Perspective

Frozen elephant trunk in acute type I dissection—a personal view

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Introduction

The frozen elephant trunk technique (FET) has become an established surgical strategy to treat ascending, arch and descending aortic pathologies through median sternotomy. Over time, the indications elaborated for its application included acute and chronic dissections, as well as complex aneurysmal disease (1). There is no doubt that this surgical approach represents major surgery, particularly as it necessitates prolonged perfusion and ischemic times as well as extensive experience in arch surgery.

Acute type I dissection

There remains debate among the cardiothoracic surgical community whether or not it is justified to perform the FET operation acute type I aortic dissection, particularly due to its inherent risk of 15-20% hospital mortality in the Western world. Rapid repair of only the proximal thoracic aorta overlooks the fact that approximately 30% of patients have additional arch tears and/or proximal descending aorta re-entry sites (2). When neglected, these pathologies can cause significant complications later on. In addition, approximately 90% of the false lumina remain open over time, therefore potentially creating an underestimated risk of late aortic enlargement and rupture, or true lumen collapse with ensuing malperfusion problems downstream in the range of up to 30% within 10 years (3-6).

This prompted us to apply the FET technique using the E-vita open hybrid graft (Jotec GmbH, Hechingen, Germany) in up to 60% of our acute type I or complicated type III (retrograde dissection into the arch) dissection cases using the zone 2 anastomosis technique (7). Of course, in type II dissection, no indication for FET exists due to a stable downstream aorta over time (3). Follow-up (100%) of up to 8 years demonstrates that none of our surviving patients who have undergone FET operation for acute dissection returned for problems with the FET-covered ascending, arch or descending aortic portion down to the stent-graft end. Analysis of perioperative risk for morbidity and mortality did not demonstrate augmented risk for the FET procedure in our hands.

During follow-up, downstream problems such as distal endoleak or aneurysmal growth can be expected in about 10% of the cases within 5 years with freedom from secondary thoracoabdominal surgery in 96% and from endovascular intervention in 91% (7).

Perspectives

FET has become a valid option for the treatment of acute type I and complicated, retrograde type III dissection. The goal of avoiding secondary major surgery seems to be achieved in 96%, at least over a 5-year follow up period. In case it is required, clamping of the FET or anastomosis to a conventional graft can be easily accomplished. The landing of thoracic endovascular aortic repair (TEVAR) within the FET is simple and of low risk as well (1,8). The classic ("fresh") elephant trunk technique no longer plays a role in this context since it is well known that the periprosthetic thrombosis rate is comparable to its non-use, with 80-90% persistent false lumen perfusion long term (9,10).

In addition, the landing of TEVAR within the dangling, and often small-sized, elephant trunk is cumbersome and carries an increased risk of endoleakage around the trunk-endoprosthesis. Alternative prosthetic devices such as the Thoraflex hybrid graft (Vascutek Ltd, Renfrewshire, Scotland, United Kingdom) certainly enrich our capacity to deal with this kind of pathology (11). However, all hybrid grafts retain the complexities of surgery and its associated risks, particularly the prolonged ischemic and perfusion durations of the heart,

brain, spinal cord and viscera.

Thus, enormous endeavors are under way in the vascular surgical and endovascular. This leads to applications beyond the so called 'debranching approaches' where extracorporeal circulation still is required in acute thoracic aortic dissections (12,13). It is only a matter of time before full endovascular treatment of the ascending aorta, the arch and the descending aorta will be available via the transapical and transfemoral route with reasonable results, at least in "bail out" situations (14-16). My personal approach is the development of a new 3-zone hybrid graft consisting of a distal covered stent, an integrated proximal non-covered stent for arch coverage and another integrated proximal polyester prosthesis for ascending aorta anastomosis (17). The first application in human patients was successful in September, 2013 in Essen, Germany, with 35-minute brain and visceral ischemic time. If this approach proves to be successful in the open, full endovascular application with or without transapical transcatheter aortic valve implantation will be around the corner.

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