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Commentary: Antegrade cerebral perfusion versus retrograde cerebral perfusion: If only it was that easy

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Cerebral protection remains the crux of aortic surgery involving the arch and, not surprisingly, cerebral-protection strategies have been the topic of passionate debate and intense research from the onset of arch surgery with deep hypothermia. Multiple approaches to cerebral protection have been developed to achieve the goal of neurologic preservation, but the past 15 years have seen a strong emphasis of antegrade cerebral perfusion (ACP) for cerebral protection. Despite this trend, retrograde cerebral perfusion (RCP) use has not only persisted but also experienced a resurgence over the last 5 years. This resurgence suggests that, despite individual biases, there are likely roles for antegrade, retrograde, as well as potentially mixed approaches to cerebral protection as the field progresses.

In this issue of the *Journal*, Brown and colleagues¹ from Pittsburgh present an impressive single-institution series evaluating a retrograde cerebral protection strategy at 20°C for hemiarch replacement during proximal aortic surgery in both dissection and aneurysmal disease. The overall stroke rate of 4.6% in this cohort (2.6% for aneurysm, 6.8% for dissection), with low perioperative mortality and 5-year survival well above 80% for the cohort are admirable. Importantly, this study demonstrates the importance of expediency during circulatory arrest, with increased rates

CENTRAL MESSAGE

The interplay of temperature, cerebral perfusion, and circulatory arrest time remains critically important to neurologic outcomes, with differences in both benefits and risks across them.

of stroke (9.0% vs 2.0%) and mortality (13.5% vs 3.1%) when circulatory arrest duration crosses a 23-minute threshold. These results are encouraging and validate isolated RCP for isolated hemiarch at 20°C. The authors allude to the complexity of cerebral protection and astutely highlight 3 major variables involved in what can be called the triangle of cerebral protection; nadir temperature, cerebral perfusion approach, and circulatory arrest time (Figure 1).

The interplay of these 3 variables is critically important with respect to neurologic outcomes, with differences in each providing both benefits and risks. Many surgeons would argue that 20°C and the associated prolonged bypass time complicate coagulation, preferring warmer nadir temperatures. Other surgeons would argue that despite the benefits of embolic washout of RCP, it is may not be sufficient at long circulatory arrest times and so ACP should be

FIGURE 1. Cerebral protection triangle in arch surgery.

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Disclosures: The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

Received for publication Aug 12, 2021; revisions received Aug 12, 2021; accepted for publication Aug 13, 2021.

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J Thorac Cardiovasc Surg 2021; ■:1-2

0022-5223/\$36.00

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<https://doi.org/10.1016/j.jtcvs.2021.08.032>

considered with any possibility of prolonged ischemia, such as in more complicated or unpredictable dissection repair. Outside of a single surgeon at Yale who does it well, most surgeons, and the Society of Thoracic Surgeons database, would agree that straight circulatory arrest should be avoided whenever possible. The literature has become riddled with single-centered successes with specific combinations of these 3 variables but in a sporadic way, which makes the development of firm guidelines difficult.

Every surgeon must decide the combination of these 3 variables that work best for them and their specific patients and commit to perfecting their technique as the Pittsburgh

group has here. Despite this, we must not become complacent or resistant to “thinking outside the triangle.” Emerging approaches, such as RCP for embolic washout followed by ACP for protection at warmer nadir temperatures, are promising and may eventually prove to be the best of both worlds. Only time, and well-designed studies, will tell.

Reference

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