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EDITORIAL COMMENTARY

Setting the stage: Thoracoabdominal aortic aneurysm repair in 2 acts

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See related article on pages 1074-9

Ischemic spinal cord injury associated with thoracoabdominal aortic aneurysm (TAAA) repair remains a serious concern in patients treated with either open surgical or endovascular techniques. The advent of the collateral network concept by Griep and Griep in 2007¹ significantly improved our understanding of the intricate anatomic and physiologic processes affecting spinal cord ischemia associated with aortic repair. Furthermore, the collateral network concept, for the first time, opened the theoretical possibility of staging aortic repair in the hopes

of recruiting collateral channels for spinal cord perfusion to compensate for loss of valuable intercostal arteries.² However, the practicalities of staging aortic repair in association with recruiting the collateral network have, until now, been difficult to implement clinically. As has been said before, all the world is a stage and aortic surgery for TAAA has previously been a single-act play (ie, definitive aortic repair), whereas now there can be 2 acts with an intermission.

In this issue of the *Journal of Thoracic and Cardiovascular Surgery*, Etz and colleagues³ report the first-in-man endovascular ischemic preconditioning treatment to help prevent ischemic spinal cord injury. The technique of minimally invasive selective segmental artery coil-embolization (MISACE) described by the authors involves triggering recruitment of the spinal cord arterial collateral networks by first coil-embolizing important lumbar arteries that had been identified by preoperative computed tomography, followed by an interval of 4 weeks before definitive aortic repair. As noted in the title, the 2 patients treated as part of this study are the first reported successful cases of this staged approach to aortic repair.

There are several important breakthroughs relating to managing and preventing spinal cord injury that have been simultaneously brought together with the MISACE technique. The first is that optimal perioperative management of spinal cord function is not enough to prevent spinal

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cord ischemia. Perioperative adjuncts such as intraoperative monitoring of spinal cord function with motor- and somatosensory-evoked potential, spinal cord drainage, and optimal hemodynamic management still do not address the root problem of spinal cord injury; that is, a disruption to the arterial perfusion of the spinal cord. Once surgeons move past this concept, then the ability to precondition the spinal cord becomes more acceptable. The MISACE technique is not meant to replace these important adjuncts, but instead to increase their effectiveness by helping identify patients and situations that could benefit from intraoperative interventions such as draining more cerebrospinal fluid.

The second breakthrough represented by the MISACE technique is the capacity to selectively coil-embolize segmental arteries. Although this can be done with percutaneous techniques using local anesthesia, the ability to selectively cannulate a segmental artery is very intricate and not simple. This is especially the case in patients undergoing TAAA with tortuous anatomy and thrombus in the aneurysm sac. The authors note that in 1 of their patients, the tortuous iliac artery anatomy prevented them from coil-embolizing a unilateral segmental artery. Moreover, once the vessel is selectively cannulated, it is important to preserve as much of the collateral network as possible by only occluding the ostium of the segmental artery. These techniques are not within the realm of most aortic surgeons and frequently multidisciplinary collaboration is required.

The third breakthrough represented by the MISACE technique is that an interval is needed between coil-embolizing the segmental artery and the definitive aortic repair. The authors state that the experimental work suggests 5 days between procedures, but they elected to wait a minimum of 4 weeks.³ This interval allows for physiologic recruitment of collateral networks. However, this delay means that urgent and emergent patients with TAAA will not be able to benefit from the MISACE technique.

Additional work needs to be done to better understand the number of segmental arteries that need to be coil-embolized, as well as to more clearly define the necessary interval between procedures. Nevertheless, the concept of staging TAAA repairs, both open and endovascular, needs to be in the minds of aortic surgeons and interventionalists. Etz and colleagues³ have exposed a new frontier in managing and helping prevent spinal cord injury associated with TAAA repair.

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