How to predict aortic events after acute type A dissection repair: a matter of 'core' architecture

Editorial comment

How to predict aortic events after acute type A dissection repair: a matter of "core" architecture

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Ancient pagodas are architectural landmarks in many oriental countries. They usually consist in polygonal structures made of stone or wood built with sophisticated symmetries (both reflectional and rotational) due to the oriental cultural background [1]. As the height of the slice increases, the estimated radius will change rapidly so that the slice of the roof, eaves, and main bodies (multiple floors) can be identified.

The aorta can be imagined like a pagoda, both characterized by being long structures constructed over three multifunctioning layers that have the function to protect its integrity over decades.

Although these two fascinating creations present some architectural similarities, there is one big difference among them. The pagoda's secret is a core pillar that runs from the ground to the ceiling which is able to increase the pagoda's strength and protect it from collapse. Hence, an acute aortic dissection is able to alter the aortic architecture more than an earthquake is capable of damaging a Pagoda because the aortic "core" is missing.

For certain, distal aortic remodelling after dissection depends on multiple anatomic elements (including number and location of entries, aortic diameters, patency of FL, etc.) where the possibility to resect the primary entry tear represents the first fundamental step towards a positive remodeling of the downstream aorta [2,3].

In a very interesting study of Sang yoon Kim et al. from Seoul [4], they try to answer an ambitious question: can preoperative computed tomographic (CT) features predict residual false lumen remodelling after tear-oriented limited resection for acute type I aortic dissection. With this aim, the authors evaluate 101 patients who underwent ascending aorta with and without proximal partial arch replacement, analyzing preoperative and postoperative late CT scans. Preoperative CT parameters at the level of distal anastomosis were compared between patients who presented late positive remodeling of proximal portion of descending thoracic aorta and those who did not.

The main results of the study demonstrated that a positive remodelling of proximal descending thoracic aorta was observed in almost half of the patients and it was strongly correlated with small FL area ratio (<50%), with narrow FL width (<20%) at the distal anastomotic zone, and with not leaving residual arch branches having patent FL [4]. Based on these results, the authors concluded with the statement that a favorable remodelling can be expected in patients with limited cross-sectional extent of dissection after tear-oriented

limited resection and some elderly and non-Marfan patients can be spared from the aggressive total arch replacement with FET.

These very interesting findings raised two major reflections:

- The presence of residual entry in the downstream aorta usually influences blood fluid dynamic and patency of the false lumen affecting on distal aortic event-free survival [5]. The study did not investigate the impact of distal re-entry tears, neither the anastomotic technique for handling the distal anastomotic stump which is an important determinant for new anastomotic entry tear.
  On the other hand, the authors respected the important principle of resecting every tear found in the operative field and focused the attention on cross-sectional extent in the preoperative CT image in the proximal descending thoracic aorta, which may affect the chance of creation of a new tear at the anastomosis site.
- Initial limited aortic resection is associated with an unsatisfactory long-term prognosis as demonstrated by a 70% occurrence of late distal aortic complications, including aneurysmal degeneration, rupture, malperfusion, and the need for extensive secondary interventions [6]. The possibility to predict distal aortic remodelling after total arch replacement (Zone II or III anastomosis) with a classical or a frozen elephant trunk (FET) was not considered because the authors wanted to focus just on the remodelling features following less extensive procedures. However, the FET become a widely adopted procedure supported by strong evidences reporting up to 85% positive remodelling in the proximal descending thoracic aorta [7]. Certainly, total arch replacement could have obscured the significance of other relevant preoperative factors but it still remains a crucial issue that would deserve further analyses.

In summary, we might argue that the only certain way to reduce later reinterventions is to resect or cover the primary entry tear in the arch at the time of first intervention. However, the study from the group of Seoul enhances the utility of computed tomographic features in predicting postoperative changes of the remaining descending thoracic aorta. In the same direction a future mission, similar to the “core pillar” of pagodas, should be to gain engineeristic capabilities regarding the use of geometric models and artificial intelligence systems to anticipate catastrophic events.

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