Management of bilateral renal artery aneurysms with laparoscopic nephrectomy, ex vivo reconstruction, and autotransplantation in a woman planning pregnancy

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ABSTRACT

Renal artery aneurysms (RAAs) are rare, with an estimated incidence of 0.01% to 0.97%. These aneurysms are often asymptomatic, although they occasionally manifest with hypertension, back pain, hematuria, or rupture. Despite limited evidence guiding treatment, women of childbearing age are consistently offered treatment because of the high risk of rupture. We present a case of a woman planning pregnancy with bilateral RAAs after failed endovascular management. She underwent bilateral laparoscopic nephrectomy, ex vivo reconstruction, and autotransplantation for treatment of her aneurysms. This appears to be safe and effective for treatment of RAAs and should be considered in similar patients. (J Vasc Surg Cases and Innovative Techniques 2020;6:126-8.)

Keywords: Endovascular surgery; Renal artery aneurysm; Minimally invasive surgery; Visceral aneurysms

Renal artery aneurysm (RAA) is a rare visceral aneurysm with an approximate incidence of 0.01% to 0.97%, depending on the series; there is approximately equal incidence between sexes.[1] RAAs can be true or false aneurysms. Approximately 75% of true aneurysms are saccular and occur at the renal artery bifurcations. False aneurysms, or pseudoaneurysms, are typically associated with iatrogenic injury or trauma. Most RAAs are asymptomatic; however, they can be found on evaluation of hypertension, flank pain, and hematuria or in cases of rupture.[1] There is currently a paucity of high-quality data guiding management of RAAs. Women of childbearing age, however, are consistently offered treatment, given the risk of rupture and associated morbidity and mortality to mother and fetus.[2,3] With the involved patient's informed consent, we present a case of bilateral RAA repair in a woman planning pregnancy and a review of current literature providing treatment recommendations for RAAs.

CASE REPORT

A 41-year-old woman was referred to us from her fertility specialist after a renal artery ultrasound examination, done for hypertension, identified bilateral RAAs. Computed tomography angiography confirmed a left 2.5- × 3-cm saccular aneurysm and a right 2- × 2.5-cm saccular bilobed aneurysm (Fig 1). The patient desired to become pregnant in the coming year; therefore, we offered repair of the aneurysms based on the aneurysm size >2 cm and for risk reduction, given a likely pregnancy. Preoperatively, her hypertension was controlled on a dual medication regimen.

The initial management plan was to proceed with staged embolization of both RAAs, beginning with the larger left aneurysm in September 2018. The trunk of the left renal artery was cannulated with a guiding catheter, followed by placement of a microcatheter into the saccular RAA; five 22- × 16-mm microcoils (Boston Scientific, Minneapolis, Minn) were deployed. After coiling, some sluggish flow was noted in the aneurysm sac that we thought would thrombose during the next several weeks. Given the location of the aneurysm near a bifurcation, a stent was not used. She tolerated this procedure well and was discharged home the next day.

At the 1-month follow-up appointment, a renal artery duplex ultrasound examination noted continued flow in the left artery aneurysm sac around the coils; this was confirmed by repeated arteriography (Fig 2). She was counseled on the ongoing risk of rupture and ultimately elected to undergo surgical repair.

A staged repair was planned with the urology and transplant surgery services beginning with the uncoiled right RAA. In November 2018, the urology service performed a laparoscopic donor nephrectomy of the right kidney (Fig 3.) Once the kidney was removed, it was flushed with chilled Collins solution. On the back table, the RAA was resected; the two efferent branches were sewn back together in a common channel that was then primarily anastomosed to the afferent branch in an end-to-end fashion. With adequate artery remaining, the kidney was then autotransplanted to the external iliac vessels by slightly extending the incision made for the hand-assist port of the laparoscope. The patient recovered well, with normal kidney function, and was discharged on postoperative day 5. In January 2019, the patient underwent similar repair of the left RAA.

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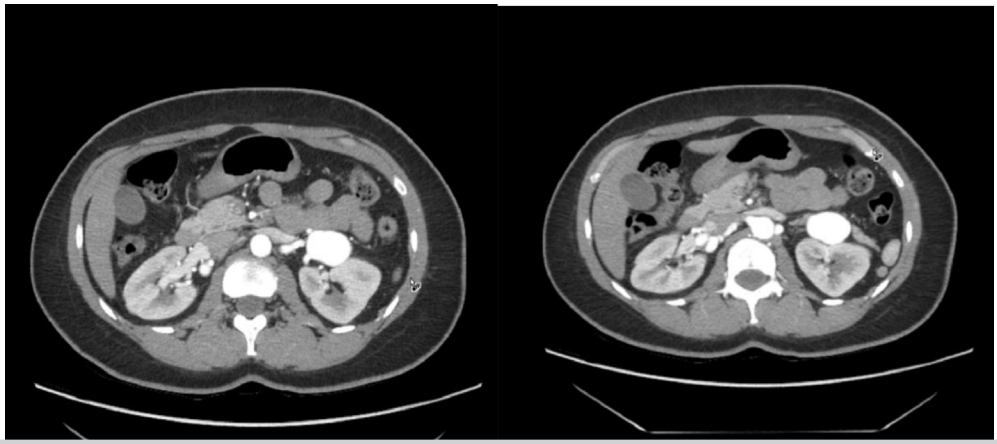

Fig 1. Preoperative computed tomography angiography showing the renal artery branches from the left renal artery aneurysm (RAA; *left*) and the bilobed nature of the right RAA (*right*).

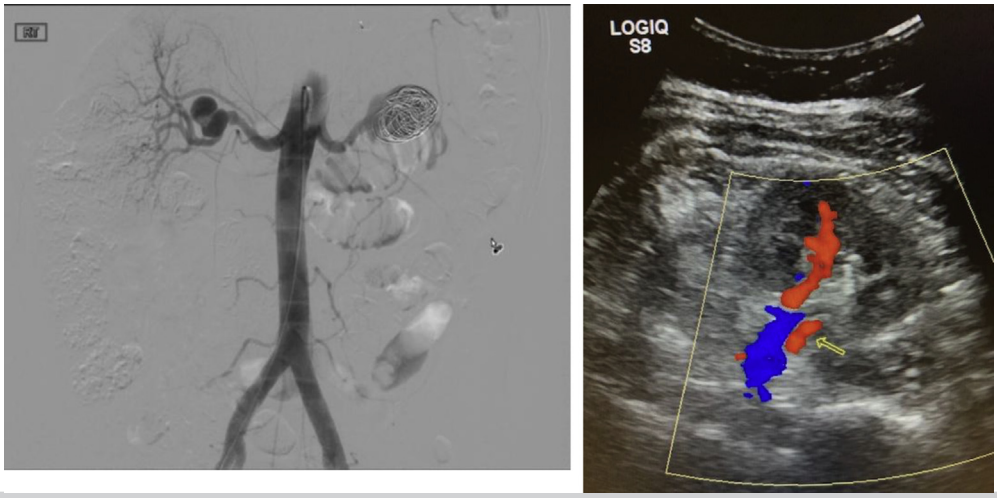

Fig 2. Nonselective renal artery arteriogram (*left*) showing bilobed right renal artery aneurysm (RAA) and left RAA after coiling with continued flow into the aneurysm sac. Duplex ultrasound image (*right*) showing flow around the coils in the aneurysm sac.

The patient's 1-month postoperative duplex ultrasound surveillance confirmed patent renal arteries with good kidney perfusion and normal function. However, her hypertension persisted, and she continues to require a dual medication regimen. She has continued family planning and intends to become pregnant in the near future.

DISCUSSION

The threshold to repair asymptomatic RAAs has historically been set at a diameter of 2 cm; however, growing evidence suggests that many renal aneurysms of this size are still at low risk of rupture. A retrospective review found that asymptomatic aneurysms grow at a rate of 0.60 mm/y and that many aneurysms >2 cm can be observed with noninvasive imaging. Furthermore, none of the asymptomatic aneurysms that were observed required any intervention during the 36-month study period.[2] This study did not include pregnant women or those planning pregnancy. Both open repair and endovascular repair have a low morbidity and 0% mortality in several series. However, there is a significant risk of renal infarction with endovascular management, up to 22%.[4] Open repair carries a risk of renal infarction of around 5%.[5] Because the majority of RAAs are unilateral, it is possible that postoperative infarction of one kidney is not identified owing to compensation by the contralateral kidney. The risk of renal infarction in either treatment modality, compared with the overall safety of observing asymptomatic RAAs, supports the conclusion of Klausner et al[2] that our current recommendations may be too aggressive.

Aneurysm rupture in pregnant women has been associated with survival rates as low as 44% for the mother and 22% for the fetus.[3,6] Aneurysm rupture in the general population is rare, and most studies do not encounter rupture in nonpregnant patients; however, the current

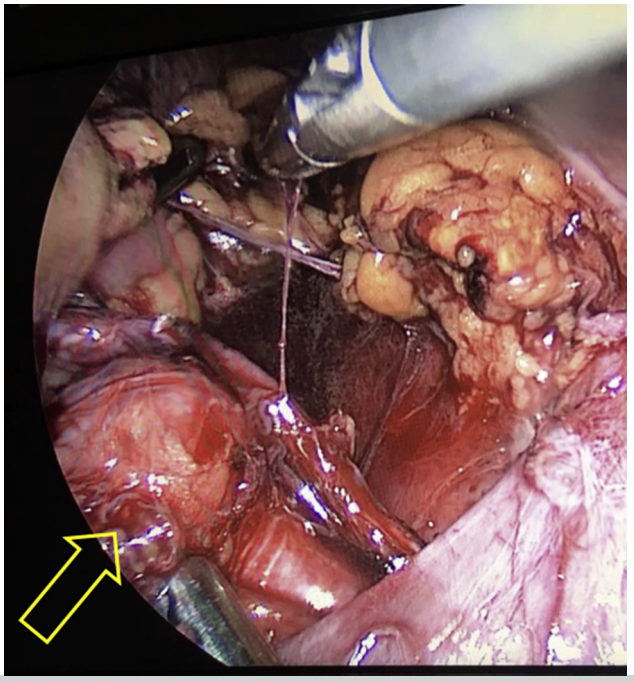

Fig 3. Photograph showing laparoscopic dissection of the right kidney. The aneurysm is seen in the *lower left*, just above the laparoscopic grasper (*arrow*).

estimates are <3%.[2] Pregnancy is an established physiologic stressor that increases rupture risk because of increased intra-abdominal pressure, increased blood volume, and vascular endothelial changes related to steroid production.[7] Exclusion of the aneurysm sac is imperative in these patients. Therefore, repair of RAAs in women of childbearing age is regarded as standard therapy.

Initially, we opted for endovascular management, which unsuccessfully excluded the left aneurysm. Although many surgeons would further place a covered stent over the site of the coiled aneurysm, this was not possible owing to the distal extent of the aneurysm nearing the bifurcation into the segmental arteries. We elected not to continue with coiling of the right RAA, given the discussed risk of excluding both kidneys from circulation, and proceeded with an open approach.

Open approaches include in situ aneurysmectomy with vessel reconstruction; ex vivo repair on the abdominal wall while leaving the ureter connected, followed by in situ reimplantation; and ex vivo repair on the back table, followed by either in situ reimplantation or autotransplantation in the iliac fossa. In situ repair requires a large midline laparotomy or retroperitoneal incision. Furthermore, given the distal location of RAAs deep in the abdomen, exposure and a technically complex repair prove to be exceedingly difficult. Ex vivo repair on the abdominal wall improves the surgeon's ability to see and to perform the technically complex repair of the RAA but still requires a large incision and reanastomosis of the renal vessels deep in the abdomen. Ex vivo back-table repair allows perfusion with chilled Collins solution and the surgeon's ability to perform the technically complex repair faster, mitigating warm ischemia time. Furthermore, removal of the kidney through a laparoscopic approach, now a standard method used by urologists for living donor kidney transplantation, makes for a minimally invasive open surgical approach. Therefore, we thought an ex vivo repair using a laparoscopic nephrectomy and autotransplantation to be the most minimally invasive approach with the highest yield for technical success as well as long-term freedom from rupture.

CONCLUSIONS

Whereas this technique has been described for unilateral aneurysms, we were unable to find other cases in the current literature to use laparoscopic nephrectomy, ex vivo repair, and autotransplantation for bilateral complex RAAs in a patient planning a future pregnancy.[8] In patients with RAA who are planning a future pregnancy, laparoscopic nephrectomy with ex vivo repair and autotransplantation should be considered because it is the minimally invasive open approach for definitive repair.

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