

BEYOND PCN AND URETERIC STENTING: A BEGINNER'S GUIDE TO DIVERSE VASCULAR AND NONVASCULAR RENAL INTERVENTIONS

Zahid Amin Khan, Atif Iqbal Rana, Namrah Khalid, Maria Rauf, Jamshaid Anwar, Ahmad Ammar Afzal

Department of Radiology, Shifa International Hospital, Islamabad, Pakistan.

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ABSTRACT

Management of renal emergencies has revolutionized over the past years and in that domain intervention radiology has gained an emerging role as the minimally invasive procedures aid at salvaging renal function and minimizing morbidity and mortality. Aim of this study is to highlight emerging importance of newer transcatheter therapies available to intervention radiologists in managing renal emergencies, attending in detail the techniques and clinical outcomes of interventional procedures. **METHOD:** We compiled few of the procedures performed at Shifa international hospital, Islamabad from January 2017- January 2023. These include:

- Management of fibromuscular dysplasia.
- Renal angiomyolipoma embolization.
- Renal artery giant aneurysm coiling/ embolization.
- Management of post renal biopsy bleed.
- Post partial nephrectomy bleed management.
- Embolization of renal cell carcinoma metastasis to stomach and small bowel.
- Renal cyst alcohol ablation.

CONCLUSION: Knowledge about the disease, procedures of intervention developed for their management and their clinico-therapeutic outcomes can help efficiently treat the patients with renal illnesses.

Keywords: Interventional radiology, renal emergencies, transcatheter procedures, fibromuscular dysplasia, angiomyolipoma, embolization.

Introduction

Management of renal emergencies has revolutionized over the past years and in that domain intervention radiology has gained an emerging role as the minimally invasive procedures aid at salvaging kidney function and minimizing mortality and morbidity.¹ These emergencies are categorized as atraumatic, traumatic, iatrogenic and obstructive etiologies. The domain of IR has extended beyond PCN and ureteric stenting to transcatheter interventions for the

management of multitude of renal ailments including vascular renal diseases, renal or primary hypertension and neoplasms. With advancement of technology, we expect even more innovative procedures to be at hand in future providing lesser invasive alternatives to traditional surgical procedures. Aim of this study is to highlight emerging importance of newer transcatheter therapies available to intervention radiologists in managing renal emergencies, attending in detail

Correspondence : Dr. Maria Rauf
Department of Radiology,
Shifa International Hospital,
Islamabad, Pakistan
Email: mari23392@gmail.com

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the techniques and clinical outcomes of interventional procedures.

Methods

This study was granted waiver by ethical review committee of institute. Stated underneath are a variety of renal interventions, but not limited to, performed at Shifa international hospital, Islamabad from January 2017- January 2023. These include:

- Management of fibromuscular dysplasia.
- Renal angiomyolipoma embolization.
- Renal artery giant aneurysm coiling/ embolization.
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MANAGEMENT OF FIBROMUSCULAR DYSPLASIA:

Fibromuscular dysplasia, commonly known as FMD, is predominantly nonatherosclerotic angiopathy of one or more arteries (commonly renal) causing narrowing (stenosis) and enlargement (aneurysm) classically presenting as renal hypertension. The severity and type of FMD, the symptoms (hypertension not controlled by medication) and the artery location determine the choice of therapy.



Figure 1A: Focal severe stenosis right renal artery at junction of mid and proximal third with post stenotic dilatation and delayed venogram.

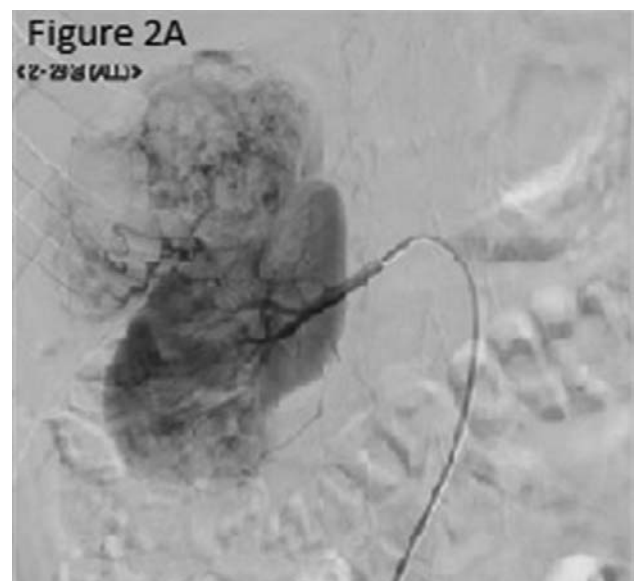


Figure 1B: Good result on final angiogram with no significant stenosis.

In our case of fibromuscular dysplasia, there was severe focal stenosis at proximal and mid third of right renal artery. 5Fr sheath later upsized to 6Fr Ansel sheath was applied to gain antegrade access of right common femoral artery. Renal artery was engaged by 5Fr C2 catheter followed by monorail balloon inflation. Successful outcome was achieved.

RENAL ANGIOMYOLIPOMA EMBOLIZATION:

Renal angiomyolipomas (AMLs) are benign tumors which are predominantly sporadic (80%) and the rest have association to tuberous sclerosis. AML count up for 3% of renal masses. Lesions with size less than 4 cm are usually asymptomatic. Symptoms are



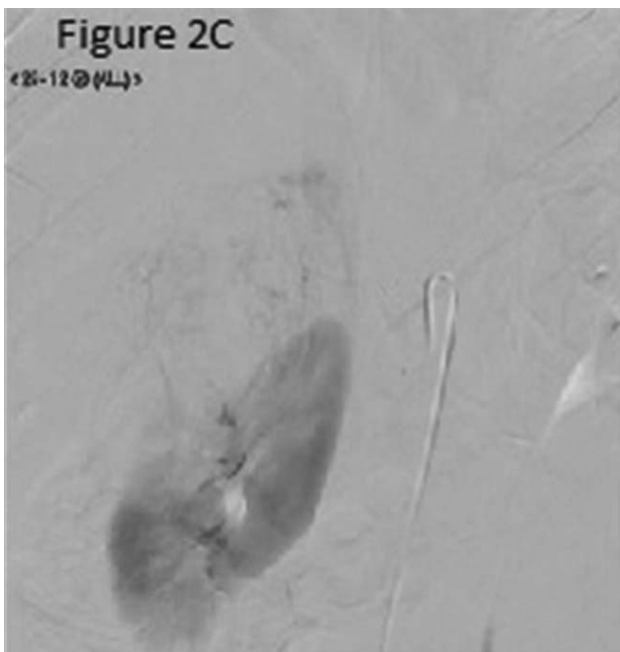
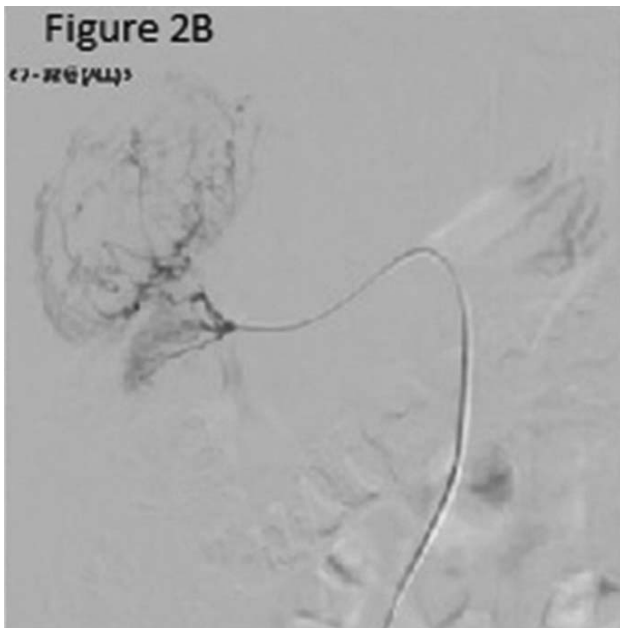


Figure 2A & B: Large Angiomyolipoma blush at upper pole on selective right renal artery angiogram. **C:** Satisfactory flow stasis on final angiogram.

mostly seen in 80% of lesions with sizes greater than 4 cm. They can spontaneously hemorrhage and be fatal.²

A case of large right renal angiomyolipoma with symptoms of hematuria was managed by using 5Fr MKH3 (Performa- Merit) catheter and Microcatheter Terumo through right CFA approach. 250-355 microns

PVA particles and absolute alcohol were used as embolization material and closure was done by manual compression. Successful result with adequate stasis of flow was achieved.

RENAL ARTERY GIANT ANEURYSM COILING / EMBOLIZATION

A dilated renal artery segment with expansion of all three layers with diameter more than twice the original diameter is termed as renal artery aneurysm.³ Causes include fibromuscular dysplasia, trauma, vasculitis and percutaneous renal interventions.⁴ By preserving adequate blood flow to the targeted kidney, exclusion of the aneurysmal sac from the circulatory pathway is the mainstay of management. Size of the sac more than 2cm, renal hypertension, symptomatic aneurysms (hematuria and/or flank pain), dissection and female of child bearing age are indicators of intervention.⁵ A large lobular aneurysm at lower pole of right kidney was managed through catheterization by using 5Fr CB2 catheter followed by deployment of nester coil sized 6 mm x 14 cm. This resulted in successful non filling of sac in post angiogram images.



Figure 3A: Large lobular aneurysm at lower pole of right kidney.

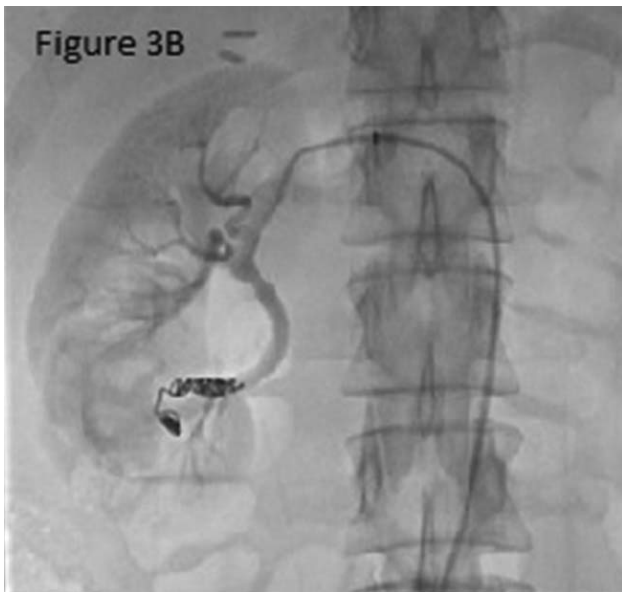


Figure 3B: Post coiling angiogram showing satisfactory results and aneurysms no more filled.

MANAGEMENT OF POST RENAL BIOPSY BLEED

Percutaneous renal biopsy (PRB) is presently widely acknowledged and used in making diagnosis and management of renal ailments. Despite newer developments, skills and technologies, post biopsy bleeding still remains a life threatening complication and is inevitable.⁶⁻⁹ Post biopsy bleeding is effectively

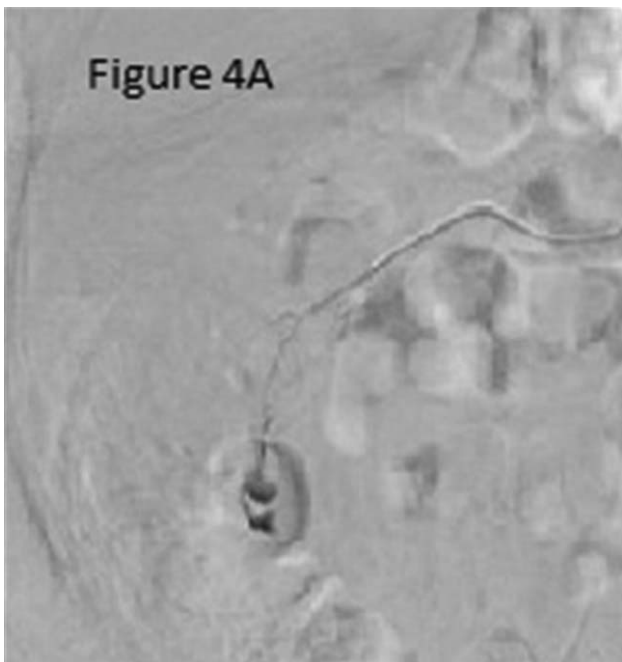


Figure 4A: Active contrast leak from lower pole branch of renal artery, post biopsy.



Figure 4B: Final angiogram showed no active contrast extravasation.

and efficiently managed by renal artery embolization. It provides safer approach by preserving the renal parenchyma and minimal damage to renal function. In one of the cases, post biopsy bleed was managed by engaging renal artery by 5Fr MK3 catheter. Right renal angiogram showed active contrast leak from lower polar branch of renal artery. Microcatheter was used for superselective catheterization and embolization was performed by 300-500 microns PVA particles with successful outcome.

POST PARTIAL NEPHRECTOMY BLEED MANAGEMENT

About 3-10% of partial nephrectomies show complication of post operative hemorrhage. Embolization can be utilized to treat acute hemorrhage. Patients having clinically significant hematuria however are hemodynamically stable are efficiently managed by transcatheter embolization method. It provides safe approach without significantly effecting renal function hence preserving GFR. However clinical signs of post operative bleeding and hemodynamic instability warrants urgent reopening or otherwise complete nephrectomy.¹⁰

Through right common femoral artery approach, a case of post partial nephrectomy was managed by engaging renal artery with 5Fr MKH3.

(Perfluma- Merit). Superselective catheterization done by microcatheter followed by embolization using two 4 x 2 mm Tornado microcoils.

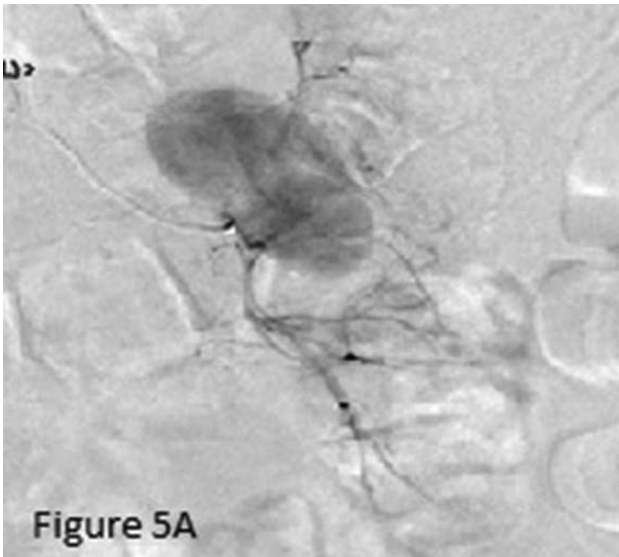


Figure 5A

Figure 5A: Active bleed identified from left renal artery in post partial-nephrectomy bed.

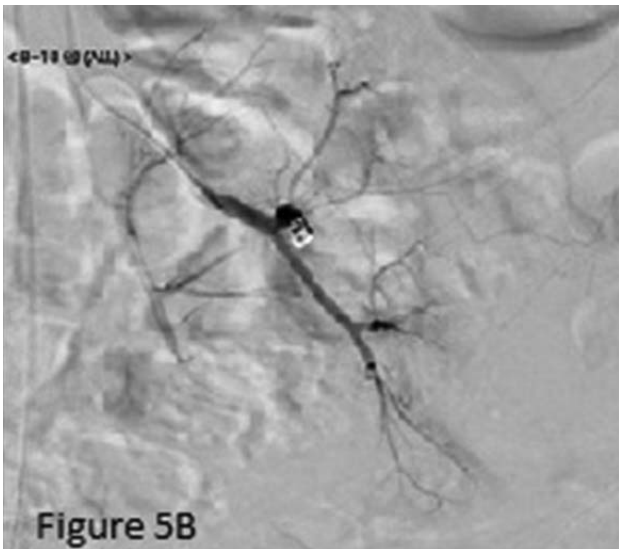


Figure 5B

Figure 5B: Good results with no active extravasation.

EMBOLISATION OF RENAL CELL CARCINOMA METASTASIS TO STOMACH AND SMALL BOWEL:

Renal cell carcinoma, being most abundant renal malignancy, count up for 3.5% of major malignancies. Preoperative embolization of hypervascular RCCs and their metastatic deposits to various organs facilitates to a greater extent the future management by delivering a more positive prognosis, reducing chances of spontaneous bleeding/bleeding during future surgeries and facilitating pain reduction.¹¹ It plays a significant role in oncological treatment options and providing improved quality of life.



Figure 6A



Figure 6B

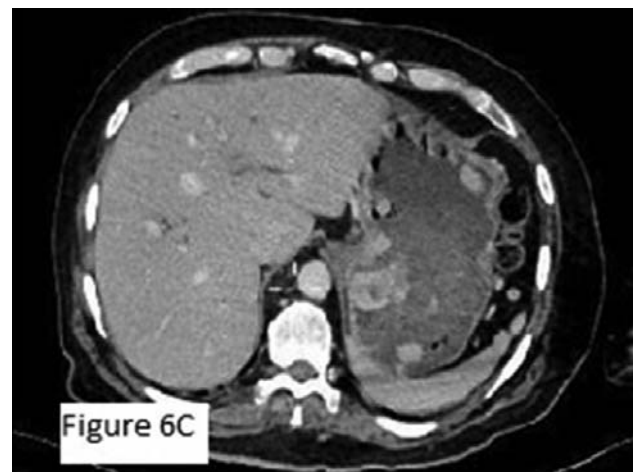


Figure 6C

Figure 6A: Axial CT scan image with contrast showing large nodular enhancing metastatic deposits along walls of stomach. 6B: Selective left gastric angiogram and embolization performed. 6C: Post-embolization contrast enhanced CT showing significant reduction in disease bulk.

Patient having RCC metastatic deposits to stomach and bowel was managed by approaching left gastric artery through right common femoral artery approach. Arteriogram showed arterial blushes in distal left gastric artery branches corresponding abnormality seen on CT scan. Selective embolization was done by PVA particles injection until near complete stasis.

RENAL CYST ALCOHOL ABLATION

Only complicated or symptomatic renal cysts need treatment. Many treatments have been practiced, such as laproscopic or surgical excision, simple drainage by percutaneous approach and instillation of a sclerosing agent after percutaneous drainage. The most commonly used sclerosing agent is sterile ethanol (95-99%).

In our case, a complex cyst measuring 7.4 x 5.7 cm was seen on CECT abdomen. Cyst ablation was successfully done using absolute alcohol.

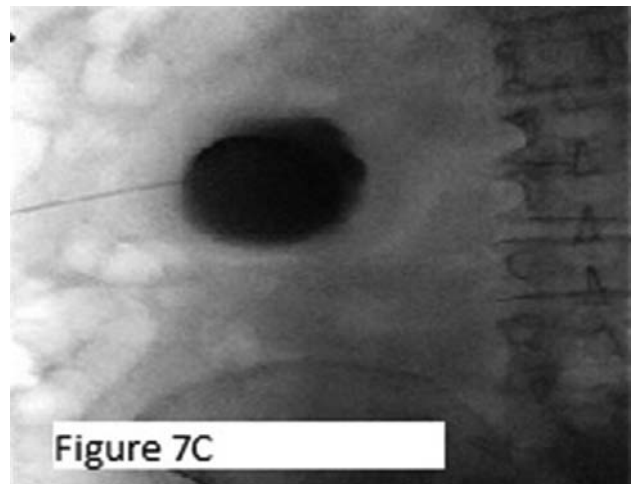
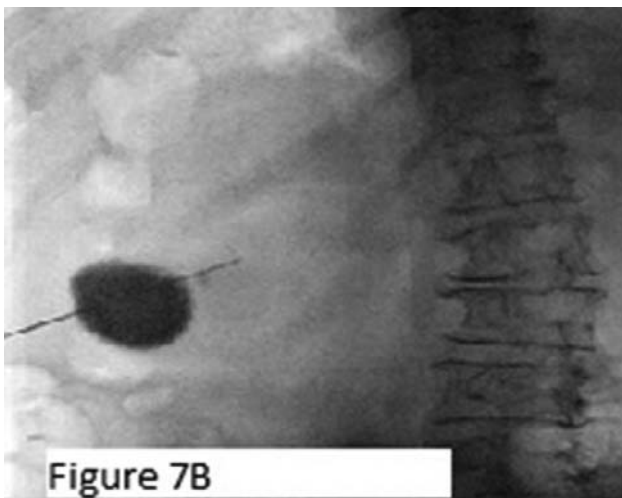
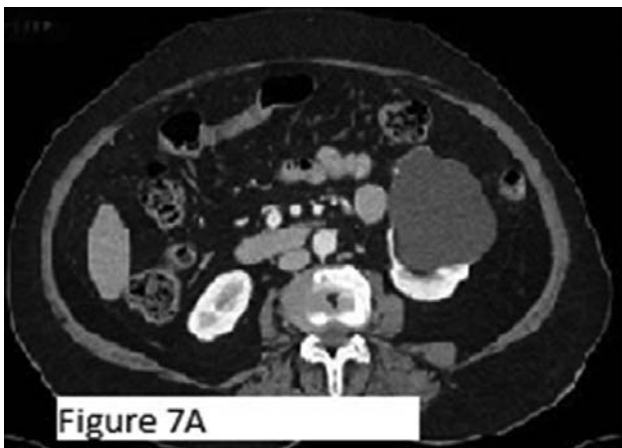


Figure 7A: Axial contrast enhanced CT abdomen image showing left renal cyst. **7B:** About 70 cc fluid was initially aspirated from this cyst and contrast was injected which showed no communication with pelvicalyceal system. Minimal amount of absolute alcohol was also injected.

Conclusion

Renal emergencies are usually consequence of obstructive, traumatic or atraumatic etiologies that should not be left untreated as they increase the risk of loss of renal function or life. For past few years, minimally invasive procedures have gained importance in managing such emergencies given their efficacy, safety and role in salvage of renal function. Knowledge about the disease, procedures of intervention developed for their management and clinicotherapeutic outcomes can help efficiently treat the patients with renal illness.

Conflict of interest: None

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