Author has nothing to disclose with regard to commercial support.

superiority of either technique. We need to be careful not to overstate the use of AA cannulation in aortic arch surgery, especially when the study is of a small sample size and there are no comparative outcomes reported in using IA cannulation as an alternative arterial cannulation method.

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REPLY: FINDING THE BEST OPTION OF THE CANNULATION SITE

Reply to the Editor:

Aortic lesions are often detrimental to aortic cannulation. Ideally, cannulations should be placed at sites with a healthy aortic or arterial wall. The jet of blood from the cannula can have a sandblast effect on the adjacent diseased aortic wall and could lead to disastrous embolic complications or aortic dissection. Thus, aortic cannulation is a really sensitive issue in aortic surgery. The issue includes not only the cannulation site but also the size and shape of the cannula.

I completely agree with the conclusion in the letter by Harky and colleagues.¹ The use of the axillary artery cannulation in aortic arch surgery should not be overstated. The authors imply the superiority of the innominate artery cannulation to the axillary cannulation. Attention should also be given to the cannulation at the innominate artery, which is showing its presence. I have often observed the fragile atheroma at the orifice of the innominate artery during

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aortic arch surgery. Such lesions are less frequently seen at the orifice of the left common carotid artery. Accordingly, a cannula for selective cerebral perfusion is often inserted first at the left common carotid artery in my practice. The innominate cannulation might have more powerful jet at the lesion of the orifice, and the axillary cannulation has less sandblast effect due to the long distance to the orifice in the same situation. To find the best cannulation site, minute evaluation of the quality of the aorta by preoperative computed tomography and epi-aortic echography during operation is essential.

The comparison between the innominate cannulation and axillary cannulation is essential to understand the drawbacks and advantages of each cannulation procedure. One may be better than the other in particular cases. The cannulation site should be decided for each situation for cases with various aortic lesions. Fortunately, we can use several cannulation sites and can also combine them to prevent complications.

Standardization is key to achieve safety of the surgery. We need a standard in surgical techniques. However, only one golden standard cannot be determined for the choice of cannulation technique, especially in aortic surgery. Aortic surgeons should know several ways of the cannulation and apply the best option of the cannulation site to fit the situation.

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REPLY FROM THE AUTHORS: THE OPTIMUM ARTERIAL CANNULATION SITE DURING OPEN AORTIC ARCH REPAIR: IS IT THE AXILLARY

ARTERY?

Reply to the Editor:

Thank you for thoughtful comments. I agree with your comment that the possibility of bias exists from combined axillary artery (AA) cannulation. We carried out an analysis comparison outcome of pure AA and non-AA groups. Pure

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AA (n = 177) and non-AA (n = 159) groups were reviewed. Results revealed that the AA group showed a lower rate in early stroke (2.8% vs 8.2%, $P = .03$), as well as lower trends in hospital (5.5% vs 10.1%, $P = .09$) and 30-day mortality rate (4.5% vs 9.4%, $P = .08$). In matching data (pairs = 87), the AA group also showed a lower rate in early stroke (2.3% vs 8.2%, $P = .04$). However, in hospital (4.6% vs 10.1%, $P = .34$) and 30-day mortality rate (4.6% vs 9.4%, $P = 1.74$), the AA group had a trend for a lower rate without statistical significance. We think that the small volume in matching data may be a limitation for having a statistical power for benefit in the mortality rate. We think that axillary cannulation has an independent protective effect for an embolic event, even if it is combined with femoral or ascending cannulation. As we emphasized in the Discussion section of our article, the main mechanism of protection for embolic events in axillary cannulation is that continuous antegrade flow from axillary artery cannulation can keep debris from the ascending and distal aorta from going into the carotid vessel. This protective action of axillary cannulation is applied in any situation of pure AA and combined AA cannulation.

We routinely initially perform axillary cannulation to establish cardiopulmonary bypass. If the discrepancy between radial and systemic pressure is significant (>30 mm Hg), we add an ascending or femoral artery cannulation. Moreover, when the cooling time between

the upper and lower body is significantly different, we also add the additional cannulations for organ protection. If the ascending is healthy and non-dissected, we use ascending aorta cannulation. If not, we select femoral artery cannulation.

In terms of innominate artery cannulation, we agree with your opinion regarding its advantages of convenience and short operation time. However, we think that the potential possibility of stroke risk from manipulation of the head vessel may be greater rather than axillary cannulation. Preoperative computed tomography scans usually show the condition of innominate artery (dissection or atherosclerosis), but we sometimes experience that it is difficult to accurately expect the real condition of innominate artery in the operative field. Regarding this point, we prefer axillary cannulation rather than innominate artery cannulation. Of course, a large-volume, randomized controlled study is needed to confirm the superiority of either technique.

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