Secondary Hematuria from Traumatic Renal Artery Pseudo Aneurysm with Arteriovenous Fistula Treated by Successful Stenting

Praveen Gopi[a], Vasudevan S[a], Abhinav Kumar[a], Rustam Singh[a], Vivek Sharma[a], Sunil R[a], Jaydevan ER[b], Santhosh Kannath[b]

a. Department of Urology, Government Medical College, Trivandrum, Kerala, India;
b. Department of Radiology, SCTIMST, Trivandrum, Kerala, India*

ABSTRACT

Published on 27th March 2017

Renal artery pseudoaneurysm with renal arteriovenous (AV) fistula is an uncommon complication after blunt trauma injury.It can present with life threatening secondary hematuria. We report on a case of 19 year old young man admitted to our hospital following blunt abdominal trauma. He presented with right flank pain, frank hematuria and was hemodynamically stable. After evaluation it was diagnosed as grade IV renal injury and treated conservatively. Thirty days after trauma, he developed secondary hematuria caused by renal artery pseudoaneurysm with AV fistula which was treated successfully by endovascular stenting.

Keywords: Renal artery Pseudoaneurysm, Renal AV Fistula, Hematuria, Stenting

*See End Note for complete author details

INTRODUCTION

Delayed hemorrhage after renal trauma is a life-threatening complication. The causes of the delayed hemorrhage include renal artery pseudoaneurysm (RAP) and renal AV fistula. Renal artery pseudoaneurysm usually results from iatrogenic renal procedures, while it can also be a rare complication of blunt abdominal trauma.[1] We report a case of grade IV renal injury treated conservatively and 1 month later presented with RAP and AV fistula which was successfully managed with endovascular renal artery stenting since angioembolisation could compromise the renal vascularity.

CASE REPORT

A 19 year old young man attended casualty with history of fall from bike and presented with right flank pain and frank hematuria. On arrival, the patient was hemodynamically stable and physical examination revealed abrasion over right hypochondrial and lumbar region

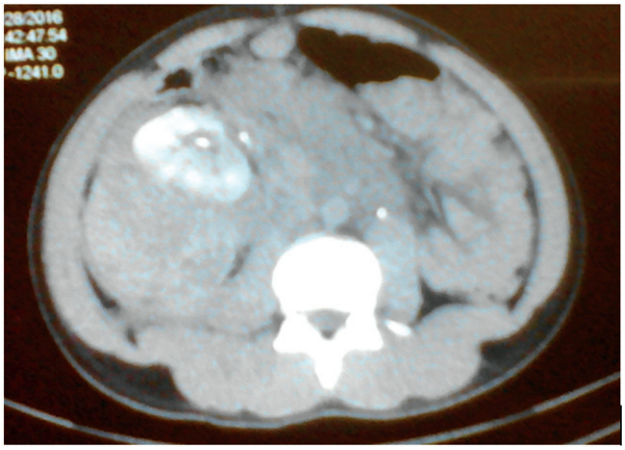

Figure 1. **CT Abdomen shows a large right retroperitoneal hematoma with contrast leak in venous phase compatible with Grade IV injury.**

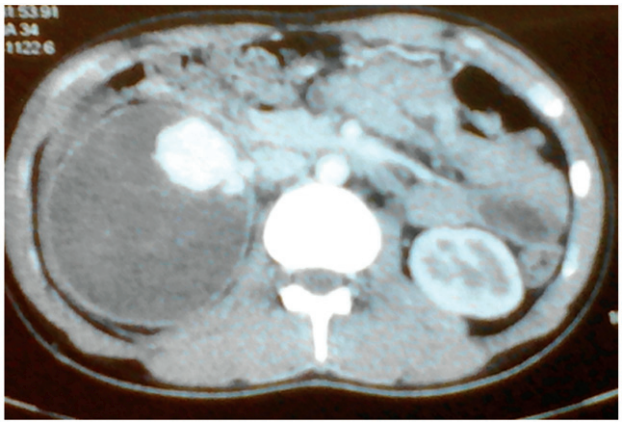

Figure 2. **Right perirenal hematoma with hyperdense rounded lesion of 5.5cm in hilar region suggestive of pseudoaneurysm.**

Cite this article as: Gopi P, Vasudevan S, Kumar A, Singh R, Sharma V, Jaydevan ER, et al. Secondary Hematuria from Traumatic Renal Artery Pseudo Aneurysm with Arteriovenous Fistula Treated by Successful Stenting. Kerala Medical Journal. 2017 Mar 27;10(1):44–8.

Corresponding Author:
Dr Vasudevan S, Professor, Department of Urology, Government Medical College, Trivandrum, Kerala.
E-mail: periamana@gmail.com

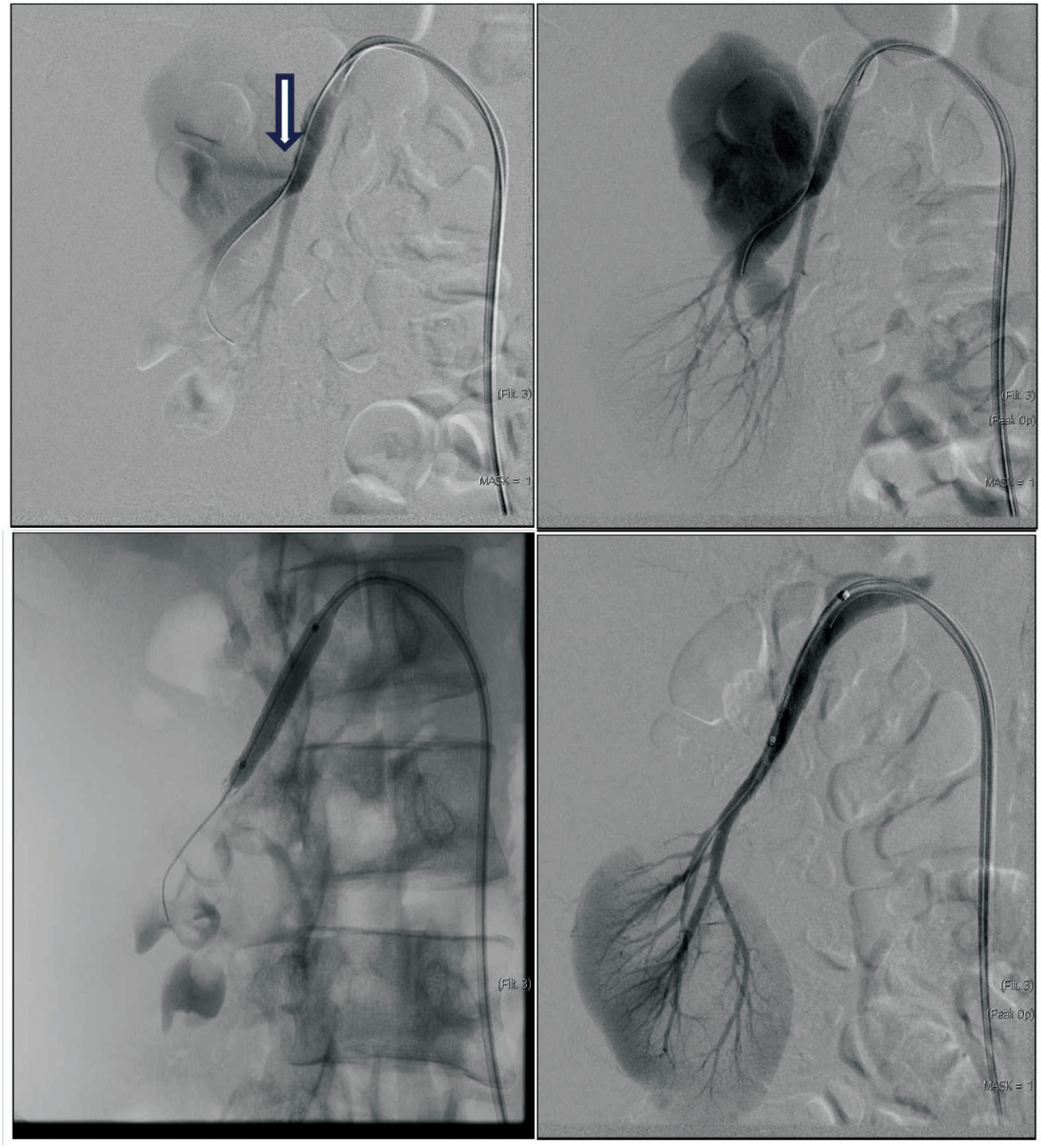

Figure 3. A&B. **Right renal artery selective angiogram showing pseudoaneurysm of size 6x3cm. Contrast jet indicates site of leak (arrow).**
C. **Stent graft deployment with balloon inflation.**
D. **Post stent angiogram showing no contrast filling in psudoaneurysm**

with tenderness and fullness over these regions. Blood investigation showed decrease in hemoglobin to 8 gm/dl and hematocrit 24% with rest of parameters normal. Initial imaging with FAST showed right retroperitoneal hematoma on right kidney upper pole. Contrast enhanced CT abdomen scan demonstrated normal enhancing renal parenchyma with right retroperitoneal hematoma 15x 10 cm replacing upper pole of right kidney with non-visualization of renal vein and contrast extravasation in venous phase **(figure 1)** suggesting grade IV renal injury. Patient was admitted to ICU for monitoring of vital signs, serial hematocrit and blood transfusions. Repeat CT imaging on day 3 noted same sized hematoma, non-visualization of segmental branches supplying upper pole and no contrast extravasation from renal vein. Patient improved with stable vital signs, increase in hemoglobin and decrease in hematuria and discharged on day 13. Immediate follow

up visit was uneventful. After 30days from trauma, he presented with frank hematuria with passage of clots and fever. Hemoglobin dropped to 7gm/dl and renal function values in normal range. CT abdomen showed right perinephric hematoma 19x10cm with hyperdense rounded lesion of 5.5x3cmin hilar region suggestive of pseudoaneurysm and upper pole cortical devascularization **(figure 2).** Blood transfusions were initiated to correct the hemoglobin. Selective angiography of renal artery revealed two rents 2mm and 1.5mm proximal and distal with a pseudoaneurysm of size 6 x 3cm and intra renal AV shunt **(figure 3 A&B)**. No parenchymal blush noted in superior aspect and normal parenchymal blush in inferior pole. Balloon expandable stent 5.7mmx3.7mm (Bard Life stream) placed over guidewire across the rents and sequential balloon expansion of stent done to prevent endoleaks **(figure 3C).** Post stenting angiogram showed complete exclusion of the pseudoaneurysm and small lower pole segmental artery with intact nephrogram and no new defects **(figure3D).** Patient's postoperative period was uneventful with heart rate- 80/min and blood pressure-124/80 mmHg. Hematuria started to decrease from 3rdPOD onwards. He was discharged 10 days after procedure with a normalizing hematocrit (hematocrit 38%, hemoglobin 12.8 g/dL) and a creatinine level of 1.2 mg/dL. Follow up angiogram after 2 weeks showed patent stent with normal flow maintaining the lower pole parenchymal vascularity **(figure 4).**

Figure 4. **Follow-up CT angiogram volume rendered image shows patent stent graft with normal distal flow**

DISCUSSION

Secondary haemorrhage following post traumatic renal injury is usually due to pseudo-aneurysm or an arteriovenous fistula (AVF) bleeding into the pyelocaliceal system or perinephric area [16]. Renal pseudoaneurysm is commonly associated with iatrogenic causes like open and endoscopic surgery, percutaneous surgery and renal biopsy. 19% of pseudoaneurysms are seen in penetrating trauma.[2] Blunt abdominal trauma rarely causes RAP and is believed to result from rapid deceleration- induced, full- or partial-thickness injury to arteries supplying the renal parenchyma.[3,4] After complete or partial injury of an artery, the surrounding tissues – vascular adventitia, renal parenchyma, and Gerota's fascia may contain the hemorrhage. Following the initial renal injury, the combination of hypotension and coagulation results in temporary bleeding cessation. The clot lyses, and surrounding necrotic tissue degradation results in recanalization between the intravascular and extravascular space and, subsequently, result in the formation of a pseudoaneurysm. With restoration of normal hemodynamics, the pseudoaneurysm can grow and eventually rupture into the pyelocaliceal system or the perirenal space.[3,4,5] Due to the risk of RAP or AVF development after major renal injury, a CT scan imaging is recommended 3–6 months after any high grade injury.[17]

The pseudoaneurysm can be asymptomatic for long period and in symptomatic patients its presentation include hypertension, gross hematuria, lumbar pain and pulsating abdominal mass.[6] The average interval between injury and onset of secondary renal hemorrhage is approximately 12 days (2 to 36 days).[1] In our case, symptoms presented after one month. In particular, persistent bleeding or delayed gross hematuria should raise the suspicion of segmental vascular injury, including the possibility of pseudoaneurysm.[5] Renal artery pseudoaneurysms may rupture suddenly and cause life-threatening hemorrhage.[3,11] Pseudoaneurysm may rupture into an adjacent vein or erode into a neighboring viscus[11] resulting in a potentially fatal arteriovenous or gastrointestinal fistula. An AVF may present either in isolation[18] or in combination with a pseudoaneurysm.

Angiography is the "gold standard" exam used to diagnose traumatic RAP.[2-7] It confirms the presence of a pseudoaneurysm, provides anatomic localization, assessment of the renal parenchyma and moreover, concomitant therapeutic embolization is possible.[5,8,9] Several noninvasive imaging modalities, ranging from

renal ultrasound, intravenous pyelogram, contrast-enhanced CT scan, magnetic resonance imaging (MRI), and renal scintigraphy, can also be used when a pseudoaneurysm is suspected.[4,5,9] Computerized tomography reveals the enhancing juxta renal collection.[3] Color Doppler ultrasound might be helpful in diagnosing pseudoaneurysm. The pseudoaneurysmal mass is easily detected by the bidirectional swirling blood flow in pseudoaneurysm neck and a "ying-yang" colour pattern inside the lesion, revealing the direction of blood flow entering and leaving the pseudoaneurysm.[10]

Treatment of RAP includes observation, open surgery, minimal invasive techniques. In small asymptomatic RAP simple observation is required. Intervention is required for expanding pseudoaneurysm, persistent pain or frank hemorrhage. Rationale of intervention is to control bleeding, prevent rupture, and preserve a maximum of viable renal tissue. In addition to the hemodynamic status of the patient, the anatomical location of the pseudoaneurysm determines the treatment option – embolization, superselective embolization, stent-graft placement, or open explorative surgery.[7,9]

Transcatheter embolization is safe and effective for controlling hemorrhage from RAP and has become the initial treatment of choice in hemodynamically stable patients. Although endovascular embolisation may result in partial renal infarction, the primary use of this technique is justified because less loss of renal parenchyma is to be expected from catheter embolisation than from an attempt at conservative operative repair such as renal branches ligation or fistula excision.[19] Embolization is recommended for small intrarenal arteries where functional loss would be minimal. Currently, micro catheters are available that allow superselective catheterization and the embolization of interlobular arteries within the renal parenchyma.[5,10,12] Materials include coil (Gianturco coils or platinum micro-coils), liquid embolization with either an adhesive agent eg: histoacryl or a nonadhesive agent like Onyx, gelfoam pledgets, detachable balloons, and hydrogel particles, may be used, depending on the location, size and accessibility of the feeding artery.[16] Bleeding control after embolisation is achieved in 80–100% of patients.[16] Weak thin-walled pseudoaneurysms should be approached percutaneously with great care and low-pressure delivery systems to prevent rupture.[13] Embolization of a chronic pseudoaneurysm may face problems like multiple feeding vessels, large vessels, collateral recanalization of the pseudoaneurysm, and a severely damaged unsalvageable kidney.[14] The potential complications of percutaneous embolization includes dislodgement of the embolic material into the aorta,[13,14] interfere with adequate control and ligation of a bleeding artery during bailout surgery[15] and postembolization hypertension with incidence of 5%.[13,15]

For AVF or arteriocaliceal fistula occlusion, coils or micro-coils properly sized to the feeding vessel are embolic agents of choice, since they offer a better deployment control, compared with gelfoam pledgets, and are less likely to pass through the fistula into the venous system than smaller particles or gelfoam pieces.[19] Truncal or hilar renal pseudoaneurysm or arteriovenous fistula could be managed by placement of a covered stent as an alternative to surgical repair to preserve vessel patency and prevent the associated renovascular hypertension.[18] Open surgery (Total or partial nephrectomy) is considered for hemodynamically unstable pseudoaneurysm, failed endovascular management and chronic pseudoaneurysm.[13]

CONCLUSION

Renal pseudoaneurysm with renal AV fistula is rare following blunt abdominal trauma. However, when there is persistent bleeding or delayed gross hematuria, this diagnosis should be considered and confirmed by angiography. In our case, the pseudoaneurysm was located in the main renal artery with an intrarenal AV shunt, so we decided to proceed with balloon expandable stent to preserve vascularity to the remaining renal parenchyma. RAP with AV fistula presentation is rare and only very few cases are reported in literature. The symptomatic arteriovenous fistula requires fast and precise diagnosis subsequently enabling efficient treatment. Endovascular manipulation is a method allowing the preservation of kidney affected by arteriovenous fistula with renal artery pseudoaneurysm.

END NOTE

Author Information

1. Dr. Praveen Gopi, Senior Resident, Department of Urology, Government Medical College, Trivandrum, Kerala, India.
2. Dr. Vasudevan S, Professor, Department of Urology, Government Medical College, Trivandrum, Kerala, India.
3. Dr. Abhinav Kumar, Senior Resident, Department of Urology, Government Medical College, Trivandrum, Kerala, India.

4. Dr. Rustam Singh,
Senior Resident, Department of Urology,
Government Medical College,
Trivandrum, Kerala, India.
5. Dr. Vivek Sharma,
Senior Resident, Department of Urology,
Government Medical College,
Trivandrum, Kerala, India.
6. Dr. Jaydevan E R,
Associate Professor, Interventional Radiology,
Sree Chithra Tirunal Institute of Medical Sciences and Technology, Trivandrum, Kerala, India.
7. Dr. Sunil R,
Senior Resident, Department of Urology,
Government Medical College,
Trivandrum, Kerala, India.
8. Dr. Santhosh Kannath,
Associate Professor, Interventional Radiology,
Sree Chithra Tirunal Institute of Medical Sciences and Technology, Trivandrum, Kerala, India.

Conflict of Interest: None declared

Abbreviation:

AVF - Arteriovenous Fistula
RAP- Renal artery Pseudoaneurysm

REFERENCES

1. Heyns CF, Stellmacher GA. Selective renal artery embolization in the management of non-iatrogenic renal trauma – experience in 28 patients. African Journal of Urology. 2005; 11(2):89−94.
2. Bernath AS, Schutte H, Fernandez RR. Stab wounds of the kidney: conservative management in flank penetration. J. Urol. 1983; 129: 468–70. Medline.
3. Swana HS, Cohn SM, Burns GA, Egglin TK. Renal artery pseudoaneurysm after blunt abdominal trauma: case report and literature review. J Trauma. 1996; 40(3):459–461.
4. Jebara VA, El Rassi I, Achouh PE, Chelala D, Tabet G, Karam B. Renal artery pseudoaneurysm after blunt abdominal trauma. J Vasc Surg. 1998;27(2):362–365
5. Miller DC, Forauer A, Faerber GJ. Successful angioembolisation of renal artery pseudoaneurysms after blunt abdominal trauma. Urology. 2002;59(3):444.3
6. Lee RS, Porter JR. Traumatic renal artery pseudoaneurysm: diagnosis and management techniques. J Trauma. 2003; 55(5):972–978.
7. Halachmi S, Chait P, Hodapp J, et al. Renal pseudoaneurysm after blunt renal trauma in a pediatric patient: management by angiographic embolization. Urology. 2003; 61(1):224.
8. Lee DG, Lee SJ. Delayed hemorrhage from a pseudoaneurysm after blunt renal trauma. Int J Urol. 2005; 12(10):909–911.
9. Lindekleiv H, Haro S, Nordhus K, Eggen T, Due J. Renal artery pseudoaneurysm secondary to blunt trauma nine years earlier: case report and review of the literature. Scand J Urol Nephrol. 2008;42(5):488–491.
10. Saad NE, Saad WE, Davis MG, et al. Pseudoaneurysms and the role of minimally invasive techniques in their management.Radiographics.2001; 21(3):557-74.
11. Hassantsh AS, Mock C, Maier RV. Traumatic visceral artery aneurysm: presentation as massive hemorrhage from perforation into an adjacent hollow viscus. J Trauma 1995;38: 357-60
12. More B, Chandran H, Pimpalwar A, John P. A traumatic intra-renal pseudo-aneurysm in a child. Pediatr Surg Int. 2004; 20(9):729–730.
13. Uflacker R. Transcatheter embolization of arterial aneurysms. Br J Radiol 1986; 59:317-24.
14. Uflacker R, Paolini RM, Lima S. Management of traumatic hematuria by selective renal artery embolization. J Urol 1984; 132:662-7.
15. Lieberman SF, Keller FS, Pearse HD, Fuchs EF, Rösch J, Barry JM. Percutaneous vaso-occlusion for nonmalignant renal lesions. J Urol 1983; 129:805-9.
16. Hagiwara A, Sakaki S, Goto H et al. (2001) The role of interventional radiology in the management of blunt renal injury: a practical protocol. J Trauma. 2001 Sep;51(3):526-31.
17. Blankenship JC, Gavant ML, Cox CE et al. (2001) Importance of delayed imaging for blunt renal trauma. World J Surg 25:1561– 1564.
18. Sprouse LR II, Hamilton IN Jr (2002) The endovascular treatment of a renal arteriovenous fistula: placement of a covered stent. J VascSurg. 2002 Nov;36(5):1066-8.
19. Steffens MG, Bode PJ, Lycklama à Nijeholt AA et al. (1996) Selective embolization of pseudo-aneurysms of the renal artery after blunt abdominal injury in a patient with a single kidney. Injury 27:219–220.
20. Van der Zee JA, Van den Hoek J, Weerts JGE (1995) Traumatic renal arteriovenous fistula in a 3-year-old girl, successfully treated by percutaneous transluminal embolization. J PediatrSurg 30:1513–1514