Surgical strategies for zone 2/3 pathologies of the thoracic aorta: Resolve or prepare?

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Surgical strategies to address pathologies of the distal aortic arch and proximal descending aorta (ie, zones 2 and 3) should be made on an individual basis. Concomitant cardiac pathologies, the extent of aortic involvement, and presence of comorbidities should be taken into account when deciding on the optimal choice between 1 of 4 approaches: median sternotomy, lateral thoracotomy, clamshell incision, or hybrid procedure with thoracic endovascular aortic repair (TEVAR).

In this issue of the *Journal*, Joo and colleagues¹ report a single-center experience of 229 patients with zone 2/3 aneurysms. Surgery was performed via sternotomy in 98 patients, via thoracotomy in 84, and as a hybrid approach with TEVAR in 47 patients. In-hospital mortality and stroke rate were significantly lower in patients operated via sternotomy. With the exception of vocal cord palsy, the hybrid approach was not associated with better clinical outcomes compared with the other 2 more invasive procedures. In addition, patients operated via sternotomy showed better long-term survival. The authors concluded that the sternotomy approach is the superior option for patients with zone 2/3 aneurysms.

Aortic pathologies of zone 2/3 are most often associated with additional pathologies of the heart and/or aorta. The incidence of multiple aortic segmental involvement is high, depending on the etiology and location of the “culprit” lesion.² It is therefore important to determine whether an operation can resolve the pathology, or whether the surgeon needs to prepare for a second stage procedure.

Conventional surgery via sternotomy involves the conventional elephant trunk (CET) procedure—first introduced by Hans Borst in 1983³—and its more recent modification, the frozen elephant trunk (FET).⁴ The latter can be used for definitive treatment of zone 2/3 pathologies or for the preparation for subsequent TEVAR treatment, if the distal aorta shows residual pathologies or is at increased risk for subsequent interventions.⁵ The CET procedure always requires a second step for definitive cure, either by conventional surgical repair via thoracotomy or with TEVAR completion. However, TEVAR insertion into a FET graft is technically more straightforward than into a CET graft.

Hybrid management of zone 2/3 aneurysm with aortic arch debranching.

Central Message

The surgical treatment of zone 2/3 aneurysms should be individualized. The (frozen) elephant trunk is an excellent technique to resolve patient pathology or prepare for a second-stage procedure.

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For isolated pathologies of zone 2/3, the FET technique is our preferred approach. Although we initially observed increased rates of paraplegia with the FET procedure,⁶ several precautions have since been implemented to decrease the risk of this catastrophic event.⁷ For those patients with extensive aortic pathologies, especially young patients, we advocate conventional second-stage surgery via a thoracotomy or thoracoabdominal approach. As demonstrated in the analysis by Joo and colleagues,¹ the rate of reintervention in such patients is quite high after TEVAR completion. In select zone 2/3 patients with severe comorbidities, a hybrid approach may be a good alternative. As current stent grafts are not designed for the curved aortic arch, however, the risks of iatrogenic aortic dissection and endoleaks are considerable.⁸ The development of branched aortic arch grafts may lead to improved outcomes compared with hybrid approaches, but substantially more data are required.

The paper by Joo and colleagues¹ demonstrates that an individualized approach to treat zone 2/3 pathologies can lead to very good clinical outcomes. The CET and, particularly, FET techniques offer an excellent option to either resolve the pathology or to prepare the patient for a second-stage procedure. Hybrid procedures should be reserved for those patients who are not surgical candidates, at least until improvements in stent technology have been achieved.

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