Atherotome Dislodgement and Successful Retrieval During Cutting Balloon Pulmonary Angioplasty

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Cutting balloons (CBs) are beneficial for dilation of resistant branch pulmonary artery (PA) stenosis in children. There are rare reports of atherotome fracture and a Food and Drug Administration adverse event report of a fractured atherotome dislodging and remaining in the patient. We report CB atherotome dislodgement and embolization with successful retrieval in a patient with Alagille syndrome and branch PA stenosis.

Case

A 7-year-old girl with Alagille syndrome, systemic hypertension, branch PA stenosis, and a small patent ductus arteriosus was referred for left PA dilation and percutaneous patent ductus arteriosus closure to optimize her cardiac status before liver transplantation. Angiograms of the left PA demonstrated stenosis of the proximal left lower PA (LLPA) measuring 3.07 mm, with the distal LLPA measuring 6.2 mm.

An 8-mm balloon (Sterling; Boston Scientific) was inflated to 8 atm with a 6-mm waist (Figure 1). Through a 7F long sheath (Check-Flo Performer Introducer, Mullins Design; Cook Medical), a 7-mm×2-cm CB (Peripheral Cutting Balloon; Boston Scientific) was advanced to the LLPA. The CB was inflated per manufacturer instructions by 1 atm every 5 seconds to 7 atm, the waist resolved, and it was deflated by 1 atm every 5 seconds until completely deflated (Figure 2). CB removal into the long sheath was met with some resistance. The CB and sheath were advanced distally to straighten both, with subsequent removal into the LLPA. On inspection of the CB once out of the sheath, 1 atherotome was missing (Figure 3). With alteration of the fluoroscopy settings (FD20; Philips Medical Systems) for improved visualization, the atherotome was visible in the distal LLPA. A 5-mm snare easily retrieved the atherotome into the long sheath in the LLPA (Figure 4). The online-only Data Supplement video shows the retrieval of dislodged atherotome into the long sheath. Postintervention angiograms confirmed a

Figure 1. Balloon angioplasty to 8 atm with 6-mm residual waist.

Figure 2. Cutting balloon inflated to 8 atm with no residual waist.
confined therapeutic tear in the stenotic LLPA segment. The patent ductus arteriosus was coil occluded. The patient was discharged home without additional complications. She underwent orthotopic liver transplantation and has remained asymptomatic from a cardiovascular standpoint.

Discussion

Peripheral CBs are approved for treatment of arteriovenous dialysis fistulae. The increased balloon rigidity provided by the longitudinal atherotomes (microblades) provides a substrate for difficulty in delivery and removal of the balloon. A case of a CB atherotome fracture in an adult coronary artery has been reported, but to our knowledge, atherotome fracture or dislodgement has never been reported in the pediatric cardiology literature. Review of PA angioplasty procedures over almost 2 years in a multiinstitutional interventional registry revealed no reported malfunctions of the CB. In a pediatric randomized study comparing CB to high-pressure balloons, a CB was trapped on a stent with difficult removal in 2 cases, and delivery of a CB out of the sheath was difficult in 1 case, but no atherotome fracture or dislodgement was reported. There is one case in the Food and Drug Administration adverse outcomes registry of fracture and dislodgement of a Flextome CB (Boston Scientific) atherotome during angioplasty of a PA that could not be retrieved. The small, thin blade may not have been visible because the dislodged atherotome in the present case was only visualized with modern fluoroscopic equipment. Arguably, the microblade would not have caused long-term sequelae, but it was retrieved without incident.

Atherotome dislodgement in this patient occurred following removal of the deflated balloon into the sheath, despite taking the recommended precautions of using an appropriately sized sheath and slow inflation and deflation. It is possible that the initial attempt at removal at the proximal left PA associated with a curve may have caused an atherotome edge to lift from the balloon, which then sheared off despite subsequently obtaining linear balloon and sheath position. However, initial resistance with removal of a CB is not unusual because refolding of the CB is imperfect and was quite mild with an experienced operator familiar with CB use in PAs. The atherotome was not bent as visualized by fluoroscopy before retrieval.

Conclusions

This case demonstrates atherotome dislodgement from a peripheral CB during branch PA angioplasty with successful retrieval. CB removal into the sheath is the likely cause of the dislodgement, and even when all recommended precautions are taken, examination of the CB following removal is imperative.

Disclosures

None.

References


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Figure 3. Cutting balloon following removal. Note that only 3 atherotomes are present. Arrow denotes location of missing atherotome.

Figure 4. Retrieved atherotome. Deformation of the tip is associated with withdrawal into the sheath.
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Video 1: Retrieval of dislodged atherotome into the 7 French long sheath.