» **Case Report** «

Repair of Internal Iliac Artery Aneurysm Anastomosed to Donor Renal Artery in a Renal Transplant Patient

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We herein report a successful repair of an internal iliac artery aneurysm in a renal transplant patient. At renal transplantation, the main renal artery and accessory renal artery had been anastomosed to the right internal iliac artery and right external iliac artery, respectively. The patient underwent resection and graft replacement of the iliac artery aneurysm with reattachment of the main renal artery to the right external iliac artery through a midline laparotomy with repeated topical cold perfusion for renal protection. The postoperative course was uneventful, and no evidence of renal function impairment was present at discharge.

Keywords: iliac artery aneurysm, renal transplant

Introduction

With increasing numbers and longer survival of renal transplant patients, it is estimated that the number of such patients who develop abdominal or iliac artery aneurysm might also be increasing.^{1,2} Most case reports of aneurysm repair in renal transplant patients have focused on the methods of preservation of postoperative renal function. The ischemic time is undoubtedly important for renal protection, and the success of protection might depend on the locations of the donor renal artery and aneurysm as well as the presence of any concomitant anomalies of the transplanted renal artery system. We herein report the successful repair of an internal iliac artery aneurysm anastomosed to the donor renal artery in a renal transplant patient with

accessory renal artery of the donor kidney with repeated intermittent topical cold perfusion for protection of the transplanted kidney.

Case Report

A 69-year-old female patient had undergone allogeneic renal transplantation in the right iliac fossa 32 years before the current presentation. She subsequently developed multiple cardiovascular events. The patient underwent emergent graft replacement of the ascending aorta and femorofemoral bypass for acute type A dissection 22 years later (the bypass thrombosed before the present operation). The left internal iliac aneurysm was resected, and the distal internal iliac artery was reconstructed with an expanded polytetrafluoroethylene graft 1 year later. Aortic root replacement (Bentall procedure) and total arch replacement were performed for enlargement of the residual aortic dissection and progression of aortic regurgitation 8 years later (1 year before current presentation). Enlargement of the bilateral common iliac arteries (right, 32 mm; left, 33 mm) and right internal iliac artery (30 mm) was subsequently observed. The transplanted kidney was accompanied by an anomaly: an accessory renal artery and triple ureter. End-to-end anastomosis had been performed between the right internal iliac artery and main renal artery, and end-to-side anastomosis had been performed between the right external iliac artery and accessory renal artery for the renal allograft (**Fig. 1**). The three ureters had been anastomosed to the urinary bladder. The patient took methylprednisolone (4 mg/day) and azathioprine (50 mg/day) in preoperative state.

We performed resection and graft replacement of the iliac artery aneurysm through a midline laparotomy as follows. The right femoral artery, right common and external iliac arteries, and transplanted renal artery that had been anastomosed to the internal iliac artery aneurysm were dissected. Additionally, the transplanted renal vein was dissected for drainage of cold perfusate infused from the renal artery to protect the transplanted kidney. The left external iliac artery and internal iliac graft were also dissected.

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Fig. 1 Preoperative computed tomography scan showed a bilateral common iliac and right internal iliac artery aneurysm, to which the donor renal artery had been end-to-end anastomosed. The accessory renal artery had been anastomosed to the right external iliac artery.

Topical cold perfusion was applied to protect the transplanted kidney. After systemic heparinization (100 U/kg), the right common iliac and common femoral arteries were clamped, and a longitudinal incision was created in the transplanted renal vein. The transplanted renal artery and external iliac artery were cut, and 1000 ml of 4°C cold Ringer's lactate solution containing 125 mg of methylprednisolone sodium succinate and 62 ml of mannitol was perfused manually. The cold perfusate was drained from the incision site of the renal vein, and systemic temperature remained. The total of single dose of perfusate was 1000 ml. The administration interval was around 1 h. A 16/8 mm diameter bifurcated graft (Gelsoft Plus Bifurcate, Vascutek Terumo, UK) was applied. The infrarenal abdominal aorta, left external iliac artery, and prosthetic graft anastomosed to the left internal iliac artery were then clamped. Proximal anastomosis between the abdominal aorta and prosthetic graft was performed. Upon completion of the proximal anastomosis (56 min after the onset of renal ischemia), the topical cold perfusion was repeated in the same fashion. The transplanted renal artery was reattached to the right external iliac artery following anastomosis between the prosthetic graft and right external iliac artery. The incision of the transplanted renal vein was closed with a running 5-0PROLENE (Ethicon, Inc., Somerville, NJ, USA) suture. These anastomoses were technically difficult to perform because of the dissection, adhesion, and fragility of the vessels and the

Fig. 2 Postoperative computed tomography scan. The two donor arteries of transplanted kidney were anastomosed to right leg of bifurcated graft (arrow).

occurrence of bleeding; the total ischemic time was prolonged at 101 min. Finally, the prosthetic graft was anastomosed to the left common iliac artery (Fig. 2).

The postoperative course was uneventful. After operation, she resumed immunosuppressant and steroid with preoperative dosage. Transient elevation of the serum creatinine level (0.59 mg/dl to 1.13 mg/dl) occurred on postoperative day 1, but decreased to the normal level on postoperative day 2. The patient was discharged without renal function impairment.

Discussion

The increasing number of renal transplantations and improvement in the long-term allograft survival rate may increase the frequency of performance of formerly uncommon abdominal and iliac aneurysmal repair. The reason for this is that the patients are often at risk for the development of proatherogenic side effects of immunosuppressive agents as well as the leading cause of atherosclerosis such as diabetes mellitus and hypertension. In surgery, prolonged administration of the immunosuppressive agents can also have significant deleterious effects, including increased risk of infection and damage to connective tissue. In fact, fragility of the vessels caused difficulty in bleeding control during dissection and anastomosis. Although these drugs are reported to be effective for prevention of intraperitoneal adhesion, the patient in our case, who took methylprednisolone and azathioprine, showed severe local adhesion.

Abdominal aortic repair after renal transplantation has been previously reported,¹⁻⁶⁾ and most of these reports focused on the method of protection of the transplanted kidney. The kidneys reportedly tolerate a warm ischemia time of approximately 50 min.⁷⁾ Surgeons must attempt to minimize the ischemic time. Moon et al. reported two successful cases of abdominal aortic aneurysm repair without additional operative protection (renal ischemic times of 25 min and 37 min).¹⁾ However, unexpected prolongation of the ischemic time may occur in the clinical setting, and any possible modality of renal protection is desirable. Previously reported methods of renal protection include extra-anatomical bypass (axillofemoral bypass)³⁾ for maintenance of the blood supply, aortofemoral shunting,⁴⁾ extracorporeal bypass,⁵⁾ and cold perfusion and systemic hypothermia.^{2,6)} Axillo-femoral bypass has the merit of providing pulsatile blood flow and prevention from ischemic time whereas the operation time is somewhat prolonged. The merit of extracorporeal bypass is also to prevent ischemia of transplanted allograft, whereas it might be more expensive than other method and induce systemic inflammation related to extracorporeal bypass. To the best of our knowledge, no randomized clinical trials have investigated the effects of such renal protection methods.

We applied intermittent topical cold perfusion in the present case. Nghiem and Lee first reported the use of continuous hypothermic renal perfusion during aneurysm repair.⁶⁾ The type, amount, and method (continuous or intermittent) of infusion may vary.^{2,6)} In the present case, the transplanted kidney was successfully preserved for 101 min by intermittent cold perfusion. The reason why we selected intermittent perfusion was that this maneuver was simple and provided clear surgical view without catheter for injection in surgical field. However, the infusion of cold perfusate may decrease the systemic temperature, resulting in the production of critical arrhythmia such as ventricular fibrillation. Therefore, we believe that drainage of the cool perfusate from the renal vein is essential if dissection of the transplanted renal vein is not technically difficult.

Accessory renal arteries are a common variant and are present in about 25% of the general population. Therefore, the presence of an accessory renal artery of the donor kidney complicated with an abdominal or iliac aneurysm is not uncommon. In such cases, the renal ischemic time might be prolonged for anatomical reasons, and renal protection will be desirable. When applying cold perfusion for renal protection in such cases, infusion into the kidney via the accessory renal artery is proposed; this often supplies the inferior pole of the kidney in addition to the main renal artery.

In the era of endovascular surgery, there are several case reports describing endovascular aneurysm repair (EVAR) for patients with coexisting transplanted kidney.⁸⁾ The advantage of EVAR is avoidance of aortic cross clamp which prevents ischemia and reperfusion injury of the transplanted

kidney. In contrast, the disadvantages are restricted availability due to anatomical reasons, application of contrast medium during the procedure, and ischemia due to passing of the devices through narrow arterial access of the transplanted side. Therefore, device selection and access route are crucial for success of operation. In our case, EVAR was not indicated because of an unsuitable anatomy of the aneurysm, which branched transplanted main renal artery.

Conclusion

We have reported the successful repair of an internal iliac artery aneurysm anastomosed to the donor renal artery in a renal transplant patient with an accessory renal artery of the donor kidney. Reattachment of the renal artery prolongs the ischemic time, and cold perfusion infused via main and accessory renal artery is convenient and safe.

Disclosure Statement

All authors have no conflict of interest.

Author Contribution

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