Renal Autotransplant in Patients With Complex Hilar Renal Artery Aneurysms

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Abstract

Renal artery aneurysms are uncommon, with an incidence of 0.01% in the general population. The improvement of radiologic techniques and the increased incidence of abdominal imaging for various indications has resulted in increased detection of asymptomatic renal artery aneurysms. Hilar renal artery aneurysms are a subtype of the disease and constitute management challenges. Here, we report 3 patients with hilar renal artery aneurysms treated with renal autotransplant and review the literature.

Key words: Renal artery aneurysm, Renal autotransplant, Solitary kidney

A renal artery aneurysm (RAA) is defined as a dilatation of the renal artery that exceeds twice the diameter of the normal renal artery at that point. The frequency of an RAA based on autopsy studies is about 0.01%. In selected patients who have undergone abdominal and/or renal angiography, the incidence is 0.3% to 1%. The true prevalence in the normal population is unknown. Fibromuscular dysplasia and atherosclerosis are the most common causes of an RAA. Arteritis, such as periarteritis nodosa and Wegener granulomatosis, commonly cause intrarenal aneurysms. Most RAAs are asymptomatic and are discovered incidentally during the investigation of other intra-abdominal disorders. The most common symptom is hypertension (90%), presenting with flank or abdominal pain, hematuria, collecting system obstruction, and renal infarction. Rupture of the aneurysm is a rare condition, and the patient usually presents with signs of an intra-abdominal catastrophe with frank hemorrhagic shock. A challenging subtype of an RAA is one with multiple aneurysms in the hilar area. In these cases, if in vivo reconstruction of the artery is not feasible, ex vivo reconstruction with autotransplant of the kidney is a possible treatment option. An autologous internal iliac artery can be used to reconstruct the renal artery. The internal iliac artery is recovered and its side branches anastomosed to the branches of the renal artery. We report 3 cases of an RAA in which ex vivo reconstruction and renal auto-transplant were performed.

Case Reports

Patient one is 31-year-old woman with a history of a right nephrectomy when she was 2.5 years old for pyelonephritis associated with stenosis of the right ureter and hydronephrosis. She was seen for hypertension with a renal ultrasound and angiogram. The ultrasound suggested renal artery stenosis. It was thought that any form of radiologic intervention would be too risky and would be associated with nephron loss. Furthermore, preoperatively, she had refractory hypertension despite treatment with 3 antihypertensive agents. Her serum creatinine level was 133 μmol/L. She underwent a nephrectomy of her solitary left kidney an ex vivo repair, with excision of the renal artery stenosis and dual renal artery aneurysms, and...
reconstruction using an autologous internal iliac artery after an autotransplant of the reconstructed kidney into the right iliac fossa. Her surgery was uneventful, and her blood pressure and creatinine levels returned to normal, without reintroduction of any antihypertensive medication. Her renal function has remained stable after 9 years’ follow-up.

Patient 2 is a 38-year-old woman, with a normal delivery, with an incidental finding of a 3-cm renal artery aneurysm in the hilum of her solitary left kidney that was diagnosed by an abdominal ultrasound scan performed for vague abdominal symptoms. A renal angiogram revealed a main renal artery and a lower polar artery. The main renal artery branched in the hilum, and there was an aneurysm of the upper branch. During surgery, she underwent a nephrectomy of her left kidney with reconstruction. During dissection at the back bench, when excising the aneurysm, there were 4 branches of the renal artery. The renal arteries were reconstructed using the patient’s internal iliac artery, and the kidney was autotransplanted into the right iliac fossa. Her postoperative recovery was straightforward, save for a urinary infection that was treated with antibiotics and removal of the ureteric JJ stent. Her renal function has remained stable after 5 years’ follow-up.

Patient 3 is a 65-year-old woman with intractable hypertension currently on 4 antihypertensive medications. Renal angiogram showed bilateral fibromuscular dysplasia of the renal arteries with a left renal artery aneurysm (2 cm) close to the hilum (Figure 1). The patient underwent a left nephrectomy with reconstruction when it was found that the main renal artery branched into 2 arteries. Using the patient’s internal iliac artery, the renal artery was reconstructed (Figures 2 and 3) and autotransplanted into the left iliac fossa. Her postoperative period was uneventful. She was discharged on a single antihypertensive, and her kidney function remains normal at 4 years’ follow-up.

Discussion

Aneurysms of the renal artery are rare and are usually diagnosed incidentally. The true prevalence of the disease is unknown. Based on autopsy studies, its frequency is around 0.01%. An RAA most frequently is associated with atherosclerosis and fibromuscular disease. Patients usually are asymptomatic and receive a diagnosis after investigating another intra-abdominal disorder. Symptomatic aneurysms can cause hypertension, abdominal or flank pain, obstruction of the collecting system, hematuria, and renal infarction owing to embolization from an aneurysmal thrombus. Diagnosis is based on ultrasound findings after a computed tomography angiogram or magnetic resonance angiogram. Conventional angiography is required in cases of complex anatomy.
Treatment is required in case of a rupture, and if the RAA is symptomatic (causing hypertension, pain, or renal infarction). The chance of rupturing an RAA during pregnancy is high; therefore, treatment of RAAs discovered during pregnancy or in women contemplating pregnancy also is indicated. There is no current consensus on the size of an RAA in an asymptomatic patient when intervention should be considered. Experts recommend repair of an asymptomatic RAA if the diameter is 1.5 to 3 cm, although most suggest 2 cm. However, it should be noted that rupture has been reported of aneurysms with diameters of 1.5 cm. Asymptomatic RAAs with a diameter of less than 2 cm should be followed by regular ultrasound or computed tomographic scan.

Treatment modalities include surgical and endovascular techniques. Emergency surgery and nephrectomy usually are unavoidable in cases of rupture. In elective settings, tangential excision of an aneurysm with primary repair or patch angioplasty of renal artery provides the best outcomes when treating solitary saccular aneurysms. Aneurysms with small necks may be repaired primarily; bigger ones may be repaired with an angioplasty using autogenous saphenous vein or prosthetic material. Fusiform, large aneurysms, and aneurysms associated with proximal renal artery stenosis may be repaired using aortorenal bypass grafts. Saphenous vein grafts provide superior patency rates compared with prosthetic materials. Nephrectomy usually is required for treating symptomatic or large intrarenal aneurysms not amenable to other repair techniques.

Endovascular treatment modalities have high clinical success rates, but the long-term results remain unclear. Coil embolization can be used in saccular aneurysm. Its advantage is that it can be used in extraparenchymal and intrarenal lesions as well. Stent grafts are bare metal stents lined with polytetrafluoroethylene or GORE-TEX. They can be used in fusiform and saccular aneurysms to treat renal artery stenosis and aneurysms concurrently.

With complex hilar, intrarenal, and multiple aneurysms of renal artery exposure, in vivo repair may be difficult. Ex vivo surgery allows for adequate exposure and repair with reduced time demands put upon the surgeon. The affected kidney can be removed from the body perfused with preservation solution used in renal transplant and cooled to 4°C. For reconstruction, an autologous saphenous vein or internal iliac artery may be used. The kidney can be reimplemented in the anatomic position or into the iliac fossa. The latter technique used in kidney allotransplant is less complicated. Most publications report only 1 or 2 cases; only few had larger series. Brekke and associates reported 21 cases of renal autotransplant for RAA. They had no organ loss after an average 4.3 years’ follow-up. Smaller series have reported 7 to 8 patients had no early graft loss.

The widespread application of minimally invasive surgical techniques also affects the treatment of RAA. Callagher and associates removed the kidney using a laparoscopic technique in 7 patients. There were no surgical complications or organ loss after 2 years of follow-up. Autologous saphenous vein extension grafts were used for bench reconstruction of the renal artery. The kidneys were implanted into the iliac fossa as in a routine transplant. All arterial branches were anastomosed individually to the saphenous vein graft, and all the saphenous vein extension grafts were anastomosed separately to the external iliac artery. In cases of 2 or 3 arterial branches, that number of intracorporeal anastomoses were done. The advantage of our technique is that only 1 intracorporeal arterial anastomosis is needed because all the other anastomoses are done on the backbench.

In summary, repair of a complex RAA in a solitary kidney can result in losing the kidney, acute renal failure, and the need of dialysis. Both our patients with solitary kidneys and the third one with 2 kidneys underwent ex vivo repair and autotransplant with good results. All 3 patient are asymptomatic and have normal kidney function at 4, 5, and 9 years after the operation. In cases in which in situ repair of complex RAA could result in nephron loss, ex vivo repair followed by reimplantation of the kidney is a safe technique providing good long-term results.

References