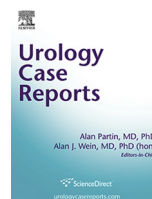


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Functional Medicine

Ureteral Involvement Within an Incarcerated Inguinal Hernia in a Patient With Crossed-fused Renal Ectopia



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ABSTRACT

Crossed-fused renal ectopy is an uncommon abnormality of the genitourinary tract that results from errors during embryological development. Ureteral herniation represents another rare anatomic event and can often occur from spontaneous, postoperative, and congenital causes (Allam, Johnson, Grewal & Johnson 2015; Pollack, Popky & Blumberg 1975). Here, we discuss the complex clinical course of a patient with crossed-fused renal ectopia who presents with symptoms due to ureteroinguinal herniation and provide a brief overview of the literature. We highlight the clinical considerations in the management of this patient and provide a potential anatomical and embryological explanation for his presentation.

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Introduction

Ureteral herniation is a rare genitourinary anomaly with few isolated cases in the literature.^{1–3} Sites of ureteral herniation include the inguinal, femoral, sciatic, thoracic, and parailiac regions.⁴ Similarly, crossed-fused renal ectopy is a rare entity that results from the disruption of normal kidney migration during embryological development and occurs in an estimated 1 out of 2000 births. In crossed-fused renal ectopy, the ectopic kidney migrates and fuses with the contralateral kidney, while its ureter maintains its orthotopic connection within the bladder. Most patients with crossed-fused renal ectopy are asymptomatic despite other associated possible anomalies of the skeletal, gastrointestinal, and cardiovascular systems. Some cases present with vesicoureteral reflux, urinary tract infection, and ureteropelvic junction obstruction.⁵ Similarly, while many cases of ureteral herniation are asymptomatic and seen incidentally at the time of surgical intervention, extraperitoneal types are associated with various congenital urologic abnormalities.^{1,3,4} Despite this relationship, to

our knowledge there are only two reported cases of concomitant ureteral herniation and crossed-fused renal ectopy.^{2,3} Here, we describe a case of a 65 year old man with previously unknown crossed-fused renal ectopia who presents with an inguinal hernia and flank pain.

Case presentation

A 65 year old male with no previous urological history initially presented to an outside hospital with severe left groin and flank pain. Subsequent examination and imaging with a non-contrast CT scan revealed the presence of crossed-fused renal ectopia with a complex left inguinal hernia, including incarcerated fat and a looped left ureter resulting in obstruction of the left kidney. Cystoscopy with attempted retrograde stenting of the left ureter was unsuccessful due to tortuosity and kinking of the ureter and the patient was transferred to the University of Michigan for further evaluation and treatment. On arrival, the patient was hemodynamically stable and complaining of pain in the scrotum, groin and left lower quadrant. Erythema and edema along the left scrotum and left inguinal region was evident. There were no signs of infection and his renal function was normal (serum creatinine 0.86 mg/dL, eGFR >60 mL/min). A CT urogram (Figs. 1 and 2) was

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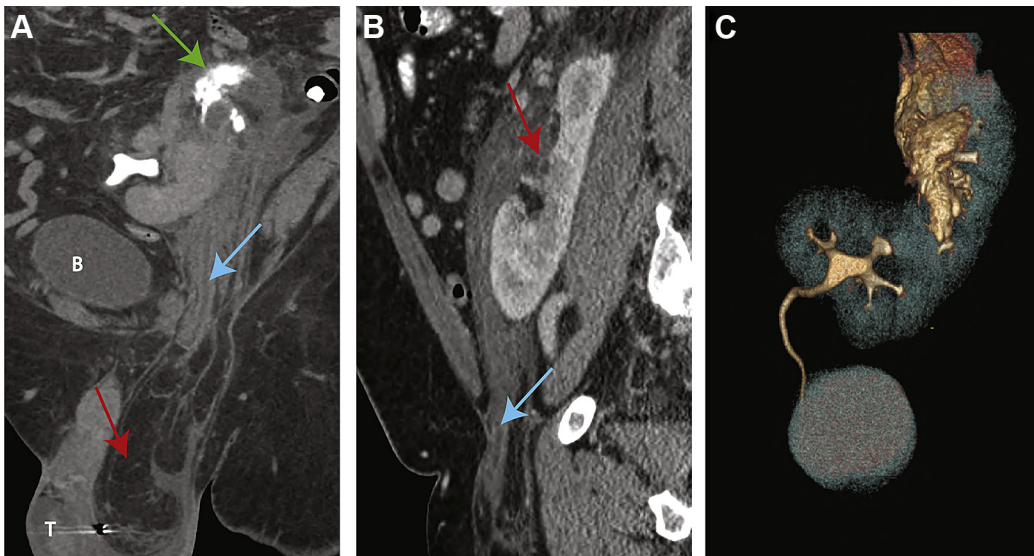


Figure 1. CT urogram showing crossed-fused renal ectopia with left ureteroinguinal herniation. (A) Coronal CT image highlighting the presence of the left ureter (blue arrow) herniating into the inguinal canal and associated indirect inguinal hernia sac (red arrow) with associated left forniceal kidney rupture (green arrow), bladder (B), testicle (T). (B) Sagittal CT image showing left ureteral herniation (blue arrow) and a fused kidney (red arrow). (C) 3D reconstruction of CT imaging showing crossed-fused renal ectopia. The right moiety collecting system inserts normally into the bladder. The left moiety collecting system is distorted on the image due to extravasated urine. No contrast extends into the left ureter due to the extravasation and the obstructed segment in the hernia sac.

obtained to evaluate his anatomy, which confirmed an obstructed and dilated left ureter within an incarcerated left inguinal hernia, as well as left renal forniceal rupture and resultant extravasation of urine into the perinephric space.

As an initial management step, a percutaneous nephrostomy tube (PCN) was placed by interventional radiology. An antegrade nephrostogram demonstrated a long, redundant left ureter looped into an inguinal hernia sac, without contrast flow into the bladder (Fig. 3). A left inguinal hernia repair with mesh was done 24 h after PCN placement and confirmed that the ureter, along with retroperitoneal fat and a portion of Gerota's fascia, was incarcerated within the hernia sac. Following the hernia repair, a repeat antegrade nephrostogram confirmed the resolution of the ureteral obstruction and the PCN was subsequently removed. However, prior to discharge, the patient experienced recurrence of his left-sided flank pain. A dynamic renal scan showed diminished excretion on the left side, consistent with obstruction, and a percutaneous nephroureteral stent was placed. This was converted to a capped PCN after 1 month, and the PCN was removed 1 week later after an antegrade nephrostogram confirmed patency of the left ureter. He has remained asymptomatic on subsequent follow up. Given his aberrant anatomy, he was advised to have a renal ultrasound in 6 months to assess his kidneys.

Discussion

Ureteroinguinal hernias are the most common type of ureteral hernia, and the most common presentation is a groin mass. Femoral ureteral hernias, a relatively rare subset of ureteral hernias, are more commonly seen in women. Overall, the right ureter is three to four times more likely to herniate than the left and roughly 50% of patients with ureteral hernias present with obstructive upper urinary tract symptoms.^{2,4} Radiographic diagnosis of an ureteroinguinal hernia is made by the presence of a redundant loop of pelvic ureter outside the abdominal cavity. Ureteral hernias can be divided into intra- or paraperitoneal and extraperitoneal types.

Intraperitoneal ureteral hernias represent 80% of all ureteral hernias and are characterized by the ureter being inside or associated with a hernia sac, whereas in extraperitoneal hernias no sac is found.⁴ Our patient presented with an intraperitoneal hernia, as the ureter, retroperitoneal fat, and components of Gerota's fascia were all contained in the sac. We chose to evaluate the hernia preoperatively with a CT urogram given the patient's obstructive urinary symptoms, and great care was taken during repair of the hernia in order to avoid injury to the involved ureter.

Interestingly, the most common genitourinary abnormalities found with ureteral hernias are crossed-fused ectopia and nephroptosis.^{2,5} Renal ectopy results from abnormal ascension of the kidney into the retroperitoneum during embryological development. Ectopic kidneys that cross the midline are commonly inferior to the contralateral, orthotopic kidney and this presumably predisposes patients to complications like ureteral herniation, as in the case of our patient.⁵ Furthermore, the ectopic ureteral course may also be due to abnormal Wolffian duct development or traction during testicular descent.⁴ However, a majority of these congenital renal and urinary tract anomalies are asymptomatic and found incidentally on imaging.^{2,3}

Conclusion

While ureteral herniation is uncommon, it may be important to consider in patients presenting with inguinal hernias and concomitant renal colic, especially since cross-sectional imaging is not routinely performed prior to hernia repair. Preoperative diagnosis of ureteral involvement in an inguinal hernia with a CT urogram allows for improved surgical planning and may potentially reduce the risk of intraoperative ureteral injury.^{2,3} In this report, we provide a brief overview of the complicated course of management of a patient with ureteroinguinal hernia and implicate a potential anatomical congenital anomaly as the predisposing factor.

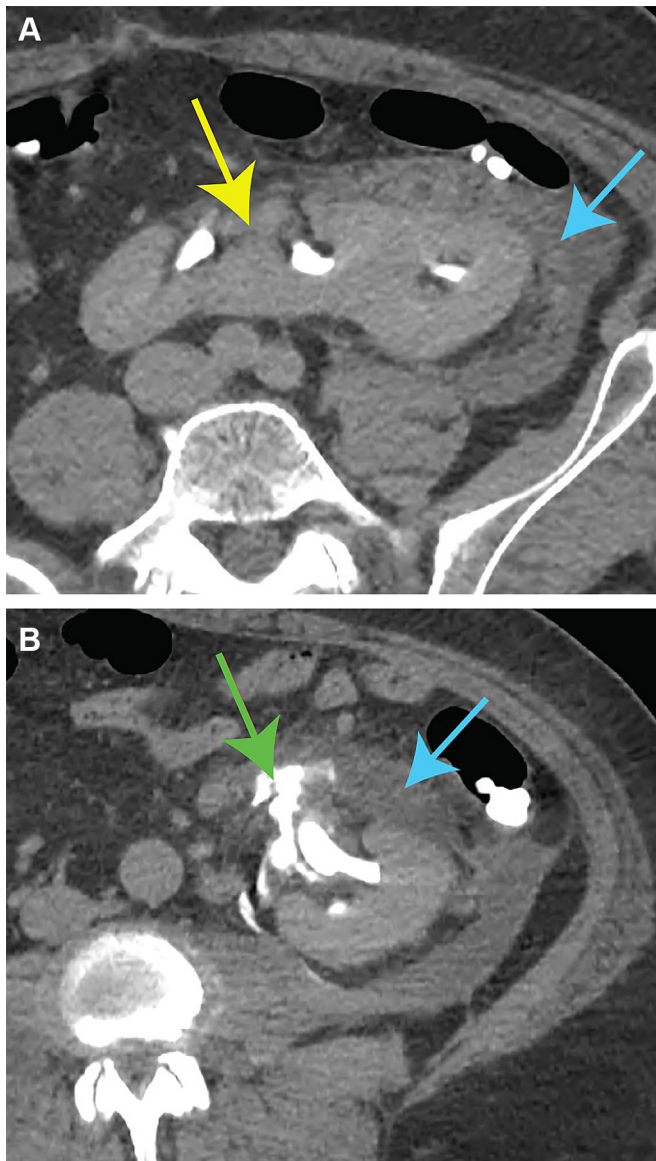


Figure 2. CT urogram showing crossed-fused renal ectopia with left forniceal rupture and extravasation of urine into perinephric space. (A) Axial view showing fused kidney (yellow arrow) with extravasation of urine into perinephric space (blue arrow). (B) Axial view showing left forniceal rupture (green arrow) with resultant escape of urine (blue arrow) into perinephric space.

Consent

Informed consent for publication of this case was obtained.

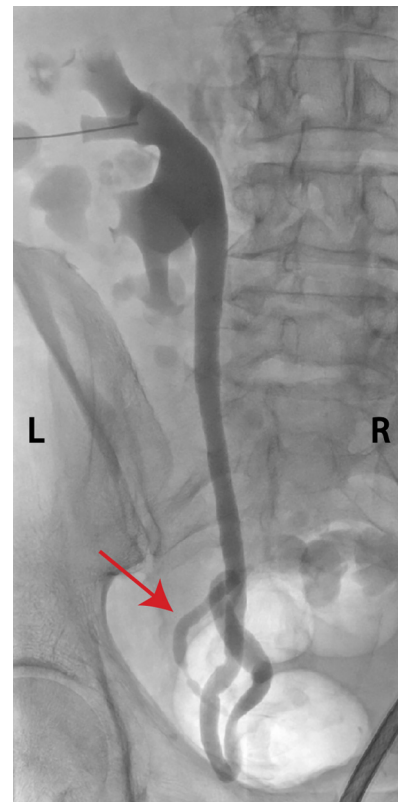


Figure 3. Antegrade nephrostogram showing dilated, tortuous left ureter with absence of contrast enhancement of bladder, indicating obstruction due to ureteral herniation into the inguinal canal. (A) Prone radiograph showing redundant ureter (red arrow) entering the hernia sac.

Conflict of interest statement

The authors declare no conflicts of interest.

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