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Which Is Best for Abdominal Aortic Aneurysms Treatment with Chronic Renal Insufficiency

Endovascular Aneurysm Repair or Open Repair?

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• Endovascular repair • Open repair • Abdominal aortic aneurysm
• Chronic renal insufficiency • Intra-vascular ultrasound • CO_2 arteriogram
• Duplex ultrasound

Key points

- Endovascular aneurysm repair (EVAR) should be the first-line therapy for abdominal aortic aneurysm (AAA) in patients with moderate renal dysfunction (30 mL/min < estimated glomerular filtration rate [eGFR] <60 mL/min) because of better outcomes compared with open repair.
- Elective repair of AAA in patients with severe renal dysfunction (eGFR <30 mL/min) should be avoided because of significant risk of postoperative renal failure/dialysis with either EVAR or open repair.
- Intravascular ultrasound (IVUS) and CO_2 arteriograms should be used for the initial EVAR procedure to minimize contrast nephrotoxicity.
- Follow-up protocols after EVAR should include color duplex ultrasound and abdominal radiograph to prevent further decline of renal function due to multiple CT angiograms (CTAs).

INTRODUCTION

Endovascular aneurysm repair (EVAR) has become the first-line treatment of infrarenal AAAs in patients with appropriate anatomy because of superior early outcomes and equivalent long-term results compared with standard

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open repair [1]. Nevertheless, despite its minimally invasive nature, EVAR is not an entirely benign procedure. The use of intra-arterial contrast during and after the procedure to monitor for endoleaks is a potential source of nephropathy, which could cause up to 10% decrease in creatinine clearance after the first year [2]. Likewise, up to 20% of patients with open AAA repair (OPEN) had decreased renal function postoperatively [3]. These statistics referred to all patients with AAAs; for patients with impaired renal function at baseline, any further decline in renal function could be catastrophic because that could push them toward dialysis. More importantly, chronic renal insufficiency (CRI) has been identified as an independent predictor of early and late mortalities in both OPEN and EVAR [3–7].

This high-risk patient population presents a real dilemma for the vascular surgeons regarding which approach should be used to treat patients with infrarenal aneurysms who have suitable anatomy for both endovascular and open repair. EVAR is less invasive but requires the use of contrast during implantation, whereas OPEN is known to have higher operative mortality than EVAR. In addition, the hemodynamic shifts associated with OPEN are not favorable to a fragile renal function either. This article reviews the current data in the literature regarding these 2 treatment modalities for this challenging patient population.

THE MECHANISMS OF POSTOPERATIVE DECLINE IN RENAL FUNCTION AFTER ABDOMINAL AORTIC ANEURYSM REPAIR

Acute renal failure could complicate the outcomes of up to 12% of patients undergoing OPEN, resulting in a significant increase in hospital mortality (25%–66%) [8–10]. Even in the cases of infrarenal clamping, renal perfusion could be altered due to any technical difficulty, such as dissection or atheroemboli to the renal arteries due to the proximity of clamping site to the aortic origin of these arteries. In addition, the ischemia/reperfusion effect of the lower extremities and the overall hemodynamic shift during the operation could lead to postoperative renal dysfunction. Nevertheless, most renal function impairment after OPEN occurs in the immediate postoperative and slowly recovers with time.

On the other hand, although EVAR spares patients the perioperative hemodynamic shift, the continuing exposure to contrast during the procedure from angiogram used to deliver the endovascular device and after the procedure from multiple follow-up CT scans could be detrimental to both short-term and long-term renal function. Atheroemboli from manipulation of the catheters/wires in shaggy aortas and stent graft migration are other causes of impaired renal perfusion after EVAR. Regardless of the type of stent grafts used, there is an average 10% decrease in creatinine clearance after the first year of EVAR [2,11,12]; but does contrast nephropathy during the initial procedure play a major role or is the cumulative effect of multiple follow-up CT angiograms the real culprit?

Contrast-induced nephropathy typically causes a peak of serum creatinine approximately 2 to 3 days after the procedure and frequently recovers