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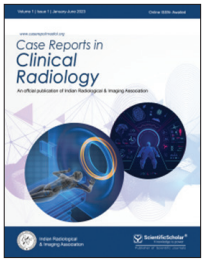

Case Report

Endovascular embolization of idiopathic renal arteriovenous fistula – A case report and literature review

S. Vignesh[1], B. Madhumitha[1], T. Mukuntharajan[1]

[1]Department of Imaging Sciences and Interventional Radiology, Meenakshi Mission Hospital and Research Centre, Madurai, Tamil Nadu, India.

***Corresponding author:**
S. Vignesh,
Associate Consultant,
Interventional Radiologist,
Department of Imaging Sciences and Interventional Radiology, Meenakshi Mission Hospital and Research Centre, Madurai, Tamil Nadu, India.

vigneshmdrd@gmail.com

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ABSTRACT

Idiopathic renal arteriovenous fistulas (RAVFs) are rare vascular anomalies with no identifiable etiology. We present a case of 65-year-female who was being evaluated for complaints of the right flank pain and dysuria with no past history of trauma or surgery. Computed tomography showed arteriovenous fistula in lower pole of the right kidney with dilated branch of the right renal artery and dilated venous sacs. The patient was planned for endovascular embolization. Right renal angiogram showed dilated lower polar artery with a single-hole arteriovenous fistula. Selective coil embolization of the arterial channel was done. Post-deployment angiogram showed complete occlusion of the fistula and normal opacification of remaining segmental branches. On follow-up 1-month later, the patient was in good general condition. With advancements in endovascular techniques, transcatheter embolization has become initial treatment of choice for managing RAVF due to its less incidence for complications and preservation of renal function.

Keywords: Arteriovenous fistula, Renal fistula, Coil embolization, Endovascular, Venous sac, Idiopathic

INTRODUCTION

Renal arteriovenous fistula (RAVF) refers to direct communication between renal artery and vein without intervening capillary network. They are mostly acquired secondary to iatrogenic procedures (biopsy, surgery, or percutaneous drainage), trauma, or malignancy, accounting for ~70% of total RAVF.[1] The occurrence of acquired RAVF is growing with increasing incidence of percutaneous interventions including biopsies and nephrostomies.[2] Congenital RAVF accounts for ~25% of cases and idiopathic RAVF is the least common (3–5%).[1] These fistulas usually present with hematuria, cardiogenic failure, and flank pain or rarely can be asymptomatic.[3] Previously, RAVF was treated surgically by ligating the dilated artery with partial nephrectomy if required. With advancements in endovascular techniques, transcatheter embolization has become initial treatment of choice for managing RAVF.[4] There are very few case reports on idiopathic RAVF and most of them have been presented either with cardiac failure or hematuria. Here, we present a case of idiopathic RAVF in a middle-aged female which was incidentally detected and successfully managed by endovascular coil embolization.

CASE REPORT

A 65-year-old female was being evaluated for complaints of the right flank pain and dysuria for the past 1 month. There was no history of hematuria. She was a known hypertensive and

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diabetic, on regular medications for the past 10 years. Initial ultrasound of abdomen done in another hospital showed mild hydronephrosis with a small calculus and simple cyst in the lower pole of the right kidney. She had history of the right ureteric calculus 5 years back, for which she underwent conservative management. There was no history of surgery or other iatrogenic procedure. Routine laboratory investigations were within normal limits. Her serum creatinine was 1.1 mg/dL, hemoglobin was 11.5 g/dL, and urine red blood cells were nil. Computed tomography (CT) of abdomen was done which showed normal sized right kidney with a ~3 × 2 cm isodense lesion in the lower pole and a small calcification in wall of the lesion [Figure 1]. A dilated vascular channel was seen adjacent to the lesion. With the suspicion of vascular malformation, contrast CT was performed. Arterial phase showed a dilated lower polar branch of the right renal artery with tortuous interlobar branch. Two-dilated intraparenchymal vascular channels were seen with enhancement similar to the renal artery, which drained into dilated renal vein [Figure 2]. These findings were suggestive for arteriovenous fistula [Figure 3]. The dilated venous sac compressed on the renal pelvis causing mild hydronephrosis. The left kidney was normal. No other similar findings were seen elsewhere in abdomen. Echocardiography was done for the patient, which was found to be normal.

The patient was planned for endovascular embolization to occlude the fistula. Under local anesthesia, through right transfemoral approach, the right renal angiogram was performed. It showed dilated lower polar artery with a single-hole arteriovenous fistula [Figure 4a]. Dilated venous sacs were seen which drained into dilated renal vein [Figure 4b]. Selective catheterization of the lower polar artery was done followed by distal cannulation with microcatheter [Figure 4c]. The fistulous site was identified by taking angiograms and tip of the microcatheter was placed just proximal to the fistula opening. It was decided to occlude the fistula using coils. Two coils (5 × 14 mm; Nester, Cook Medical, IN, USA) were deployed into the arterial channel. Post-deployment angiogram showed complete occlusion of the fistula, non-opacification of dilated veins, and normal opacification of remaining segmental branches of the right kidney [Figure 4d]. No periprocedural complications were noted.

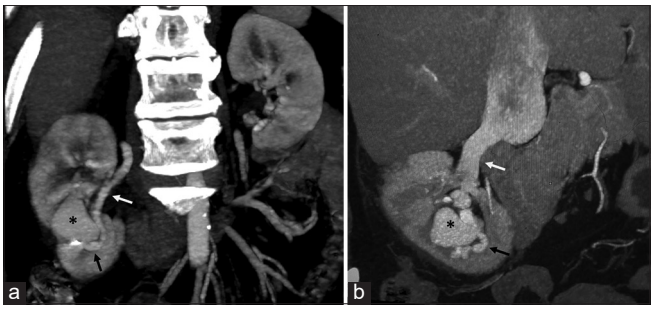

Figure 2: (a) A 65-year-old female with renal arteriovenous fistula. Coronal oblique maximum intensity projection (MIP) images showing dilated lower polar branch of the right renal artery (white arrow) with tortuous interlobar branch (black arrow) and dilated intraparenchymal venous sac (*). (b) A 65-year-old female with renal arteriovenous fistula. Coronal oblique MIP images showing tortuous interlobar branch (black arrow) with dilated intraparenchymal venous sac (*) draining into dilated renal vein (white arrow).

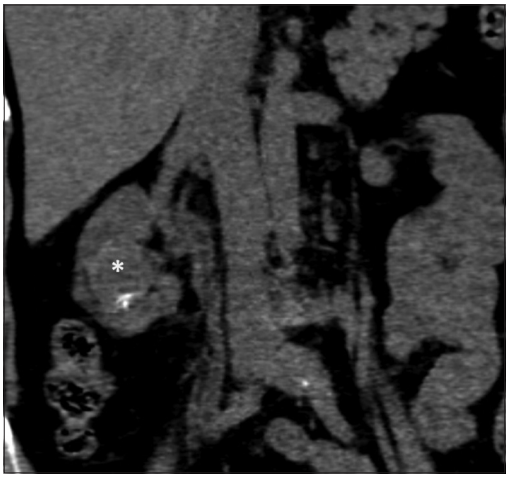

Figure 1: A 65-year-old female with renal arteriovenous fistula. Coronal oblique non-contrast computed tomography image showing an isodense lesion in the right kidney (*) with calcification in wall of lesion.

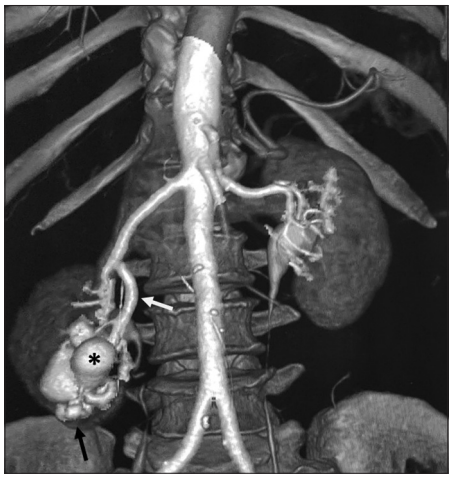

Figure 3: A 65-year-old female with renal arteriovenous fistula. Volume rendered image showing dilated lower polar branch of the right renal artery (white arrow) with tortuous interlobar branch (black arrow) and dilated venous sacs (*).

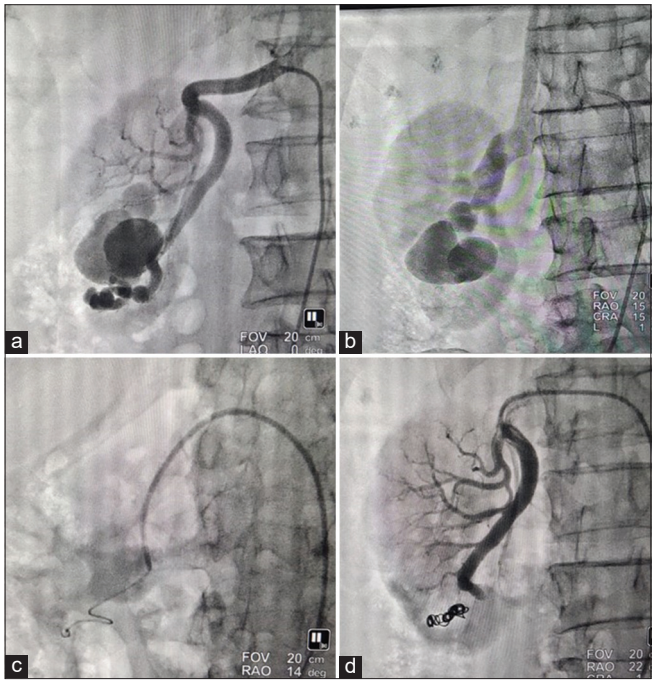

Figure 4: A 65-year-old female with renal arteriovenous fistula. Digital subtraction angiography images showing angiographic runs taken from the right renal artery. (a) Arteriovenous fistula is seen with dilated lower polar branch and dilated venous sacs. (b) Dilated venous sacs are seen draining into dilated renal vein. (c) Selective catheterization of lower polar artery with distal cannulation by microcatheter and tip of the microcatheter placed just proximal to the fistula opening. (d) Two coils are deployed into the arterial channel. Post-deployment angiogram showing complete occlusion of the fistula, non-opacification of dilated veins, and normal opacification of remaining segmental branches of the right kidney.

The patient was asymptomatic post-procedure and was discharged in stable condition. On follow-up 1-month later, the patient was in good general condition. Ultrasound showed the cystic lesion in the lower pole which did not reveal any color/spectral flow within. Rest of the renal parenchyma showed good segmental perfusion.

DISCUSSION

RAVFs can be categorized based on their etiology into acquired, congenital, or idiopathic.[1] Acquired types constitute approximately 70% of RAVFs, partly due to the increasing prevalence of percutaneous biopsies and nephrostomy procedures. They are also seen secondary to renal surgeries, blunt or penetrating renal trauma and tumor.[2] The most common pathophysiology for occurrence of acquired RAVF is erosion of arterial wall into adjacent vein causing fusion of both walls. The exact etiology of both congenital and idiopathic RAVFs is still unknown and is often grouped together as spontaneous RAVFs.[3] Congenital RAVFs also known as cirsoid fistulas are thought to be present since birth and constitute about 25% of RAVFs. They are characterized by tangle of tortuous vessel with multiple intercommunications between artery and vein and their angiographic appearance is typical of congenital arteriovenous malformations in other parts of the body.[5] Idiopathic RAVF, as the name suggests, has no identifiable cause till now. However, they are hypothesized to occur due to rupture of intrarenal aneurysm into the vein. Based on the few case reports available, they are mostly diagnosed in middle aged and common in females.[6,7] There were no inciting factors in our patient, and hence, the diagnosis of idiopathic RAVF was made.

RAVF can be asymptomatic or can present with hematuria, flank pain, abdominal bruit, and congestive cardiac failure. Hematuria is commonly seen among congenital type, while prevalence of cardiovascular symptoms including hypertension, tachycardia, and cardiogenic failure is higher in idiopathic RAVFs as compared to cirsoid type.[7,8]

Ultrasound is usually the initial imaging modality of choice. Dilated sacs associated with RAVF can be seen as anechoic cysts. Small RAVF with no aneurysmal dilatations is usually missed on gray scale ultrasound. Color Doppler will identify RAVF as dilated vascular channels which show aliasing at fistula site. Low resistance arterial waveforms in veins can be seen on spectral analysis.[6] Multislice CT helps in accurately identifying the location of fistula and deciding the treatment strategies. Imaging findings on contrast CT include dilated arteries, early opacification of venous channels in arterial phase, and dilated venous sacs. Dilated main renal veins with renal vein aneurysms can also be seen in certain cases.[1] CT offers good spatial resolution for evaluation of lesions. However, digital subtraction angiography (DSA) remains the gold standard imaging modality till date due to its excellent spatial and temporal resolution. Small fistulas which can sometimes be missed on CT can be well visualized on DSA. Acquired and idiopathic RAVF usually presents with single arteriovenous communication, while congenital RAVF has cirsoid appearance with multiple varicoid vessels and intercommunicating fistulas.[3,6] Aneurysmal dilatation of veins is hypothesized to occur due to long-standing high flow across the fistula causing pressure strain on the venous wall. They are more prone for rupture resulting in either hematuria or perirenal hematoma, which can be fatal.[9]

Indications for the treatment include high-output cardiac failure, gross hematuria, interval increase in fistula size, or aneurysmal dilatation of vascular channels.[8] In our case, though asymptomatic, the presence of multiple dilated venous sacs with increased risk of rupture warranted the necessity of the treatment. Before the recent advancements in endovascular treatment, surgery used to be the standard therapy.[10] Feeding artery ligation with or without renal function preserving partial nephrectomy was performed. Endovascular embolization has now become the preferred

option for management due to less incidence of complications and ability to preserve the renal function.[1,3,8,9] The goal of embolization is the interruption of fistula by occluding the feeding artery. Even though various embolic agents are available, the best suited ones for fistula closure are coils, vascular plugs, and liquid embolics such as glue and onyx. Inadvertent migration of embolic agents into the venous channels might result in harmful consequences such as pulmonary embolism, and hence, embolic materials should be catered to individual cases. In high flow fistulas, solid agents such as coils and vascular plugs have a distinct advantage compared to liquid embolics. While multiple coils might be needed to obliterate certain large RAVFs, single vascular plug like Amplatzer vascular plug II can be sufficient to occlude such fistulas.[1,7] Coils and plugs have to be oversized by 30–50% of the maximum target vessel size to provide complete cessation of flow and stability. Combination of embolic agents has also been used in certain cases.[8] Ischemic injury to the renal parenchyma is a likely complication post-embolization which can be decreased by selectively targeting the feeding artery and by limiting embolization of more proximal arteries.

CONCLUSION

RAVF is a rare vascular anomaly mostly being acquired secondary to trauma and iatrogenic. Idiopathic RAVF has no identifiable causes. They can present with hematuria, flank pain, cardiovascular symptoms or can be asymptomatic. Ultrasound and CT can easily diagnose these fistulas, although DSA might be needed in cases of small fistulas. Endovascular embolization is an effective method of the treatment due to its less incidence for complications and preservation of renal function.

TEACHING POINTS

- Idiopathic RAVF has no identifiable cause and can present with either hematuria, cardiogenic failure, or can be asymptomatic
- Ultrasound can diagnose renal AVFs as cystic structure, on which Doppler will show aliasing and color flow
- Endovascular embolization by coils or glue (N-butyl cyanacrylate) is an effective method of treating renal AVFs, with preservation of renal function.

MCQs

1. Cirsoid type of fistulas are commonly seen in?
    a. Post-biopsy renal fistulas
    b. Post-traumatic renal fistulas
    c. Congenital renal fistulas
    d. Idiopathic renal fistulas

Answer Key: c

2. Which is the ideal method to treat RAVF?
    a. Ligate the draining vein
    b. Occlude the main renal artery using coils
    c. Embolize the fistula using PVA (polyvinyl alcohol) particles
    d. Occlude the feeding artery along with nidus using coils or glue

Answer Key: d

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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