

Concomitant distal bare-metal stenting for residual true lumen stenosis in a frozen elephant trunk technique for acute type A aortic dissection



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Concomitant bare-metal stenting in an FET technique for acute type A aortic dissection.

CENTRAL MESSAGE

Distal extension to a frozen elephant trunk with a bare-metal stent in a 1-stage manner for acute type A aortic dissection may contribute to better aortic remodeling and avoid distal reintervention.

▶ Video clip is available online.

For acute type A aortic dissection (TAAD), we have performed aortic arch repair using a frozen elephant trunk (FET) since 2014¹ and observed that aortic remodeling was limited at the level below the FET stent end postoperatively.² For acute type B aortic dissection (TBAD), the PETTICOAT (provisional extension to induce complete attachment) technique has been an option to reopen the residual true lumen (TL) collapse after thoracic endovascular aortic repair (TEVAR).³ Similarly, proximal stent grafting with distal bare-metal stenting in a 2-staged manner has been reported in repair of acute DeBakey type I aortic dissection.⁴ Herein, we report a case of total arch repair using an FET with a concomitant distal bare-metal stent (BMS) in a 1-staged manner for reopening the residual TL stenosis and eliminating the false lumen (FL) in acute TAAD (Figure 1).

CASE REPORT

A 52-year-old man presented with a sudden migratory pain from the precordial to the epigastric region (Video 1). Computed tomography (CT) scan showed TAAD with a primary entry in the ascending aorta and a major reentry in the right iliac artery. He had no history of connective tissue disease or related surgical treatments. He underwent total-arch

repair based on the “zone 0 arch repair strategy” (surgical procedure: see our previous article¹). An FET graft (stent part, 150 mm in length and 29 mm in diameter; J Graft FROZENIX, Japan Lifeline Co, Ltd) was deployed from the distal aortic end (zone 0) toward the descending aorta, which was followed by ascending aortic replacement with the arch vessels reconstructed using a 4-branched woven polyester arch graft (J Graft SHIELD; Japan Lifeline Co, Ltd). The distal end of the FET was positioned at the eighth thoracic vertebral level after the deployment. When central repair and cardiopulmonary bypass were completed, TL stenosis with FL expansion was still observed distal to the FET using intravascular ultrasonography (Figure 2, A). A 36-mm × 164-mm Cook Zenith Dissection Endovascular Stent (William Cook Europe ApS) was deployed retrogradely into the FET graft (Figure 2, B), overlapping 2 stent bodies with the FET graft. Postoperative 3-dimensional CT finding showed satisfactory aortic remodeling throughout the thoracic aorta (Figure 2, C). Sagittal CT views in the

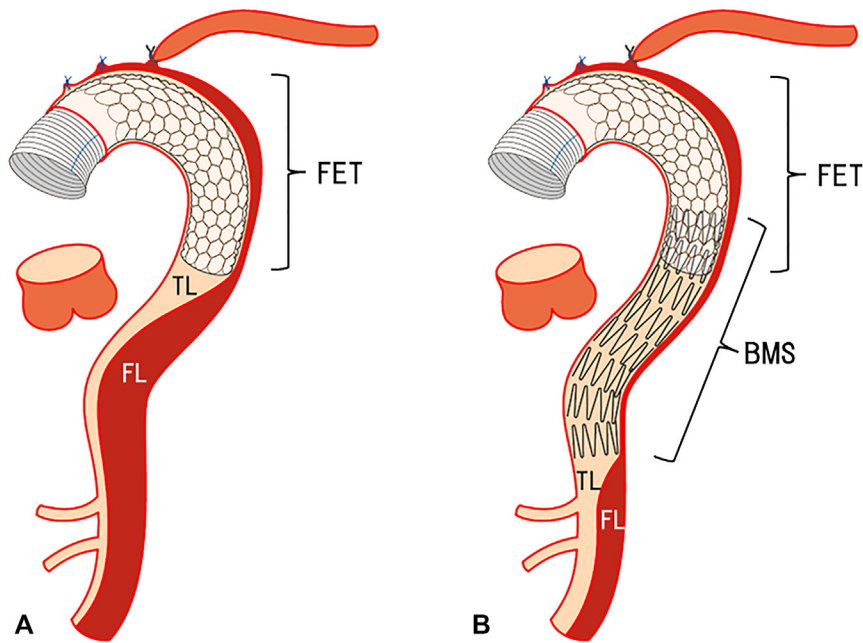


FIGURE 1. A schematic diagram showing the difference between frozen elephant trunk alone (A) and frozen elephant trunk with a bare-metal stent (B). FET, Frozen elephant trunk; TL, true lumen; FL, false lumen; BMS, bare-metal stent.

BMS deployment range revealed patent FL before surgery (Figure 3, A) and FL elimination 8 days and 6 months after surgery (Figure 3, B and C, respectively). The postoperative course was uneventful, without spinal cord injury, any residual distal organ malperfusion, or reinterventions after discharge. Informed consent needed for publication was obtained from the patient (institutional review board approval: 2802, January 25, 2022).

DISCUSSION

The FET technique for acute TAAD is believed to promote aortic remodeling in the downstream aorta and reduce the risk of reintervention. However, in our previous study, FL thrombosis and aortic remodeling distal to the FET end were insufficient even after total arch repair using an FET for acute TAAD.² This is likely to be associated with the postoperative aortic pathology, which is similar to that of post-TEVAR TBADs (remaining reentry tears with no entry tears) but totally different from that of medically treated TBADs (mostly accompanied by both entry and reentry tears). Moreover, we observed postoperative progression of the TL stenosis in a patient using an FET technique, resulting from an upward shift of the flap (steeper angle to the aortic long axis) and the subsequent distal stent-induced new entry (ie, flap perforation) caused by a mechanical stress at the distal stent edge.⁵ We speculate that this is associated with a remodeling mismatch between the stented and nonstented aortas.

In the present case, the BMS was not placed in the abdominal aorta, since the number of reentry tears has been reported to be substantially greater in the abdominal aorta than in the lower thoracic aorta.⁶ We consider that BMSs should not be placed in the aortic segment with reentry tears, because insufficient occlusion of the communication between the true and false lumens poses a risk of persistent FL perfusion. In a clinical trial investigating the endovascular treatment for patients with acute TBAD who underwent a combined deployment of proximal covered and distal uncovered stents, the dissecting abdominal aorta has been reported to dilate in

Adult: Aorta: Case Reports

Aortic remodeling mismatch: A potential risk factor of late distal stent graft induced new entry after frozen elephant trunk deployment Check for updates

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CENTRAL MESSAGE
Aortic remodeling mismatch between the stent-covered and nonstent-covered aorta may be a

VIDEO 1. Case presentation. Previously, we experienced a development of residual true lumen stenosis and subsequent late distal stent graft-induced new entry in a patient who had undergone aortic arch surgery using an FET technique for acute type A aortic dissection. Distal extension with a bare-metal stent aimed to induce true lumen recovery and false lumen elimination may undergo a sufficient remodeling of the downstream aorta. In this paper, we report a case of concomitant distal bare-metal stenting for residual true lumen stenosis during surgery using an FET technique for acute type A aortic dissection. Video available at: [https://www.jtcvs.org/article/S2666-2507\(22\)00448-5/fulltext](https://www.jtcvs.org/article/S2666-2507(22)00448-5/fulltext).

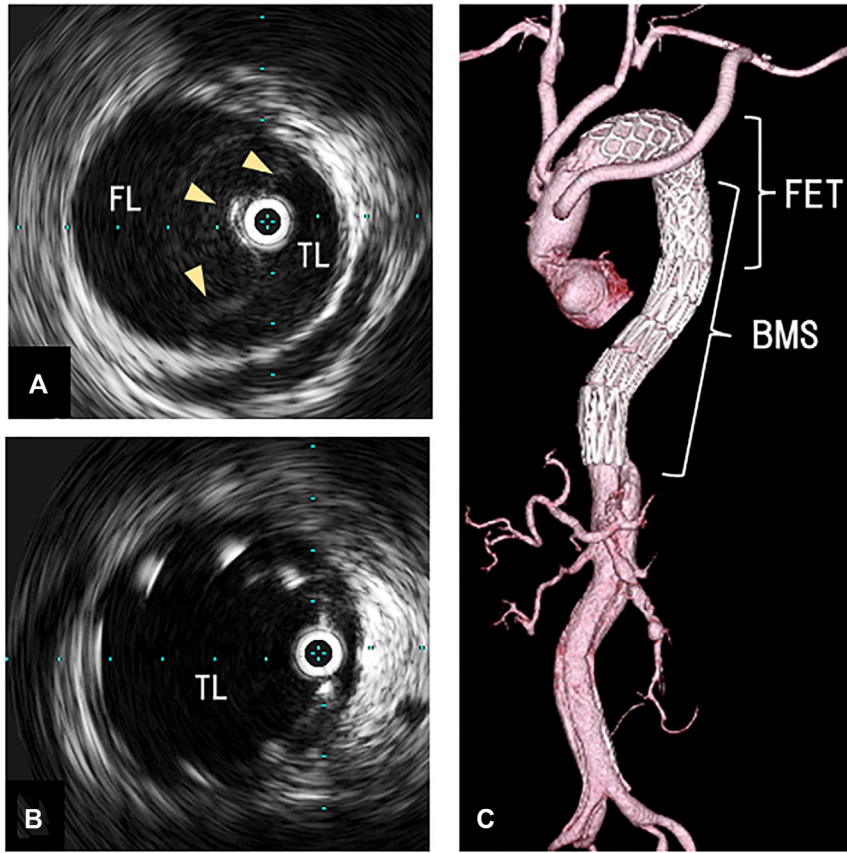


FIGURE 2. Intravascular ultrasonography images of the descending thoracic aorta distal to the frozen elephant trunk before and after bare-metal stent deployment (A and B, respectively). A flap (yellow arrowheads) is seen between the true and false lumens. Three-dimensional computed tomography image 8 days after frozen elephant trunk deployment with a BMS is shown (C). *FL*, False lumen; *TL*, true lumen; *FET*, frozen elephant trunk; *BMS*, bare-metal stent.

the uncovered-stent region of the abdominal aorta.⁷ In relation to this observation, an additional covered stent to the conventional PETTICOAT technique, separately deployed

in the infrarenal abdominal aorta and bilateral iliac arteries to occlude the distal tears, has been reported to achieve satisfactory aortic remodeling.⁸



FIGURE 3. Sagittal computed tomography images before surgery (A), 8 days (B), and 6 months (C) after a frozen elephant trunk deployment with a bare-metal stent. The deployment range of bare-metal stent is indicated by 2 red arrowheads. *TL*, True lumen; *FL*, false lumen.

Spinal cord ischemia is another serious sequela when a longer stent graft or FET is deployed. Distal extension with a BMS instead of a covered stent may preserve spinal cord perfusion after deployment, which has an advantage of preventing spinal cord ischemia under inevitable sacrifice of the collateral spinal cord circulation from the lumbar or pelvic arteries at the time of thoracoabdominal or abdominal aortic reinterventions.

We think that the distal BMS extension should be performed if TL stenosis or excessive flap movement is observed at the level below the FET stent end by intravascular ultrasonography, which may contribute to a sufficient aortic remodeling and freedom from reintervention in the downstream aorta. Further studies with a long-term follow-up period are required.

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