The surgical management of patients with extensive disease of the thoracic aorta represents a major challenge, and selecting the best treatment between the classic two-stage elephant trunk (CET) approach and the recently introduced frozen elephant trunk (FET) technique is the centre of a very controversial debate.

Much of the criticism against the classic Borst’s CET approach surrounds its two-staged nature. In particular, the CET approach carries the combined cumulative risk of morbidity and mortality of two major aortic procedures, as well as the non-insignificant rate of interval mortality and failure to complete treatment [1]. Over the past decade, while limitations of the CET approach were emerging from multiple studies, the growing experience with thoracic endovascular repair (TEVAR) in the treatment of descending aorta pathologies has promoted the development of a hybrid procedure that allows the surgeon to replace the transverse arch and synchronously stent graft the descending aorta [2]. This FET technique, considered as an ‘all-in-one’ intervention, was embraced with enthusiasm by numerous surgeons, particularly as it is not associated with the limitations of the CET approach, and applied in all aortic pathological settings [3].

In the hands of experienced surgeons, employing refined surgical techniques and advanced methods of organ protection, this option yields excellent results [4]. However, since its initial application, it has been clear that the FET technique is not without its limitations. Multiple studies and a recent review have found that spinal cord injury (SCI)—a complication which is otherwise almost negligible in total arch replacement and rarely associated with TEVAR—occurs in 5.1% (range: 0–24%) of FET cases [4]. This Achilles heel represents the main argument against FETs for those who remain in favour of the traditional two-staged approach. As a result, the initial question on what is the best treatment between CET and FET techniques has remained unanswered, especially when the second stage of CET intervention can be completed through less traumatic endovascular techniques.

Katayama et al. [5] in their article titled ‘Multiple factors predict the risk of spinal cord injury after the frozen elephant trunk’, published in the present issue of the EJCTS, assessed their large experience with the FET technique in 224 patients since 1997 at the Hiroshima University Hospital. The main surgical principles for FET interventions involved optimized brain protection with moderate hypothermia and antegrade total brain perfusion (with selective cannulation of all arch vessels), and minimized spinal cord ischaemia with lower body perfusion (via the femoral artery with an occlusion balloon catheter placed into the stent graft) and use of cerebrospinal fluid drainage in elective patients at high risk for postoperative SCI. The mean age of the study population was 72 years; nearly 60% of patients were operated on for an acute aortic dissection, while 11% had a previous cardiac/aortic operation; preoperative neurological dysfunction and chronic obstructive pulmonary disease were reported in 15 and 23% of patients, respectively. The overall hospital mortality rate was only 3.5%; stroke occurred in 2.7% of cases and varying grades of SCI in 3.6%. The authors have to be commended for such outstanding results in a very high-risk group of patients. Their work confirms that, when performed by experienced teams, FET surgery can be associated with terrific results.

While satisfactory results after FET surgery are available in the literature, this manuscript examines the predisposing risks of SCI after FET intervention. The already theorized complex and multifactorial origin of SCI after FET intervention becomes eventually well evident in Dr Katayama’s data. In the series, distal deployment of the stent graft with extensive coverage of intercostal arteries, lack of left subclavian artery perfusion, previous abdominal aortic operation, severe atherosclerosis, diabetes and postoperative mean pressure of <70 mmHg were found to be associated with an increased occurrence of ischaemic injuries of the spinal cord. The risk significantly increased when two or more of these conditions were present concurrently. Independent risk factors for SCI included the distal position of the stent graft (below Th9), mean pressure of <70 mmHg and diabetes. These findings appear extremely valuable and will certainly help surgeons improve patient outcomes by applying more appropriate patient-selection criteria to FET surgery. With this in mind, it may well be possible that CET and FET techniques (with their supporters) may stop competing and become complementary.

Dr Katayama and colleagues have to be applauded for this significant contribution to FET surgery. In fact, given the multifaceted clinical and anatomical scenario offered by patients with
extensive diseases of the thoracic aorta, studies such as this,
more than randomized controlled trials, are likely to help us pro-
gress and improve care of patients with complex aneurysmal and
dissection diseases.

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