

Paradigm Shift in the Management of Pseudoaneurysm Following Nephrolithotomy-A Case Series

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ABSTRACT

Renal artery pseudoaneurysm after nephrolithotomy or pyelolithotomy is rare, but is more often following Percutaneous Nephrolithotomy (PCNL) or renal biopsy. It is a potentially life-threatening condition, with an incidence of 0.1 to 0.3% after nephrolithotomy or pyelolithotomy. Manifestation may vary, from asymptomatic to symptoms like local bloody discharge, haematuria, pain, high blood pressure, and rupture causing a life-threatening condition. A minimally invasive technique, selective or super-selective angioembolisation is the treatment of choice. This case series reports, five cases presented with either bloody wound discharge or intermittent haematuria in the Emergency Department, post nephrolithotomy. All patients were resuscitated in the Emergency Department with intravenous fluid and packed red blood cell transfusion. After resuscitation, three patients were diagnosed with renal artery pseudoaneurysm on Computed Tomography of Kidneys, Ureters and Bladder (CT KUB) and angiography, and two patients with digital subtraction angiography during the intervention. All were treated with super-selective renal artery angioembolisation, with endovascular coiling of different sizes. All patients made an uneventful recovery, and on follow-up no complication was evident. Now-a-days the popularity of angioembolisation for renal artery pseudoaneurysm has increased, which shows a paradigm shift from a traditional surgical intervention.

Keywords: Angioembolisation, Endovascular coiling, Pyelolithotomy

INTRODUCTION

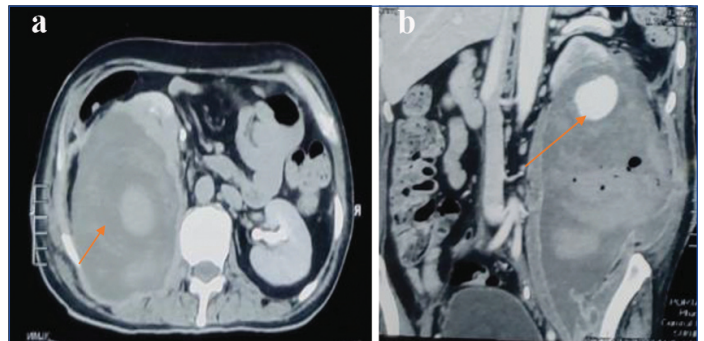
Pseudoaneurysm after nephrolithotomy is very rare. Incidence of pseudoaneurysm after nephrolithotomy and pyelolithotomy is 0.1 to 0.3%, while during PCNL and percutaneous renal biopsy, it is 0.6 to 1% and 2 to 3.4% respectively [1]. It may manifest as local symptoms, haematuria, hypertension, or even catastrophic rupture of the vessel resulting in life-threatening haemorrhage and shock. Selective or super-selective renal embolisation is now the treatment of choice [2]. Renal artery embolisation was first introduced in 1964 and advancement in radiology resulted in the development of super-selective renal arterial embolization [3]. Tissue loss after embolisation is very important in end organs like kidney [4]. Currently selective or super-selective renal embolisation is a safe and effective therapeutic option for pseudoaneurysm or arteriovenous malformation [5]. Surgical intervention is rarely required, because it usually results in partial or total nephrectomy. Surgical intervention is reserved for large and refractory renal artery pseudoaneurysm [6].

CASE SERIES

Case 1

A 58-year-old male presented to Emergency Department, with a bloody discharge from the operated site after 2.5 month of open nephrolithotomy for renal stone, done at a peripheral hospital three month ago. He had a history of 18 units of packed red blood cell transfusion before presenting to our hospital. On admission, haemoglobin was 7 gm/dL. He was resuscitated with 2 units of packed red blood cells and intravenous fluid. After hemodynamic stabilisation, Computed Tomography angiography was done which shows a pseudoaneurysm of size 5.6×3.8×5 cm, arising from the segmental artery of the interpolar region of the left kidney with a large haematoma of size-13.4×11.2×24.6 cm surrounding the interpolar region, effacing the calyx and extending posteriorly in the lumbar region of the left-side of the pelvis over the psoas muscle [Table/Fig-1a,b,2]. Selective embolisation with endovascular coil (Two IMWCE 0.035"-3 mm-3 cm) was done [Table/Fig-3a,b]. After

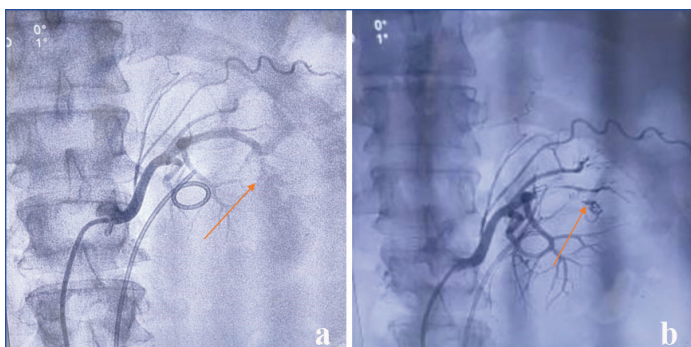
endovascular coiling, bloody discharge from the wound subsided. Follow-up was done with Ultrasonography (USG) KUB. On one month of follow-up, the patient was doing well.



[Table/Fig-1a,b]: Contrast Enhanced Computed Tomography KUB (a) Axial section and (b) Sagittal section A large haematoma of size-13.4×11.2×24.6 cm surrounding the interpolar region effacing the calyx and extending posteriorly in the lumbar region of the left side of the pelvis over the psoas muscle.



[Table/Fig-2]: CT Angiography-A pseudoaneurysm of size 5.6×3.8×5 arising from the segmental artery of the interpolar region of the left kidney.



[Table/Fig-3a,b]: Case 1 (a) Angiography before embolization dye leaking from segmental renal artery (b) Angiography after embolization no dye leak with endocoil at segmental artery.

Case 2

A 27-year-old female presented to the Emergency Department with intermittent haematuria, after one month of open right nephrolithotomy for large calyceal stone, done at a peripheral hospital two months back. On admission the patient was pale, and her haemoglobin was 6 gm/dL. The patient was resuscitated with 4 units of packed red blood cells with intravenous fluid. After stabilization of the patient, renal angiography was done which showed a lobulated pseudoaneurysm of size 18.9×13.6 mm at the right interpolar region arising from a segmental branch of the interpolar region [Table/Fig-4]. CT-guided angioembolisation with endocoil (IMWCE 0.035"-3 mm-3 cm) was done. After angioembolisation haematuria subsided, and the patient made an uneventful recovery. At one month of follow-up, she was doing well.



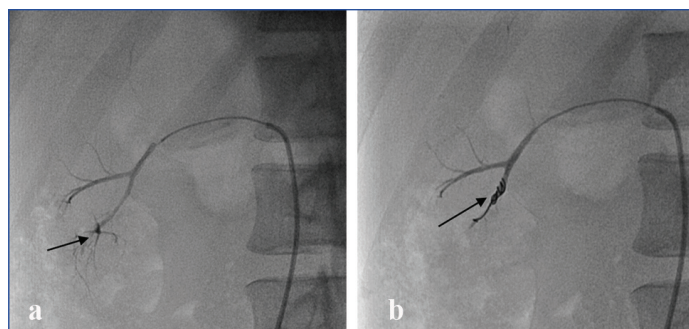
[Table/Fig-4]: CECT KUB-A lobulated pseudoaneurysm of size 18.9×13.6 mm at right interpolar region arising from segmental branch of interpolar region.

Case 3

A 23-year-old male presented to the Emergency Department, with haematuria, with the passage of clots after 15 days of open right nephrolithotomy done at another hospital for renal stone, one month back. On admission, patient was resuscitated with 2 units of packed red blood cells and intravenous fluid. After stabilisation of the patient, digital subtraction angiography was done, which showed a renal segmental artery aneurysm [Table/Fig-5a,b]. Selective angioembolisation with the endovascular coil (Two MWCE 0.018"-3 mm-3 cm-HILAL) was done. After angioembolisation haematuria subsided. At one month of follow-up, he was doing well.

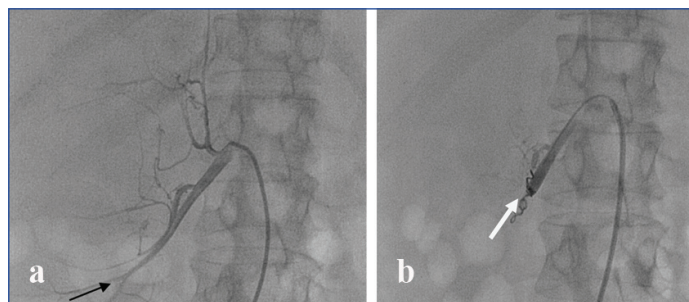
Case 4

A 42-year-old male came to the Outdoor patient Department with a complaint of haematuria after 25 days of right nephrolithotomy for large calyceal diverticular stone, done two months back at peripheral hospital. After resuscitation of patient, digital subtraction angiography



[Table/Fig-5a,b]: Case 3 Angiography before and after embolisation dye leaking from segmental renal artery.

was done which shows segmental artery aneurysm and treated with selective arterial embolisation [Table/Fig-6a,b]. Postoperative recovery was uneventful. On follow-up, he was doing well.



[Table/Fig-6a,b]: Case 4 Angiography before and after embolisation dye leaking from segmental renal artery.

Case 5

A 29-year-old female presented in the Emergency Department with complaints of pain at the operative site, and haematuria for 18 days after left nephrolithotomy, which was done two months ago at peripheral hospital. On admission, the patient was pale, and her haemoglobin was 5 gm/dL. The patient was resuscitated with 5 units of packed red blood cells with intravenous fluid. After stabilisation of patient, CT KUB and angiography were done, which showed a renal segmental artery aneurysm of size 22 mm×16 mm in the left interpolar region, which was treated with angioembolisation. The patient became asymptomatic afterward. At one month follow-up, patient was doing well. Basic details of all cases are given in [Table/Fig-7].

DISCUSSION

There are variety of options exist for the treatment of renal stone, including Extracorporeal Shock Wave Lithotripsy (ESWL), PCNL, laparoscopic/open pyelolithotomy, and nephrolithotomy. Nowadays, most renal stones are managed with ESWL or PCNL. Pyelolithotomy/nephrolithotomy is still performed occasionally if the stone size is large, lack of endourology facilities, or lack of experience in PCNL [1].

Pseudoaneurysm is an unusual condition, associated with nephrolithotomy or PCNL. The most common symptom associated with renal artery pseudoaneurysm is hematuria [7]. CT angiography is a valuable non invasive diagnostic modality of choice for the diagnosis of renal artery aneurysm and also for the follow-up. Pseudoaneurysm is best seen in the arterial phase of CT angiography. It also demonstrates the entire urinary tract, along with focal lesions at the same time. Digital Subtraction Angiography (DSA) remains the gold standard for the diagnosis of renal artery pseudoaneurysm. So, it is used both as a diagnostic as well as therapeutic method [8]. In this case series, three patients were diagnosed with CECT KUB with CT angiography, and the remaining two patients were diagnosed with DSA, which was both diagnostic and therapeutic.

Treatment options for renal artery pseudoaneurysm are conservative, nephrectomy, open vascular surgery, or angioembolisation, depending on the patient's clinical condition [6]. But now-a-days, angiographic embolisation is the treatment of choice due to its selective and minimal invasive nature, and the maximal preservation

Parameters	Case 1	Case 2	Case 3	Case 4	Case 5
Age	58 year	27 year	23 year	42 year	29 year
Sex	Male	Female	Male	Male	Female
Preprocedure Hb	7 gm/dL	6 gm/dL	9 gm/dL	8.2 gm/dL	5 gm/dL
Renal artery branch involved	Segmental artery of interpolar region	Posterior inferior segmental branch	Segmental artery of interpolar region	Upper polar segmental artery aneurysm	Posterior inferior segmental branch
Blood Transfusion	18 unit PCV	4 unit PCV	2 unit PCV	5 unit PCV	5 unit PCV
CT KUB and Angiography	Pseudoaneurysm of size 5.6×3.8×5 cm arising from the segmental artery of the interpolar region of the left kidney with a large hematoma of size-13.4×11.2×24.6 cm surrounding the interpolar region effacing the calyx and extending posteriorly in the lumbar region of the left side of the pelvis over the psoas muscle	Lobulated pseudoaneurysm of size 18.9×13.6 mm at right interpolar region arising from segmental branch of interpolar region	Only DSA was done	Only DSA was done	Renal segmental artery aneurysm of size 22 mm ×16 mm at left interpolar region
Size of endovascular coil	Two IMWCE 0.035"-3 mm-3 cm	IMWCE 0.035"-3 mm-3 cm	Two MWCE 0.018"-3 mm-3 cm (HILAL)	IMWCE 0.035"-3 mm-3 cm	Two MWCE 0.018"-3 mm-3 cm (HILAL)
Postrecovery Hb (at one month)	13 gm/dL	11 gm/dL	12.8 gm/dL	12.5 gm/dL	11.8 gm/dL
Duration of hospital stay	5 days	6 days	6 days	5 days	5 days

[Table/Fig-7]: Basic details of all cases.

Hb: Hemoglobin; PCV: Packed cell volume; DSA: Digital subtraction angiography

of renal parenchyma. Small-sized (<2cm) pseudoaneurysm may be managed conservatively, but if symptomatic in terms of bleeding, pain, and hypertension then selective/super-selective embolisation is the best treatment [1]. Embolisation is well-tolerated, relatively safe, and allows maximal preservation of functioning renal tissue [4]. Angioembolisation has the disadvantage of arterial injury, infection, haemorrhage requiring nephrectomy, contrast-induced nephropathy, and radiation exposure [4]. A large pseudoaneurysm/AV malformation (>2cm), renovascular hypertension, expansion of the aneurysm, and evidence of renal damage, may need nephrectomy or partial nephrectomy [6]. Currently, total or partial nephrectomy is reserved for the patient with renal infarction, severe ischaemic renal atrophy, or particularly complex intrarenal aneurysm [1].

The procedure of angioembolisation starts from renal angiogram through a transfemoral approach. Selective embolisation of renal artery branches can be achieved by using microcatheters, inserted co-axially in a guidewire, minimising loss of viable tissue. Different embolic agents are available to treat pseudoaneurysm like endocoils, particulate agents, and liquid agents. Embolic agents can be used either alone or in combination [9]. The choice should be based on the patient's vascular anatomy and the pathologic process. We have used endocoils agents, because of their availability in our institution.

According to Rami A et al., and Ansari MS et al., successful management of a case of the renal artery pseudoaneurysm was done by angioembolisation [1,9]. Similarly, we managed all the cases of renal artery pseudoaneurysm by angioembolisation with very minimal complications. Angioembolisation is a paradigm shift in the management of renal artery pseudoaneurysm because it is a minimally invasive technique, less time-consuming, nephron sparing procedure, and has less complication. But the limitation of this procedure is, it needs an expert intervention specialist and the high cost of endo coils.

CONCLUSION(S)

Pseudoaneurysm following nephrolithotomy though rare, can be life-threatening. In the modern era, such cases can be managed by minimal invasion technique, in the form of embolisation of specific branches of the renal artery and thus, kidneys can be saved. Angioembolisation can be regarded as a game changer in the modern era to manage these cases in a minimally invasive way.

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