Commentary: Respect the brain, and please perfuse mine bilaterally during arch surgery

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To optimize neurologic outcomes after open aortic arch surgery, various intraoperative brain protection strategies have been advocated, including hypothermic circulatory arrest, alone or in combination with supplying metabolites via retrograde cerebral perfusion or antegrade cerebral perfusion (ACP). Proponents of these techniques (alone or in combination) at aortic centers of excellence are ready to defend their position with very acceptable results. The use of ACP, whether unilateral (uACP) or bilateral (bACP), during the period of circulatory arrest allows raising of the target intraoperative circulatory arrest temperature to moderate or even mild hypothermia. Nonetheless, controversy persists regarding the safe upper limit of hypothermia with ACP and whether uACP or bACP is the better mode of administration.

In this issue of the *Journal*, Urbanski and colleagues¹ report a large series of operations (9.8% urgent or emergency), continuing a tradition of excellent results from their center with the use of uACP and moderate hypothermia. As outstanding as these results are, from a group of outstanding surgeons, this is a descriptive review, with only one mode of CP (uACP), making comparison impossible. The mean arterial pressure in the perfused artery was kept at 70 to 100 mm Hg, and the blood temperature chosen for cerebral perfusion was 28°C. All arch arteries were clamped when circulatory arrest began. Urbanski and colleagues¹ reported low incidences of permanent and temporary neurologic deficits. Interestingly, multivariable analysis identified duration of cerebral perfusion (CP) as a predictor of temporary neurologic deficit.

A meta-analysis by Angeloni and colleagues² comparing uACP and bACP showed similar mortality and neurologic outcomes after circulatory arrest for complex arch surgery. That group's updated meta-analysis,³ however, associated longer circulatory arrest times with greater mortality only among patients who received uACP; thus, uACP could be considered safe only for shorter periods of circulatory arrest (30-40 minutes). The reported circulatory arrest and CP

Bilateral antegrade cerebral perfusion during aortic arch repair.

Central Message

Among experienced aortic teams, the different cerebral perfusion strategies have similarly good outcomes. Studies of the effects of these approaches on patients' quality of life would be useful.

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times of Urbanski and colleagues¹ are within that range: 18.4 ± 9.9 and 23.3 ± 17.2 minutes, respectively, with a CP time of 49.6 ± 17.2 minutes for supra-aortic repairs. In addition, the majority of their cases (65.4%) were hemi-arches, and even those that involved concomitant operations did not include complex arch distal reconstruction or require CP exceeding 50 to 60 minutes. In addition, other studies have shown better midterm quality of life with bACP among patients who had more than 40 minutes of hypothermic circulatory arrest.⁴

The question is, why not use bACP when there is no consensus yet and maybe even a potential (albeit unconfirmed) advantage? The greater effectiveness of uACP versus bACP in some cases relies mainly on crossover brain perfusion and a complete circle of Willis, which are not present in 25% to 50% of patients. It is difficult to believe that placing a small balloon-tipped catheter under direct vision for administering bACP would prolong the procedure, necessitate extra manipulation of the supra-aortic vessels, or increase the risk of embolization more than clamping the supra-aortic vessels at the beginning of circulatory arrest, which Urbanski and colleagues¹ advocate.

There is no harm in carefully perfusing both hemispheres of the brain and proceeding with an expeditious and meticulous repair. But debate will continue as long as different

centers of excellence continue to publish great results despite their differences in technique. Studies focused more on midterm and long-term quality of life in these patients would be beneficial.

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