Perioperative renal function and thoracoabdominal aneurysm repair: Where do we go from here?

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Disclosures: Author has nothing to disclose with regard to commercial support.

Received for publication June 16, 2018; revisions received June 16, 2018; accepted for publication June 18, 2018; available ahead of print Aug 7, 2018.

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J Thorac Cardiovasc Surg 2018;156:2049-50

0022-5223/\$36.00

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<https://doi.org/10.1016/j.jtcvs.2018.06.057>

In this issue of *The Journal of Thoracic and Cardiovascular Surgery*, Coselli and colleagues¹ examine the impact of preoperative renal dysfunction on perioperative outcomes and survival in patients undergoing Crawford extent II thoracoabdominal aneurysm (TAAA) repair. With an estimated glomerular filtration rate of 60 mL/min/1.73 m² as the definition of chronic kidney disease (CKD),² Coselli and colleagues¹ identified compromised preoperative renal function in 399 (39.8%) of their 1003 patients. Not surprisingly, these patients were older and sicker, with a much higher percentage of degenerative aneurysms and a lesser incidence of either connective tissue disorders or dissections as etiology. Interestingly, CKD strongly predicted a composite of adverse events and postoperative renal failure requiring hemodialysis. It did not predict operative mortality, however, a finding contradicting previously published data examining the influence of CKD on a broader cohort of patients undergoing TAAA repair.^{3,4} Propensity analysis of 311 pairs of patients with and without CKD did not change these results. After adjusting for median age, 5- and 10-year survivals were also worse when CKD was present. Although, as Coselli and colleagues¹ stated, this information is useful when counseling patients on the risks of TAAA repair, would it not be nice if we could actually do something to reduce the incidence of postoperative renal failure and its profoundly negative impact on perioperative and long-term outcomes?

It seems logical that cold crystalloid renal perfusion (CRP) should help. Previous randomized trials have shown the benefits of this strategy when compared with cold blood perfusion in patients undergoing TAAA repair.⁵ In this very large cohort of patients undergoing extent II repair, however, neither patients with CKD nor those without CKD had a reduction in the incidence of acute renal failure requiring hemodialysis when CRP was used as an adjunct. Other methods of renal support have been similarly disappointing in preventing either temporary or permanent renal injury. Partial left heart bypass,³ profound hypothermic circulatory

Extent II thoracoabdominal aneurysm.

Central Message

Chronic kidney disease predicts worse outcomes for patients undergoing extent II thoracoabdominal aneurysm repair. Additional adjuncts are needed to reduce this highly morbid complication.

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arrest, and a variety of preservation and perfusion solutions have failed to provide significant renal protection.⁶ An aggressive posture toward renal revascularization when renal artery dissection or stenosis is present also sounds like an appropriate strategy to improve renal perfusion; however, surgical bypass, endarterectomy, and endovascular stenting all fail to prevent the need for dialysis in the setting of compromised baseline renal function.⁷

So what else can we do to help those with CKD avoid the 40% mortality reported for those who have renal failure after undergoing extent II TAAA repair? How can we improve on the 39% renal recovery rate for those who survive extent II repair after dialysis-dependent renal failure? Renal hypothermia has been the predominant method of reducing oxygen demand and prolonging ischemic tolerance in donor kidneys.⁸ Aortic occlusion without protective adjuncts creates similar stresses to prolonged periods of warm ischemia. When TAAA repair is performed with a simple crossclamp technique, CRP has been shown to reduce the incidence of postoperative renal failure.⁹ Granted, no other center will ever report an experience with more than 1000 extent II TAAAs, the cohort at greatest risk for renal failure after aneurysm repair. Nonetheless, most high-volume aneurysm centers use some form of CRP for extent II, III, and IV repairs and continued use is recommended when possible. Most centers that use CRP include mannitol in the cold perfusate, and this hyperosmolar agent may reduce ischemic-reperfusion injury and improve renal

blood flow by reducing renal endothelial swelling. Goal-directed hemodynamic optimization has been shown to reduce renal dysfunction after infrarenal aneurysm repair¹⁰ and is likely to be useful in open TAAA repair as well. Further investigation of novel pharmacologic agents for renal protection may add another level of protection for those with CKD.

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