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Commentary: Going transesophageal will make your monitoring simpler!

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CENTRAL MESSAGE

Bipolar transesophageal thoracic spinal cord stimulation may facilitate neuromonitoring in thoracoabdominal surgery.

The most important problem in surgical and endovascular approaches to the thoracoabdominal aorta is spinal cord ischemia (SCI). Patient- and family-devastating paraplegia develops, either acutely or delayed, in 3% to 10% of patients or more, even in the hands of experts.[1] SCI in some form is considered unavoidable during thoracoabdominal repair. Furthermore, there remains no therapeutic approach to SCI. Strategies that have been implemented in practice, including cerebrospinal fluid drainage, systemic and epidural hypothermia, and endorphin receptor blockade, have proven effective in preventing paraplegia and thus reducing morbidity and mortality.[2] As SCI entails devastation, laboratory and animal research aimed at developing strategies to control its risks is ongoing.[3,4]

Neurophysiological monitoring has obviously received much attention for some 3 decades now, and much research has been devoted to identifying the ideal monitoring system, which theoretically should be able to identify ischemia in the shortest period and recognize the efficacy of reperfusion after surgical maneuvering. Transcranial motor-evoked potential (TC-MEP) monitoring is currently the most reliable technique in the clinical setting and provides more rapid information during ischemia and fewer false-positive results for reperfusion compared with somatosensory evoked potentials (SSEPs).[5] Lumbar collateral network oxygenation levels seem to respond to compromised aortic blood circulation, and thus transcutaneous near-infrared spectroscopy is currently under investigation.[6]

In this issue of the *Journal*, Yamanaka and colleagues[7] present an elegant animal experiment performed to evaluate a novel method using a bipolar esophageal electrode to enable thoracic cord stimulation. These authors previously showed in canine experiments that measurement of monopolar transesophageal motor-evoked potentials (m-TE-MEP) is feasible, safe, and superior to TC-MEP in terms of stability, response time to ischemia/reperfusion, and prognostic value.[8] They induced SCI by aortic balloon occlusion at the thoracic level for 10 minutes and evaluated response time at the proximal thoracic cord after 25 minutes. Interestingly, bipolar transesophageal (bi-TE) stimulation was successful in all animals, and their forelimb waveforms were identical to those obtained with transcranial stimulation.

There is no distinct difference in latency between bi-TE-MEP and TC-MEP. Identical waveforms can be obtained. Advantages of this method include not only the shape of the waves, but also the stimulation intensity. The lowest stimulation intensity needed to produce >90% of the maximum MEP amplitude at the hind limbs was higher with TC-MEP compared with m-TE-MEP or bi-TE-MEP.

This appears to be good news, as a transesophageal approach producing the same wave shape and stimulation intensity as a transcranial approach should simplify neuromonitoring while maintaining accuracy. This idea is very attractive, and the authors have already exported it into the clinical setting with confirmation of feasibility and safety.[9] Nonetheless, this approach faces certain

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challenges before it can become widely accepted. Injury to the esophageal wall, interference from instrumentation of the TEE probe, and probe migration must be taken into consideration. In the clinical setting, whether stimulation-induced esophagitis may become an issue awaits further analysis.[10] In addition, artifacts from unshielded equipment may complicate concomitant TEE and bi-TE-MEP stimulation. These challenges notwithstanding, this technique is an exciting, more simplified approach that merits continuing research.

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