Commentary: Is seeing believing?

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In this edition of the *Journal*, Kondo and colleagues¹ report their single experience with using central retinal artery (CRA) Doppler flow ultrasonography as a means of monitoring cerebral perfusion during a debranching thoracic endovascular aortic repair. Their patient presented with a saccular aortic arch aneurysm, which was complicated by severe cerebrovascular disease and an incomplete circle of Willis. On clamping of the left carotid artery, CRA flow diminished quickly, whereas cerebral regional oxygen saturation (rSO₂) dropped in the course of minutes. The patient's blood pressure was pharmacologically increased to optimize cerebral perfusion, and CRA flow subsequently improved.

CRA Doppler flow ultrasonography is an intriguing new adjunct for neurovascular monitoring during complex aortic surgery. Although rSO₂ has been the traditional mode of cerebral perfusion monitoring particularly, in complex aortic cases, there are limitations. These include variations in sensitivity across devices and the inability to monitor the entire cerebrum. Interpretation of values and trends is challenging due to wide variations in baseline values.^{2,3} These limitations may explain the findings of a systematic review by Zheng and colleagues,⁴ in which they state that “data are insufficient to conclude that interventions to improve rScO₂ desaturation prevent stroke or POCD [postoperative cognitive dysfunction].” Adjuncts to help interpret rSO₂ include transcranial Doppler flow ultrasonography, bispectral index monitoring, and electroencephalographic monitoring. Regardless, monitoring rSO₂ still has clinical merit, because clinical judgment can help abrogate the potential pitfalls of this technology.

CRA Doppler flow ultrasonography, as presented in this case, potentially allows a more direct assessment cerebral perfusion. Kondo and colleagues' case report¹ narrates a seemingly simple cause and effect; however, there are more variables to consider when interrupting the data provided by this technology. The lack of posterior cerebral monitoring may cloud the clinical picture for patients with a known intact circle of Willis. Would diminished

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Central Message

Central retinal artery Doppler flow imaging is an intriguing adjunct for neurovascular monitoring. It may be of utility, given the limited evidence basis for standard cerebral monitoring techniques.

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CRA flow be a warning sign of ongoing cerebral ischemia? Should the team be reassured by the stable rSO₂, or should they take action? Obviously, a single experience cannot shed light on the multitude of scenarios that could exist with this new technology. With that in mind, it has been suggested in a small patient series that sustained hypoperfusion detected by CRA flow ultrasonography is associated with neurologic complications.⁵

Stroke remains one of the most devastating complications during cardiac surgery, and those undergoing complex aortic surgery present a particular challenge. Although rSO₂ monitoring continues to be one of the more conventional modalities, CRA Doppler flow ultrasonography represents another possible adjunct in monitoring cerebral perfusion during aortic surgery. For now, its clinical relevance is limited by its lack of objective efficacy. Both modalities would benefit from further study.

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