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Commentary: If the news is good, it is better that we know ... if the news is bad, it is better than we know fast

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The risk of stroke in aortic arch (AA) surgery remains a serious concern, despite modern surgical techniques and strategies for cerebral protection. Brain perfusion during AA surgery faces embolic and global ischemic threats, from manipulation and crossclamping of the aorta to malperfusion due to incomplete protective perfusion during the circulatory arrest phase of the operation. Intraoperative diagnosis of stroke can be a challenge, and there are no current standard guidelines for intraoperative neuromonitoring (IONM).

Despite this, data from IONM may allow for early diagnosis of stroke and inform subsequent management of

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Intraoperative electroencephalography tracing during aortic arch surgery.

CENTRAL MESSAGE

Intraoperative neuromonitoring can provide early diagnosis and intervention for stroke and provide reassurance that cerebral perfusion is adequate during aortic arch surgery.

the patient. Although the operation may not be aborted, interventions such as optimizing oxygen delivery through increasing mean arterial blood pressure and hematocrit and by decreasing cerebral metabolic rate may decrease sequelae of cerebral hypoperfusion. In addition, in the cases of embolic stroke, early diagnosis allows for the stroke team to be on standby for the possibility of emergent imaging and intervention after the operation is complete. IONM strategies used include electroencephalography (EEG) and evoked potential measurements, transcranial Doppler, and near-infrared spectroscopy (NIRS).

NIRS is most common technique used to diagnose and treat cerebral hypoperfusion in AA surgery. Although

evidence suggests that NIRS assists during cannulation positioning for cerebral perfusion during aortic surgery, there are insufficient data demonstrating the ability of NIRS in decreasing risk of stroke or cognitive dysfunction in general.¹ Similarly, while NIRS has been used to determine individual patient cerebral autoregulation curves during CPB,² this has not yet been shown to improve neurologic outcomes.³

EEG, motor-evoked potentials (MEPs), and somatosensory-evoked potential (SSEP) changes such as slowing, decreased amplitude, increased latency, and development of asymmetric signals may suggest ischemia intraoperatively outside the period of hypothermic circulatory arrest. However, the need for experienced personnel and high rate of false-negative alerts, due to similar patterns caused by anesthetic agents and hypothermia mimicking ischemia, may limit the use of EEG, MEP, and SSEP clinically. Processed EEG is more popular because of the ease of interpretation but evidence is inconclusive on its utility to detect ischemia.⁴⁻⁷

Ghincea and colleagues⁸ address an important deficit in the literature regarding the utility of using this type of neuromonitoring 223 of 365 patients undergoing arch surgery over an 8-year period. In their experience, the sensitivity of using MEPs, SSEPs, and EEG was 75%, with a specificity of 88.5%, positive predictive value (PPV) of 27.3%, and a negative predictive value of 97.4% with a significant increase in PPV, negative predictive value, and specificity when excluding patients in whom IONM abnormalities returned to baseline at the end of the operation.³ These are promising results; intraoperative monitoring abnormalities, although they have limitations, can be used to guide relatively benign and low-cost interventions that will likely help and not harm the patient. Further cost and resource use will be limited until after the

operation, where the test has a significant greater PPV and specificity. The absence of alerts has the benefit of reassuring both the surgeon and cardiac anesthesiologist that there is adequate cerebral perfusion. In the age of embracing technology and culture of more information is better, IONM described by Ghincea and colleagues may be an attractive option for surgeons, patients, and cardiac anesthesiologists in the perioperative period. The increased cost of monitoring may be worth the peace of mind. In the rare cases of stroke, neuromonitoring may provide opportunities for early intervention, mitigate the extent of ischemia, and improve clinical outcomes, which we consider as priceless.

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