Changing body temperature during aortic arch surgery

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Ever since Griep and colleagues¹ reported excellent results in aortic arch replacement with total body hypothermia and circulatory arrest, deep hypothermic circulatory arrest (DHCA) has been used as a standard procedure in aortic arch replacement. The use of selective antegrade cerebral perfusion has empirically revealed that the body temperature during circulatory arrest can safely be raised with this style of perfusion, however, and many institutions worldwide have reported good results in aortic arch replacement with moderate hypothermic circulatory arrest (MHCA).² Raising the body temperature during circulatory arrest has become a trend nowadays in aortic arch replacement; however, the merits of a lesser degree of hypothermia in aortic arch replacement remain unclear. We previously conducted a comparative study of aortic arch surgery at different temperatures and found that although the temperature could be raised safely, there were no definite advantages to doing so.³ Thomas and colleagues⁴ reported in a study 209 patients who had undergone aortic arch replacement in the course of a decade and described satisfactory results in aortic arch replacement with DHCA compared with MHCA.

A detailed analysis of a comparison between DHCA and MHCA in aortic arch replacement conducted by Keenan and colleagues⁵ is reported in this issue of the *Journal*. They used a propensity-matched comparison in hemiarch replacement and concluded that 30-day mortality and morbidity did not significantly differ between the 2 groups. They highlighted their finding that during the surgery the MHCA group required statistically less volume of transfusions and also demonstrated a slight reduction in median volume of blood returned through cell saver and postoperative chest tube output. Unfortunately, the difference was minimal and not clinically appealing. Keenan and colleagues⁵ did demonstrate the safety of performing aortic arch replacement with MHCA, in which the temperature was successfully raised. I commend their sophisticated data analysis.

The same group previously reported excellent results in proximal arch replacement with DHCA.⁶ Although that study population included 36% of urgent or emergency cases, the 30-day mortality was only 2.9%, and the rate

of stroke in elective cases was 0.8%. Accordingly, their report raised questions about the safety of MHCA. Nevertheless, they began to use MHCA in their practice.

Surgeons are eager to raise the body temperature during circulatory arrest because of the risk of coagulopathy in deep hypothermia. A lower temperature requires longer cooling time, and a longer cooling time indicates a longer pump time. A longer pump time in turn leads to a longer duration of operation and may trigger coagulopathy.

We cardiac surgeons have noticed that DHCA is not essential for aortic arch surgery; however, the safe limit of a lesser degree of hypothermia has still not been elucidated. The basis of using the MHCA strategy varies among institutions. In addition, we should be aware that the length of circulatory arrest, site of measurement of body temperature, ways of monitoring various functions, and, most importantly, empirical values differ among institutions.⁷ Therefore, as mentioned in the guideline,⁸ institutional experience is an important factor in selecting the strategy for aortic arch replacement, and we should not simply assume that warmer temperature is better than DHCA.

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Central Message

The use of moderate hypothermia has become a recent trend in aortic arch surgery; however, the definite advantage of moderate over deep hypothermia has not yet been elucidated.

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