

Hybrid procedures for complex thoracoabdominal aortic aneurysms in high-risk patients

Procedimentos híbridos para aneurismas complexos da aorta toracoabdominal em pacientes de alto risco

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Although surgical repair of thoracic (TAA) and thoracoabdominal aortic aneurysms (TAAA) is an effective therapeutic option with excellent long-term results, with a number needed to treat of two,¹ it is also a potentially problematic procedure, owing to both technical difficulties of aortic reconstruction and organ stress suffered in patients who are often elderly and afflicted by multiple comorbidities.² As a result, morbidity and mortality rates are still rather high, especially in patients with high risk for conventional surgical repair.

Total endovascular aneurysm repair by branched stent graft technology is proposed by few authors as an experimental approach to very sick patients, nevertheless, the availability of this technology is currently limited to a handful of institutions that are conducting investigational studies.³ Also, the safety, effectiveness, and durability of these pioneering techniques are yet to be fully assessed.

Hybrid approach to TAAA repair consists of open surgical extra-anatomical bypasses providing a suitable proximal and/or distal landing zone and simultaneous or staged thoracic endovascular exclusion of the aneurysm, being less invasive than open surgery in the treatment of complex aortic pathology.⁴⁻¹¹

By avoiding thoracotomy, a hybrid TAAA repair is particularly advantageous in the case of previous descending thoracic aortic repair in which a redo left-sided thoracotomy may be associated with major bleeding, increased rate of postoperative respiratory and organ failure, longer

distal aortic perfusion time, longer total aortic clamping time, longer operation time, and reduced long-term survival.^{7,12-14}

Furthermore, in the case of frozen chest, a hybrid TAAA repair may be the only treatment alternative to large pulmonary iatrogenic injuries or simple observation.¹⁵

Hybrid repair may also have some advantages over conventional open TAAA repair in cases of previous ascending aortic or arch repair, in which pericardial or proximal aortic adhesions may increase the technical challenges and risk of major bleeding at the site of inflow cannulation if a left heart bypass from the left atrium, pulmonary vein or distal aortic arch is required.⁷

It is interesting that existing thoracic or abdominal tube grafts in hybrid TAAA repairs offer optimal graft landing zones for endografts and ideal inflow sites for visceral bypasses. In our published series of 13 TAAA hybrid repairs, 14 endograft ends out of 26 (53.8%) landed in pre-existing or novel tube grafts, and the absence of endoleak and endograft migration may also be the result of the high incidence of these kinds of ideal aortic necks.⁷

The one-stage strategy had several advantages, one of which was related to the problem of endograft access site. An iliac or aortic approach was required in 9 out of 13 cases, and after the retrograde visceral reconstruction, the one-stage procedure made the femoral artery, iliac axis or infrarenal aorta promptly available for endograft insertion. The hybrid approach also gave us the option to place a wire around the aortic landing zone as a radiologic marker and

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No conflicts of interest declared concerning the publication of this editorial.

also enabled direct visualization of the vascularization of abdominal organs during deployment of the endograft.⁷ A two-stage technique is effective in reducing paraplegia^{6,7} and reducing invasiveness.

The long-term results of hybrid repair are another matter of concern. The safety and durability of retrograde bypass grafting in hybrid repair still needs to be assessed; however, based on patency records for retrograde visceral artery bypasses performed for mesenteric ischemia, the results seem to be encouraging.¹⁶ Given the necessary extra-anatomic routing of visceral retrograde grafts, the risk of aortoenteric erosion or fistula and the fate of thoracoabdominal endografts will also need to be closely monitored.⁷

The largest clinical series of hybrid TAA repair, presented by Jenkins at the 2007 annual meeting of the European Society for Vascular Surgery, comes from a collaborative group (London, Heidelberg, Munich) and is not yet published. It comprises 89 patients, with a 30-day survival rate of 87%, 8% of paraplegia, 6% of graft occlusion, 3% of long-term dialysis and 2% of gut infarction.

Based on a mortality rate of 30% in patients undergoing conventional open repair of TAAA, some authors encourage the use of hybrid TAAA repair in preference to conventional surgery.

In our published series,⁷ we had three perioperative deaths resulting in a high (23%) early rate of mortality; however, only one of these deaths was probably related to a complication of the hybrid technique: a pancreatitis likely caused by the retropancreatic routing of the graft directed to the hepatic artery. The other two deaths (respiratory failure and coagulopathy) were due to typical complications of major surgeries. In these aspects, we did not note a protective effect of the hybrid treatment as less invasive than conventional TAAA repair. In our current experience,¹⁷ out of 31 hybrid procedures, we achieved technical success in 100% of the cases, and perioperative mortality of 19.4% due to the already mentioned cases. Complications were reported in 35.5%: three cases of renal failure (9.6%), one case of respiratory failure (3.2%), two transient paraparesis (6.4%) and one paraplegia (3.2%), three cases of pancreatitis (9.6%). Late results: mortality related to the procedure was due to one case of visceral graft thrombosis (3.2%), and non-related mortality was due to one case of myocardial infarction. Complications that were lately pre-

sented were: visceral graft occlusion rate (6.8%), one case of endoleak (3.2%), one case of migration (3.2%), one case of acute pancreatitis (3.2%), and one case of dysphagia and regurgitation (3.2%), suggesting the development of a secondary achalasia.¹⁸

Visceral aortic patch dilatation or aneurysm after TAAA conventional repair is not uncommon, it may lead to aortic rupture, and is particularly frequent in patients with connective tissue disorders, dissecting aneurysm, or prior thoracic or AAA repair.¹⁹ All of the patients included in the study had undergone prior aortic surgery, and the incidence of dilatation of visceral aortic patch in the conventionally treated group was high (3 cases, 10.3%). Successful hybrid TAAA treatment should eliminate this complication and could be considered an appealing alternative treatment for patients exhibiting a tendency to have multiple aneurysmal degeneration.⁷

Morbidity and mortality of hybrid TAAA repair is not negligible, and we did not conclude that outcomes were significantly better when compared to open TAAA repair in similar groups of high-risk patients. Open TAAA repair remains our first choice of management, and we believe that hybrid repair remains indicated only for selected patients.⁷

Hybrid treatment is appealing in high-risk patients, with pulmonary or cardiac comorbidities, or those who have undergone prior aortic surgery, especially with recurrent TAAA. However, larger series are required for meaningful statistical comparisons, and longer follow-ups are necessary to provide data on the durability of aortic stent-grafts and visceral artery reconstructions.⁷

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