REPAIR OF LATE AORTIC ARCH PSEUDOANEURYSM FOLLOWING IMPLANTATION OF A NOVEL BARE METAL AORTIC DISSECTION STENT

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CENTRAL MESSAGE

Re-intervention options on the distal aorta after bare metal stent implantation for ATAAD remains undefined. We describe using a FET within the AMDS stent to treat a late distal arch pseudoaneurysm.

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CENTRAL IMAGE

(A) Distal aortic arch pseudoaneurysm (*) 5 years post AMDS implantation and (B) repair.

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GLOSSARY:

Acute Type A Aortic Dissection (ATAAD)
Ascyrus Medical Dissection Stent (AMDS)
Computed Tomography (CT)
Frozen elephant trunk (FET)
Transesophageal echocardiography (TEE)
The Dissected Aorta Repair Through Stent Implantation trial (DARTS trial)
INTRODUCTION

The Ascyrus Medical Dissection Stent (AMDS; Artivion, Kennesaw, GA) 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 five years post-AMDS implantation and discuss management and therapeutic challenges.

CLINICAL SUMMARY

A 48-year-old male 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 (CT) 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 five years (Fig. 1a, b, d). This complication within the AMDS posed unique challenges: 1) removal of the stent would be difficult due to aortic tissue ingrowth, 2) cutting the AMDS may risk unwinding of the entire stent and risk late stent migration, and 3) sealing the aorta with an endovascular solution may be difficult due to AMDS recoil. We elected for a redo-sternotomy with ascending aorta replacement utilizing a hybrid arch frozen elephant trunk (FET) reconstruction via a Thoraflex with a separate head vessel reconstruction, to exclude the pseudoaneurysm neck from within the AMDS. This was planned as a two-stage approach, with the patient first undergoing a left carotid
subclavian artery transposition. Written informed consent for publication was obtained from the patient; IRB approval was not required.

At operation, the right common carotid artery was used for arterial inflow through an 8 mm dacron side-graft. Under fluoroscopy and transesophageal echocardiography (TEE) guidance, a pigtail catheter was utilized to wire the AMDS from the right femoral artery (*Fig. 1c, video*). Following the redo-sternotomy, the innominate and left carotid arteries were isolated, and the aortic root skeletonized. Cardiopulmonary bypass (CPB) 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 cross clamp was applied 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 (*Fig. 2a, video*), 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 28x30x150mm hybrid FET graft (Terumo Aortic, Inchinnan, Scotland), sized to a landing zone of 28-29 mm, which was deployed into the descending aorta beyond the origin of the pseudoaneurysm. We routinely employ 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 guide wire were placed antegrade through the Thoraflex perfusion limb, and the FET was ballooned utilizing a Reliant balloon to ensure full expansion of the FET to successfully exclude the pseudoaneurysm and to prevent AMDS recoil. Intraoperative TEE and fluoroscopy (*Fig. 2c*) demonstrated a well deployed FET with no signs of endoleak. The
patient had an uncomplicated postoperative course and remained well at 6-months. CT demonstrated an intact hybrid arch FET reconstruction with complete exclusion and thrombosis of the aortic arch pseudoaneurysm (Fig. 2d).

**COMMENT**

The PERSEVERE trial is an ongoing US IDE trial to evaluate the safety, performance, and feasibility of the AMDS in ATAAD. The 3-year’s results of the DARTS trial\(^1\) in Canada reported a successful AMDS implantation in 46 patients, with six patients requiring disease-related reintervention (13%), with one 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 could also have been addressed by excising the AMDS and reconstructing the compromised segment, by thoracotomy or clam-shell incision and the associated morbidity. An aortic arch debranching followed by retrograde endovascular stent grafting could have been another, less invasive option. However, as this was the first time we had encountered this complication, we wanted to leave all options available and felt 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 remain necessary to identify and understand possible late complications. Their management should be carefully planned and performed by experienced, multidisciplinary teams.
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None.
REFERENCES

FIGURE LEGENDS:

Figure 1
(A) and (B) Preoperative Computed Tomography (CT) scan demonstrating appropriate aortic remodelling post AMDS implantation with pseudoaneurysm originating from distal aortic arch (*) (C) Preoperative fluoroscopy demonstrating well seated AMDS with incomplete AMDS expansion in the arch (D) Preoperative CT scan 3D reconstruction demonstrating pseudoaneurysm originating from distal aortic arch (*)

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 frozen elephant trunk (FET) (D) Postoperative Computed Tomography 3D reconstruction demonstrating intact hybrid arch and FET reconstruction with complete exclusion and thrombosis of the pseudoaneurysm in the aortic arch

Video:
Case presentation of a patient undergoing pseudoaneurysm repair post AMDS implantation utilizing a Thoraflex.

Supplemental Video:
Preoperative CT images of initial ATAAD 5 years ago, pre AMDS implantation.