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CASE REPORT
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Renal autotransplantation in open surgical repair of suprarenal abdominal aortic aneurysm

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Although the standard treatment of abdominal aortic aneurysm has shifted from open surgery to endovascular repair, open surgery has remained the standard of care for complex aneurysms involving the visceral arteries and in patients unsuitable for endovascular aneurysm repair. Postoperative renal insufficiency may occur after open surgical repair of suprarenal abdominal aortic aneurysm. Methods of minimizing renal ischemic injury include aortic cross-clamping and renal reconstruction techniques. This report describes the use of renal autotransplantation for renal reconstruction during open surgical repair of a suprarenal abdominal aortic aneurysm. This technique was successful, suggesting its feasibility for open suprarenal abdominal aortic aneurysm repair, minimizing renal ischemic injury and optimizing postoperative renal function.

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Key Words: Aorta, Aneurysm, Kidney, Transplantation

INTRODUCTION

Although endovascular aneurysm repair (EVAR) has been replacing open surgical repair (OSR) in the treatment of standard infrarenal abdominal aortic aneurysms (AAAs) over the last 10 years, OSR has remained the standard of care for patients with complex aneurysms involving the visceral arteries and for patients unsuitable for EVAR [1,2]. Fenestrated and chimney EVAR techniques were recently developed to manage complex AAAs [3-5]. Due to their technical difficulties and concern over long-term durability, however, OSR still remains the gold standard for patients with complex AAAs [6].

Since OSR of suprarenal AAAs requires suprarenal aortic, often supraceliac, cross-clamping, blockage of renal perfusion may occur during surgical procedures, making the preservation of renal function a critical issue in these patients [1]. Efforts to minimize renal ischemic injury have involved various surgical considerations regarding aorta cross-clamping sites and techniques of renal reconstruction [1]. This report describes a relatively young patient who underwent renal autotransplantation as a surgical alternative to renal preservation during OSR of suprarenal AAA.

CASE REPORT

A 53-year-old man was admitted to Asan Medical Center with a diagnosis of asymptomatic suprarenal AAA. Except for hypertension, he had no other risk factors for atherosclerosis, and his medical and family histories were unremarkable. Preoperative contrast-enhanced CT showed a fusiform AAA

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extending from below the level of the superior mesenteric artery to both common iliac arteries, with a maximal diameter of 7.1 cm (Fig. 1). The relatively young age of this patient suggested the feasibility of OSR, rather than the fenestrated or chimney EVAR technique, with bilateral renal autotransplantations to avoid suprarenal aortic cross-clamping.

During OSR procedures, the left kidney was harvested first, with kidney preservation solution immediately infused for cold preservation. Cutting and side-to-side angioplasty were performed on the 8-shaped renal artery. About 20 minutes later, the right kidney was harvested and infused with kidney preservation solution. Side-to-side angioplasty of the two renal arteries was performed. Because of the exceptionally short right renal vein, renal vein extension with an autologous gonadal vein was performed as previously described [7]. Both upper polar renal arteries were sacrificed. The aneurysm was resected and a Y-graft interposition was performed using a polytetrafluoroethylene vascular prosthetic graft (GORE-TEX, W. L. Gore & Associates Inc., Newark, DE, USA) (Fig. 2). Both harvested kidneys were implanted using the standard method of retroperitoneal placement in the iliac fossa. Both renal arteries and veins were anastomosed to both external iliac arteries and veins, respectively, in an end-to-side fashion. The left kidney had a cold ischemia time of 210 minutes and a warm ischemia time of 30 minutes, 3 minutes for harvest and 27 for anastomosis. The right kidney had a cold ischemia time of 316 minutes and a warm ischemia time of 32 minutes, 2 minutes for harvest and 30 for anastomosis. Uretero-neocystostomy was performed using the standard technique.

The postoperative course of this patient was uneventful, with well-preserved renal function. Nineteen months after the operation, contrast-enhanced CT scan and renal Doppler ultrasonography confirmed the patencies of the aorto-iliac graft and both renal arteries, with both kidneys having a normal parenchymal echo and perfusion.

DISCUSSION

The decision to perform OSR with bilateral renal autotransplantation rather than a fenestrated or chimney EVAR

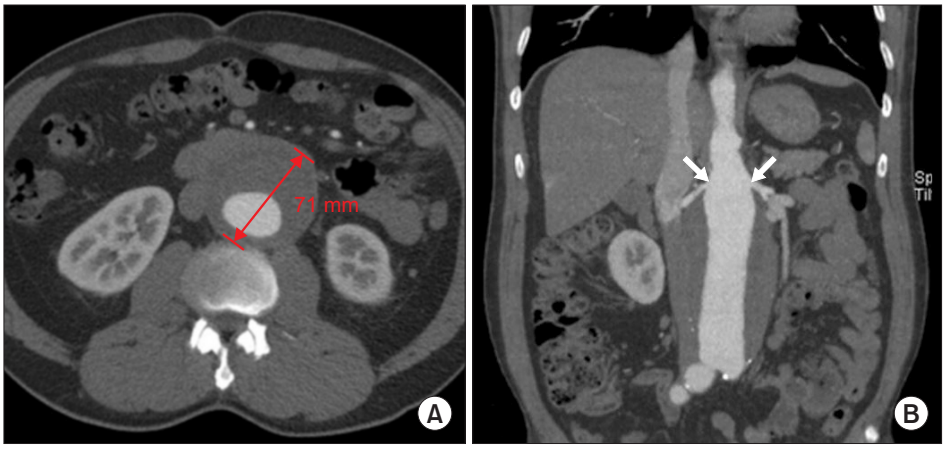

Fig. 1. Initial contrast-enhanced computed tomography image showing (A) a fusiform abdominal aortic aneurysm of maximal diameter 7.1 cm, (B) involving both renal arteries (white arrows).

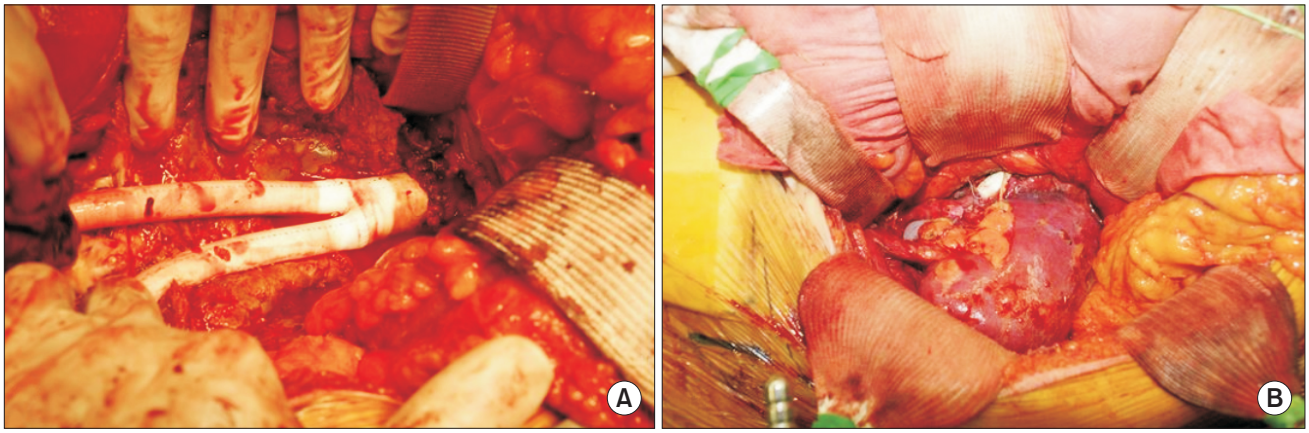

Fig. 2. Intraoperative findings showing (A) interposition of an aorto-bi-iliac Y-graft with a polytetrafluoroethylene vascular prosthetic graft and (B) renal autotransplantation.

technique was due to questions about the long-term patency of recently developed endovascular techniques for complex AAAs and the relatively young age of this patient. Moreover, compared with OSR with standard techniques of renal reconstruction, renal autotransplantation can avoid suprarenal aortic cross-clamping, thus reducing warm ischemia time.

Over the last decade, large, multicenter, randomized trials have shown the benefits of EVAR rather than OSR in patients with standard infrarenal AAAs. Standard EVAR, however, cannot be performed in patients with complex AAAs, such as short-necked, juxtarenal and suprarenal AAAs. Moreover, recently developed fenestrated and chimney EVAR techniques cannot guarantee long-term graft patency, making OSR challenging [8]. The most frequently used technique for renal reconstruction in patients undergoing OSR for suprarenal AAA is renal artery reimplantation, e.g., Carrel patch angioplasty or the aorto-renal bypass anastomosed to the aortic graft [1]. During this renal reconstruction procedure, renal ischemia occurs due to suprarenal aortic cross-clamping. The optimal warm ischemia time for renal preservation is less than 30 minutes, an objective hard to achieve in patients with complex renal vascular structures or abnormal anatomical structures around the kidneys. Thus, several steps of angioplasty are required for final renal revascularization [1]. More than 25% of patients undergoing suprarenal aortic cross-clamping during OSR experience postoperative renal dysfunction caused by renal ischemia, and may even require hemodialysis [9].

Renal autotransplantation, first described for high ureteric injury, has been shown to be safe and effective in the treatment of ureteric length deficiencies, loin-pain syndrome, and renovascular disease [10]. Warm ischemia time during renal autotransplantation, however, may be prolonged in patients undergoing anastomosis of renal vessels to external iliac vessels. Because kidneys preserved under cold conditions have already undergone renal vascular angioplasty for anastomosis, the warm ischemic time can be reduced, thus optimally preserving renal function.

This case report described the use of renal autotransplantation for renal reconstruction during OSR in a patient with suprarenal AAA. A good clinical outcome was obtained with renal function being well preserved. These findings suggest that renal autotransplantation during OSR offers an appropriate alternative for younger patients with suprarenal AAA who have any conditions that restrict the use of routine renal construction methods. Widespread application of this method may allow statistically meaningful comparisons of postoperative renal function preservation, long-term patency, surgical costs, and technical feasibility.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reports.

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