



Frozen elephant trunk with T-NEXT

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Keywords: Frozen elephant trunk (FET); arch surgery; re-intervention



Submitted Jan 25, 2025. Accepted for publication Jun 02, 2025. Published online Jul 10, 2025.

doi: 10.21037/acs-2025-eket-0017

View this article at: <https://dx.doi.org/10.21037/acs-2025-eket-0017>

Clinical vignette

The patient was a 75-year-old female with an extensive thoraco-abdominal aortic aneurysm (59 mm) extending from the ascending aorta to the infrarenal abdominal aorta, along with severe aortic valve regurgitation. A three-staged hybrid approach was scheduled, including aortic valve replacement and frozen elephant trunk (FET) with the new T-NEXT graft (Terumo Aortic, Vascutek Ltd., Inchinnan, UK), followed by branched endovascular repair (BEVAR) of the thoracoabdominal aortic aneurysm and subsequent endovascular repair (EVAR) of the infrarenal aorta.

Surgical technique

T-NEXT graft

The T-NEXT graft is a customized Thoraflex graft, featuring a modified arrangement of the aortic arch branches, specifically designed to facilitate both proximal and distal interventions after FET. Unlike the traditional proximal-to-distal configuration of the neck vessels, the T-NEXT graft has a new distal and transverse alignment of the branches. Each branch is positioned at a 90° angle to the main body of the graft (1). To ensure precise orientation, the graft has been recently implemented with a black line marker, aligned with the branch designated for the innominate artery, facilitating accurate prosthesis placement.

First stage: FET with T-NEXT graft

Following a median sternotomy, the innominate artery and right atrium were cannulated to establish cardiopulmonary bypass. During the cooling phase, the left subclavian artery was proximally ligated and distally anastomosed to an 8-mm graft, which was independently perfused to enable antegrade selective cerebral perfusion (ASCP). The ascending aorta was clamped, and cardioplegic arrest was induced. The left common carotid artery was ligated at its origin and perfused distally for ASCP. At a nasopharyngeal temperature of 26 °C, the innominate artery was clamped proximally, and the ascending aorta and aortic arch were excised. A 28-30-150 mm T-NEXT graft was deployed in zone 2, and the distal anastomosis was completed. Cardiopulmonary bypass was reestablished through the graft's side branch, and rewarming was started. The aortic valve was replaced with a tissue valve, and the proximal anastomosis between the graft and the aortic root was finalized. After removal of the aortic clamp, the reconstruction of the arch vessels was carried out in the standard fashion. The operation was then completed as usual.

Second and third stage: BEVAR and EVAR

Secondary BEVAR was performed 5 weeks later. The right axillary artery (RAA) and right iliac artery were exposed. Through the RAA, a 400-cm hydrophilic guide wire was smoothly advanced into the thoracic aortic aneurysm. A

34-34-200 mm Valiant Captivia (Medtronic, Minneapolis, MN, USA) endoprosthesis was deployed in overlap to the FET. Due to a small aortic diameter at the level of the renal artery takeoffs, the inner-branched 38-26-21 mm E-nside^{VR} endograft (Jotec GmbH^{VR}, Hechingen, Germany) was partially deployed until opening the branches intended to the left renal artery. The preloaded guide wire was snared through the RAA, and a through-and-through was established. The left renal artery was catheterized and connected to the graft branch using a covered stent (6 mm × 59 mm VBX, Gore, Flagstaff, AZ, USA). The graft was then deployed completely, and the coeliac trunk, the superior mesenteric, and the right renal arteries were catheterized and stented with 9 mm × 59 mm, 8 mm × 59 mm, and 6 mm × 59 mm VBX, respectively.

Three months later, EVAR of the residual infrarenal aneurysm was completed with a bifurcated graft (Endurant II, Medtronic).

Discussion

Conventional FET grafts were designed to restore the typical anatomy of the aortic arch, with the distal anastomosis placed in zone 3 and the arch branches arranged sequentially from proximal to distal (2). However, there has been a shift in clinical practice, with many aortic surgeons now opting for a more proximal distal anastomosis (zones 0, 1, or 2). This results in the arch vessel branches being positioned more proximally in the ascending aorta, which can obstruct access to the aortic root during reoperative surgery. Additionally, this configuration may complicate future EVAR due to the acute and double angulation between the arch vessels and the main body of the graft, making cannulation of the visceral vessels from an upper body access increasingly challenging. The T-NEXT design modifies the conventional Thoraflex graft by altering the configuration of the arch vessel branches, creating a more accessible proximal graft segment. This adjustment ensures that no other prosthetic structures obstruct the ascending aorta, facilitating distal aortic clamping during future surgeries and reducing the risks associated with sternal reopening. Furthermore, it preserves a clear, bidirectional path for catheter access between upper and lower body arteries. This feature is particularly important when secondary distal visceral vessel stenting during BEVAR is required, as well as for diagnostic and interventional procedures on the cerebral circulation via the femoral arteries. The T-NEXT graft enables seamless wire

and catheter exchange across the aortic arch, supporting both antegrade (top-down) and retrograde (down-top) catheter-based procedures.

Conclusions

The T-NEXT graft may offer substantial advantages in patients with thoracic and thoracoabdominal aortic diseases. Its modified design enhances accessibility for both proximal and distal interventions, facilitating reoperative surgery and future EVARs. Further studies are needed to assess its long-term benefits and potential limitations.

Acknowledgments

None.

Footnote

Funding: None.

Conflicts of Interest: The authors have no conflicts of interest to declare.

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Cite this article as: Berretta P, Galeazzi M, Malvindi PG, Vento V, Gatta E, Di Eusanio M. Frozen elephant trunk with T-NEXT. *Ann Cardiothorac Surg* 2025;14(4):314-315. doi: 10.21037/acs-2025-eket-0017