2. Miyamoto TA, Miyamoto KJ. Alpha-stat induced anaerobiosis: Cause of transient neurologic deficits and hepatic mitochondrial oxido-reduction impairment during hypothermic cardiopulmonary bypass [letter]. *J Thorac Cardiovasc Surg*. In press.
3. Lawson JWR, Veech RL. Effects of pH and free Mg^{2+} on the K_{eq} of the creatine kinase reaction and other phosphate hydrolyses and phosphate transfer reactions. *J Biol Chem*. 1979;254:6526-37.
4. Miyano H, Inagaki M, Hashimoto N, Shishido T, Kawada T, Miyake Y, et al. Regional cerebral blood flow during rewarming of cardiopulmonary bypass correlates with posthypothermic regional glucose use. *J Thorac Cardiovasc Surg*. 1998;116:503-10.
5. Sakamoto T, Zurkowski D, Duebener LF, Hatsuoaka S, Lidov HGW, Holmes G, et al. Combination of alpha-stat strategy and hemodilution exacerbates neurologic injury in a survival piglet model with deep hypothermic circulatory arrest. *Ann Thorac Surg*. 2002;73:180-9.
6. Tseng EE, Brock MV, Kwon CC, Annanata M, Lange MS, Troncoso JC, et al. Increased intracerebral excitatory aminoacids and nitric oxide after hypothermic circulatory arrest. *Ann Thorac Surg*. 1999;67:371-6.
7. Cook DJ, Boston US, Orszulak TA, Slater JM. Carbon dioxide management and the cerebral response to hemodilution during hypothermic cardiopulmonary bypass in dogs. *Ann Thorac Surg*. 2001;72:1331-5.

12/8/128323

doi:10.1067/mtc.2002.128323

Reply to the Editor:

We would like to thank Miyamoto and Miyamoto for their insightful comments on our article. We have the following opinion in response to their observations.

Recent studies have revealed the advantages of pH-stat management over alpha-stat management in infants.¹⁻³ In the old cerebral infarct model that we used in our study, we also presume that pH-stat management might prevent the progress of anaerobic metabolism as indicated by Miyamoto and Miyamoto. However, we do not know whether pH-stat management may improve the surgical results in adult patients with old cerebral infarction, because atheromatous microembolism may also be as important a factor as ischemia of the penumbra. Although the metabolism in the penumbra that we described may be improved by pH-stat management, microembolism will certainly not decrease; if anything, it will increase.⁴ Most of the adult patients who undergo aortic arch operations have atherosclerosis in the aorta, arch

vessels, and intracranial vessels. Patients with old cerebral infarction are especially likely to have severe atherosclerosis, whereas infants or young patients do not have any atherosclerosis. Moreover, blood flow of the penumbra would not necessarily increase in pH-stat management because there is a derangement of autoregulation in pH-stat management; this autoregulation is maintained in alpha-stat management.

We agree that pH-stat management has the potential of improving neurologic outcome in hypothermic operations. However, more investigations will be necessary to ascertain the actual merits of this strategy when applied in adult patients with severe atherosclerosis.

Naoki Washiyama, MD

Teruhisa Kazui, MD

Abul Hasan Muhammad Bashir, MBBS

First Department of Surgery

Hamamatsu University School of Medicine

1-20-1, Handayama

Hamamatsu, 431-3192, Japan

References

1. Plessis AJ, Jonas RA, Wypoj D, Hickey PR, Riviello J, Wessel DL, et al. Perioperative effects of alpha-stat versus pH-stat strategies for deep hypothermic cardiopulmonary bypass in infants. *J Thorac Cardiovasc Surg*. 1997;114:991-1001.
2. Priestley MA, Golden JA, O'Hara IB, McCann J, Kurth CD. Comparison of neurologic outcome after deep hypothermic circulatory arrest with alpha-stat and pH-stat cardiopulmonary bypass in newborn pigs. *J Thorac Cardiovasc Surg*. 2001;121:336-43.
3. Kurth CD, O'Rourke MM, O'Hara IB. Comparison of pH-stat and alpha-stat cardiopulmonary bypass on cerebral oxygenation and blood flow in relation to hypothermic circulatory arrest in piglets. *Anesthesiology*. 1998;89:110-8.
4. Patel RL, Turtle MR, Chambers DJ, James DN, Newman S, Venn GE. Alpha-stat acid-base regulation during cardiopulmonary bypass improves neuropsychologic outcome in patients undergoing coronary artery bypass grafting. *J Thorac Cardiovasc Surg*. 1996;111:1267-79.

12/8/128322

Effects of storage solutions on in vitro vasoreactivity of radial artery conduits

To the Editor:

We read with great interest the work carried out by Chong and associates¹ on the

best solution for preservation of radial artery endothelial and contractile functions. We are not surprised to hear that the best solution was heparinized whole blood. For the past 4 years we have been harvesting radial arteries and intuitively believed that blood was the best solution. To this extent we have advocated that the radial artery should remain in the circulation until it is required as a conduit. Taking the radial artery out of the circulation and storing it in any form of storage solution will potentially make the endothelium ischemic, which in our view is the most significant factor in the development of spasm. We are curious whether the investigators have any additional information regarding the development of endothelial ischemia and degree of vasoreactivity.

Our experience in more than 1000 patients convinces us that maintaining the flow of blood through the artery is the most important factor in avoiding spasm. The radial artery can be dissected in the standard manner, after which the arm can be left out abducted between 80° and 90° or 10° and 30°. This provides enough space for the assistant to stand comfortably while the radial artery continues to be preserved in vivo by whole blood (heparinized or not). We do use topical papaverine or glyceryl trinitrate to counteract any spasm that may have developed during dissection. We have not found it necessary to use verapamil (topical or systemic) on any occasion to date.

We are delighted that Chong and associates have demonstrated the value of whole blood, as in our opinion it is the natural "preservation solution" for arteries normally. We would urge them and other surgeons to use our technique of keeping the radial artery in circulation for as long as possible before use.

Uday Trivedi, FRCS(C-Th)

Andrew Forsyth, FRACS

Department of Cardiothoracic Surgery

The Royal Sussex County Hospital

Brighton, BN2 5BE, United Kingdom

Reference

1. Chong WCF, Ong PJL, Hayward C, Moat N, Collins P. Effects of storage solutions on in vitro vasoreactivity of radial artery conduits. *J Thorac Cardiovasc Surg*. 2001;122:470-5.

12/8/128074

doi:10.1067/mtc.2002.128074