Complete robotic repair of a renal artery aneurysm

Kira Long, MD,[a] Jonathan Silberstein, MD,[b] Raju Thomas, MD,[b] Ashlie White, MD,[a] Jack Hua, MD,[c] *and* Albert D. Sam II, MD,[d] *New Orleans, La; and Middletown, Conn*

ABSTRACT

Although the majority of renal artery aneurysms require only observation, those that require treatment have been addressed primarily surgically or endovascularly. We report a case of surgical resection of a large, symptomatic renal artery aneurysm from an entirely robotic approach. (J Vasc Surg Cases and Innovative Techniques 2017;3:225-7.)

CASE REPORT

A 38-year-old woman presented with several days of right upper quadrant pain radiating to her right flank. She denied fevers, chills, hematuria, or postprandial symptoms. There was no history of hypertension, diabetes, or kidney stones, and previous surgical history included cesarean section and thyroidectomy. Her only medication was levothyroxine. She denied use of tobacco, ethanol, or any illicit drugs.

Initial physical examination revealed only mild right-sided costovertebral angle tenderness. All laboratory values were within normal limits, with urinalysis revealing no microscopic or macroscopic blood. Computed tomography of her abdomen revealed a bilobed 3.8- × 3.6- × 3.2-cm right-sided renal artery aneurysm with hydronephrosis of the ipsilateral kidney (Fig 1). Angiography was performed in the hope of performing an endovascular covered stent placement (Fig 2). The location of the aneurysm at the renal hilum eliminated this option as this would have caused the exclusion of blood flow to one of the major renal pelvic branches. In addition, it was thought that ureteral compression due to aneurysm mass effect was the cause of the hydronephrosis and would not be altered by endovascular exclusion. After a multidisciplinary meeting involving the urology, vascular surgery, and transplant surgery services, the decision was made to attempt a robotic repair of the renal artery aneurysm.

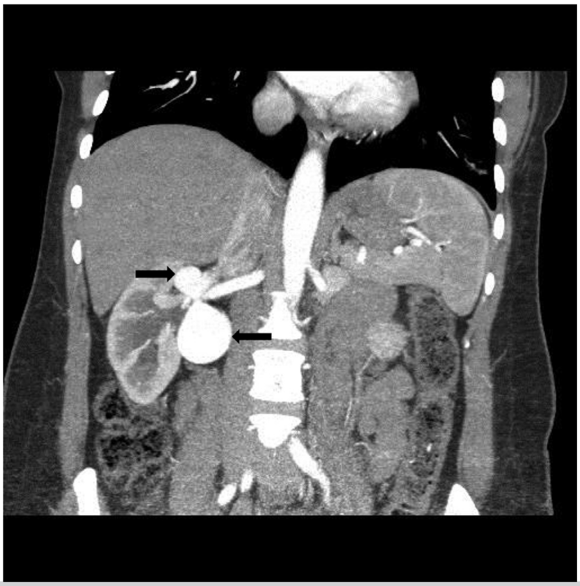

Fig 1. Computed tomography angiography shows a bilobed 3.8- × 3.6- × 3.2-cm right-sided renal artery aneurysm (*arrows*) with hydronephrosis of the ipsilateral kidney.

Fig 2. Selected renal angiography.

After placement of a right ureteral stent, she was induced under general anesthesia and positioned in the left modified flank position. After trocar placement, we achieved a robust pneumoperitoneum with two insufflators to reduce venous bleeding and to maximize visualization of vascular structures. The ascending colon was mobilized, and the ureter was

From the Department of Surgery,[a] Department of Urology,[b] and Department of Radiology,[c] Tulane University School of Medicine, New Orleans; and the Southern Connecticut Vascular Center, Middletown.[d]

Author conflict of interest: none.

Correspondence: Albert D. Sam II, MD, Southern Connecticut Vascular Center, Division of Vascular Surgery, 540 Saybrook Rd, Ste 210, Middletown, CT (e-mail: adsammd@gmail.com).

The editors and reviewers of this article have no relevant financial relationships to disclose per the Journal policy that requires reviewers to decline review of any manuscript for which they may have a conflict of interest.

2468-4287

https://doi.org/10.1016/j.jvscit.2017.08.002

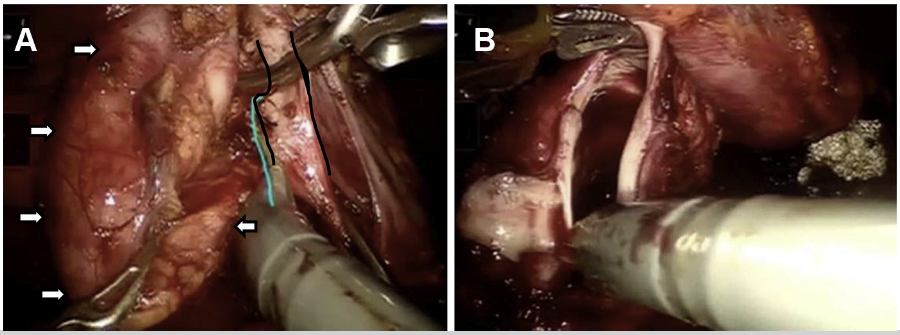

Fig 3. A, The aneurysm has been decompressed and is being retracted, allowing transection at the neck (*arrows*). The distal clamp is seen across the normal-caliber renal artery (*outlined*). **B,** The aneurysm sac after transection.

identified and then dissected along the psoas. The hilum of the right kidney was dissected, and all lymphatics were clipped. The aneurysm was identified, and after proximal and distal control of the renal artery was obtained, the aneurysm was decompressed, transected (Fig 3, *A*), and excised (Fig 3, *B*) on the normal-caliber renal artery. Because of the large size of the renal artery after aneurysmectomy, reconstruction was performed in the standard lateral arteriorrhaphy fashion with 4-0 polypropylene suture.

After the procedure, her course was uneventful, with discharge to home on postoperative day 2 with normal creatinine concentration. Histopathologic evaluation revealed an ectatic renal artery with atherosclerosis without evidence of fibromuscular dysplasia.

She has had no recurrence of right upper quadrant or right flank pain. Computed tomography scan at 12 months showed a patent renal artery with no aneurysmal recurrence and a well-perfused kidney (Fig 4).

The patient consented to the use of her data in this article.

Fig 4. Computed tomography angiography 1 year later showing arterial patency (*arrow*), no aneurysmal recurrence, and a well-perfused kidney.

DISCUSSION

Although they are the second most common visceral artery aneurysm, renal artery aneurysms remain relatively rare, occurring in <1% of the population.[1] The guidelines for repair have classically been aneurysms that measure >2 cm in diameter and aneurysms that are symptomatic[2] (although recent recommendations infer that these size guidelines may be overly aggressive[3]). Our patient met both of these criteria.

In recent years, the two main options for repair of renal artery aneurysms have been open repair and endovascular repair (stenting or coil embolization). Endovascular repair of renal artery aneurysms has become the preferred approach in patients with favorable anatomy.[4] Favorable outcomes have been demonstrated, with both short- and long-term data showing high technical success rates and acceptable incidences of restenosis.[5-7] Our patient was not a candidate for endovascular repair; however, we believed that a robotic repair was technically feasible. We thought that a successful robotic approach would avoid the major disadvantage of open surgery—significant postoperative pain and a prolonged recovery. Data supporting the safety and efficacy of robotic repair are lacking, and thus it should not be employed as the preferred method of treatment when endovascular options are feasible.

Whereas robotic kidney surgery in the form of parenchymal resection for tumors (either partial or radical nephrectomy) or collecting system reconstruction for ureteropelvic junction obstruction has become common and is moving toward de facto standard of care, robotic surgery for renal vascular aneurysms remains rare and poorly described. The only similar previous report to our knowledge is a series of robotically *assisted* laparoscopic repair of renal artery aneurysms.[8] Unlike in our case, saphenous vein graft interposition was primarily employed for reconstruction. These five patients had excellent results with a mean follow-up period of 28 months.

Whereas robotic repair is feasible as demonstrated by this complex case, it is not without its limitations. Foremost of these are the challenges involved in learning and mastering this complex procedure. Additional limitations include the cost of the robotics and absence of level I evidence demonstrating outcomes similar to those obtained with more traditional approaches. It is the opinion of the authors that the robotic approach to repair of renal aneurysms should be attempted only by those with extensive robotic experience. For this procedure, collaboration between urologic and vascular surgeons with extensive experience in robotic and open approaches was employed, and the authors would recommend this team approach to any surgeons considering such a case.

CONCLUSIONS

Robotic repair of renal artery aneurysms may be a viable option for patients whose anatomy is not amenable to endovascular options. Our case may represent one of the initial reports of a complete robotic approach to the excision and repair of a renal artery aneurysm.

REFERENCES

1. Tham G, Ekelund L, Herrlin K, Lindstedt E, Olin T, Bergentz S. Renal artery aneurysms: natural history and prognosis. Ann Surg 1983;197:348-52.
2. Eskandari M, Resnick S. Aneurysms of the renal artery. Semin Vasc Surg 2005;18:202-8.
3. Klausner JQ, Harlander-Locke MP, Plotnik AN, Lehrman E, DeRubertis BG, Lawrence PF. Current treatment of renal artery aneurysms may be too aggressive. J Vasc Surg 2014;59:1356-61.
4. Cochennec F, Riga CV, Allaire E, Cheshire NJ, Hamady M, Jenkins MP, et al. Contemporary management of splanchnic and renal artery aneurysms: results of endovascular compared with open surgery from two European vascular centers. Eur J Vasc Endovasc Surg 2011;42:340-6.
5. Tsilimparis N, Reeves JG, Dayama A, Perez SD, Debus ES, Ricotta JJ. Endovascular vs open repair of renal artery aneurysms: outcomes of repair and long-term renal function. J Am Coll Surg 2013;217:263-9.
6. Künzle S, Glenck M, Puippe G, Schadde E, Mayer D, Pfammatter T. Stent-graft repairs of visceral and renal artery aneurysms are effective and result in long-term patency. J Vasc Interv Radiol 2013;24:989-96.
7. Gandini R, Morosetti D, Chiocchi M, Chiaravalloti A, Citraro D, Loreni G, et al. Long-term follow-up of endovascular treatment of renal artery aneurysms with covered stent deployment. J Cardiovasc Surg (Torino) 2016;57:625-33.
8. Giulianotti PC, Bianco FM, Addeo P, Lombardi A, Coratti A, Sbrana F. Robot-assisted laparoscopic repair of renal artery aneurysms. J Vasc Surg 2010;51:842-9.

Submitted Mar 26, 2017; accepted Aug 19, 2017.