Urology Case Reports 17 (2018) 42–43

Contents lists available at ScienceDirect

Urology Case Reports

journal homepage: www.elsevier.com/locate/eucr

Pediatrics

Modified ex-vivo repair of distal renal artery aneurysm in a pediatric patient

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ARTICLE INFO

Article history:
Received 10 September 2017
Received in revised form
25 October 2017
Accepted 17 November 2017
Available online 19 December 2017

Keywords:
Renal Artery Aneurysm
Modified Ex Vivo Technique
Autotransplantation

Introduction

Renal artery aneurysms (RAA) are rare in the general population with a widely accepted incidence of 0.09%.[4] These aneurysms generally present in the sixth decade of life and primarily affect females with a predominance of up to 72%. While patients are generally asymptomatic at presentation, abdominal pain, flank pain or hematuria may occur and clinical exam may reveal hypertension, renal bruits or a palpable abdominal mass.[1]

Even more rarely, renal artery aneurysms can present in the pediatric population. These are most frequently reported accompanying disease processes such as fibromuscluar dysplasia and autoimmune vasculitis, with idiopathic cases being the most uncommon.[2,3] Current indications for surgical repair of RAA include size >2cm, female of childbearing age, and symptoms like pain, hematuria and HTN refractory to medical intervention, with occurrence in a female of childbearing age being arguably the most important as rupture during pregnancy has been associated with maternal mortality between 56 and 92% and fetal mortality between 82 and 100%.[1]

Case report

A 10 year old female with history of mild scoliosis, was referred to the Vascular and Urological Surgery services at the University of New Mexico Hospital after a calcified 1.5 cm left renal artery aneurysm was found incidentally on spinal x-ray. She was asymptomatic and without any family history of collagen vascular disease, fibromuscular dysplasia, vasculitis, or significant aneurysmal disease. Physical exam was unremarkable and a computed tomography arteriogram preformed confirmed an isolated calcified distal left RAA measuring $1.5 \times 1.4 \times 1.4$ cm located at the renal artery bifurcation (Fig. 1). The decision was made to proceed with a modified ex-vivo repair after extensive discussion between family and surgical specialists.

The operation was performed under general anesthesia via a midline celiotomy. The left kidney was mobilized the left ureter, the renal vein and artery were isolated and controlled. The aorta and inferior vena cava were dissected. The renal artery was then clamped at the origin, and a partial side-biting clamp was used to clamp the IVC – renal vein junction. The artery was transected proximal to the aneurysm and the vein was transected with a cuff of the IVC. The kidney was left with ureter intact, was externalized, flushed with heparinized lactated ringers and placed on ice.

The renal artery aneurysm was further dissected and segmental resection was performed. The renal artery bifurcation was then reconstructed with a posterior wall anastomosis followed by anastomosis of a previously harvested segment of great saphenous vein in an end-to-end fashion to the renal artery bifurcation. The kidney was then placed back into it anatomic location in the retroperitoneum. The saphenous vein graft was anastomosed first to the renal artery stump followed by venous anastomosis to the IVC (Fig. 2). The IVC and renal vein clamps were removed and flow was restored to the kidney. An intraoperative US demonstrated excellent flow through the arterial and venous anastomosis. Hemostasis was achieved, peristalsis of

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https://doi.org/10.1016/j.eucr.2017.11.010

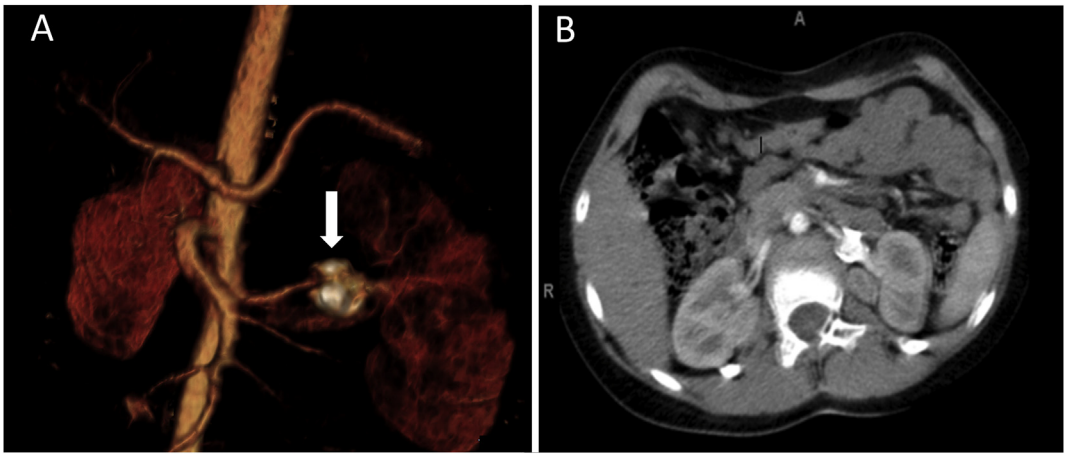

Fig. 1. (A) 3D Reconstruction of left renal artery aneurysm (white arrow). (B) Computed tomography scan showing aneurysm of the distal left renal artery.

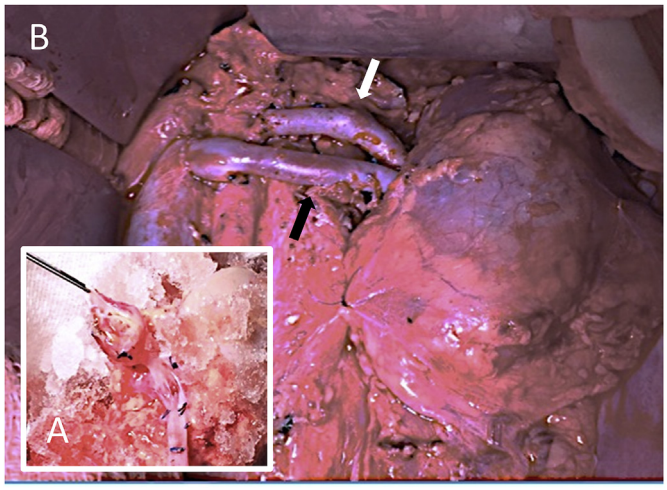

Fig. 2. (A) Intraoperative picture showing dissected aneurysm with renal artery divided distally. (B) Reconstructed renal artery with saphenous vein interposition graft (white arrow) and anatomically re-implanted left renal vein (black arrow).

the left ureter was observed, viscera were replaced and the patient's abdominal incision was closed.

The patient was discharged home following 3 days of ICU stay and a total hospital stay of 4 days. She had normal renal function and excellent urine output throughout her postoperative course. Follow-up was conducted in clinic at 2 weeks, 3 months and 15 months post operatively and renal duplex ultrasonography at 1, 12 and 60 weeks revealed excellent graft patency and renal perfusion.

Discussion

Due to the low incidence of RAA, the natural history of these entities has not been well defined. While new research has shown RAA to be slow growing (0.08 cm/y) with a low risk of rupture, repair should be strongly considered in women of childbearing age.[4] Pediatric RAA are exceedingly rare and the treatments and indications for interventions have been poorly defined.[3] In children, endovascular approaches are less desirable due to the continued growth of the aneurysm and the child and has therefore been utilized only in cases where renal salvage was not deemed possible. Previous treatments in pediatric patients have included resection with primary anastomosis or interposition grafts, patch angioplasty or re-implantation of the renal artery directly into aorta.[3] Ex vivo approaches with any have been well described and utilized in adult patients with RAAs that occur in the distal hilar renal artery where it is not anatomically suitable for endovascular therapy. This technique has been found to be quite durable with good preservation of renal function and both low morbidity and mortality.[5]

Conclusion

Surgical treatment of RAAs in the pediatric population has not been well defined due to the extremely low incidence. Modified ex vivo approaches have been described in the adult population and have been found to preserve kidney function and have good long-term outcomes. To the author's knowledge, this is the first time that an open modified ex-vivo approach with renal auto transplantation into the renal fossa has been utilized to repair a renal artery aneurysm in a pediatric patient. We believe this technique is a safe and effective long-term solution for this patient population.

Conflicts of interest

There are no conflicts of interest to declare.

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