Repair of late aortic arch pseudoaneurysm following implantation of a novel bare metal aortic dissection stent

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The Ascyrus Medical Dissection Stent (AMDS; Artivion) is a novel hybrid prosthesis used to facilitate simplified extended arch repairs in patients with acute type A aortic dissection (ATAAD). It aims to improve malperfusion and promote positive remodeling of the residual dissected aorta. Little is known about late complications and how to treat them. We present the case of a distal aortic arch pseudoaneurysm 5 years post-AMDS implantation and discuss management and therapeutic challenges.

CLINICAL SUMMARY

A 48-year-old man presented with ATAAD with cerebral, mesenteric, and lower-limb malperfusion and underwent an emergency aortic root, ascending aorta, and hemiarch repair along with an AMDS bare metal stent deployed to the arch and descending aorta. Echocardiography demonstrated an intact aortic valve repair with trace aortic insufficiency. Computed tomography scans before discharge and at 3 months were unremarkable. At 8 months follow-up, a small saccular pseudoaneurysm in the distal aortic arch was found, which initially remained stable in size but steadily grew and measured 3.4 cm at 5 years (Figure 1, A, B, D). This complication within the AMDS posed unique challenges (1) Removal of the stent would be difficult because of the aortic tissue ingrowth; (2) cutting the AMDS may risk unwinding of the entire stent and late stent migration; and (3) sealing the aorta with an endovascular solution may be difficult because of AMDS recoil. We elected for a redo sternotomy with ascending aorta replacement using a hybrid arch frozen elephant trunk (FET) reconstruction with a Thoraflex prothesis (Terumo Aortic) with a separate head vessel reconstruction to exclude the pseudoaneurysm neck from within the AMDS. This was planned as a 2-stage approach, with the patient first undergoing a left carotid subclavian artery transposition.

At operation, the right common carotid artery was used for arterial inflow through an 8-mm Dacron side-graft. Under fluoroscopy and transesophageal echocardiography guidance, a pigtail catheter was used to wire the AMDS from the right femoral artery (Figure 1, C, and Video 1). After the redo sternotomy, the innominate and left carotid arteries were isolated, and the aortic root was skeletonized. Cardiopulmonary bypass was initiated via carotid and central aortic perfusion with cooling to 28°C. The carotid and innominate arteries were transected and anastomosed to a trifurcated head vessel graft. The crosstalk was applied, and the AMDS within the FET was cut to facilitate distal anastomosis. This was accomplished without complications.

CENTRAL MESSAGE

Reintervention options on the distal aorta after bare metal stent implantation for ATAAD remain undefined. We describe using a FET within the AMDS stent to treat a late distal arch pseudoaneurysm.
and del Nido cardioplegia was administered. Circulatory arrest was initiated with bilateral antegrade cerebral perfusion at 2 L/min. The aortic arch was transected proximal to the AMDS (Figure 2, A, and Video 1), and an Amplatz extra-stiff wire was advanced through the catheter. The AMDS was rigidly fixed into the distal aorta, and there was significant tissue ingrowth. Sutures were placed radially around the AMDS cuff at zone 0 to anchor an Anteflow Thoraflex 28 × 30 × 150-mm hybrid FET graft (Terumo Aortic), sized to a landing zone of 28 to 29 mm, that was deployed into the descending aorta beyond the origin of the pseudoaneurysm. We routinely use a 2-layer suture technique for the arch anastomosis to optimize hemostasis. The head vessel graft was anastomosed to the Thoraflex, which was subsequently attached to the previous ascending aortic graft. A sheath and guidewire were placed antegrade through the Thoraflex perfusion limb, and the FET was balloononed using a Reliant balloon to ensure full expansion of the FET to successfully exclude the pseudoaneurysm and to prevent AMDS recoil. Intraoperative transesophageal echocardiography and fluoroscopy (Figure 2, C) demonstrated a well-deployed FET with no signs of endoleak. The patient had an uncomplicated postoperative course and remained well at 6 months. Computed tomography demonstrated an intact hybrid arch FET reconstruction with complete exclusion and thrombosis of the aortic arch pseudoaneurysm (Figure 2, D).

COMMENT
The PERSEVERE trial is an ongoing US Investigational Device Exemption trial to evaluate the safety, performance, and feasibility of the AMDS in ATAAD. The 3-year results of the Dissected Aorta Repair Through Stent Implantation trial1 in Canada reported a successful AMDS implantation in 46 patients, with 6 patients requiring disease-related reintervention (13%), with 1 distal aortic growth treated with thoracic endovascular repair. However, no aortic arch reintervention was performed. Although rare, in cases that

require aortic reintervention in a segment covered by the AMDS, there is great concern about the feasibility of its removal, given the potential bare stent ingrowth into the aortic wall. Thus, explanting it risks tearing the aortic wall or septum, potentially resulting in new entry tears or catastrophic rupture. The presented case also could have been addressed by excising the entire AMDS and reconstructing the compromised segment by thoracotomy or clam-shell incision, but would likely be associated with significant morbidity. An aortic arch debranching followed by retrograde endovascular stent grafting could have been another less-invasive option. However, because this was the first time we had encountered this complication, we wanted to leave all options available and thought that a redo sternotomy allowed as much flexibility as possible. The described approach simplified the repair by leaving the AMDS in place, achieving single-stage head vessel debranching and pseudoaneurysm exclusion, and eliminating the risk of type IA endoleak.

Given its recent introduction, close monitoring of patients post-AMDS implantation remains necessary to identify and understand possible late complications (Video 2). Their management should be carefully planned and performed by experienced, multidisciplinary teams.

Conflict of Interest Statement
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Reference

**FIGURE 2.** A, Intraoperative image demonstrating AMDS stent within the proximal aortic arch. B, Intraoperative image demonstrating the Thoraflex implanted within the AMDS. C, Intraoperative fluoroscopy demonstrating well-seated FET. D, Postoperative computed tomography 3-dimensional reconstruction demonstrating intact hybrid arch and FET reconstruction with complete exclusion and thrombosis of the pseudoaneurysm in the aortic arch.

**VIDEO 2.** Preoperative computed tomography images of initial ATAAD 5 years ago, pre-AMDS implantation. Video available at: https://www.jtcvs.org/article/S2666-2507(24)00064-6/fulltext.