Breaking dogma: Fire, brimstone, and aortic arch surgery

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There are many existing dogmas in aortic arch surgery, with most beliefs being held with strong internal conviction. A central dogma concerning aortic arch surgery states that no matter how well optimized the cerebral protection strategy is, total duration of hypothermic circulatory arrest beyond 30 minutes most significantly affects neurovascular outcomes in patients undergoing aortic arch surgery.¹ This immutable reality has changed little since 1975 when Dr Griep and colleagues² described their technique of aortic arch surgery being performed with hypothermic circulatory arrest. Admittedly, every aortic surgeon strives to achieve the shortest hypothermic circulatory arrest times, which also translates into shorter cardiopulmonary bypass and operative times. In this issue of the *Journal*, Chen and colleagues³ report their experience with a novel self-adaptive, triple-branched graft technology that safely decreases the duration of hypothermic circulatory arrest in patients undergoing aortic arch surgery for acute type A aortic dissection and that technically facilitates surgical management of the great vessels.

A significant challenge of the triple-branched technique for open arch repair is proper alignment of the great vessels with the graft branches because of significant variability in the distances between each of the orifices of the great vessels.⁴ Chen and colleagues³ describe their experience with a stented graft that allows for better conformability and alignment with the great vessels because of the addition of a nitinol frame to both the arch component of the graft and each of the 3 branches. The mean cardiopulmonary bypass time was 169.37 ± 27.17 minutes (range, 118-240 minutes), aortic crossclamp time was 60.48 ± 16.72 minutes (range, 30-91 minutes), and selective cerebral perfusion and lower body arrest time was 28.95 ± 7.23 minutes (range, 12-41 minutes).

This study represents a significant step forward in aortic arch repair for type A aortic dissections. The unique self-

adaptive, triple-branched stent-graft design helps bridge the gap between total endovascular repair and conventional open arch repair. The major limitations of the total endovascular arch repair are inability to gain a proximal seal because of the dissected aorta and variability in the vessel diameters and spacing of the great vessels. This device overcomes

these limitations. First, by using a standard surgical graft repair of the ascending aorta, a suitable proximal landing zone is surgically created that eliminates antegrade flow into the false lumen and allows for secure fixation of the stent-graft. All surviving patients had total thrombosis of the false lumen in the arch and proximal descending thoracic aorta at 3 months postprocedure. In addition, the self-adaptive design of the nitinol stent and fabric allows for manual alignment of the branches. Rapid deployment of the branched stent-graft into all 3 great vessels decreases cerebral ischemia time and facilitates safer management of the left subclavian revascularization. As a result, the arch repair is quicker than open surgical repair and more effective than total endovascular repair.

Another hotly contested dogma in aortic arch surgery for type A aortic dissections is whether an elephant trunk procedure (frozen or conventional) is beneficial in patients in whom the dissection continues into the descending thoracic aorta. The self-adaptive, triple-branched graft design includes a 10-cm extension that is placed into the true lumen of the descending thoracic aorta at the time of the open arch placement of the stent. No additional imaging is needed because the stent is placed into the descending thoracic aorta under direct vision. In this study, there were no incidences of paraplegia as a result of the stent-graft not extending below the Th8 level associated with the frozen elephant trunk component. Long-term follow-up on these patients will be needed to evaluate whether 10 cm of stent-graft into the proximal descending thoracic aorta is enough length to prevent aneurysmal degeneration of the false lumen.

This new technology is the optimal convergence of open and endovascular techniques and stent-graft design for aortic arch repair in type A aortic dissections. By allowing direct, manual placement of a self-adaptive technology during open arch exposure, many of the limitations of total endovascular repair of the aortic arch are overcome. The next big question is, will there be a parallel stent-graft design advance on the total endovascular side to compete with this revolutionary self-adaptive stent?

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