A rare case of concurrent proximal and hilar renal artery aneurysm with renal arteriovenous fistula

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ABSTRACT

Renal artery aneurysm (RAA) and renal arteriovenous fistulae (RAVF) are uncommon pathologies. Here we present a rare case of a proximal main RAA with concurrent hilar aneurysm with fistula to the renal vein in a patient with no other vascular history and review the literature.

CASE REPORT

A 61-year-old Caucasian man with history of hypertension, alcohol dependence, and previous blunt trauma in 1979 requiring open splenectomy presented with chief complaint of right flank pain for 5 days. He was bacteremic presumably from a urinary tract infection. Computed tomography angiography (CTA) showed a dilated, tortuous right renal artery (RRA) with a proximal aneurysm measuring 3.5 cm and a concurrent 4.5 cm hilar aneurysm with early contrast opacification of the renal vein and inferior vena cava (IVC) concerning for RAVF (Fig 1). A diagnostic arteriogram depicted an aneurysmal RRA with rapid filling of the suprarenal IVC (Fig 2). The most proximal RAA had a wide neck takeoff from the aorta: it was unclear where the RAVF originated (Fig 3). A multidisciplinary approach was taken owing to the complex anatomy, and he was deemed not to be a candidate for endovascular management. After completing a 14-day course of antibiotics for Enterococcus bacteremia, he was offered nephrectomy with primary repair of the aorta.

The patient subsequently underwent a midline laparotomy, right nephrectomy, ligation of the RAVF, and bovine patch repair of the aortic defect. The aorta was exposed via the transperitoneal approach and the right kidney and IVC via the Cattell-Braasch maneuver. The RRA was expectedly tortuous and aneurysmal; a thrill was palpated in the right upper quadrant. The fistula was found between the hilar aneurysm and the adjacent renal vein that drained directly to the IVC (Fig 4). Together with urology, we deemed the kidney nonsalvageable. The aorta was clamped above and below the RRA and below the left renal artery for proximal and distal control. The aneurysmal orifice of the RRA was identified and resected with a 2-cm defect, which was repaired with bovine patch. A right nephrectomy was performed. There were no intraoperative complications and the patient was discharged 7 days later. His postoperative peak creatinine was 1.47 mg/dL and his new baseline was between 0.8 to 0.9 mg/dL. A follow-up CTA demonstrated no issues with the aortic repair and a normal appearing IVC.

DISCUSSION

Recently published clinical practice guidelines on the management of visceral aneurysm by the Society for Vascular Surgery listed the following indications for intervention in RAA: size of more than 3 cm, female gender within childbearing age regardless of size, symptomatic (pain, hematuria), medically refractory hypertension, and functionally important renal artery stenosis. The previous repair threshold of 2 cm was increased to 3 cm based on more contemporary data describing the lower associated risk of rupture, slow growth rate, and improved survival after rupture. Currently, there is no prospective or randomized control trial directly comparing surgical repair of RAAs that are more than 2 cm with surveillance. Intervention for RAA repair is driven by the risk of rupture, whereas the indications for treatment of an RAVF are symptom based, which include progressive increase in fistula size, hematuria, and medical complications associated with RAVF such as hypertension, high-output heart failure, and circulatory overload.
RAAs can be repaired by an open or endovascular approach. Open aneurysmorhaphy with arterial reconstruction is well-established, with the goal of resecting the aneurysm and restoring renal perfusion. After resection, vascular continuity can be achieved by primary closure with or without branch reimplantation, patch angioplasty, primary reanastomosis of the renal artery, interposition bypass, aortorenal bypass, or splanchnorenal bypass. An autogenous vein, typically the greater saphenous, or prosthetic grafts can be used with excellent patency rates for both. Saccular aneurysms can be repaired with suture plication or unroofing followed by patch angioplasty, with latter being the favored approach.1,4,5 Complex distal branch lesions and multibranched RAAs can be treated with ex vivo repair; cold perfusion should be considered if the expected warm ischemic time exceeds 30 minutes.4 Finally, nephrectomy is indicated in patients who have nonreconstructable anatomy, failed reconstruction, or contraindications for kidney salvage, such as renal cell carcinoma or end-stage ischemic nephropathy.4-6 Reports of robotic repairs have been recently published without short-term or long-term outcome assessments.1,4,5 The principle of endovascular repair of RAA is similar to the open approach: exclusion of the RAA without compromising renal blood flow and anatomy dictates whether a patient is an endovascular candidate. The largest series published comparing endovascular and open surgical approaches to RAA repair spanned between 1988 and 2011 and reported that endovascular repair was not independently associated with an improvement in mortality. A similar article echoed these findings: the authors found that endovascular RAA repair contributed to the increasing of overall RAA repair without decreasing open repair using statewide data.1

Similar to RAA repair, open and endovascular repairs are available for RAVF. The decision for either approach is determined by patient characteristics and anatomy. Traditional surgical approach includes ligation of feeding
artery to the RAVF followed by partial or total nephrectomy. Endovascular approach has gained popularity over time due to the morbidity of open surgery and preservation of renal parenchyma with endovascular techniques. Coil embolization is often used in small RAVFs and covered stents or plugs are described in larger AVFs. To our knowledge, concurrent ipsilateral RAA and RAVF are rare in literature with its earliest debut in 1975. The first reported endovascular management of combined RAA and RAVF was published by Troccoli et al in 2005; the authors reported successful embolization of feeding vessels of the 13-cm aneurysm without complications. In the past decade, numerous cases reported on endovascular approaches for these combined lesions involving stent graft (aneurysm <3 cm with associated RAVF) and implantation of patent ductus arteriosus occluder (aneurysm 6.3 cm in length with associated RAVF). Despite these reported successes, open surgical repair continues to be the treatment of choice in patients with complex anatomy. The Table below summarizes open surgical repairs of combined RAA and RAVF reports from the past decade.

Our case is unique in that our patient was asymptomatic until his development of a urinary tract infection; whether his symptoms were caused by his RAA/RAVF or urosepsis was unclear. However, he did not have pyelonephritis on his initial CTA. The etiology of his pathology was thought to be due to blunt trauma from the past; he did not have any invasive procedures of his kidneys, nor did he have any other arterial aneurysmal disease on his CTA aside from the RAA/RAVF. Although endovascular approach has shown similar outcomes for RAA repair as open approach, open surgical repair was indicated in our patient for multiple reasons. Neither CTA nor angiography provided a clear anatomical connection of his RAVF and, therefore, made endovascular embolization risky. Furthermore, the proximal RAA takeoff was at the aorta, and it was wide based, measuring about 2 cm, requiring a patch repair after ligation. Finally transplant surgery and urology were consulted regarding renal preservation; neither team believed the kidney was salvageable due to complex anatomy, especially at the hilum, involving two RAAs and RAVF.

CONCLUSIONS

We present a case of an RAA with a concurrent additional hilar RAA/RAVF. An open right nephrectomy, ligation of RAVF, and bovine patch repair of the aortic defect was performed. Currently, there is no consensus regarding the treatment protocol for a combined RAA
and RAVF. The approach is individualized and largely dependent on patient anatomy.

REFERENCES

1. Chaer RA, Abularrage CJ, Coleman DM, Eslami MH, Kashyap VS, Rockman C, et al. The Society for Vascular Surgery clinical practice guidelines on the management of visceral aneurysms. J Vasc Surg 2020;72:3S-39S.

2. Zhang Z, Yang M, Song L, Tong X, Zou Y. Endovascular treatment of renal artery aneurysms and renal arteriovenous fistulas. J Vasc Surg 2013;57:765-70.

3. Maruno M, Kiyosue H, Tanoue S, Hongo N, Matsumoto S, Mori H, et al. Renal arteriovenous shunts: clinical features, imaging appearance, and transcatheter embolization based on angioarchitecture. Radiogr Rev Publ 2016;36:580-95.

4. Orion KC, Abularrage CJ. Renal artery aneurysms: movement toward endovascular repair. Semin Vasc Surg 2013;26:226-32.

5. Coleman DM, Stanley JC. Renal artery aneurysms. J Vasc Surg 2015;62:779-85.

6. Klausner JQ, Lawrence PF, Harlander-Locke MP, Coleman DM, Stanley JC, Fujimura N, et al. The contemporary management of renal artery aneurysms. J Vasc Surg 2015;61:978-84.

7. Tabibi M, Gottesman L. Calcified renal artery aneurysm with arteriovenous fistula: report of a case. J Am Osteopath Assoc 1975;74:747-50.

8. Troccoli SM, Chaer RA, Lin SC, Dayal R, Scherer M, Garner M, et al. Embolization of renal artery aneurysm and arteriovenous fistula: a case report. Vasc Endovascular Surg 2005;39:525-9.

9. Jiang Q, Wu J, Zou S, Jin J, Ji X, Qu L. Endovascular therapy of a giant renal artery aneurysm combined with high-flow renal arteriovenous fistula using a patent ductus arteriosus occluder. Ann Vasc Surg 2019;58:377.e1-4.

10. Antoniou GA, Papas TT, Tsagkos I, Trachanellis S, Antoniou SA, Tsanis A, et al. Endovascular stent-graft repair of bleeding common femoral artery pseudoaneurysm in intravenous drug users: a bridge to surgical reconstruction. VASA Z Gefasskrankheiten 2014;43:473-6.

11. Manogran V, Govindarajan N, Naidu KRS. Renal artery aneurysm in pregnancy presenting as an arteriovenous fistula: an uncommon presentation. Turk J Urol 2015;41:104-7.

12. Franz RW, Tanga CF. Treatment of complex, combined renal artery aneurysm and renal arteriovenous fistula with nephrectomy. Int J Angiol 2017;26:68-72.

13. Ivandaev A, Askerova A, Zotikov A, Kozhanova A, Schima W, Karmazanovsky G. Successful surgical treatment with ex vivo technique in a patient with renal artery aneurysm rupture and bilateral arteriovenous fistula. J Vasc Surg Cases Innov Tech 2018;4:232-6.

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