The fenestrated frozen elephant trunk technique: A not-all-comers strategy

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Central Message

Despite arch entry tears and although supra-aortic trunk involvement limits its application, the total fenestrated frozen elephant trunk might represent a viable surgical option in patients with ATAAD.

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Total arch replacement for acute type A aortic dissection (ATAAD) is often a technically demanding operation burdened by high rates of postoperative complications.¹ The branched frozen elephant trunk (FET) technique is a standardized approach that allows extensive treatment of the thoracic aorta in case of ATAAD, reducing surgery times and reoperation rates.¹⁻³ However, the treatment of supra-aortic trunk remains an open issue, despite the fact that new-generation hybrid prostheses have simplified the surgical techniques.

Okamura and colleagues⁴ report their successful experience with a modified technique of FET for total arch and descending aorta treatment in a patient with ATAAD using a fenestrated hybrid prosthesis without the need to reimplant the supra-aortic trunks.⁴ Specifically, the authors created 2 handmade fenestrations on the stent and graft portion of the FET that corresponded to the origin of the supra-aortic trunks, creating a sort of free-flow prosthesis. The proposed technique appears to be a good treatment option because it avoids reimplantation of supra-aortic vessels and it can reduce surgery time and deep hypothermic arrest time. However, they discourage the use of this technique in the presence of proximal arch entry tear to avoid proximal endoleak.

Some considerations should be made because the risk of endoleak cannot be completely excluded. The creation of manual fenestrations in both stented and graft portions of a prosthesis might lead to a mismatch between the supra-aortic trunk ostia and the prosthesis' fenestrations, resulting in IIb type endoleak formation.⁵ Moreover, fenestration of the stent hampers its sealing function.⁶ The presence of endoleak may lead to false aortic lumen reperfusion through the entry tear and its subsequent enlargement.

Although the approach presented by the authors may seem less technically demanding, the creation and the sizing of the fenestrations in the prosthesis can hide pitfalls that are potentially harmful to neck vessel perfusion. In addition, it might be very difficult to find the perfect correspondence between the supra-aortic trunk ostia and

the fenestrations. In case of small holes, supra-aortic trunk perfusion could be impaired, whereas large fenestrations can lead to endoleak formation.⁵⁻⁷ Moreover, unfavorable angulation between fenestrations and side vessel ostia may lead to cerebral hypoperfusion.⁷

This modified FET technique seems to be promising for the treatment of ATAAD because it gives a simple alternative to supra-aortic vessels reconstruction without the strict necessity of selective cerebral perfusion. However, the presence of bovine trunk has definitively facilitated this approach and we do not know if it is technically feasible in presence of normal anatomy of supraortic trunk vessels. The fenestrated FET technique is useful only in selected cases, after careful evaluation of the dissection characteristics, to avoid complications such as endoleak and cerebral malperfusion. Aortic arch replacement with supra-aortic vessels reimplantation still represents the safest approach in the presence of proximal arch entry or re-entry tear and/or dissection of neck vessels.

References

1. Poon SS, Theologou T, Harrington D, Kuduvalli M, Oo A, Field M. Hemiarch versus total aortic arch replacement in acute type A dissection: a systematic review and meta-analysis. *Ann Cardiothorac Surg*. 2016;5:156-73.
2. Di Bartolomeo R, Murana G, Di Marco L, Pantaleo A, Alfonsi J, Leone A, et al. Frozen versus conventional elephant trunk technique: application in clinical practice. *Eur J Cardiothorac Surg*. 2017;51:20-8.
3. Miceli A, Murzi M, Lio A, Farneti PA, Etz CD, Glauber M. Hybrid approach in acute aortic dissection. In: Edizione E, ed. *Innovative for the aortic arch replacement*. Torino, Italy: Minerva Medica; 2016.

4. Okamura H, Arakawa M, Takeuchi T, Adachi H. Total fenestrated frozen elephant trunk technique for aortic repair of acute type A aortic dissection. *J Thorac Cardiovasc Surg.* 2019;157:e71-3.
5. Haulon S, Sobocinski J, Spear R, Kratzberg J, Roeder B, Azzaoui R. Total endovascular repair of the aortic arch. *Endovasc Today.* 2014;11:67-73.
6. Pacini D, Murana G, Di Marco L. Frozen elephant trunk technique: ready to get back to the future? *J Thorac Cardiovasc Surg.* 2018;156:e79-80.
7. Schlösser FJV, Mojibian HR, Dardik A, Verhagen HJM, Muhs BE. Pitfalls and complications of fenestrated and branched endografts. *Endovasc Today.* 2008;2: 57-61.