

# Selective renal segmental artery embolization for hydronephrotic upper renal moiety: simple alternative to standard surgical resection

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## ABSTRACT

Duplex kidney with an ectopic upper moiety ureter usually presents with urinary incontinence in young females. If the ectopic ureter belongs to a non-functioning moiety, it is treated with surgical resection of the moiety. Renal artery embolization has been used in patients with a poorly functioning kidney for various indications. In the present report, a 30-year old lady presented with continuous urinary incontinence with normal voids in between. On evaluation, she was found to have duplex left kidney with poorly functioning upper moiety associated with an ectopic ureter opening into the vagina. She underwent successful upper segmental renal artery embolization with no postoperative complications and uneventful recovery. Hence, renal artery embolization is a minimally invasive and well tolerated alternative to surgical partial or heminephrectomy for a non-functioning duplex renal moiety.

**Keywords:** Embolization; hydronephrosis; nephrostomy.

## Introduction

The leading causes of non-functioning kidney in urology practice include pelviureteric junction obstruction (PUJO) and stone disease.<sup>[1]</sup> Urolithiasis has been identified as the most common risk factor for nephrectomy in a non-renal tumor patient.<sup>[2]</sup> By definition, any kidney with relative function less than 10% in a nuclear scan is said to be a non-functioning kidney.<sup>[3]</sup> If the opposite kidney is functioning normally, most of such kidneys do not cause any symptoms.

In patients with duplicated collecting system, it is not uncommon to find a non-functioning upper renal moiety and this is frequently associated with an ectopic ureter. The indications for removal of a non-functioning upper pole remain the same as those for a non-functioning kidney itself, including pain and recurrent urinary tract infection. While laparoscopic partial or simple nephrectomy in such cases is the current practice, they may not be feasible in patients who have contraindications to gen-

eral anesthesia. Alternatively, a fit patient may refuse a surgical approach. Renal artery embolization (RAE) offers a less morbid alternative for the management of the non-functioning kidney/moiety. Renal artery embolization has established indications including bleeding following renal biopsy or percutaneous surgery, angiomyolipomas larger than 4 cm in size or symptomatic, unresectable renal masses, renal trauma,<sup>[4]</sup> arteriovenous malformations,<sup>[5]</sup> refractory proteinuria, failed allograft,<sup>[6]</sup> malignant hypertension and severe hydronephrosis. In the present case, we performed successful renal artery embolization in a young female with symptomatic non-functioning upper renal moiety with an excellent outcome.

## Case presentation

A 30-year-old unmarried lady was admitted to our hospital with complaints of intermittent episodes of left flank pain and burning micturition since 10 years. She also had a history of continuous urinary leak with normal voiding in between since childhood. There was no history of hema-

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Figure 1. Contrast-enhanced computed tomography (arterial phase) coronal section shows no enhancement of upper duplex moiety with percutaneous nephrostomy catheter (\*) in situ. The upper moiety ureter is dilated and draining into the vagina (+)

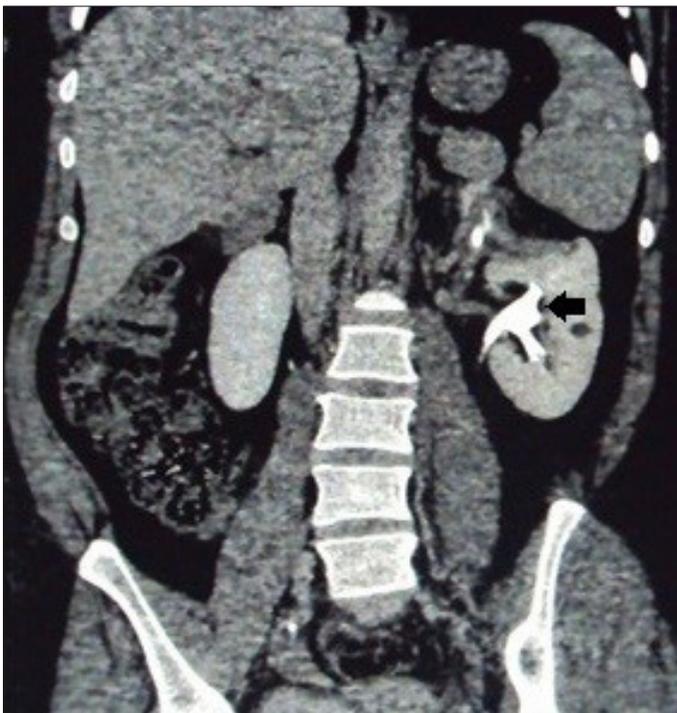


Figure 2. Contrast-enhanced computed tomography (excretory phase) coronal section: lower moiety is showing excretion of contrast in pelvicalyceal system (arrow)

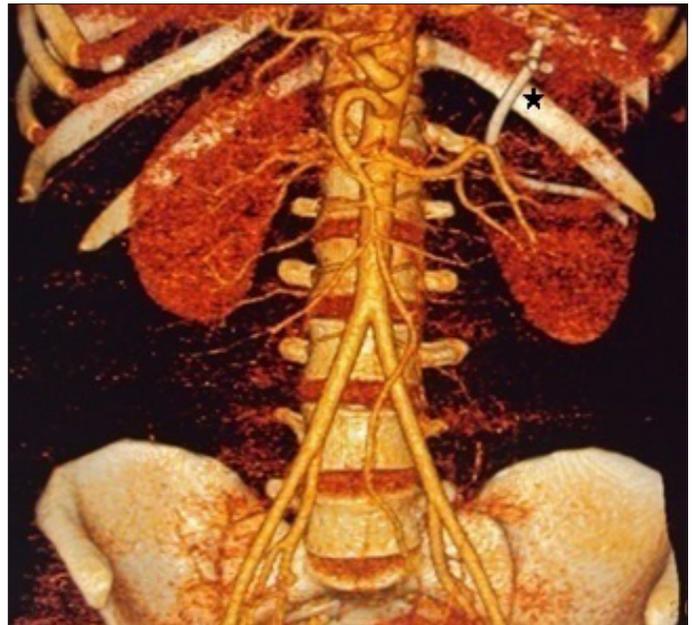


Figure 3. 3D volume-rendered imaging shows left duplex moiety with non-visualization of upper moiety with percutaneous nephrostomy catheter (\*) in situ



Figure 4. Left renal angiogram: small segmental branches supplying the left upper moiety are visualized (arrow)

turia, pyuria, or trauma. She denied passing stones in urine. At admission, she was afebrile with biochemical values as follows: hemoglobin, 10.3 g/dL, WBC, 11,600 cells/ $\mu$ L and serum creatinine, 0.8 mg/dL. Urinalysis revealed 8 to 10 pus cells per high power field. Ultrasonography was suggestive of hydronephrosis



Figure 5. Selective cannulation of the left upper moiety segmental branches done with microcatheter



Figure 6. Injection of polyvinyl alcohol particles (300-500µ) until stasis of blood flow is achieved (arrows)

of the upper pole of left kidney. Upon suspicion of duplex left kidney, Diethylene triamine penta acetate (DTPA) scan was done which revealed the split function of left kidney as 35% (upper moiety-5%, lower moiety-30%). Left percutaneous nephrostomy

(PCN) was performed, the daily urine output from this kidney was 50 mL. Following PCN placement, urinary incontinence resolved. Culture from the left PCN was positive for coagulase- negative staphylococci. She was treated with culture specific antibiotics and sterile urine culture was documented. A multiphasic abdominal computed tomography (CT) revealed complete duplication of the left kidney with hydronephrosis of the upper moiety with ectopic insertion of its dilated ureter into the vagina (Figure 1-3). The patient refused laparoscopic partial nephrectomy to be performed for the poorly functioning upper renal moiety. She was informed about the alternative treatment by interventional radiology. After describing the benefits and potential complications of this procedure, an informed consent was obtained from her. She underwent digital subtraction angiographic embolization of the left upper moiety (Figure 4, 5). After visualizing small segmental branches supplying to left upper moiety, polyvinyl alcohol (PVA) particles (300-500 µm, PVA300, Cook Inc., Bloomington, USA) were injected until blood flow was blocked (Figure 6). Post embolization, the patient did not have flank pain or fever. Urine output from PCN tube ceased after embolization within 24 hours and PCN tube was removed after 48 hours. She was discharged on the third postoperative day and reviewed 6 months later. Ultrasonography showed resolution of hydronephrosis and subsequently, she was followed up annually. At 5 years of follow up, the patient was asymptomatic and did not develop hypertension.

## Discussion

Laparoscopic or open simple nephrectomy is the current standard for the management of a symptomatic non-functioning kidney. A non-functioning moiety is usually managed by partial nephrectomy. The word simple in simple nephrectomy is a misnomer as recurrent infection or inflammation lead to dense adhesions around the kidney which not only complicates the tissue dissection but also it has potential for causing serious injury. Non-operative attempts with ethanol sclerotherapy have been made for ablation of such kidneys but they are not often the first choice in many patients.<sup>[7]</sup>

Renal artery embolization has been described as an alternative to surgery for benign obstructive uropathy in patients who are unfit for surgery. In the present case, we offered RAE to a patient who was otherwise fit for surgery but preferred a non-surgical procedure. Ubaraet al.<sup>[8]</sup> reported three cases of symptomatic hydronephrosis, secondary to ureteral obstruction due to stone disease in one patient and PUJO in two patients. All patients underwent successful RAE. Abdominal distension resolved in these patients within two weeks although radiological resolution occurred over a two year period. Except for mild fever and flank pain, no complication was observed. Mitra et al.<sup>[9]</sup> performed RAE in 15 patients with symptomatic hydronephrosis with poor

renal function. The cause of hydronephrosis was PUJO in 13, and stone disease in 2 patients. They used absolute alcohol, steel coils and polyvinyl alcohol particles for angioembolization. One patient had puncture site hematoma. Over a median follow up period of 64 weeks, ultrasonographic resolution of hydronephrosis was seen in 9 patients.

Partial nephrectomy or a heminephrectomy in patients with non-functioning renal moiety is associated with complications such as urinary leaks, refluxing ureteral stump and recurrent urinary tract infections. In addition, there is a risk of injury to the vessels supplying the remaining functioning moiety leading to atrophy in as many as 5% of the patients. The median hospital stay in patients without complications is 3.8 days.<sup>[10]</sup> In patients with renal arterial embolization, the mean hospital stay is around 2.3 days.<sup>[8]</sup> Schwartz et al.<sup>[11]</sup> reported their experience in RAE performed in 121 patients over a 12 year period. Over 50% of the patients who underwent RAE prior to nephrectomy had a resultant decrease in blood loss. One patient underwent RAE for a hydronephrotic kidney. Most (74.4%) of all patients had post-embolization syndrome (PES) and most of them were self-limiting. Complications specific to the RAE procedure such as incomplete embolization, coil migration and groin hematoma were seen in 6 patients (5%). The authors concluded that RAE was a safe and effective procedure for vascular and urological indications. The higher incidence of PES in their study could be related to the greater proportion of cases with functioning renal parenchyma. Since a non-functioning hydronephrotic kidney has minimal renal parenchyma, the actual incidence of PES is less, around 60%.<sup>[9]</sup> Coil related complications have also been studied by Capozza et al.<sup>[10]</sup> They performed RAE as an alternative to surgical nephrectomy in 12 children with standard indications for nephrectomy. Revascularization after embolization was reported in one case and they concluded that a post procedure angiogram should be done in all cases to confirm successful embolization. Incomplete embolization also has a possible risk of renin-related hypertension although it is rarely encountered in clinical practice.<sup>[12]</sup>

In conclusion, RAE is a minimally invasive option for the nonsurgical management of non-functioning moiety of a duplex kidney. It is well tolerated and effectively spares the remaining renal parenchyma. It may be offered as an alternative to surgery not only to patients unfit for surgery but also to well informed motivated patients who do not prefer to undergo surgical treatment.

**Informed Consent:** Written informed consent was obtained from patient who participated in this case.

**Peer-review:** Externally peer-reviewed.

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**Conflict of Interest:** The authors have no conflicts of interest to declare.

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