Thoracoabdominal repair evolving

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“It ain’t over till it’s over.” Yogi Berra

The treatment of thoracoabdominal aneurysm (TAAA) has evolved over the last 2 decades to become safer. Improvements in the surgical technique have helped to greatly reduce death and complications at experienced centres. The development of totally endovascular repair with branched graft devices has provided a mechanical treatment option for patients who were previously deemed inoperable.

Kato et al. [1] describe their experience in treating 54 consecutive patients with various stages of TAAA, 52 of who were deemed too high risk for standard open repair. It is a heterogeneous group including patients from each of Crawford’s classifications. Most were treated with custom-branched endografts but some underwent hybrid debranching procedures and fewer had a standard stent graft that was positioned across the origin of the celiac artery (called Crawford type 1). Despite the high-risk population and an early experience with new technology, their results are good with a 6% mortality rate and 2 cases of late spinal cord injury.

It is promising to see that the pioneering work of the late Roy Greenberg and many others has disseminated to clinical practices throughout the world [2–6]. During the evolution of our experience in Cleveland, we have learned many lessons about endovascular treatment of thoracoabdominal aortic disease from our own experience and others that have led to improved outcomes especially regarding the risk of spinal cord injury. Kato et al. have also applied these lessons to their protocol for spinal cord protection.

In a comparison of 372 patients undergoing open repair with 352 patients having total endovascular repair with branched graft devices, we found that the overall length of aorta treated was the most important predictor of spinal cord injury; open versus endovascular approach was not [7]. Previous aortic surgery and Crawford type 2 coverage were also strong predictors of risk. When a greater length of coverage is expected, Kato et al. applied adjunctive measure to protect the cord. Spinal fluid drainage was used in 74% of their patients. In an analysis of open TAAA repairs, we found that the use of intrathecal papaverine was associated with a reduced occurrence of spinal cord injury [8]. We have been using this in patients during endovascular repairs as well, but do not have enough data yet to determine its importance in this population. In an analysis of 1251 patients undergoing endovascular repair of aortic aneurysms, we found that the compromise of more than one collateral vascular bed including the segmental arteries, left subclavian artery or internal iliac arteries was predictive of spinal cord injury [9]. Kato et al. used an aggressive strategy directed at revascularization of left subclavian and internal iliac artery beds, and have been careful to avoid sheath-induced malperfusion to the internal iliac arteries. We also subscribe to this practice, and are careful about the duration and position of access sheaths within the iliac system. In a series of several elegant animal studies, Randall Griep et al. [10] have shown that a staged approach to repair allows for adaptation of collateral network vessels to provide adequate spinal cord perfusion. We have applied this staged approach to repair for patients at the highest risk for spinal cord injury, and have reduced the incidence of this devastating complication in the branched stent graft population. Kato et al. have also included a staged approach in their protocol.

Despite the use of a modern protocol including several strategies directed at spinal cord protection, the authors still had 2 cases of spinal cord injury. Both were delayed in onset, and related to serious late complications associated with hypotension. This was a small series of only 54 patients. Although the authors described the extensive coverage of segmental arteries in most of these patients, only a small percentage had disease compromising internal iliac and/or subclavian vascular beds too. The loss of internal iliac artery perfusion combined with hypotension and embolism-induced ischaemia being associated with late paraplegia in 1 patient is instructive about the risk factors for spinal cord injury: it is a multifactorial problem. The authors maintained a mean arterial pressure of 80 mmHg or higher throughout the hospitalization, another important aspect of optimal perioperative care, but these patients are at risk throughout their lives.

Unfortunately, patients with thoracoabdominal aortic aneurysm and extensive dissection, like the patients in this series, usually do not come to surgery until they have developed late-stage disease. The mean age was only 74 years, but the mean aortic diameter was >6 cm. Despite a risk of perioperative death of only 6% and excellent protection of the spinal cord, 11/51 survivors died at a sudden death and known aortic events.

As our understanding of complex aortic disease continues to improve, so will our techniques to treat it safely, but we have a
long way to go before we achieve the optimal state of affairs. Earlier recognition and a more detailed understanding of the pathophysiological processes that lead to aneurysm and dissection will be critical to us making the greatest impact on reversing the natural history of these devastating diseases. In the meantime, a thoughtful, multifaceted approach to aortic repair using a combination of open, hybrid and endovascular techniques with a sophisticated protocol for spinal cord protection and careful patient and procedural selection can lead to the best outcomes.

REFERENCES