Complicated ureterocele with ureterolithiasis and recurrent urinary infections

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Section: Uroradiology & genital male imaging
Area of Interest: Urinary Tract / Bladder
Procedure: Diagnostic procedure
Procedure: Endoscopy
Imaging Technique: CT
Imaging Technique: Percutaneous
Special Focus: Congenital Case Type: Clinical Cases
Authors: Tonolini Massimo, M.D.
Patient: 56 years, female

Clinical History:

G1P1 woman from Sri Lanka with unremarkable past medical history, suffering from recurrent episodes of urinary infection despite multiple antibiotic therapies during the last three years. Currently complains of pelvic pain which worsens after urinating, malaise and 6-kg weight loss over the last 4 months. No significant abnormal physical findings.

Imaging Findings:

Two years earlier, unenhanced CT (Fig. 1) obtained for similar complaints disclosed the unsuspected presence of left-sided ureterocele with dilated ipsilateral pelvic ureter; urolithiasis, pelvicalyceal dilatation and signs of acute renal colic were absent. Unfortunately, this finding mentioned in the CT report had not received any treatment. Currently, ultrasound (not shown) confirmed the known ureterocele. Urine cultures tested positive for E. coli and Klebsiella infection. CT-urography (Figs. 2, 3) confirmed the orthotopic ureterocele with unchanged size, morphology and thin uniform walls compared to previous CT study, and the characteristic "cobra head" appearance on excretory-phase acquisition. The ipsilateral pelvic ureter showed stable dilatation, and development of lithiasis consisting of several tiny, closely grouped calcific calculi. A blind-ending accessory ureter was noted. The kidneys showed normal size, parenchymal thickness and enhancement, non-dilated single collecting systems. Cystoscopy (Fig. 4) confirmed the orthotopic ureterocele bulging into the bladder lumen, without signs of inflammation. Endoscopic meatotomy and lithotripsy were planned.

Discussion:

Ureterocele is a developmental anomaly which results from congenital mural weakness of the lower ureter and strictured distal ureteral orifice, leading to formation of a cystic submucosal dilatation of the terminal ureter which prolapses into the bladder lumen. Ureteroceles occurring at the usual ureteral insertion at the bladder trigone are termed orthotopic ("simple") ureteroceles, as opposed to ectopic ones which are commonly associated with a duplicated system. Nowadays, uni- or bilateral ureteroceles are generally diagnosed during antenatal ultrasound in 1/4000 pregnancies, with a striking (10:1) female predominance [1, 2]. However, orthotopic “adult-type” ureteroceles (AUT) may be incidentally encountered in adulthood since they are typically well-tolerated, associated with a single excretory system and with good renal function. Alternatively, AUT manifest with symptoms due to superimposed urosepsis or stones. The development of ureterolithiasis is secondary
to ureteral atony and urine stagnation, and is reported with a variable incidence (ranging between 4% and 39%) according to the geographical origin of the patient. Furthermore, intravesical AUTs may predispose the patient to recurrent urinary tract infections, and occasionally cause urinary bladder outlet obstruction [3-6].

As this case exemplifies, detection of AUT and timely management allow preventing complications. Sonographically, AUT may sometimes be missed when small-sized, or within an empty or overdistended urinary bladder. Normally, at CT the ureterocele is identifiable with a thin, regular peripheral wall. The classical "cobra head" sign described at intravenous pyelography is nowadays depicted at MR- or contrast-enhanced CT-urography: the "bulbous" dilatation of the terminal ureter protrudes within the bladder as a uniform nonenhancing rim filled and surrounded by opacified urine, with the upstream ureter serving as the snake's body. Hydronephrosis of variable entity may be present. Additionally, CT provides comprehensive information regarding the presence or absence of ureterolithiasis and ureteral obstruction, the relevant excretory system anatomy (especially with regard to potential duplications), and the differential renal perfusion. In adults, the key differential diagnosis is the pseudo-ureterocele secondary to obstructive lesions such as tumours, tuberculosis, or stones in the ureteral orifice [1, 2].

Treatment of AUT aims to preserve renal function and eliminate infection, reflux or obstruction. Indications include symptomatic ureteroceles with recurrent colics and urinary tract infections, obstruction, deteriorating renal function, and ureterolithiasis. Transurethral endoscopic management with transverse incision (meatotomy) with additional stone fragmentation and extraction as needed represents the gold standard therapy and is generally curative in up to 90% of patients [3-6].

**Differential Diagnosis List:** Complicated left ureterocele with development of ureterolithiasis, recurrent urinary infections, Uncomplicated ureterocele, Primary megaureter, Ectopic ureter, Duplicated collecting system, Pseudoureterocele

**Final Diagnosis:** Complicated left ureterocele with development of ureterolithiasis, recurrent urinary infections

**References:**


Description: Unenhanced CT scans disclosed the unsuspected presence of thin-walled left ureterocele (thin arrows) protruding into the bladder lumen, with dilated pelvic ureter (*) without urolithiasis. Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
Description: Both kidneys showed normal size and parenchymal thickness, without hydrenephrosis, urolithiasis and accessory CT signs of acute renal colic, particularly perirenal fluid. Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
**Description:** Currently, preliminary unenhanced scan detected the development of calcific lithiasis (arrowhead) in the dilated left pelvic ureter. **Origin:** Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
**Description:** After intravenous contrast, the known left-sided orthotopic ureterocele showed unchanged size, morphology and thin uniform walls (thin arrows) compared to previous CT study in Fig.1. The calibre of the ipsilateral pelvic ureter was also stable. **Origin:** Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
**Description:** After intravenous contrast, the known left-sided orthotopic ureterocele showed unchanged size, morphology and thin uniform walls (thin arrows) compared to previous CT study in Fig. **1.**

**Origin:**
Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
**Description:** Multiplanar reconstructions from post-contrast volumetric acquisition confirmed lithiasis (arrowheads) in the dilated left pelvic ureter. Note normal renal size, parenchymal thickness and corticomedullary enhancement, absent hydronephrosis. **Origin:** Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)
Description: Multiplanar reconstructions from post-contrast volumetric acquisition confirmed lithiasis (arrowheads) in the dilated left pelvic ureter. Note ipsilateral ureterocele (thin arrows), normal renal size, parenchymal thickness and corticomedullary enhancement. Origin: Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)
Description: Focused maximum-intensity projection (MIP) reconstructed image from post-contrast acquisition depicted tiny-sized, closely grouped calculi (arrowhead) in the left pelvic ureter. Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
Description: Multiplanar images from CT-urographic acquisition depicted the left orthotopic ureterocele (thin arrows) with the characteristic "cobra head" appearance, protruding into the opacified bladder lumen. The ipsilateral distal ureter persisted dilated (*). Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
Description: The left orthotopic ureterocele (thin arrows) showed the characteristic “cobra head” appearance protruding into the opacified bladder lumen. The ipsilateral distal ureter persisted dilated (*) and contained tiny, closely grouped calculi (arrowheads). Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
**Description:** The left pelvic ureter persisted dilated (*) and contained tiny, closely grouped calculi (arrowheads). Additionally, opacification of a blind-ending accessory ureter (arrows) was noted. **Origin:** Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
Description: Three-dimensional volume-rendering images depicted the left ureter (*), increasingly dilated towards the orthotopic ureterocele, and the blind-ending duplicated ureter (arrows). Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
**Description:** Three-dimensional volume-rendering images depicted the left ureter (*), increasingly dilated towards the orthotopic ureterocele, and the blind-ending duplicated ureter (arrows). Note non-dilated ipsilateral single-system pelvicalyceal system. **Origin:** Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)
Figure 4

Description: Cystoscopy (magnified view) confirmed left-sided orthotopic ureterocele bulging into the bladder lumen, without signs of inflammation. Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)