The safety of moderate hypothermic circulatory arrest with selective cerebral perfusion

To The Editor:

We read with great interest the recent article by Kamiya and colleagues¹ on the safety of moderate hypothermic circulatory arrest with selective cerebral perfusion (SCP). In a retrospective analysis, the authors divided 377 patients undergoing aortic arch repair with SCP and hypothermic circulatory arrest into 2 groups: group 1 comprised 125 patients with deep lower body circulatory arrest at 20°C to 24.9°C, and group 2 comprised 252 patients with moderate lower body circulatory arrest at 25°C to 28°C. The 2 groups were compared with regard to mortality and neurologic outcomes. A propensity score matching analysis was also undertaken to compensate for the differences in patient characteristics between the 2 groups. The authors found no significant differences between the 2 groups in terms of mortality or morbidity and concluded that moderately hypothermic lower body circulatory arrest during aortic arch repair was safe. The authors are a well-known group of aortic surgeons who deserve credit for undertaking such an important study. The point they wanted to make here is also well taken. However, being a group practicing an essentially similar technique, we could not help bringing up some concerns regarding this article.

First, this is basically a low-flow, low-pressure 2-vessel SCP (the left subclavian artery is mostly occluded) that we also practice at our institution.^{2,3} Basically, at a perfusion flow rate of $10 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$, there should not be a big difference between 20°C and 28°C as far as the cerebral protective effect is concerned. This is especially true for short SCP intervals, as the authors had in this series (22 minutes in both groups). What happens to the spinal cord and visceral organs when the temperature is increased to 28°C? Moreover, do the authors consider the possibility of left vertebrobasilar

ischemia in certain cases? Have they ever had to switch to a 3-vessel perfusion, especially when they suspected inadequate intracranial arterial communication?

Second, the authors mention that systemic circulatory arrest time is shorter with the island technique of arch vessel reconstruction practiced at their institution. However, we have a different view on this. In our experience we have seen that the arrest time can actually be shorter with the separated graft technique of arch vessel reconstruction, as opposed to that with the island technique. This is because, with the separated graft technique, systemic circulation can be started through the side branch of the arch graft immediately after the completion of distal graft anastomosis. On the other hand, with the island technique, one has to wait for the en bloc repair of the arch vessels to be completed before the systemic circulation can be started.

Third, mean systemic circulatory arrest time was generally short in this series (about 27 minutes). Most patients will be able to tolerate this. However, with an arrest time exceeding 60 minutes in a moderately hypothermic condition of 28°C, the spinal cord can be at risk of ischemic injury, which is also evident in the results of the present study (paraplegia rate of 18.2% in these patients as opposed to 0% in the deep hypothermic arrest group). The authors might want to tell the readers how to bail out when the arrest time becomes unexpectedly long.

Fourth, re-exploration for bleeding was excessively high in both groups: 14% and 19% in the moderate hypothermic arrest and deep hypothermic arrest groups, respectively. In our series this rate is less than 2%. What was the reason for such a high rate of re-exploration for bleeding?

Finally, we agree with the authors that the moderately hypothermic lower body arrest can be deemed safe for cases in which its duration is expected to be less than 60 minutes. However, for compli-

cated cases, such as acute type A aortic dissection requiring expeditious surgical intervention or in those with a very deeply located distal aortic anastomotic site, where the duration of arrest time can often be unexpectedly long, it might result in a higher rate of stroke, paraplegia, or paraparesis. Further decreasing of the temperature would offer a better protection in these situations.

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References

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Reply to the Editor:

We are grateful for the opportunity to respond to the letter by Kazui and associates. We appreciate the comments on our recent article reporting moderate hypothermic lower body circulatory arrest with selective cerebral perfusion.¹ Their comments can be summarized as follows: (1) concern with the safety of moderate hypothermic lower body circulatory arrest with selective cerebral perfusion in regard to protection of other organs, especially the spinal cord; (2) concern about the possibility of left vertebrobasilar ischemia in patients with 2-vessel selective cerebral perfusion; (3) concern