Case Report: Ureter Impingement with the Psoas Muscle: A Case Report

Wen Wang, MD*, Carlos Gonzalez-Baerga, MD, Manuel Menendez Santos, MD, Sindhu Kumar, MD, Mauricio Hernandez, PhD

University of Florida College of Medicine, Jacksonville, USA

***Correspondence:** Wen Wang, University of Florida College of Medicine – Jacksonville, 655 8th St W, Jacksonville, FL, 32209, USA

wen.wang@jax.ufl.edu

Radiology Case. 2024 Feb; 18(2):16-20 :: DOI: 10.3941/jrcr.v18i2.5218

ABSTRACT

Renal malrotation is associated with a wide range of congenital anomalies. This report describes an asymptomatic ureteral impingement between the psoas muscle and lower pole of the kidney, a rare type of anomaly found on imaging. Radiologists should always look for these anomalies for early detection and better preoperative planning.

CASE REPORT

INTRODUCTION

Obstructive uropathy, or obstructive flow of the urinary tract, can lead to retrograde flow of urine and cause hydronephrosis. It can have a multitude of causes that include congenital, iatrogenic, nephrolithiasis, and ureter impingement by adjacent tissues [1]. Proximal ureter stenosis below the ureteropelvic junction is less commonly seen compared to the pelvic-ureteral junction obstruction which is usually associated with intrinsic pathology. Here we report a case of proximal ureteral stenosis from impingement between the lower pole of the mal-rotatated kidney and psoas muscle.

CASE PRESENTATION

A 43 y/o Hispanic female patient with a past surgical history of pyeloplasty 17 years ago, asthma and obesity arrived for evaluation of right-sided hydronephrosis diagnosed during a prior admission. The patient denied nausea, vomiting, abdominal pain, urinary urgency or burning upon presentation.

No abnormal findings were observed during the initial physical examination. During the initial workup, only elevated blood glucose levels were detected (Table 1). A urine culture was ordered and resulted in mixed genital flora. A renal ultrasound (Figure 1) revealed severe right hydronephrosis with overall normal cortical thickness. Computer tomography (CT) was subsequently (Figures 2-4) performed which demonstrated: 1) focal narrowing of the proximal ureter impinged between the lower pole and psoas muscle causing moderate right hydronephrosis. 2) The right kidney is malrotated with renal hilum facing posteromedially. Duplicated renal arteries also present on the right. 3) Incidental finding of partially duplicated left ureter. Nuclear medicine renal scan (Figure 5) was performed using 10.595 mCi of Tc-99m MAG3. It demonstrated retention within the right kidney collecting system with partial clearance of 10 minutes. Renal function demonstrated 55% of left kidney and 45% of right kidney.

Surgical intervention was deemed unnecessary due to the relatively preserved function and cortical thickness of the right kidney. Patient was followed up for kidney stone.

DISCUSSION

Obstructive uropathy has been described as consequences of stone, adhesion or impingement. Our patient's entity with the impingement between of the lower pole and psoas presents as a unique anatomical anomaly.

It is possible that the recurrence of the hydronephrosis is from adhesion from the prior surgery. However, the stenosis is 2 cm below the UPJ not at the UPJ. It is more likely that the hydronephrosis persists due to unresolved external compression. Imaging findings of posteromedial orientation of the renal hilum and contralateral kidney ureteral duplication suggest renal development anomalies.

During embryology development kidney undergoes 90-degree medial rotation while it ascends from the pelvis to the upper retroperitoneum, transitioning from an initial ventral hilar orientation to a medial position that is slightly ventral [2]. Malrotation of the kidney typically occur along the horizontal plane, revolving around a vertical axis [2,3]. These irregularities manifest as insufficient rotation, excessive rotation (hyperrotation), or reversed rotation (inversed rotation). The most common type of malrotation is when the hilum faces anteriorly known as an incomplete rotation or nonrotation [4,5].

In our case, there is a hyperrotation of the kidney exceeding 90 degrees, considering the kidney's lateral hilum position, with vascularization located towards the posterior aspect. It's

important to note that abnormalities in vascularization are common in renal malrotation, but they do not follow a specific pattern [3,6]. Duplicated renal arteries seen in this case. On the contralateral side, our patient has partially duplicated ureters.

As these malformations are extremely rare, a multimodal imaging approach my better identify associated anatomy. Renal radiological workup is usually initiated with ultrasound imaging, as it can identify important renal pathologies and congenital anomalies. Despite the advantages of being cost-effective, readily available and involves no radiation, US carries technique-dependent, patient-dependent and interpretation-dependent pitfalls [7]. Cross-sectional imaging such as CT contributes the diagnostic workup when US is limited. Additionally, specific CT techniques can cater to the pathologies in question. CT-urography, for example, was beneficial in the case of out patient to assess the complicated anatomy associated to her congenital renal malformation. Through this technique, associated anatomic variants were identified including renal artery duplicity in the hyperrotated kidney and duplicated ureteropelvic junction in the contralateral kidney. These findings, along with the hydronephrosis previously identified through US, builds a comprehensive account of the patient's rare condition.

CONCLUSION

Congenital urologic malformations are rare and can present diagnostic challenges. To our knowledge, cases such is this where the ureter is compressed between the psoas and inferior renal pole due to renal malrotation, have not been previously reported. These cases are important, as they highlight the complex anatomical and pathologic associations presented through imaging studies.

REFERENCES

1. Rishor-Olney, C.R. and M.R. Hinson. Obstructive Uropathy, in StatPearls. 2023: Treasure Island (FL) ineligible companies. Disclosure: Melissa Hinson declares no relevant financial relationships with ineligible companies. PMID: 32644347.
2. Gandhi, K., J. Jaison, and E. Mantri. Unilateral non-rotated left kidney with vascular and ureter variations in a cadaver: a unique case report with embryological and educational aspects. *J Vasc Bras*. 2021; PMID: 34630538.
3. Divjak N, Birraux J, Chehade H, Sanchez O. Hydronephrosis caused by kidney malrotation. *Urol Case Rep.* 2021; PMID: 33489770.
4. Di Giuliano F, Picchi E, Lacchè A, et al. Congenital kidney malformation: Computed tomography and scintigraphy findings of renal reversed rotation. *Radiol Case Rep*. 2019; 14(6): 678-682. PMID: 30976367.
5. Kozlov, V.M. and A. Schedl, Duplex kidney formation: developmental mechanisms and genetic predisposition. *F1000Res*. 2020; PMID: 32030122.
6. Cocheteux B, Mounier-Vehier C, Gaxotte V, McFadden EP, Francke JP, Beregi JP. Rare variations in renal anatomy and blood supply: CT appearances and embryological background. A pictorial essay. *Eur Radiol.* 2001; 11(5): 779-786. PMID: 11372607.
7. Gulati M, Cheng J, Loo JT, Skalski M, Malhi H, Duddalwar V. Pictorial review: Renal ultrasound. *Clin Imaging.* 2018; 51: 133-154. PMID: 29477809.

FIGURES

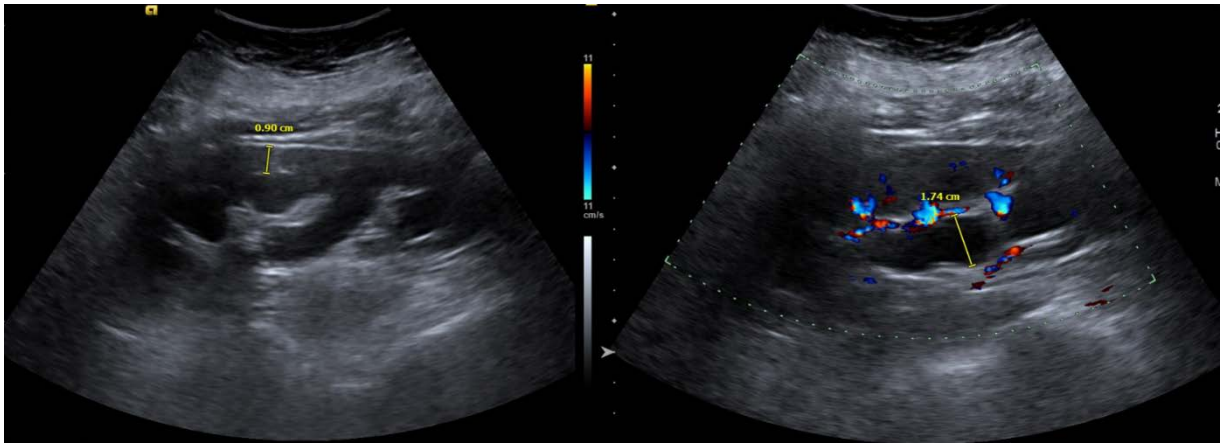

Figure 1: On the renal ultrasound, the right kidney measures 4.7 x 12.9 x 4.9 cm. The renal cortex measures in 9mm thickness. The calyceal depth measures 17mm. The right ureter is not well visualized on the ultrasound.

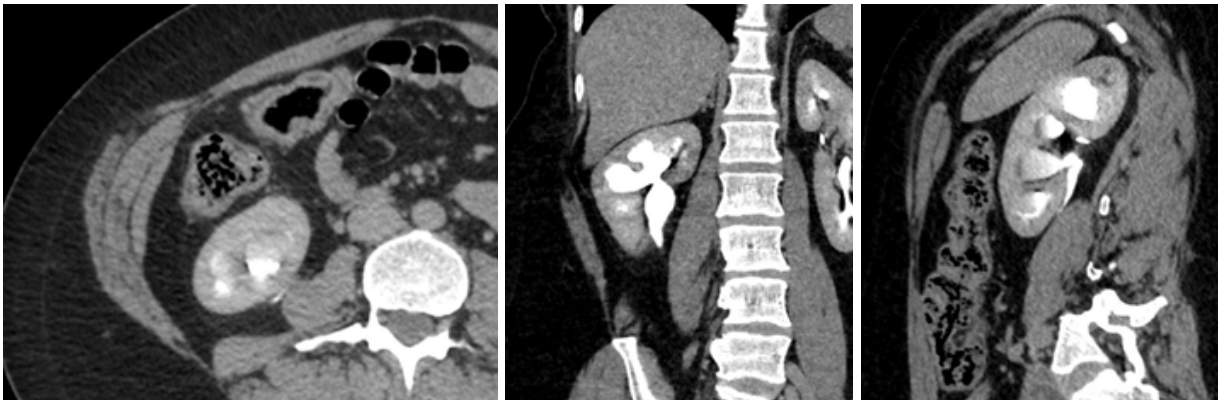

Figure 2: Oblique axial (A), coronal (B) and oblique sagittal (C) views of CT abdomen and pelvis demonstrate right-sided moderate hydronephrosis. Ureter originates at the posterior aspect of the renal pelvis (red arrow in C) and courses anteriorly through the posterior inferior renal pole and psoas muscle with focal narrowing (red arrow in A).

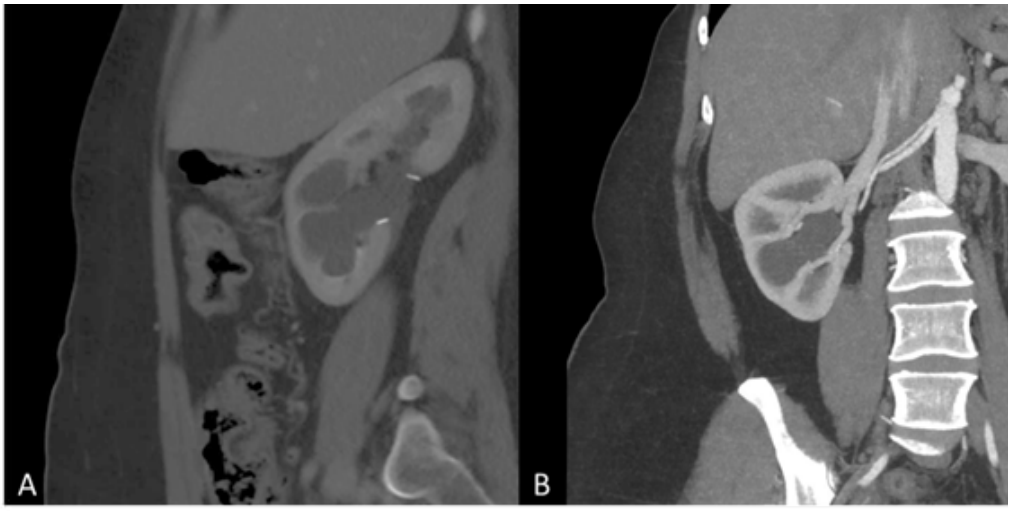

Figure 3: Surgical clips are noted along the renal pelvis (red arrows in A) which is higher than the ureter stricture. On coronal CT (B), anatomical variant of renal arteries is present with double arteries supplying the right kidney.

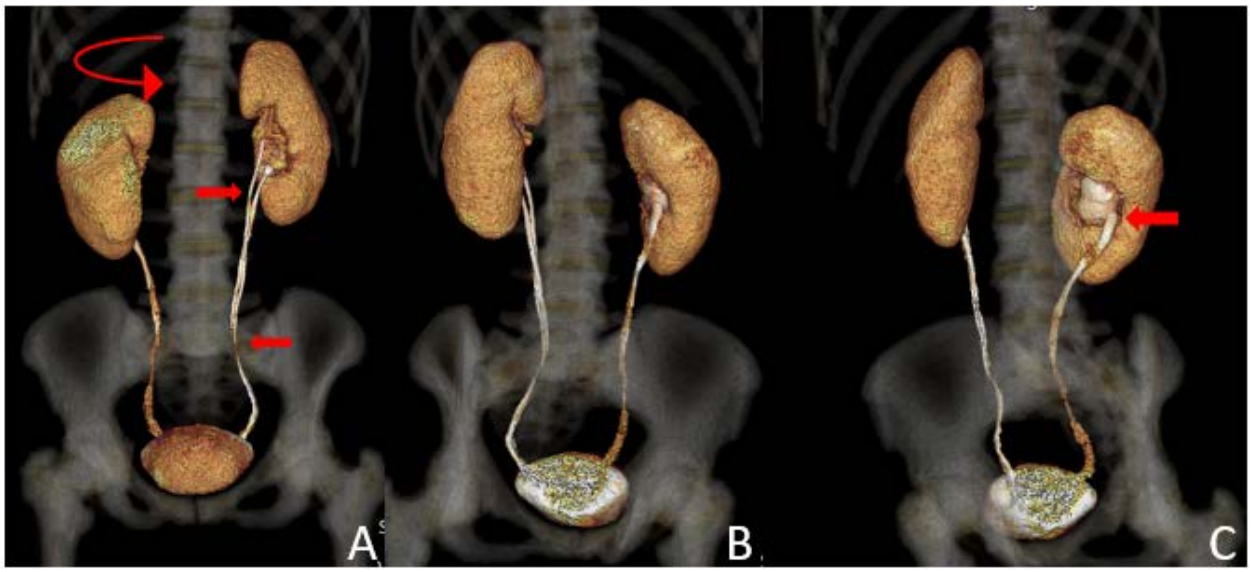

Figure 4: 3D VRT of the CT urogram: The frontal view (A) demonstrates posteromedial rotation of the right kidney compared to the contralateral side. Arrows on the left kidney show the duplicated ureteropelvic junctions with distal single ureterovesical junction. Posterior views (B) and (C) show the dilated renal pelvis and proximal ureter facing posteriorly (arrow). The focal ureteral narrowing (thin arrow) is 2 cm below the UPJ (arrowhead).

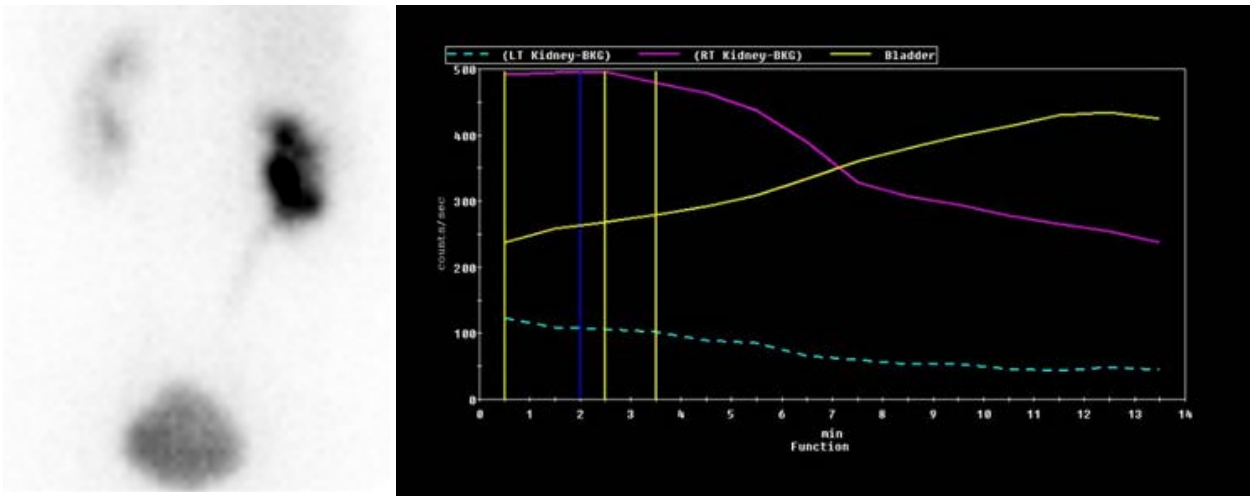

Figure 5: Nuclear medicine renal scan demonstrated normal flow and uptake bilaterally with differential renal function 55% for the left kidney and 45% on the right kidney. There is retention of activity within the right kidney collecting system

Table 1: Basic Metabolic Panel

Component	Value	Reference Values
Na	136 mmol/L	135-146 mmol/L
K	4.1 mmol/L	3.5-5.3 mmol/L
CL	104 mmol/L	98-110 mmol/L
CO2	26 mmol/L	20-32 mmol/L
BUN	14 mg/dL	7-25 mg/dL
CREATININE	0.67 mg/dL	0.50-0.99 mg/dL
BUN/Creatinine	20.9	6-22
GLUCOSE	109 mg/dL	65-99 mg/dL
CALCIUM	9.3 mg/dL	8.6-10.2 mg/dL
EGFR	112 mL/min/1.73m2	>60 mL/min/1.73m^2

KEYWORDS

Herniation, Ureter, Imaging, CT, Urogram, Psoas muscle