Case Report

Robotic-assisted reconstruction of a ureteral herniation into the psoas major fascia: A unique obstructive etiology and a surgical approach to management

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Abstract Ureteral herniation has been described in urologic literature. Documented sites of herniation include the femoral and inguinal canals, obturator and sciatic foramen, and the thoracic cavity. Herein, we report what we believe to be the first described case of symptomatic obstruction from ureteral herniation through a defect in the psoas major muscle fascia and detail our approach to definitive robotic-assisted surgical management of this unique entity.

Keywords: Firefly™, herniation, reconstruction, robotic, stricture, ureter

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INTRODUCTION

Ureteral herniation has been well documented within surgical case reports. Reported sites of herniation include the inguinal and femoral canals, sciatic and obturator foramen, diaphragm, and the thoracic cavity.[1-3] While many cases are noted incidentally, some are identified during workup or intervention for symptomatic obstruction.[4,5] Management may include conservative measures for those who are asymptomatic, while symptomatic obstruction requires endoscopic or surgical management.[2-4] Herein, we present what we believe to be the first documented case of ureteral herniation through a defect in the psoas major muscle fascia and detail our robotic approach to ureteral reconstruction.

CASE REPORT

The patient was an otherwise healthy 23-year-old woman who originally presented to an outside emergency department complaining of 3 years of intermittent, yet progressively severe and frequent left abdominal and flank pain. Vitals and laboratory studies were within the normal limits, but computed tomography (CT) imaging revealed, on initial review, no ureteral defect or source of extrinsic compression [Figure 1a]. Recent stone passage was hypothesized; therefore, no intervention was pursued. She then re-presented weeks later with similar symptoms and a repeat CT demonstrated persistent hydroureteronephrosis and prompting urology consultation. A retrograde pyelogram (RPG) was completed and showed serpiginous coursing of the proximal ureter with ureteral "kinking" at the level of obstruction [Figure 1b]. A stent could not be passed proximal to the obstruction, necessitating the placement of an interventional radiology-guided percutaneous nephrostomy (PCN) tube. During PCN placement, an antegrade nephrostogram also showed

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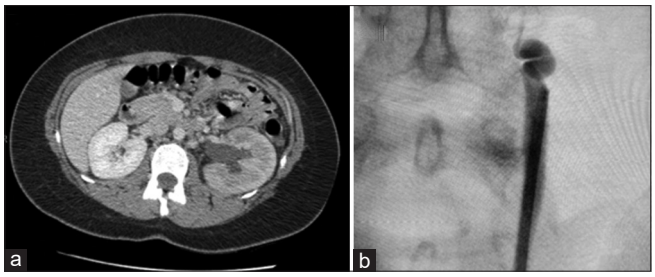

Figure 1: (a) CT abdomen and pelvis showing left hydronephrosis. (b) Left retrograde pyelogram during failed stent placement showing a serpiginous proximal ureter. CT: Computed tomography

obstruction, with no antegrade flow of contrast beyond the noted defect. The patient was then referred to our clinic for further workup and management of this unique case of obstruction.

The patient was seen in our tertiary level care center 2 months later, weeks after, her PCN was incidentally dislodged and then removed. She denied any episodes of pain since PCN removal, but strongly desired further workup. A mercaptoacetyltriglycine (MAG3) renal scan was obtained and showed no evidence of diminished perfusion or obstruction. While the patient was asymptomatic and had an unremarkable MAG3 study in light of her history of severe symptoms and prior workup strongly suggestive of obstruction she remained highly motivated to pursue treatment. We decided to proceed with an endoscopic evaluation, with the patient consenting to definitive robotic management if any significant structural pathology was noted. A repeat RPG demonstrated a persistent serpiginous proximal ureter with significant luminal narrowing and prompting robotic exploration. After mobilization of the descending colon, we discovered invagination of the ureter through a subcentimeter defect in the psoas muscle fascia, into the psoas major muscle belly [Figure 2a and b]. The ureteral herniation was further dissected and reduced, with roughly 2–3 cm of the ureter retrieved from between the psoas major muscle fibers [Figure 2c]. Interestingly, in response to this surprising finding, we reviewed the original CT imaging intraoperatively, which did show a small amount of fat invaginating into the psoas muscle [Figure 2c]. We then performed flexible ureteroscopy which uncovered a <0.5 cm fibrotic ring at the level of the herniation. Da Vinci® FireFly™ technology was utilized to better visualize the ureteroscope light, allowing for external robotic spatial identification of the stricture [Figure 3]. The stricture was resected, and the ureter was reconstructed through a fully-transecting ureteroureterostomy with antegrade stent placement. Unfortunately, due to the short length of the stricture, no adequate tissue was excised for histopathologic analysis. The psoas muscle fascial defect was then closed

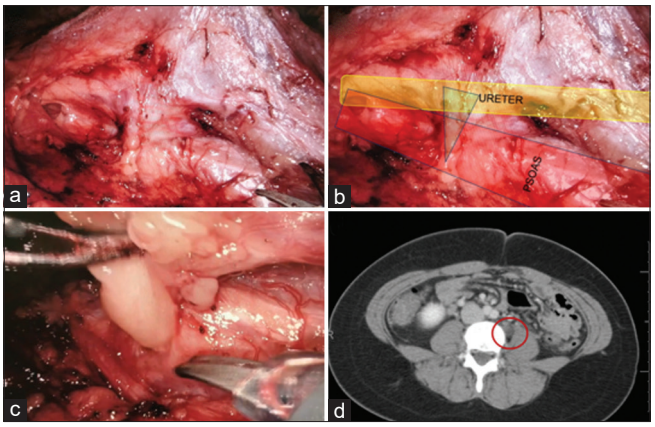

Figure 2: (a) Intraoperative view of the left ureter coursing over psoas major muscle after medialization of descending colon. (b) Highlighted view of the left ureter (yellow) psoas major muscle (red) and ureteral herniation into the psoas major muscle (blue). (c) (c) Intra-operative reduction of the ureteral hernia. (d) Original outside hospital CT scan showing ureteral herniation (red) into psoas muscle. CT: Computed tomography

with an interrupted horizontal mattress 4-0 Vicryl suture and the case was concluded. The patient's recovery was unremarkable, and she was seen 6 weeks postoperatively for stent removal. She remained asymptomatic, and a repeat MAG3 study showed no evidence of obstruction.

DISCUSSION

Ureteral herniation is a rare phenomenon that has been described at a multitude of anatomic sites.[1-3] Inguinal ureteral herniations are most commonly reported up to 60% of cases, while thoracic herniations are less frequently noted.[2] While incidence trends exist regarding sites of ureteral herniation, their general etiology is unknown.[2]

While ureteral herniations are often found incidentally, our patient's defect was identified during an extensive workup for symptomatic hydroureteronephrosis. Throughout her workup, a definitive obstructive diagnosis was never obtained. That is, while initial imaging and fluoroscopic studies suggested a high degree of obstruction, she was asymptomatic after her PCN was removed and a follow-up MAG3 study was negative for any significant obstruction. The intermittent nature of her discomfort is perplexing. We hypothesize that her obstruction may have been low-grade, occasionally presenting as a Dietl's crisis. On the other hand, the contractile nature of the psoas muscle may have contributed to intermittent obstruction.

Our case is unique in that we believe it to be the first described case of herniation into the psoas muscle belly. However, it is also distinct in that it is not a classic herniation into a natural anatomic cavity, suggesting some

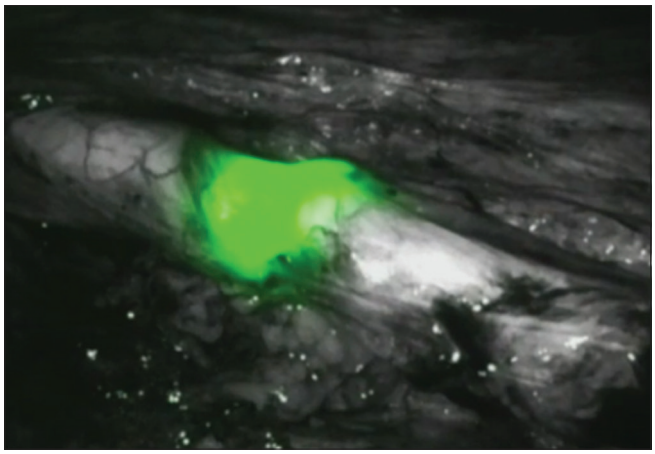

Figure 3: Intraoperative use of da Vinci® Firefly™ technology to aid in spatial localization of the ureteral stricture

level of developmental or inflammatory disruption may have contributed to the herniation and stricture formation. We surmise that a baseline defect within the psoas muscle fascia may have arisen during development, with intermittent herniation of the ureter through the defect over time causing the stricture. However, this is conjecture and cannot be known with any certainty.

Our reconstructive approach followed a standard transecting ureteroureterostomy. However, we utilized da Vinci® Firefly™ technology to spatially identify the ureteral stricture in the robotic field of view before transecting the ureter. That is, the stricture itself was noted under direct vision through the flexible ureteroscope, while the Firefly™ technology allowed for precise localization of the ureteroscope light at the level of the stricture. This allowed for more confidence in choosing our transecting incision location in a minimally invasive manner and serves as an option for spatial identification of ureteral strictures in future reconstructive cases.

Ureteral herniation is an uncommon urologic entity that has been described in multiple anatomic locations. The patient's bother ranges from asymptomatic to severe discomfort, while management options include conservative management and reconstructive surgery. Herein, we describe what we believe to be the first case of ureteral herniation into the psoas muscle belly while outlining our approach to definitive management.

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Conflicts of interest
There are no conflicts of interest.

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