Clinical Case Report

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In situ revascularization of bilateral complicated giant renal artery aneurysms

Case report

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Abstract

Rationale: Renal artery aneurysm (RAA) is a rare entity, bilateral multiple RAAs near hilum with a maximum diameter of 7 cm are even rare and bring a great challenge to surgeons. As the technique of vessel reconstruction is quite difficult for the RAAs near hilum, some surgeons choose to resect the involved kidney. We reported a young female patient with the threatened rupture symptoms for further treatment. The details of revascularization methods and procedure design were discussed in the report.

Patient concerns: A young female patient complained with lumbar and abdominal pain for 1 month. Computed tomography angiography showed bilateral RAAs with the maximum diameter of 6 and 7 cm on the left and right side separately. For the right RAA, apart from a giant aneurysm, there was another small aneurysm with a diameter of 3 cm located on the inferior polar right renal artery. There was a mild tenderness on the left lumbar and lower abdomen, no rebound tenderness was detected.

Diagnosis: According to the image feature and symptoms, the diagnosis for this patient was bilateral giant RAAs with threatened ruptured.

Interventions: Dissection of the bilateral giant RAA and in situ revascularization of renal arteries with prosthetic graft was performed.

Outcomes: The follow-up results showed the satisfactory patency of prosthetic graft and obvious improvement of renal function.

Lessons: This complicated bilateral giant RAAs was successfully revascularized through in situ renal artery repair with a very difficult procedure process. For the RAA near hilum, vessel reconstruction no matter through in situ or ex vivo are both difficult for surgeons. This extremely rare and difficult case could bring more confidence to surgeons who meet such complicated bilateral RAAs for choosing the vessel reconstruction rather than kidney resection.

Abbreviations: CTA = computed tomography angiography, PTFE = polytetrafluoroethylene, RAA = renal artery aneurysms.

Keywords: bypass, in suite renal artery repair, renal artery aneurysm, revascularization

1. Introduction

Renal artery aneurysm (RAA) was a rare entity with an estimated incidence of around 0.1% in the general population. With the development of angiographic and computed tomography angiography (CTA), the reported incidence ranges from 0.3% to 2.5%.[1,2] It was reported that RAA was dominant in female patients and appeared to be associated with a higher risk of rupture in the female. The majority of RAA is isolated, multiple and bilateral RAAs are less reported especially the giant aneurysm. In all RAA cases, bilateral RAAs only accounted for 10%[3,4]

2. Case report

A 29-year-old female with complaint of left lumbar and abdominal pain for 1 month, with symptom aggravating for 1 day. The aorta angiogram from another hospital showed that bilateral giant RAAs. She was admitted into our ward for further treatment on March 4, 2016. Physical examination showed: the vital signs were stable with temperature: 36.8°C, heart rate: 91/min, blood pressure: 125/75 mm Hg. There was a mild tenderness on the left lumbar and lower abdomen, no rebound tenderness was detected. The blood test showed: Hgb: 120 g/L, Crea: 55 umol/L, eGFR: 60 ml/min, immunologic test was all negative. The nephrogram demonstrated the renal index of left and right kidney was 25.04% and 31.06% separately. CTA showed that bilateral giant saccular RAA, the maximum diameter of left and right RAA was 7 and 8 cm separately, for the right RAA, apart from a giant aneurysm, there was another small aneurysm located on the inferior polar right renal artery with a diameter of 3 cm (Fig. 1A, B). The diagnosis for this patient was bilateral giant RAAs with threatened ruptured.

After the preoperative evaluation, we performed the bilateral RAAs resection and revascularization of renal arteries on March

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Informed written consent was obtained from the patient for publication of this case report and accompanying images.

All authors of this case declare no association with any individual, company, or organization have a vested interest in the subject matter/products mentioned in this article.

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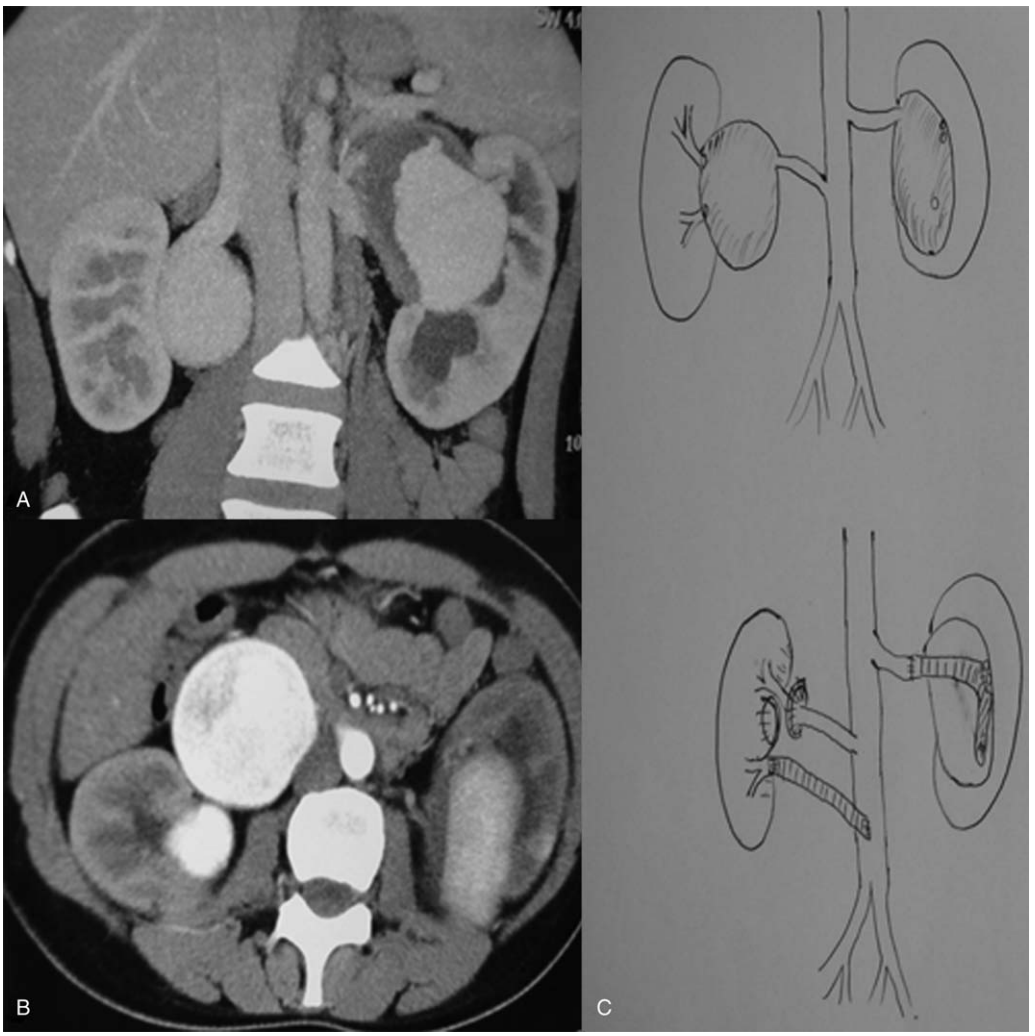

Figure 1. (A) Bilateral giant aneurysm with maximum diameter of 7 and 8 cm separately. (B) Another small aneurysm located on the inferior polar right renal artery with diameter of 3 cm. (C) Revascularization design draft before operation.

7, 2016 (Fig. 1C). Surgical exposure of the kidney and renal arteries was achieved via a transperitoneal approach through the midline incision. Mobilization of bilateral kidneys and dissection of the proximal renal artery, adjacent aorta, aneurysm, and distal renal arteries was performed. After the mobilization and dissection, we could see the right RAA originated from 2.5 cm distal to the aortic orifice, the normal proximal diameter of the right renal artery was 7 mm, for the distal branches, 1 started from a giant aneurysm to supply the upper and middle part of right kidney, another inferior polar artery supplied the lower part of right kidney also originated from a giant aneurysm, however, there was another 3 cm size aneurysm in the middle of this inferior polar artery (Fig. 2A) . The left RAA was located near the hilum with maximum diameter of 8 cm, the left renal pelvis was obviously compressed to hydronephrosis, 3 distal renal branches originated from RAA, 2 superior branches were located adjacent to each other and another inferior branch located solely.

After systemic heparin, we first chose to revascularize the right renal artery. After control the proximal main right renal artery and 2 distal branches with microvascular clips, the giant RAA was dissected and proximal main renal artery was anastomosed end-to-end with the upper branch with 7–0Prolene. For another lower branch involved with another 3 cm size aneurysm, we performed the small aneurysm dissection as well, however, the length of distal residual branch was not long enough, so we performed the end-to-end aorta-distal renal branch anastomosis with a 6 mm polytetrafluoroethylene (PTFE). The blocking time of upper and lower branches was 20 and 23 minutes separately.

For the left renal artery revascularization, as the location of RAA was quite near the renal hilum, we dissected the 3 distal branches, 2 adjacent upper branches, and another sole lower branch. As the length of distal branches were not long enough, after control the distal with microvascular clips, we chose to open the aneurysmal sac, then we interposed a 6 mm PTFE graft between the proximal main left renal artery and the 2 upper adjacent branches (Fig. 2B). The distal anastomosis to 2 adjacent branches was made as a patch. The lower sole distal branch was then anastomosed end-to-side to the PTFE graft (Fig. 2C). The blocking time of 2 upper adjacent branches and lower sole branch was 41 and 40 minutes separately. Cold perfusion preservation was employed for bilateral revascularization. Intraoperative renal duplex sonography was performed to evaluation of anastomosis patency.

After the procedure, this patient was well recovered and discharged from hospital 5 days after the operation. One-year follow-up of CTA showed that the bilateral prosthetic grafts were

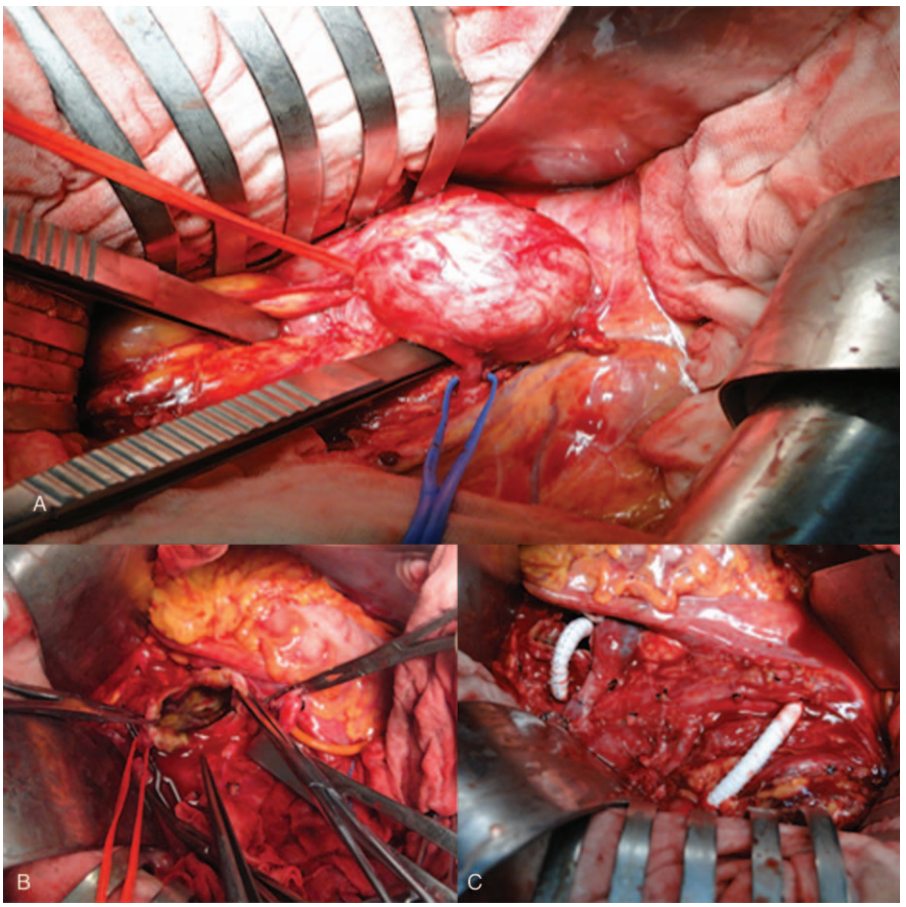

Figure 2. (A) Right renal artery aneurysm with 2 distal branches involved. (B) Left giant aneurysm sac open. (C) Completion of bilateral revascularization of renal arteries with prosthetic graft.

Figure 3. One-year follow-up CTA show great patency of revascularization of bilateral renal arteries. CTA = computed tomography angiography.

both patency and distal branches of renal artery showed well (Fig. 3). The update nephrogram demonstrated that renal index of left and right kidney was increased to 70.14% and 76.41% separately.

3. Discussion

The current criteria for surgical repair of RAA exist controversy, the accepted indications for RAA repair include diameter of aneurysm >2 cm, threaten ruptured symptoms, female gender during childbearing age, symptoms as hematuria, uncontrolled hypertension. The debate for indication focused on the 2 cm aneurysm size, as many studies reported the very slow growth rate and low incidence of rupture of 2 cm size RAA. However, once the RAA ruptured, the mortality is reported up to 80%.[5] The indication for this patient is threatened rupture and renal function injured.

As the most common site of RAA is located on the bifurcation, management of RAA involved renal artery branches or near renal hilum is a challenge for surgeons. The challenge of this case mainly lied on 2 points: more than 2 branches were involved by aneurysm for both kidneys, the bilateral giant aneurysms occupied most of room for procedure. For the left RAAs, due to the 2 branches were separated, and there was enough zone for distal branch control, our procedure design was made to revascularize the 2 branches separately with in situ primary anastomosis and aorta-renal prosthetic bypass. For the right

RAA, due to the RAA was located quite near to the hilum, few rooms left for us to hold the distal branches after aneurysm dissection, so our design was made to perform the anastomosis in the aneurysmal sac. As the 2 upper branches were adjacent to each other, a patch anastomosis was made to cover their distal orifices both.

Surgical revascularization of RAA include in situ and ex vivo, it depends on whether the distal renal branches could be adequately controlled or not, if the location of RAA prevented the distal vascular control for reconstruction, an ex vivo should be adopted. However, it also depends on the skills and experience of surgeon to choose. There is no comparison between these 2 approaches according to the current studies. However, both approaches reported has demonstrated a minimal morbidity, improvement of blood pressure control and renal function, long-term patency.[6–8]

Another question is the choice of conduit, saphenous vein is considered to be the most suitable conduit for renal artery reconstruction in adult with a satisfactory patency.[9,10] However, the preoperative ultrasound evaluation of saphenous vein for this patient showed that the diameter of saphenous vein was only 3 mm, we finally decided to perform vascular reconstruction with prosthetic graft. Even though the saphenous vein is the most common graft for renal artery reconstruction, there are also studies demonstrated good durability with no saphenous bypass graft.[11]

This complicated bilateral giant RAA is successfully revascularized through in situ renal artery repair with a very difficult procedure process, the follow-up patency and improvement of renal function give us a satisfactory response.

Author contributions

Conceptualization: Bin Huang.
Data curation: Xiyang Chen, Bin Huang, Yi Yang.
Formal analysis: Xiyang Chen.
Investigation: Ding Yuan, Yi Yang.
Resources: Xiyang Chen, Ding Yuan.
Writing – original draft: Xiyang Chen.
Writing – review and editing: Jichun Zhao, Bin Huang.

References

[1] Duprey A, Chaventa B, Meyer-Bisch V, et al. Editor's choice – ex vivo renal artery repair with kidney autotransplantation for renal artery branch aneurysms: long-term results of sixty-seven procedures. Eur J Vasc Endovasc Surg 2016;51:872–9.
[2] Buck DB, Curran T, McCallum JC, et al. Management and outcomes of isolated renal artery aneurysms in the endovascular era. J Vasc Surg 2016;63:77–81.
[3] Dawn M, Coleman JCS. Renal artery aneurysms. J Vasc Surg 2015;62: 779–85.
[4] Orion KC, Abularrage CJ. Renal artery aneurysms: movement toward endovascular repair. Semin Vasc Surg 2013;26:226–32.
[5] Klausner JQ, Harlander-Locke MP, Plotnik AN, et al. Current treatment of renal artery aneurysms may be too aggressive. J Vasc Surg 2014;59: 1356–61.
[6] Laser A, Flinn WR, Benjamin ME. Ex vivo repair of renal artery aneurysms. J Vasc Surg 2015;62:606–9.
[7] Ham SW, Weaver FA. Ex vivo renal artery reconstruction for complex renal artery disease. J Vasc Surg 2014;60:143–50.
[8] English WP, Pearce JD, Craven TE, et al. Surgical management of renal artery aneurysms. J Vasc Surg 2004;40:53–60.
[9] Tsilimparis N, Reeves JG, Dayama A, et al. Endovascular vs open repair of renal artery aneurysms: outcomes of repair and long-term renal function. J Am Coll Surg 2013;217:263–9.
[10] Morita K, Seki T, Iwami D, et al. Long-term outcome of single institutional experience with conservative and surgical management for renal artery aneurysm. Transplant Proc 2012;44:1795–9.
[11] Hansen KJ, Deitch JS, Oskin TC, et al. Renal artery repair. Consequence of operative failures. J Urol 1999;1032–3.