infant born at 28 weeks' gestation had placement of an umbilical venous catheter (UVC) at the time of birth. Because there was no free flow of fluids through this UVC, removal of the catheter was attempted. During manipulation, the catheter got accidentally transected and embolized into the pulmonary artery with its one end still remaining in the inferior vena cava (IVC) [Figure 1]. We decided to retrieve the catheter percutaneously in view of extreme surgical risk involved.

After sedating the infant, the right groin was cleansed and draped in the usual sterile manner. The venous access was taken with the help of a 20 gauge venous cannula and a 0.014" coronary guide wire. A four French venous sheath, 11 cm in length, was inserted over it. Through this sheath, a 4 mm Amplatz gooseneck snare was advanced. Though we could hold the catheter very well with the snare, its snared end was making a loop and could not be retrieved back into the 4 F sheath [Figure 2]. There were chances of femoral vein injury in the fragile neonate if the catheter was snared out in a looped state. So, we abandoned the snaring technique. Because of manipulations, the catheter now extended from superior vena cava to inferior vena cava almost aligned with the femoral venous sheath. We decided to retrieve the catheter with another maneuver. A 0.014" coronary guidewire was passed through the 4 F venous sheath and manipulated into the UVC. A 2 × 10 mm compliant coronary balloon was then passed through the 4 F sheath and placed within the proximal end of the embolized UVC. The balloon was inflated at 4 atmosphere pressure [Figure 3]. This balloon internally secured the UVC by snuggly fitting inside it. The wire and the balloon catheter were now manipulated slightly forward and backward, which confirmed the snug fit as the catheter moved along with the wire and the balloon. The UVC was

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then brought up to the venous sheath, and the whole assembly (the UVC, Balloon, coronary guide wire and the venous sheath) was then retrieved back from the femoral vein en masse [Figure 4]. Total fluoroscopy time was 20 minutes. There was minimal blood loss during the procedure, and hemostasis was achieved promptly post-procedure. Echo performed in the post-procedure period revealed normal structure and function of the heart, except for a small patent ductus arteriosus and a 4 mm atrial septal defect.

DISCUSSION

Though there are few case reports available in the literature of surgical[3] and percutaneous retrieval[4-9] of retained UVC from an infant, yet to the best of our knowledge, there are only anecdotes in the literature of percutaneous retrieval of umbilical venous catheter in less than one kg neonate.[1]

A major issue in percutaneous retrieval of any foreign body in such fragile neonates is vascular access. Though access with larger sheath may help in retrieval of the foreign body, there are high chances of local vascular complications.

There are many methods described in the literature for percutaneous retrieval of any foreign body viz. snaring technique, retrieval baskets, biopsy forceps, small balloon techniques.[10] Most practiced amongst these is snaring technique with the help of gooseneck snares, which are available in a number of loop diameters. Balloon technique of retrieving the foreign body is most commonly used in coronary arteries. It is akin to Fogarty maneuver. It is simple, easy to perform, and it does not require any special equipment. A coronary wire is advanced distal to the foreign body if a wire is not already across the object. A small (usually 1.5-2.5 mm diameter) compliant coronary balloon is then advanced distal to the foreign body and inflated at low pressure. The balloon is then pulled back over the coronary guidewire. In a successful procedure, the foreign body is either pulled back into the guiding catheter with the balloon or it is secured between the mouth of guide catheter and the balloon. The entire assembly can then

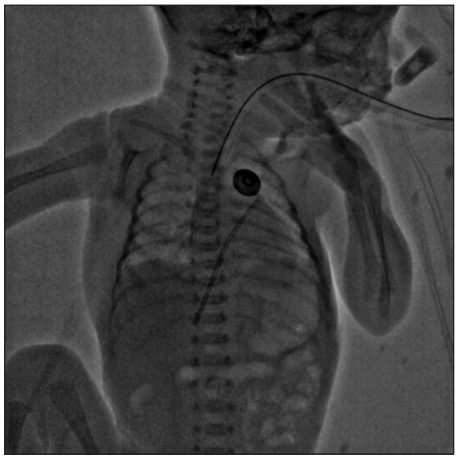

Figure 1: UVC extending from IVC to pulmonary artery

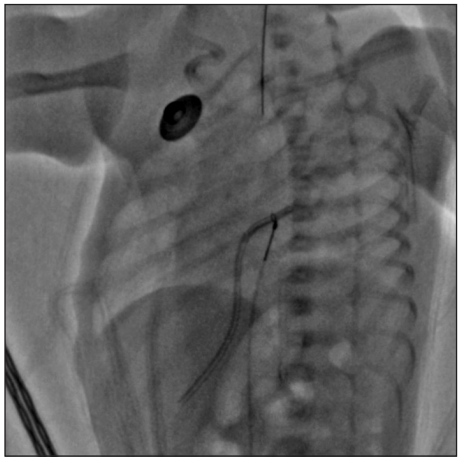

Figure 2: UVC being snared

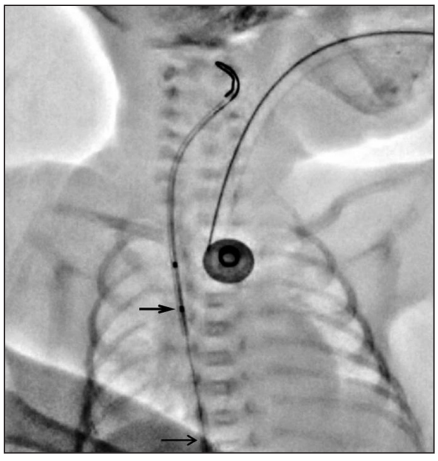

Figure 3: Balloon at the proximal end of retained UVC (bold arrow), venous sheath (thin arrow)

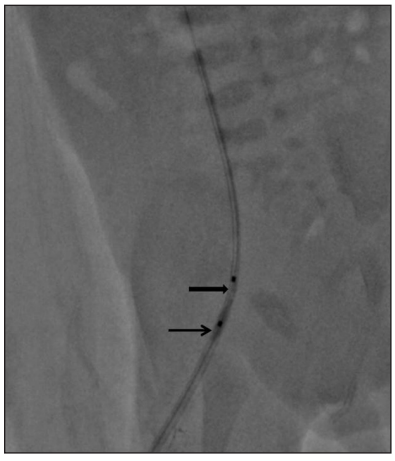

Figure 4: Entire assembly of venous sheath (thin arrow), balloon and UVC (bold arrow) being pulled out

be pulled out of the body *en masse*. This technique has been described specially for retrieval of coronary stents.

Our technique is a modification of the above described balloon technique. The novel technique we used was based on the principle of securing the foreign body internally and proximally rather than sandwiching/ securing it from the external and distal side. There are two pre-requisites for successful retrieval of the foreign body by our technique. First, that the foreign body should have an internal lumen. So, it is best applicable in case of retained or embolized catheter fragments. Second, the foreign body has to be aligned with the venous sheath or guide catheter in such a way that a wire inserted through the sheath/ guide catheter can be manipulated through the foreign body as well.

Our technique is in principle different than the Fogarty-like maneuver where inflated balloon is placed distal to the foreign body. Our technique is based on the principle of internally securing the foreign body with the help of balloon, which can fit snugly within the foreign body on inflation.

This technique, however, has a limitation that it needs the foreign body to have an internal lumen, into which a wire can be manipulated and a balloon placed. So, this technique is applicable only where we have to retrieve retained catheters. A slightly larger compliant balloon has to be used so that, on inflation, it internally secures the hollow foreign body.

CONCLUSION

In the advanced care of very low birth weight neonates, umbilical venous catheterization is a necessity. Even with utmost care, few complications cannot be avoided. Fractured and retained catheter fragments are one of them. The novel technique we described can be very helpful to retrieve retained catheter fragments in very low birth weight neonates without causing local vascular complications.

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