We congratulate the authors on this study and using DW-MRI to more thoroughly assess neurologic injury following aortic arch surgery.

References

Commentary: Axillary versus innominate artery cannulation for proximal aortic arch surgery

John S. Ikonomidis, MD, PhD

The efficacy of cerebral protection measures during operations on the aortic arch likely remains the most important determinant of favorable postoperative neurologic outcomes. Deep hypothermia with complete circulatory arrest was the gold standard for years, but surgeons were always concerned about the actual “safe” duration of cold ischemia on the brain, the deleterious systemic effects of profound hypothermia, and the untoward sequelae of the prolonged cardiopulmonary bypass (CPB) times required to cool and then rewarm. In response to this, surgeons began to experiment with warmer circulatory arrest temperatures, requiring shorter cooling and rewarming times, supplemented with either retrograde or antegrade cerebral perfusion.

Antegrade cerebral perfusion was originally delivered directly, simultaneously through the ostia of both the innominate and left common carotid arteries with the arch open during the circulatory arrest period. However, this strategy can be a bit cumbersome in terms of cluttering the operative field, and also may create confusion in terms of true lumen perfusion in the setting of aortic dissection. Subsequent to this was the introduction of selective antegrade cerebral perfusion (SACP), delivered via perfusion of the right common carotid artery via the right axillary artery. Excellent results have been achieved with this technique, owing to the high percentage of patients with an intact circle of Willis. However, accessing the axillary artery requires an incision distinct from the sternotomy incision, partial division of the pectoralis major and minor muscles, dissection within the brachial plexus, and manipulation of an arterial vessel that probably is secondary only to the pulmonary artery in fragility. From here, direct cannulation of the more stout innominate artery was introduced. This is a more attractive SACP option because this artery can be accessed via a sternotomy incision.
(perhaps extended a little cephalad) and is easier and less dangerous than an axillary dissection; however; there are concerns that the proximal nature of this arterial access could result in downstream embolization via the right common carotid and vertebral arteries, events that appear to be less likely with axillary cannulation, which is distal to these 2 arteries.

The question of neurologic outcomes related to these 2 SACP techniques has been addressed with several studies. Eldeiry and colleagues studied 206 patients undergoing elective and emergent replacement of the proximal aortic hemiarch and found shorter cardiopulmonary bypass times, less blood product use, and similar overall outcomes compared with axillary access with innominate cannulation. Preventza and colleagues studied 938 patients undergoing elective and emergent proximal aortic arch surgery and found shorter cardiopulmonary bypass times, mechanical ventilation was more common with axillary cannulation, which is distal to these 2 arteries.

Innominate and axillary cannulation in aortic arch surgery provide similar neuroprotection. The results of that trial, a unique, 6-center, 2-arm, noninferiority RCT that compared innominate to traditional axillary cannulation for providing ACP in adults undergoing elective repair of the ascending aorta and proximal arch requiring HCA and an open distal anastomosis, are presented in this issue of the Journal. In addition to the usual outcomes, the appearance of new severe ischemic lesions on diffusion-weighted magnetic resonance imaging were studied. The results, tabulated for 102 patients, showed comparable outcomes in total operative times, stroke/transient ischemic attacks, 30-day mortality, seizures, delirium, and duration of mechanical ventilation. Perhaps most interesting was the finding of new severe ischemic lesions in 19 participants (38.8%) in the axillary group compared with 18 (34%) in the innominate group ($P$ for noninferiority = .0009). Thus, the over-arching conclusion of this trial is that there is no downside to using the innominate artery as a means of SACP for proximal aortic arch surgery, and thus this would be the default strategy of this research group moving forward.

This trial provides the first truly rigorous evidence of noninferiority of these 2 approaches to SACP. The high frequency of new cerebral lesions in both groups is of concern but somewhat difficult to sort out, given that similar results have been reported in the setting of other cardiac surgical operations. However, the trial focused specifically on elective proximal hemiarch surgery, leaving many questions regarding outcomes in emergent aneurysm surgery, aortic dissection, and more complex arch work. Nevertheless, the authors are to be congratulated for an outstanding effort in addressing an important question in a very specific patient population.

References