Frozen elephant trunk surgery: evolving grafts and techniques

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The Hannover group must be commended for the continuing efforts devoted to progress the surgical treatment of patients with extensive disease of the thoracic aorta. It is from Hannover that in 1983, Borst [1] introduced the Elephant Trunk (ET) procedure, and 30 years later, Shrestha et al. [2] show the commitment to a major surgical programme with the frozen elephant trunk (FET).

In this feasibility study, Shrestha reported on 34 patients undergoing FET surgery using a novel four-branched hybrid graft. Considering that 53% of patients were operated for a type A acute dissection, 30% had undergone previous cardiac/aortic procedures and 47% received very extended aortic replacement (from the aortic valve to— at least—the mid-descending thoracic aorta), the reported incidence of hospital mortality (14.7%), in permanent (8.8%) and transient (5.8%) neurologic dysfunctions, without paraplegia, confirm that, in experienced hands, FET may be associated with the satisfactory outcomes, and likely represent a valid alternative to ET.

Despite the lack of studies comparing the postoperative occurrence of spinal cord complications in ET and FET patients, it is widely recognized that paraplegia is more likely to occur in the latter ones. Circulatory arrest, coverage of intercostal arteries by the stentgraft, embolization and postoperative periods of hypotension can all represent, alone or in combination, potential pathogenetic mechanisms for spinal cord injury. On the other side, hypothermia, bilateral brain perfusion with cannulation and perfusion of the left subclavian artery, cerebrospinal liquor drainage and maintenance, when possible, of postoperative mean arterial pressure >80 mmHg, represent the most common implements for spinal cord protection. In aneurysm cases, while performing the distal anastomosis, Shrestha et al. added a 2-3 l/min perfusion of the thoracoabdominal via a Foley catheter, probably reducing the duration of distal ischemia to no longer than 15 min. Although the limited size of the study population does not allow reaching any conclusion, it remains a remarkable fact that none of the survivors suffered paraplegia, which makes the Hannover perfusion strategy particularly fascinating, even considering the more crowded operative field.

Shrestha’s data, with more than half of patients operated for a type A dissection, highlight the aggressive attitude of the Hannover group in this setting, aiming to improve the long-term results by reducing adverse aortic events and late reoperations. Although this issue is expected to remain controversial, and appropriate patient selection is crucial to lower disappointing postoperative results, it should be emphasized that FET in patients with distal intimal tears (aortic arch and proximal descending aorta) can certainly facilitate surgery if the distal anastomosis is performed proximal to the left subclavian artery consenting the stented portion of the hybrid graft to cover the entry-tear and to carry out the distal part of the repair. In fact, such a reconstruction may avoid a deep distal anastomosis, which, especially in patients with acute dissection, is always at risk for bleeding and rupture [3].

The hybrid graft by Shrestha et al. presents several points of interest (mostly related to the un-stented portion), and others of concern (mostly related to the stented portion).

As commented in this article, the four-branched graft segment is effective in reducing the duration of both visceral and myocardial ischaemia, and allows resection of the proximal portion of the arch vessels (often sites of atheroma, calcification and dissection) with easier haemostasis. As designed by Neri et al. [4], the sewing collar may facilitate and reinforce the distal anastomosis, which represents (one of) the most challenging step during this procedure. In addition, one has to consider that the unstented and stented portions are available in different sizes, thus potentially avoiding annoying mismatches in size between the proximal portion of the hybrid graft, and the root or root graft.

On the other hand, when compared with other commercially available hybrid grafts, the stent is not provided in sizes >28 mm, which in acute or chronic dissections with reduced true lumen diameters, may end in new intimal tears distal to the stent-graft, hampering false lumen exclusion and thrombosis.

The manual deployment of the stent-graft may be hindered by the four side-branches in an operative field, and more importantly, accidental aortic or intimal flap injuries, or distal embolization in patients with atherosclerotic aneurysms may occur when blindly advancing the stent-graft into the descending thoracic aorta without guide wires.

Dr Shrestha and the Hannover group have to be commended again for their excellent results, and untiring efforts in the field of aortic surgery.
REFERENCES