Laparoscopic Nephrectomy, Ex Vivo Angioplasty, and Renal Autotransplant for a Renal Artery Aneurysm: A Case Report

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Abstract

We describe in this report the case of a renal aneurysm in a 42-year-old woman. The aneurysm measured 27 mm in diameter, and was sited at the first bifurcation of the renal artery. We performed laparoscopic nephrectomy, ex vivo angioplasty and renal autotransplant to avoid ischemic damage to the kidney during reconstruction. The patient recovered and was discharged from the hospital without any complications. Hence, we suggest these treatments can be effectively done in patients with complex renal aneurysms.

Key words: *Renal artery aneurysm, Laparoscopic nephrectomy, Extracorporeal reconstruction, Renal autotransplantation, Renal function*

Since renal autotransplant was first described by Hardy in 1963,[1] it has been used to treat patients with renovascular diseases, ureter injuries, and renal tumors. We present the case report of a patient with a renal artery aneurysm who underwent nephrectomy, ex vivo angioplasty of the renal artery, and renal autotransplant who recovered without complications.

Case Report

A 42-year-old woman visited the district general hospital, complaining of a history of continuous fever and fatigue. Her urine was clear; however, results of screening abdominal ultrasonography revealed a hypoechoic mass in the upper part of the right kidney. Doctors there suspected a right renal artery aneurysm and referred her to our hospital. On admission, her blood pressure was normal, and serum creatinine and blood urea nitrogen concentrations were within normal ranges. Results of 3-dimensional computed tomography (CT) and selective renal angiography showed a saccular right renal artery aneurysm measuring 27 mm in diameter (Figures 1 and 2). From these images, we also ascertained that the aneurysm originated from the first bifurcation of the renal artery. Results of a subsequent renogram showed normal split renal function of the bilateral kidney. The CT and angiography results indicated that endovascular coil embolization was impossible, owing to the morphology and site of the aneurysm. Based on these findings, the patient was scheduled for laparoscopic nephrectomy, ex vivo repair, and autotransplant.

The patient was placed in the lateral decubitus position with the left side down. Three 12-mm ports and a 5-mm port were inserted into the retroperitoneal space. After dissection of the renal hilum, the right renal artery and the aneurysm were

Figure 1. Results of 3-dimensional CT, showing a renal artery aneurysm located at the first bifurcation.

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Figure 2. Results of renal angiography, demonstrating an aneurysm.

exposed. The right kidney was isolated, with the exception of the renal artery, vein, and ureter.

An ipsilateral Gibson incision was made, and the abdominopelvic cavity was opened to remove the kidney. The ureter was mobilized and cut. As soon as hydration was adequate, 20 mg of furosemide was injected approximately 5 minutes before placement of the arterial clamp to promote renal perfusion and diuresis. After clamping and cutting the renal blood vessels, the freed kidney was extracted through the Gibson incision.

The kidney was placed in a container of cold extracellular solution at 4ºC and was preserved by ex vivo perfusion of cold Collins solution (4ºC) for 10 minutes via a small cannula inserted into the renal artery. Warm ischemic time was 6 minutes and 30 seconds.

As the CT and angiography results indicate, the aneurysm was saccular, with a narrow entry at the first bifurcation of the renal artery. It was resected completely, along with a safe margin of healthy arterial wall. The adjacent edges of the 2 renal arteries were sutured together to form a single opening (Figure 3).

The patient was subsequently placed in the supine position. The harvested kidney was placed into the right pelvic region. The reconstructed renal artery was anastomosed to the external iliac artery in an end-to-side fashion. The renal vein was reanastomosed to the external iliac vein in an end-to-side fashion. The autograft was perfused homogeneously, and urine production began immediately.

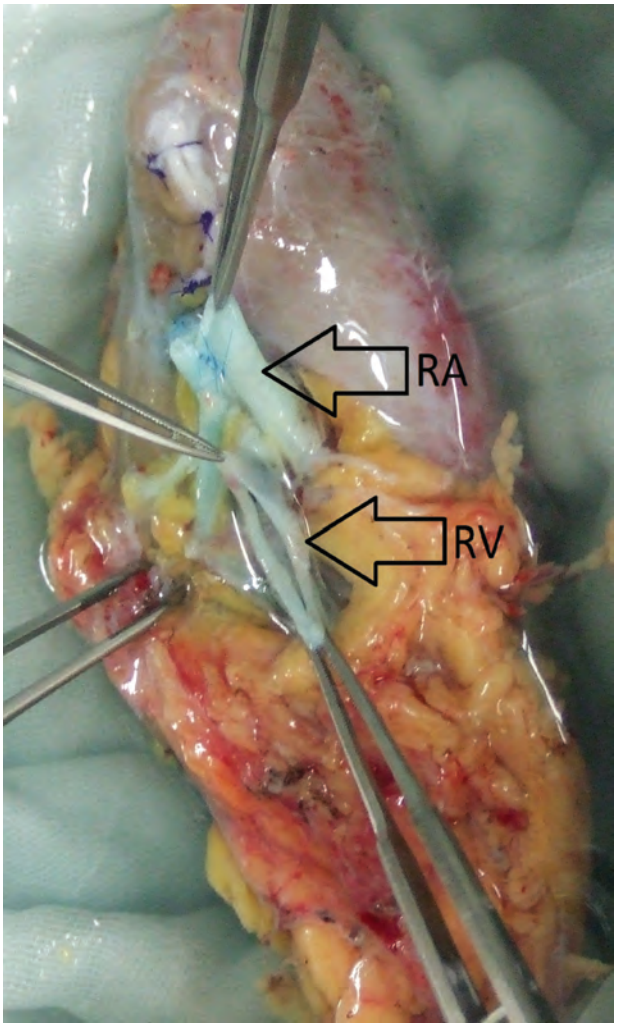

Figure 3. Revascularized renal vessels. RA, renal artery; RV, renal vein.

Cumulative cold ischemic time was 272 minutes. Ureterovesical anastomosis was performed, incorporating the submucosal tunnel method, and a single-J indwelling ureteral stent was placed to protect the anastomosis. Initial function of the autotransplanted kidney was excellent, showing 3.39 L of urine output within the first 24 hours after the operation. The patient's blood pressure was found to be satisfactorily controlled postoperatively without medication. Histopathologic examination of the resected aneurysm confirmed atherosclerotic changes in the arterial wall.

After an uneventful recovery, the patient was discharged from the hospital 11 days after the operation. Renal function and blood pressure were found to be excellent at 32 month's follow-up.

Discussion

Renal artery aneurysm is relatively uncommon,[2] and when present, it generally does not produce symptoms. However, there is a high possibility of a spontaneous rupture of the aneurysm, resulting in a life-threatening course.[3] Therefore, such aneurysms should be treated promptly. In the present case, the patient had a maximum aneurysm diameter of 27 mm, which constituted a particular therapeutic target.

Several treatment options exist for patients with renal artery aneurysms. These include nephrectomy, vascular bypass, coil embolization, and stent-graft placement.[4, 5] Symptom management and treatment should be determined according to the patient's age, anatomy, and surgical history. In the present case, the shape and location of the aneurysm prevented repair of the renal artery by interventional treatment. Choi and associates reported that damage to a partially resected kidney can occur when the warm ischemic time exceeds 28 minutes.[6] However, Seki and associates reported no correlation between total ischemic time and postoperative renal function.[4] Thus, although ex vivo repair in combination with nephrectomy and renal transplant is time-consuming, it can prevent ischemic damage to the kidney and preserve renal function by reducing warm ischemic time.

Webster and associates assessed the creatinine level in patients undergoing renal autotransplant for a short ureter after ureter injury or for renovascular disease.[7] They reported no statistical difference in creatinine level before and after surgery in either group. Seki and associates also reported that split renal function is stable or improved after ex vivo revascularization and autotransplant for renal artery aneurysms.[4] In addition, these procedures in combination can provide an effective opportunity to safely repair the artery.[7] This is why we selected nephrectomy, ex vivo repair of the renal artery, and renal autotransplant. The present patient showed normal serum creatinine and blood urea nitrogen levels at a 32-month postoperative follow-up. Several studies have shown that initial graft function after laparoscopic donor nephrectomy is equivalent to that of an open donor nephrectomy.[8-10] Thus, we performed minimally invasive laparoscopic nephrectomy. The patient experienced a rapid recovery without postoperative complications.

In renal autotransplant, the kidney is generally transplanted into the contralateral abdominopelvic cavity. However, in the present case, we made an ipsilateral Gibson incision, through which the kidney was removed retroperitoneally for aneurysm repair, and autotransplanted into the ipsilateral iliac fossa. It is usually preferable to anastomose the renal artery end-to-end to the internal iliac artery. However, the patient's reconstructed renal artery was small in diameter for an end-to-end anastomosis. In addition, the repaired renal artery was too short to anastomose to the internal iliac artery. Therefore, the repaired renal artery was anastomosed to the external iliac artery in an end-to-side fashion.

Recently, standard extracorporeal angioplasty and renal autotransplant have been performed effectively in patients with renovascular diseases, ureteric complications, or renal tumors.[9, 11] Thus, in cases similar to our present case, physicians should consider laparoscopic nephrectomy, ex vivo renal artery revascularization, and renal autotransplant as alternate procedures.

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