

Successful dilation of a novel expandable polytetrafluoroethylene pulmonary artery band negating need for further surgery



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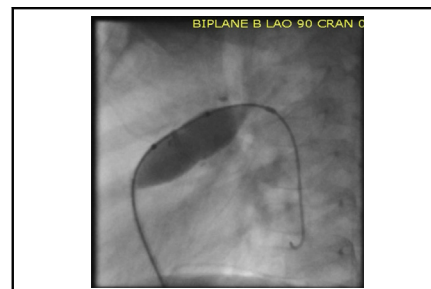
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Successful interventional dilation of a main PA band negating need for further operation.

Pulmonary artery banding (PAB) is a useful adjunct for surgeons palliating several congenital cardiac conditions such as multiple muscular ventricular septal defects (VSDs), VSD in the setting of congenital lesions being approached via a left thoracotomy, and other more complex congenital conditions. Whereas initial sizing technique has been explored by several groups, there comes a time that the PAB must be removed surgically even in the absence of requirements for additional procedures (eg, closure of a muscular VSD that was the original indication for PAB application). We present the use of a novel expanded polytetrafluoroethylene (ePTFE) graft (exGraft; PECA Labs) as the material for main PAB creation; this material is dilatable up to 250% to 300% of its original size without affecting physiologic microstructure; this allowed for the dilation of the main PAB and prevention of further surgery in a patient with coarctation of the aorta repaired via left thoracotomy and PAB placement for a VSD that subsequently closed.¹

CLINICAL SUMMARY

Ethics

Informed consent was obtained from the patient’s legal guardian for utilization of de-identified information for this report; institutional review board approval was not required.

Case Description

A female term infant born at an outside hospital was found to have a bicuspid aortic valve, patent ductus arteriosus (PDA), and a moderate-sized mid-muscular VSD that was 7 to 8 mm in size on screening transthoracic echocardiography (TTE). Follow-up imaging on day of life 2 demonstrated a closed PDA but was significant for development of

CENTRAL MESSAGE

Use of a novel dilatable ePTFE main PA band for VSD palliation during a left thoracotomy coarctation repair allowed for successful dilation upon follow-up and negated need for subsequent surgery.

severe juxtaductal coarctation requiring prostaglandin initiation and persistent VSD.

The patient underwent left thoracotomy on day of life 6 with primary repair of the coarctation with end-to-side anastomosis, PDA ligation, and PAB placement. The PAB was fashioned utilizing a 3-mm wide segment of cut ex-Graft ePTFE conduit initially sized based on Trusler’s rule (23.7 mm diameter) (Figure 1). After PAB placement and securing with serial clips to obtain oxygen saturations in the mid-90% range with a fraction of inspired oxygen of 40%, the patient recovered without complication and was discharged on postoperative day 3.

The patient was followed with serial TTE imaging, and near-complete resolution of the VSD (<1 mm by TTE) was observed by 14 months. Peak and mean gradients across the PAB were 92 mm Hg and 62 mm Hg, respectively, and she was referred for cardiac catheterization. Cardiac catheterization confirmed right ventricular pressure to

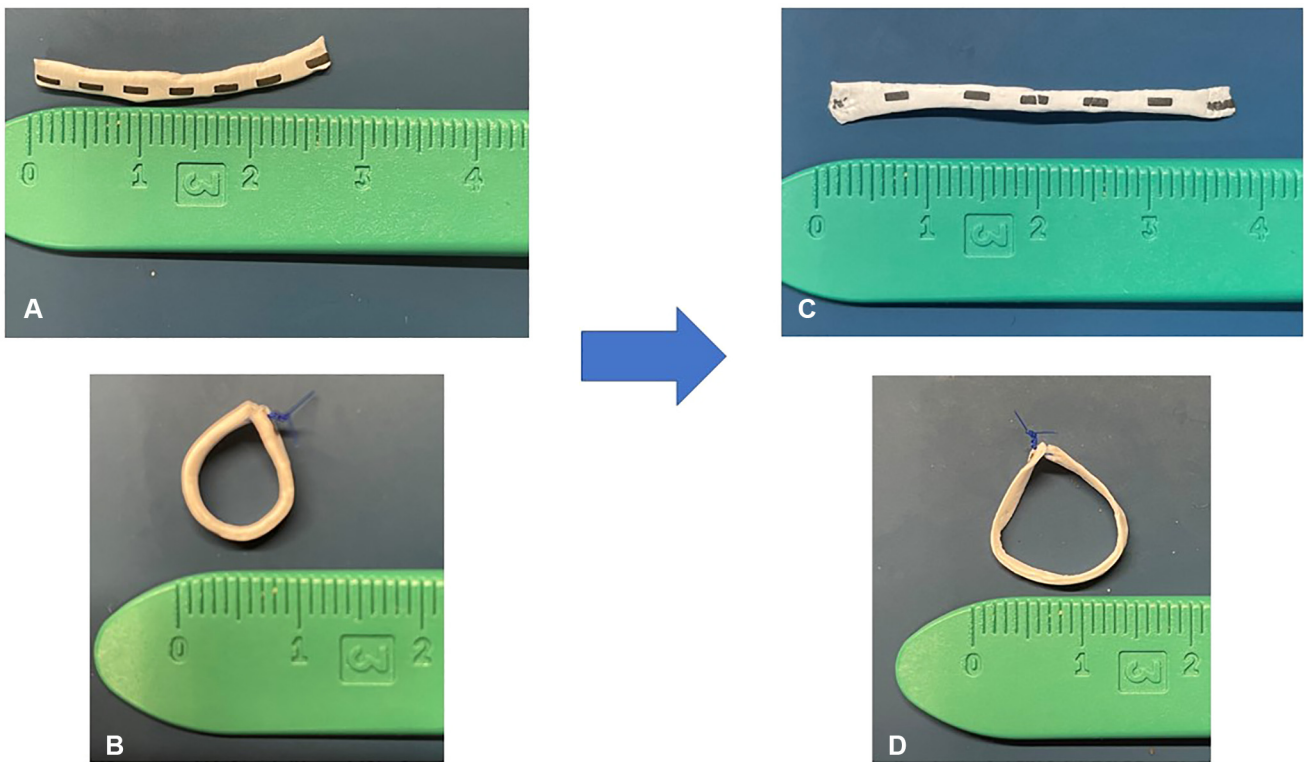


FIGURE 1. A pulmonary artery (PA) band was fashioned utilizing a ring cut from a 16-mm exGraft expandable polytetrafluoroethylene conduit to a circumferential length of 27 mm (A) and sutured into the PA band configuration (B) with an approximate diameter of 8 mm. The PA band was dilated and achieved a circumference of 38 mm (C) and approximate diameter of 13 mm (D).

be 93 mm Hg (suprasystemic) with a direct 80 mm Hg gradient across the PAB; QP:QS was 1:1 with only trivial residual anterior muscular VSD by angiography. A 12-mm \times 2-cm expandable balloon catheter was positioned across the PAB and dilated to twice to nominal pressure with good angiographic expansion of the PAB; of note, a small therapeutic tear in the pulmonary endothelium was noted with a contained pocket of contrast (Figure 2, A-E). Post-dilation peak and mean residual gradients across the PA band were 19 mm Hg and 12 mm Hg, demonstrating successful dilation of the PAB without change in QP:QS.

DISCUSSION

Study Implications

The exGraft ePTFE conduit is manufactured without an outer wrap and with single-layered construction; it can be dilated up to 300% of its original diameter while maintaining physiologic range microstructural properties.¹ The exGraft conduit has successfully been used in patients undergoing congenital heart surgery requiring right ventricle-to-PA conduit implantation and has a demonstrated ability to undergo successful clinical dilation in the cardiac catheterization laboratory.² Our report expands

on the possible uses of this novel dilatable conduit, suggesting the conduit material can be applied as a PAB with plans for later dilation when the PAB is no longer indicated. This eliminates the need for further surgery. This also could have therapeutic implications in bilateral PAB for hybrid palliation, ventricular training for corrected transposition of the great vessels, and transplantation strategies.

Catheter-directed relief of a PAB has been reported on a limited basis with other PAB materials.³ However, residual gradients were higher in those studies. PA pseudoaneurysm formation has been reported in instances of attempted catheter debanding with other nondilatable materials; indeed, a therapeutic contained tear was encountered in our patient as well.⁴ There is still much to learn about longer-term outcomes of catheter PAB relief no matter the material, and the use of exGraft material deserves further consideration in this regard.

CONCLUSIONS

We report the successful use and dilation of exGraft ePTFE conduit as a main PAB in a patient. The use eliminated the need for a surgical debanding procedure. Further investigation on materials and techniques for PAB

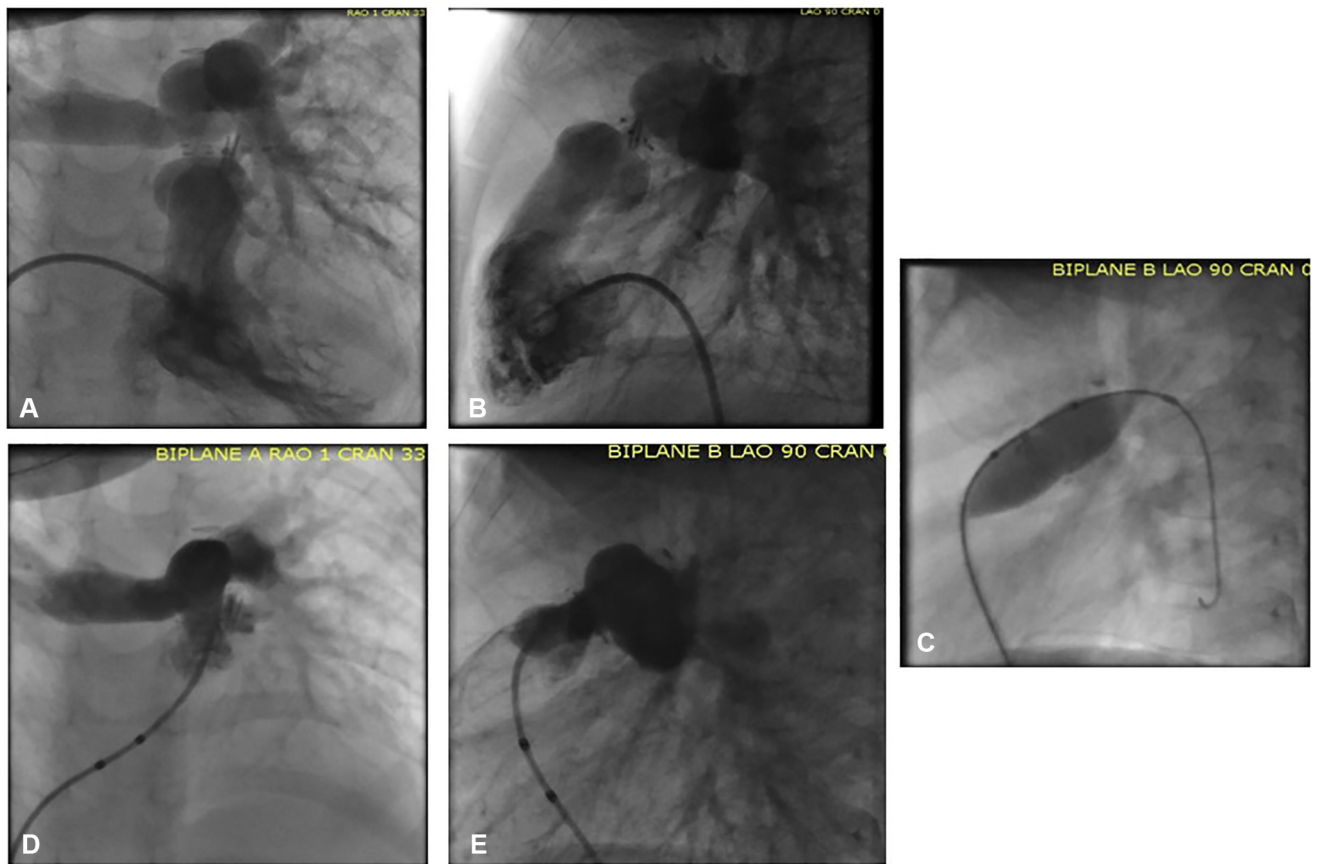


FIGURE 2. Anterior-posterior (A) and lateral (B) views of the main pulmonary artery (MPA) band before intervention. Following balloon dilation (C) of the MPA band, anterior-posterior (D) and lateral (E) views demonstrate successful dilation of the MPA band.

construction and subsequent debanding in the catheterization laboratory is warranted to optimize a PAB strategy.

Conflict of Interest Statement

Dr Coyan is a shareholder and officer of Neolife Inc and Respair Inc. Dr Maeda is a consultant for PECA Labs Inc. All other authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

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