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Commentary: Deep hypothermic circulatory arrest for left chest aneurysm repair: Ready for prime time?

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Deep hypothermic circulatory arrest (DHCA) as an adjunct during cardiovascular surgical procedures has a long history, beginning in the early 1950s.¹ In 1964, Borst and colleagues² first reported the successful use of DHCA through a left thoracotomy to repair an arteriovenous fistula of the aortic arch. Although DHCA is currently widely applied for management of aneurysms and dissections involving the aortic arch, there has been less enthusiasm for its use in the management of aortic disease that involves a lateral approach. In many experienced centers that perform open repair of descending thoracic and thoracoabdominal aortic disease, DHCA is generally reserved for situations in which aortic clamping is impossible or inadvisable or in which repair of the distal aortic arch is also required, and its use is often unplanned. In these circumstances, the use of DHCA has been associated with substantial mortality and morbidity.³⁻⁵ As a consequence, it has been used infrequently, and left heart bypass or partial cardiopulmonary bypass with mild hypothermia remain the most widely used techniques for circulatory support when a lateral approach is required.

In this issue of the *Journal*, Alhussaini and colleagues⁶ report their experience using DHCA in 46 patients undergoing repair of descending thoracic (DTA) or thoracoabdominal (TAAA) aortic disease, and compare the outcomes with those of 38 patients in whom cardiopulmonary bypass and permissive hypothermia were used. The 2 groups were comparable in terms of most of the baseline characteristics but differed substantially in the need for distal aortic arch

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CENTRAL MESSAGE

Deep hypothermic circulatory arrest is a safe and suitable technique for management of complex thoracic and thoracoabdominal aortic disease that requires a left-sided approach.

replacement (only in the DHCA group), and a higher prevalence of chronic aortic dissection and previous aortic repair and a lower prevalence of Crawford extent I TAAA disease in the DHCA group. As would be expected, the durations of cardiopulmonary bypass and total operative time were greater in the DHCA group. Despite the differences between the 2 groups, there were no statistically significant differences in the prevalence of early mortality, stroke, permanent spinal cord injury, permanent renal failure necessitating hemodialysis, reoperation for bleeding, or freedom from major adverse outcomes. Data on transfusion of blood products were not provided.

Although this is not a truly comparative study, it adds to the growing body of knowledge regarding the safety and utility of DHCA for the management of aortic disease requiring a left-sided approach. Several single-institution studies using propensity matching and a meta-analysis comparing DHCA and left heart bypass have shown comparable outcomes with regard to early mortality and major morbidity.⁷⁻¹⁰ Two of those studies demonstrated better preservation of renal, hepatic, and spinal cord function with DHCA.^{7,8} Studies from 2 centers of patients with DTA and TAAA aortic disease in which DHCA was used as the sole method of organ protection showed rates of spinal cord ischemic injury and renal failure among the lowest reported in the literature, especially in the higher-risk subsets.¹¹⁻¹³ Little published information is available on the volume of homologous blood products and hemostatic agents infused with the 2 techniques; however, in a study of 90 propensity-matched

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patients reported by Weiss and colleagues,⁷ there was no statistically significant difference in the volume of blood products administered (red cells, platelets, and fresh-frozen plasma) between the DHCA and non-DHCA patients.

The foregoing findings suggest that there may be a greater role for the use of DHCA when a lateral approach is required to treat DTA and TAAA aortic disease. Given the increased use of endovascular grafting to treat these conditions, as noted by Aljussaini and colleagues⁶ and by others, cases presenting for open repair will remain complex and challenging. When applied routinely, DHCA is a safe and highly satisfactory technique for managing patients with these conditions, and it likely will be used with increasing frequency in the future.

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