

## **Percutaneous Transluminal Renal Angioplasty and Endovascular Stenting of a week old renal artery trauma due to blunt abdominal injury and revascularization of the kidney**

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**Abstract:** We present the case of a week old left renal artery dissection following a road traffic accident. We present the Computed Tomography (CT) findings, Renal Angiograms and discuss successful Percutaneous Transluminal Renal Angioplasty (PTRA) and stenting performed which revealed multiple non-obstructive flow to the distal renal arteries.

**Keywords:** Renal Injury, Renal Artery Dissection, Endovascular Stenting

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### **INTRODUCTION**

Renal artery dissection and thrombosis is a rare complication following a blunt abdominal injury occurring in about 0.08% trauma patients [1], unilateral renal artery dissection is a rare phenomenon and literature reveals less than 25 cases and moreover focuses on early diagnosis to savage kidney function, however achieving revascularization in a week old left renal artery dissection with minimal kidney perfusion through left accessory artery has not been reported.

Blunt trauma in abdomen with respect to renal injury may result in avulsion, occlusion or laceration of the renal artery, though surgical intervention is attempted with an intention to revascularize and salvage of the kidney, it is difficult to contemplate the recovery of the functional status of the kidney. Studies reveal recovery of the kidney after open repair varies from 40% to less than 10%, and is far from satisfactory [2, 3, 4]. As the rate of functional recovery of the kidney is slow, some authors have suggested that open revascularization should not be done for occlusion in a unilateral renal artery [3, 5]. There is no modality specified in literature for management but previous reports have suggested percutaneous revascularization by endovascular stenting in patients with unilateral occlusion of the renal artery [6-10]. We Herewith report a case of blunt trauma abdomen causing left renal artery occlusion managed by endovascular stenting. Post stenting renal angiograms revealed a non-obstructive flow.

### **CASE REPORT**

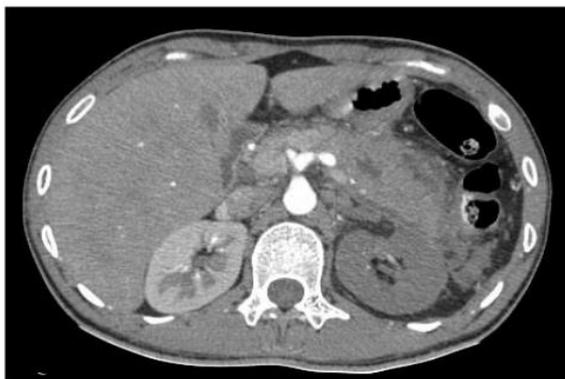
A twenty six year old male who met with a road traffic accident was conservatively managed in a secondary health center for 7 days and transferred to our center for further management. He presented with a surgically managed laceration on the scalp and old multiple abrasions over the abdomen and complained for left flank pain. There were no other major injuries. The blood work up revealed hemoglobin levels at 11.7, a TLC of 9.55 with increasing serum creatinine levels initially from 0.9 to 1.6. AST and ALT were 116 and 142 respectively. Retroperitoneal hematomas with echoes were noted in the initial ultra-sonogram. CT thorax revealed no injuries. Because of mechanism of injury and associated abdominal pain an initial abdominal computed tomography was sought for which revealed minimal contrast uptake in the upper pole of left kidney and no uptake in the middle and lower pole. CT also revealed multiple small lacerations to the left lobe of the liver and multiple contusions in the body of pancreas with peripancreatic fluid collection. No other vascular injuries were noted. Previous Renal Angiography revealed abrupt cut off of the left renal artery at 8mm from point of origin with minimal kidney perfusion at upper pole achieved only by the accessory left renal artery. A repeat Renal Angiogram revealed normal right renal artery and a completely occluded left renal artery with an active left renal accessory artery. We pursued Percutaneous Transluminal Renal Angioplasty in an attempt to salvage the left kidney and avoid impending nephrectomy. Through the femoral artery the renal artery was engaged with a RDC 6F guiding catheter and a non-ionic contrast (Visipaque)

was used. After crossing the lesion balloon dilatation (Balloon Sapphire) was pursued and dilatation was augmented from 1.5mm x 15mm to 2.0mm x 10mm at 10 ATM x 10 secs followed by further dilatation by ballooning at 4.0mm x 15mm (Balloon Sapphire NC) at 08 ATM. The lesion was directly stented with 5.0mm x 19mm stent [Boston Scientific, Express Monorail] which was deployed at 12 ATM x 10 sec. After the

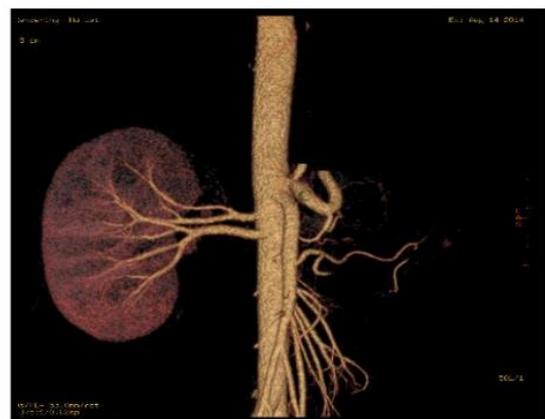
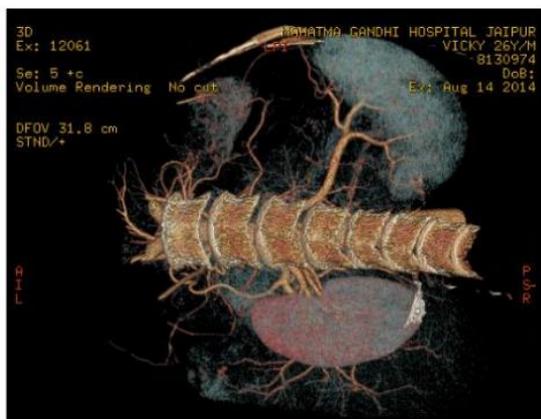
procedure a repeat renal angiogram revealed successful stent placement with no visible thrombus, no stenosis, good patency and adequate renal perfusion was achieved. The patient tolerated the procedure well and was hemo-dynamically stable throughout the procedure. Patient was managed with antiplatelet administration post procedure and follow-up angiograms revealed improved perfusion and no visible thrombus.



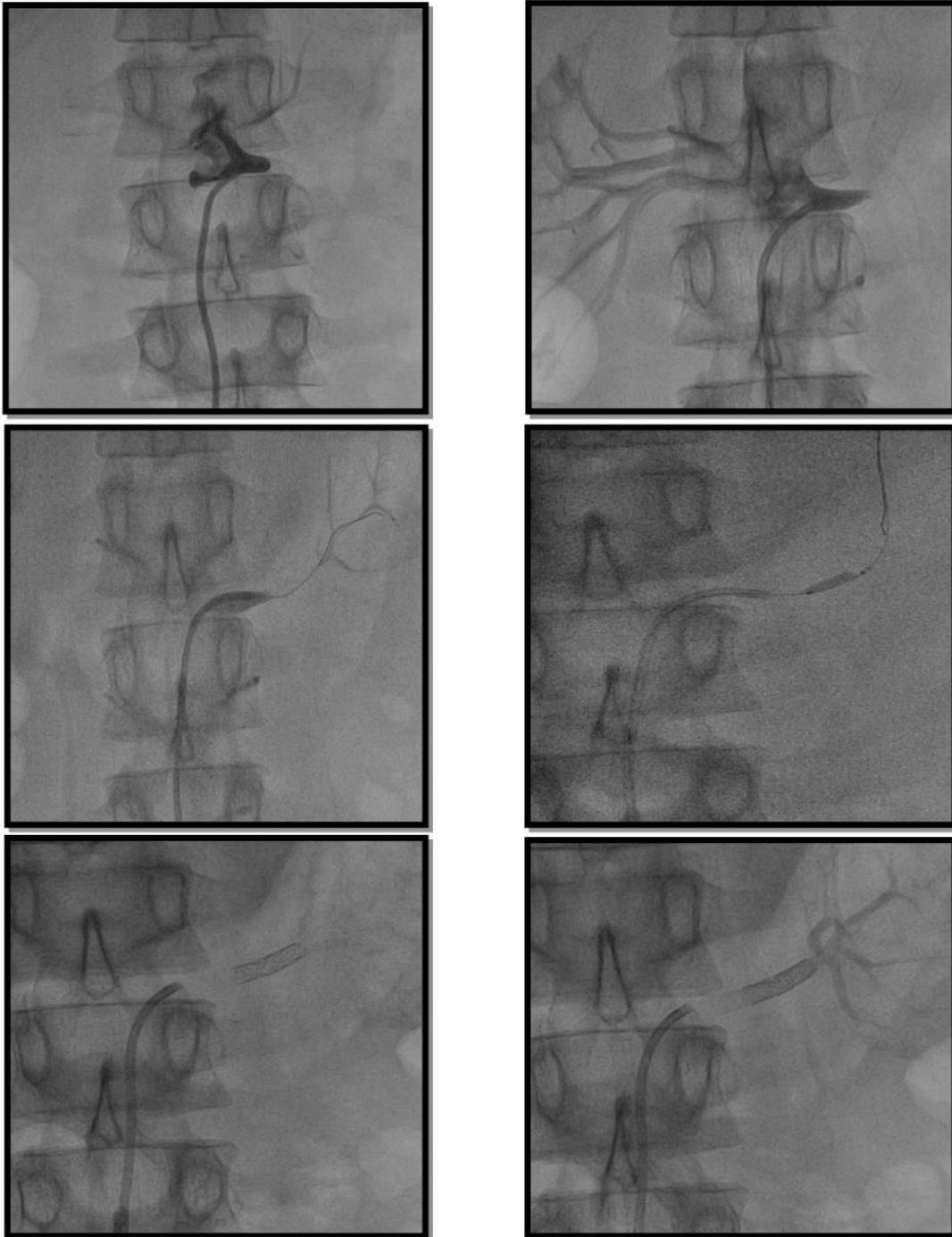
**Fig-1: Day 1: Contrast Enhanced Computed Tomography of the abdomen revealing normal contrast uptake by the right kidney and minimal contrast uptake in the upper pole of the left kidney**



**Fig-2: Day 1: A. Renal Angiogram revealed occlusion of the Left renal artery at 8mm from point of origin. B. Renal Angiogram revealed supply of upper pole of left kidney by accessory renal artery.**



**Fig-3: Day 8: 3D Reconstruction**



**Fig-4: Procedure Images: A) Renal Angiography showing contrast block at origin of Left renal artery B) Guiding catheter placement. C) Guiding Catheter revealing vague vessel structure. D) Balloon dilatation of left artery E) Stent in situ. F) Stent and vessel structure of left kidney.**

#### **DISCUSSION**

Patients with Renal Trauma and injury leading to renal artery dissection undergo a complex course for management. Patients with blunt injury to the abdomen often have associated injuries to the viscera which preclude laparotomies. Many efforts to re-vascularize the kidney have shown poor outcomes, with the added disadvantage of the loss of kidney function in most

cases leading to nephrectomy and devaluing the initial salvage procedures.

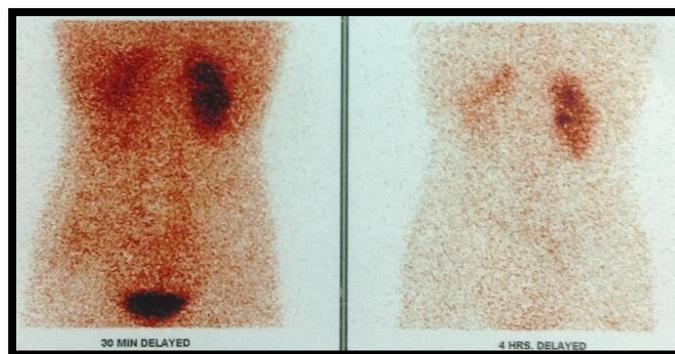
Endovascular stenting in the setting of renal artery injury has shown promise as an alternative to open surgery [11, 12]. The purpose for performing revascularization is to preserve optimal renal function, avoid renal replacement therapy in case the patient loses the contralateral kidney and most importantly to prevent

renovascular hypertension, a complication difficult to manage conservatively and eventually requiring nephrectomy in most of the cases, thus revascularization would be advantageous and could reduce the need for nephrectomy [4, 5, 7]. Goodman *et al.*; reported successfully stenting of intimal tear in the renal artery due to trauma and postoperatively managed the patient by anticoagulant therapy with heparin for 9 months when the kidney showed good functional recovery and later with warfarin for a period of 2 months. Inoue *et al.*; also successfully managed a left renal artery dissection by endovascular stenting using the same protocol after blunt trauma to the abdomen.

Villas *et al.*; reported management of renal artery dissection by endovascular stenting; post operatively their patient was managed successfully although follow-up imaging or serum creatinine was not reported and they did not address in regard to antiplatelet or anticoagulant therapy. Lee and White reported successful management of intimal injuries to the renal artery due to blunt trauma by endovascular stenting, their patient had associated trauma to the maxillofacial region and brain contusions which contradicted anticoagulation therapy thus surgical revascularization was not performed, but they reported normal follow-up creatinine levels and renal scans

showed good functional rate. These cases all had angiographic evidence of renal artery dissection and/or thrombosis and differed in the use of anticoagulation and/or antiplatelet therapy advocating that patency of the stent may be achieved without administering anticoagulation or antiplatelet therapy [8]. We iterate that use of endovascular renal artery stents with anticoagulation or antiplatelet therapy should be standard protocol and it provides a good functional recovery rate, whereas not administering the same may result in thrombosis leading to kidney loss.

In our patient, systemic anticoagulation was administered after PTRAs with sufficient evidence through clinical assessment and radiological analysis that there were no notable injuries which enabled us to pursue the treatment. Literature did not reveal any data suggesting that formation of multiple thrombi in the distal renal arteries play an important role in the renal parenchymal damage in cases of renal artery occlusion due to blunt trauma but these thrombi may be a major contributing factor to a low rate of functional preservation despite a relatively short period of renal ischemia. Timely management by angiography and endovascular stenting for the management of distal thrombi may improve the functional recovery rate of kidney and prevent renovascular hypertension.



**Fig-5: Isotope Renogram; IV administration of 6mCi Tc-99m DTPA with Furesemide administration**

DTPA done after one month of the procedure revealed a non-malfunctioning right kidney and impaired left kidney function with diff function at 12.50 and GFR at 10.55 ml/min. Further follow-up of the patient in the 6<sup>th</sup> month post procedure revealed a poorly functioning kidney with GFR at 2.50 ml/min, unfortunately the kidney could not be salvaged and nephrectomy was performed as the patient developed renovascular hypertension.

Percutaneous angiography and endovascular stenting has been used for the past 15 years [13]. The National Trauma Data Bank has reported 517 patients with renal artery occlusion due to blunt trauma to the abdomen of which 13 (3%) patients were managed by endovascular stenting. By performing a Medline search

we were able to identify only individual cases or small case series, which revealed that percutaneous angiography and endovascular stenting is advantageous over open vascular repair as it reduces the associated surgical risks, with the only contradiction being other associated intra-abdominal injuries requiring urgent exploratory laparotomy [14, 15]. In cases of an adequately functioning contra-lateral kidney, a unilateral renal artery occlusion can be managed by endovascular revascularization, but in this situation it yielded poor results as our patient subsequently developed renovascular hypertension and nephrectomy was thus indicated, mostly accounting to the delayed intervention.

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From the experience, we suggest that early understanding of radiological findings and effective communication and timely intervention with an effective protocol for management of renal artery trauma is the key to management. The professional radiological organizations have formulated guidelines to prioritize the safe communication of critical test results in recent patient safety goals [16]. Thus, swift intervention by revascularization may improve the functional recovery of the kidney and may prevent renovascular hypertension.

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