Treatment Algorithm And Results For Ascending And Aortic Arch Pathologies In Patients Who Cannot Tolerate Open Surgery

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INTRODUCTION

- TEVAR has emerged as the first-line therapy over the years for most distal arch and descending aortic pathologies.
- For ascending and proximal arch pathologies, open surgery remains the gold standard, which is associated with longer operative time, lengthened hospitalization, and more complications.
- For patients who cannot tolerate open arch reconstruction, there is no established treatment algorithm.
- We present a retrospective review of 33 consecutive patients with these types of pathologies treated in various ways and compared their outcomes.

METHODS

- We performed a total of 12 TEVAR landing in zone 0:
  - 5 Gore Thoracic Branched Endografts (TBE) preceded by open left carotid and or left subclavian re-vascularization
  - 4 with Laser Fenestrations(LF) of all three 3 arch vessels
  - 2 with LF of 2 arch vessels
  - 1 Gore CTAG was placed in zone 0 and did not require arch re-vascularization.
- For arch pathology requiring landing in zone 2, we performed TBE in 14 patients and TEVAR with 1- vessel LF in 7.
- All techniques were retrospectively reviewed for technical success defined by successful exclusion of the pathology, along with in-hospital and 30-day mortality.
- Length of stay and incidence of major adverse events such as MI, respiratory failure, bowel ischemia, stroke, renal failure, and paralysis were examined in comparison to historic controls.
- Patients were followed for partial or complete false lumen thrombosis, increase in aortic size and freedom from intervention.

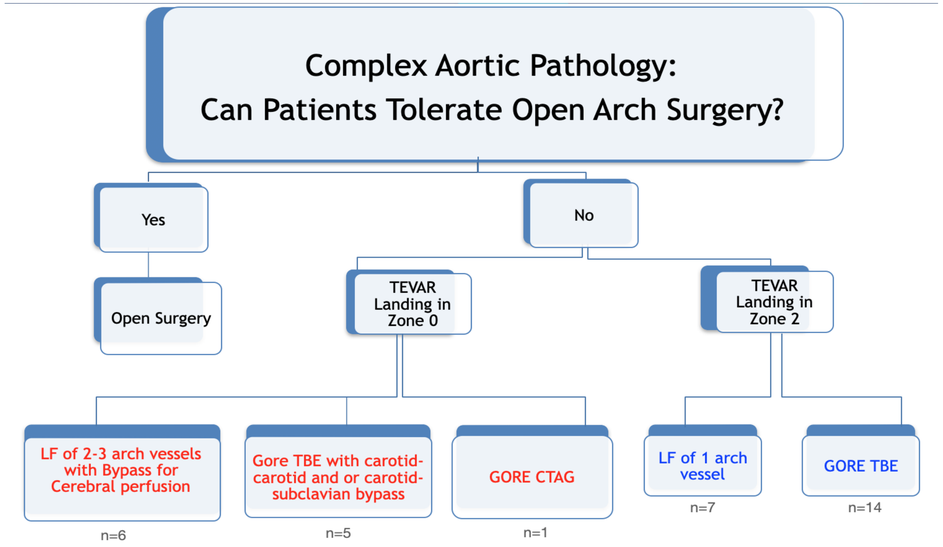

FIGURE 1 - Treatment Algorithm for Complex Aortic Pathology
For patients who cannot tolerate open arch reconstruction, treatment plans are based on anatomic consideration, graft landing zone, along with ability to undergo open arch vessel debranching procedures.
Abbreviation: LSA (left subclavian artery); LF (laser fenestration); TBE (thoracic branch endoprosthesis), CTAG (Conformable thoracic stent graft)

RESULTS

- Technical success for all techniques was 100% with successful revascularization of branch vessels with no Type 1, 2, or 3 endoleak detected on completion angiogram.
- All except one of patients treated with TBE in Zone 2 were discharged on postoperative day 1.
- There was one stroke and one death for TEVAR with LF group.
- Among the five patients treated with zone 0 TBE, one had severe dysphagia resulting in aspiration and requiring a percutaneous gastrostomy tube; one had mild dysphagia; the remaining three had neck swelling without dysphagia.
- Early postoperative imaging surveillance (<1 year) showed excellent aneurysm or dissection exclusion, along with 100% patency of the side branches.

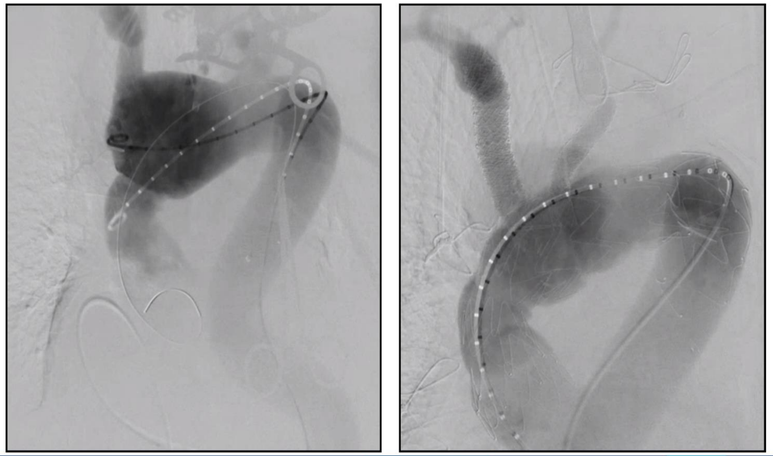

FIGURE 2A - TEVAR with Laser Fenestration of Arch Vessels
Pre-intervention aortogram (left) demonstrating large aortic arch aneurysm. Post-intervention aortogram (right) shows complete exclusion of aneurysm with patent flow via innominate and L carotid artery with no endoleak.

FIGURE 2B - GORE TBE Following Debranching Procedure
Pre-intervention aortogram (left) demonstrating an enlarging aortic arch aneurysm. A staged procedure with debranching via right carotid to left carotid and left subclavian bypasses followed by GORE TBE. Post-intervention aortogram (right) shows brisk flow in the ascending aorta and arch vessels via prior bypass.

CONCLUSION

- Following our treatment algorithm (Figure 1), we showed favorable results using TBE plus preoperative revascularization or LF for successful treatment of complex proximal aortic diseases.
- While these early results are promising, no one technique is perfect for all situations and longer term data is required.

REFERENCES

- Czerny M, Weigang E, Sodeck G, et al. Targeting landing zone 0 by total arch rerouting and TEVAR: midterm results of a transcontinental registry. *Ann Thorac Surg*. 2012;94(1):84-89.
- Dake MD, Bavaria JE, Singh MJ, et al. Management of arch aneurysms with a single-branch thoracic endograft in zone 0. *JTCVS Tech*. 2021;7:1-6.
- Fernández-Alonso L, Fernández Alonso S, Martínez Aguilar E, et al. Fenestrated and Scalloped Endovascular Grafts in Zone 0 and Zone 1 for Aortic Arch Disease. *Ann Vasc Surg*. 2020;69:360-365.
- Kudo T, Kuratani T, Sawa Y, Miyagawa S. Effectiveness and Minimal-Invasiveness of Zone 0 Landing Thoracic Endovascular Aortic Repair Using Branched Endograft. *J Clin Med*. 2022;11(23):6981.
- Kudo T, Kuratani T, Shirakawa Y, et al. Effectiveness of Proximal Landing Zones 0, 1, and 2 Hybrid Thoracic Endovascular Aortic Repair: A Single Centre 12 Year Experience. *Eur J Vasc Endovasc Surg*.
- Mizuno T, Hachimaru T, Fujiwara T, et al. One-Stage Hybrid Total Aortic Arch and Descending Thoracic Aortic Repair is a Safe and Secure Procedure With Less Postoperative Complications for Extended Aortic Arch Aneurysms. *J Endovasc Ther*. 2022;29(2):204-214.