Moderate-to-mild hypothermia may not be sufficient to protect the spinal cord during aortic arch surgery

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We read with great interest the article by Suzuki et al. [1] regarding antegrade selective cerebral perfusion (SCP) with lower body circulatory arrest (LBCA) at moderate body core temperatures of 30–32°C. We agree with the authors that antegrade SCP, utilizing deep hypothermic circulatory arrest (21–27°C) to safeguard the protection of the visceral end-organs and the spinal cord, has become the most efficient neuroprotective strategy during transverse aortic arch repair over the past decades. However, as described by the authors, antegrade SCP is being increasingly utilized in combination with progressively increasing body core temperatures [1], a trend culminating in the advocacy of moderate-to-mild temperatures (up to 35°C) and even normothermia [2].

Suzuki et al. report on their technique of total aortic arch repair in a contemporary series of 105 patients using a quadrifurcated Dacron graft. The authors proclaim that they routinely aim for deeper body core temperatures (25°C) to ensure lower body-organ protection when LBCA is expected to exceed a duration of 30 min. However, the authors also state that in ‘almost all cases ... the core temperature was still 30–32°C with a mean LBCA time of 58 ± 22 min in the reported series [1]. This progressive approach may bear potential risks for the non-perfused organs in case of prolonged operation times—apparently not only in case of unexpected technical problems (as documented by an average of 58 min of LBCA) [3, 4].

The authors also admit that they are not familiar with the safe limits of spinal cord ischaemic tolerance during distal circulatory arrest at mild hypothermia. In fact, the ischaemic tolerance of the spinal cord and the visceral organs has not yet been clearly defined, and is therefore not well recognized in clinical practice. A consensus paper of the EACTS Vascular Domain is currently underway to address this issue. However, with regard to recent experimental data, the safe ischaemic interval for the spinal cord—utilizing the currently available state-of-the-art adjuncts for intraoperative neuroprotection—may be estimated as follows [2, 5]:

(i) 15–20 min at normothermia (37°C).
(ii) 35–50 min at mild hypothermia (32°C).
(iii) 55–75 min at moderate hypothermia (28°C).
(iv) ~120 min at deep hypothermia (20°C).

There is an undeniable protective effect of distal aortic perfusion for end-organ integrity during moderate-to-mild hypothermia [2, 6]. We strongly believe that the implementation of alternative perfusion strategies e.g. involving the distal aorta and/or left subclavian artery as described by Suzuki et al. and others [1, 6] is of utmost importance to allow for safe aortic arch surgery by providing sufficient blood flow to the thoracic and lumbar cord segments via the arterial collateral network, since moderate-to-mild body core temperatures alone may not be sufficient to provide effective protection for the spinal cord.

REFERENCES