

Open thoracoabdominal aortic aneurysm repair in expert hands: “all roads lead to Rome”

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“Aortic aneurysmal disease is multifocal and needs total aortic screening for diagnosis; best results are obtained by complete replacement of all disease”, this is the most important message delivered by Dr. Crawford in the presidential address, titled “Aortic Aneurysm: A Multifocal Disease”, during the annual International Society for Cardiovascular Surgery Conference in 1982 (1). Despite more than thirty years has elapsed this concept is still actual. Recently Corvera *et al.* (2) from the Indiana University in the US brought us to the past with the interesting manuscript published on the *Journal of Thoracic and Cardiovascular Surgery* (*JTCVS*), entitled: “Open repair of chronic thoracic and thoracoabdominal aortic dissection using deep hypothermia and circulatory arrest”.

Since 1975, hypothermic cardiopulmonary bypass (CPB) with intervals of circulatory arrest was depicted to be a safe and effective method for protecting the central nervous system during complex cardiac surgery (3). However, to address the complication of paraplegia during TAAA repair, many spinal cord protective strategies have been devised during the last decades. Examples are passive shunts, profound hypothermic circulatory arrest, distal aortic perfusion with left heart bypass, total CPB with intervals of hypothermic circulatory arrest and spinal cord cooling (4-6). Finally, the largest experienced centers (7-9) converged for the use of the left heart bypass with moderate hypothermia to be the better way to preserve the spinal cord from ischemic injuries during this surgery.

In this nice study recently reported on the *JTCVS* (2) the Authors encounter 664 TAAA open repair, in a time of span of 10 years since 1995. Of these, a subset of 196 patients with chronic thoracoabdominal aortic dissection (CTAAD) was investigated. Men comprised 74% of the cohort, mean age of patients was 58±14 years and prior thoracic aortic repair occurred in 57% of patients (2). Main feature of their surgical treatment was the use of circulatory arrest under deep hypothermia (15 °C of nasopharyngeal temperature achieved on CPB) during the aortic reconstruction. All the procedures were supported with multiple adjuncts as motor-evoked and somatosensory-evoked potentials recording, perfusion catheters for epiaortic or visceral vessels, monitoring of transcranial oxygen and placement of cerebrospinal fluid drains (2).

The authors achieved excellent early outcomes; overall operative mortality was 3.6%, permanent paraplegia 2.6%, acute renal failure 5.1%, hemodialysis 4.1% and tracheostomy 2.6% (2).

Should be amended that variability in the early results was observed according to the extension of the repair. Patients that required a partial or total arch replacement together with the descending thoracic aorta experienced almost zero complications instead those who replaced more extensively the aorta (extend type II and III) reached up to 10% of spinal cord injuries and acute renal failure.

The results confirmed to be persistently valid also at follow-up where 1-, 5-, and 10-year survivals were 93%,

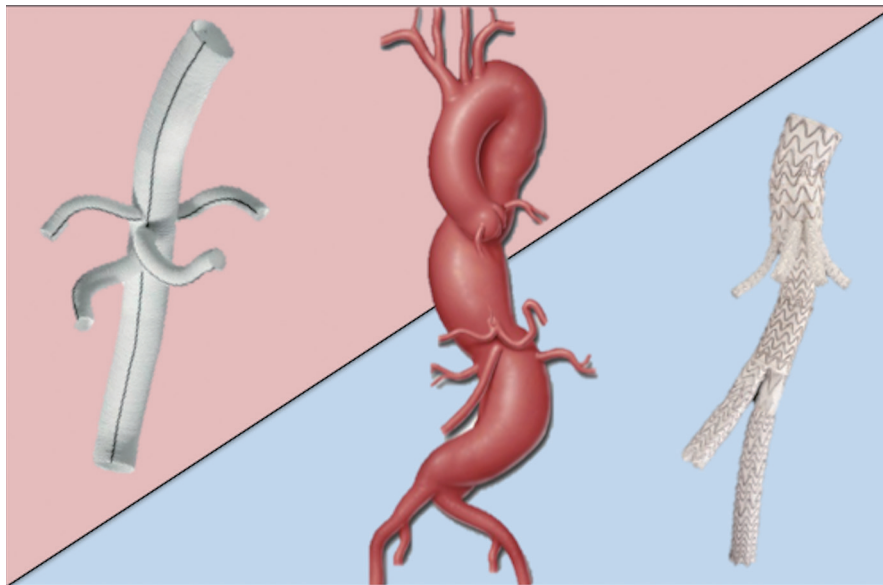


Figure 1 Treatment options for thoracoabdominal aneurysm repair. Open repair *vs.* endovascular exclusion.

79%, and 57%, respectively (2).

In conclusion, they claimed that the advantages of a full CPB using deep hypothermia include organ protection (spinal cord and kidneys), the ability to extend the repair proximally into the arch as needed, and reduce the ischemia to important vascular beds.

In contraposition to the technique proposed by the authors, other relevant series have achieved similar or even better results using mild to moderate hypothermia. For example, Coselli *et al.* (7) with the largest experience on open TAAA repair (more than 3,000 patients) ever published before continue to support the safe use of left heart bypass with mild permissive hypothermia (32–34 °C, nasopharyngeal) showing as hypothermic circulatory arrest is a predictive of operative death, adverse event, and permanent renal failure (10). Focusing on CTAAD, Estrera *et al.* (11) used mild hypothermia on left heart bypass and achieved excellent early results; the 30-day mortality was 8.6% and immediate neurologic deficit occurred in 0.9% of the extent resection. From the Netherlands (12), has been also reported that under mild hypothermia post-dissection aneurysms achieves better results, either in the early and long-term survival compared with degenerative atherosclerotic chronic aneurysms. In particular, the hazard of dying when the etiology was a degenerative atherosclerotic aneurysm was 1.66 times higher compared with dissection.

Beyond surgical repair, in the last years we assisted to an

increasing use of “less” invasive endovascular procedures for the treatment of thoracic and thoracoabdominal aortic disease (*Figure 1*). Initially the new stent graft technology has been used in older and high-risk patients but slowly it continued to spread achieving comparable results to surgery for the treatment of more healthy patients. So, nowadays the initial sentence proposed by Dr. Crawford is probably only partially applicable and the next question would be the following: is the complete replacement or the endovascular coverage of the thoracoabdominal aorta the next gold standard?

A recent systematic review of the literature (13) compared the result of open surgical repair, standard thoracic endovascular aortic repair (TEVAR) or branched and fenestrate TEVAR (B/FEVAR) for CTAAD. This paper underlined the importance of a new concept: “TUTE: time until treatment equipoise”. Which, has been described in an attempt to better advise patients of the relative risks of different management modalities (14). It is defined as the duration of time that elapses after an intervention, before the risk of the intervention is canceled out and reversed by the cumulative risk of conservative management (14). After a TUTE analysis for open repair, TEVAR and B/FEVAR, the study found favorable results for endovascular treatment, especially considering the lower operative risk compared to open repair, associated with a relevant percentage of positive outcomes, despite higher rates of reintervention compared to surgery (14).

Of course, the study is based on a retrospective analysis and perhaps it still necessary to carry out prospective and randomized studies to demonstrate the superiority of either technique for CTAAD.

According to the Oxford Dictionary meaning for “challenge” (15), which seems the most appropriate and used match for TAAA repair, “A call to someone to participate in a competitive situation or fight to decide who is superior in terms of ability or strength”. The challenge on the treatment of extensive aortic aneurysm repair just began and a definitive solution between less invasive and conventional “mild to deep cold” open procedures is yet to be defined.

In summary, with the current available evidences, probably two are the keys to success on this hazardous surgical procedure. The first is the feasible preoperative conditions of the patients’ candidate. Not everyone can afford a thoraco-phreno-laparotomy access and a transient multiple organs ischemia required for extensive aortic repair. The second point is the referring center; once again the manuscript testimonies as good results are still coming only from specialized center on this field of surgery. The possibility to choose among different options of treatment (surgical and/or endovascular) and adjuncts (for visceral and cerebral monitoring) along with the experience of the center surely makes the differences on outcomes.

To conclude, a common point to all the previous reported prestigious studies could be summarize in the conclusion of Corvera and coworkers (2) as “open repair continues to be the gold standard in patients who are suitable candidates for surgery” especially for young candidate, patients with connective tissue disorders and chronic aortic dissection aneurysms. Needs also to be enhanced that excellent results are usually achieved in experienced center no matter what type of adjuncts are adopted to repair the TAAA.

This concept is probably the crucial point coming out from the manuscript of the *JTCVS*. Like the ancient Latin proverb said “Omnes viae Roman ducunt” if experience join perseverance and care for the patient a good final result is achieved no matter how is chased as “all roads lead to Rome”.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest

to declare.

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