Delivery sheath tip invagination – An unusual cause of failure to retrieve duct occluder

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ABSTRACT

Transcatheter closure of patent ductus arteriosus is the standard of care. Retrieval of a duct occluder device is generally easy until it is detached from the delivery cable. We report two instances of failed retrieval of the device due to sheath tip invagination. The report highlights the importance of prompt identification of the mechanism of unforeseen complications in managing them effectively.

Keywords: Amplatzer duct occluder, patent ductus arteriosus, slenderizing

Transcatheter closure of patent ductus arteriosus (PDA) is the standard of care.[1] With growing experience, complications have become less frequent, but they do occur in some cases.[1,2] We present two unusual instances of failure to retrieve the device due to the invaginated tip of the delivery sheath. We discuss the mechanism of this unusual problem and demonstrate how the active slenderization technique helped in a successful resolution.

In the first instance, a 3-year-old boy with an 8 mm large PDA and severe pulmonary artery hypertension underwent cardiac catheterization. The ratio of pulmonary to systemic blood flow (Qp/Qs) was 1.8 and the pulmonary vascular resistance index 8.9 WU.m^2. Test occlusion with a 10 mm × 30 mm Tyshak balloon (Numed Inc., Canada) resulted in reduced PA pressure, although with an incompletely occluded PDA. Hence, we used a duct occluder device for optimal test occlusion. A 12/10 mm Amplatzer Duct Occluder (ADO) (St. Jude Medical, USA) was deployed through a 7 Fr Amplatzer TorqVue 180° (St. Jude Medical, USA) sheath. Unexpectedly, there was less than desirable fall in PA pressure despite complete occlusion of PDA for 15 min. Retrieval of the occluder device was tried, but despite multiple attempts, the device could not be achieved. While it was possible to slenderize the pulmonary end of the device, the aortic end remained expanded. We suspected a problem with the sheath tip interfering with device slenderization. The device was pushed in the descending aorta,

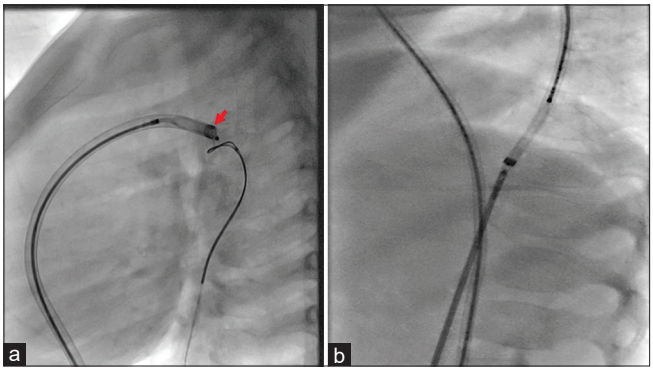

Figure 1: Fluoroscopic images show assisted active slenderization of ductal occluder using a gooseneck snare (a) and bioptome (b) inserted from the arterial side in patients 1 and 2, respectively. The red arrow indicates the deformation of the sheath tip

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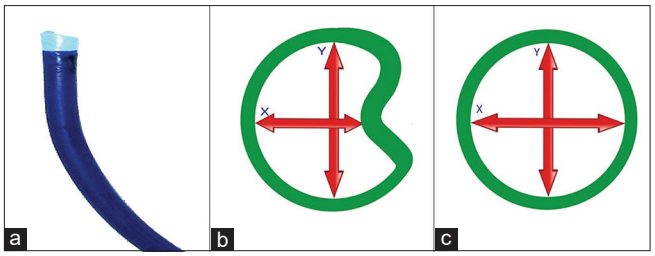

Figure 2: Photograph of the deformed sheath (a) and line diagram (b) shows reduced internal lumen compared to a normal sheath (c)

where the aortic end of the device was caught using a 10 mm 4 Fr gooseneck snare (ev3 Inc., Plymouth, MN, USA) [Figure 1a]. A constant pull from both the ends of the device facilitated the recapture of the occluder device within the delivery sheath.

The second case was a 2-year-old girl with a 3.8 mm PDA. A 6/4 mm ADO (St. Jude Medical, USA) was deployed using a 6 Fr 180° TorqVue (St. Jude Medical, USA) sheath. However, since there was unacceptable residual flow, an upsizing of the occluder device was contemplated. Similar to the first case, despite multiple attempts, the device could not be recaptured in the sheath. Once again, the device was pushed into the descending thoracic aorta where the knob on the aortic end was held using a 5 Fr bioptome (Cook Medical, USA) inserted through the right femoral artery. With the constant tug on the knob at the aortic end and pull from the delivery cable, the device could be retrieved in the delivery sheath [Figure 1b and Online Video 1].

In both instances, an invaginated tip of the delivery sheath caused failed retrieval of the occluder device [Figure 2a]. The invagination of the sheath tip reduced the lumen, making it insufficient to accommodate the incompletely slenderized device [Figure 2b], compared to a normal sheath [Figure 2c]. Once the mechanism was suspected, an assisted active slenderization technique was employed. An active pull from both ends of the device led to a much lower device profile, which in turn permitted the recapture of the device despite the reduced lumen of the delivery sheath. Although exchanging the sheath is an alternative strategy, it necessitates an exchange length cable that is not easily available.

In summary, this report highlights the importance of identifying the exact mechanism in prompt resolution of an unforeseen problem.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest. The cases are from the time when the first author, Anunay Gupta, was a Cardiology trainee at AIIMS, New Delhi.

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