CASE REPORT – DUPLEX COLLECTING SYSTEM WITH ECTOPIC URETER INSERTING INTO THE PROSTATIC SEGMENT OF THE URETHRA

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Abstract: Congenital anomalies of the urinary tract include a broad range of variations, from subtle deviations to complex structural malformations. Among these, duplex collecting systems are relatively common, identified in roughly 0.7% of the population, while ectopic ureters are much less frequent, with a prevalence ranging between 0.025% and 0.05%. In male patients, ectopic ureters most often terminate in the prostatic urethra, seminal vesicles, or vas deferens. Because such anomalies are frequently asymptomatic, they are often discovered incidentally during imaging performed for unrelated reasons, which can make diagnosis particularly challenging. The purpose of this case report is to describe the incidental detection of a duplex collecting system with an ectopic ureter inserting into the prostatic segment of the urethra in a 36-year-old male. The patient was initially referred for computed tomography urography after ultrasound demonstrated a dilated tubular structure suggestive of congenital abnormality. CT urography confirmed the presence of a duplex system in the left kidney, demonstrating a markedly dilated ectopic ureter, measuring up to 4.5 cm in diameter, that drained the upper pole calyx and descended distally to the prostatic urethra. The findings were associated with severe calyceal distension, proximal urethral dilation, and mechanical displacement of adjacent structures, including anterior displacement of the pancreatic tail and impression upon the posterior bladder wall. In addition, dual arterial supply to the left kidney was demonstrated, representing an additional anatomical variation relevant to surgical planning. The right kidney was unremarkable. These results underscore the importance of advanced cross-sectional imaging in revealing both the collecting system configuration and vascular anatomy, which are critical for diagnosis and therapeutic planning. Although many collecting system anomalies remain without symptoms, the considerable dilation and impaired drainage observed in this case highlight the potential for future complications, including infection, obstruction, or loss of renal function. The conclusion drawn from this report is that detailed imaging plays a pivotal role not only in identifying rare ureteral insertions but also in assessing their structural and functional impacts. Recommendations for practice emphasize close monitoring in asymptomatic cases, interdisciplinary evaluation involving radiologists and urologists, and early consideration of surgical correction if symptoms or progressive changes occur. Additional elements of interest in this case, such as the dual renal arteries and mass effect on neighboring organs, illustrate that congenital anomalies may extend their clinical relevance beyond the urinary tract alone. This case contributes to the growing documentation of rare ureteral terminations in males and supports the importance of vigilant imaging review for accurate detection and individualized management planning.
Keywords: ectopic ureter, anatomical ureteral variations, duplex collecting system, urinary tract anomalies, ectopic ureter with prostatic urethral insertion

1. INTRODUCTION

The ureters serve as tubular conduits for urine produced in the kidneys during the process of renal filtration, transporting it to the bladder, which it is expelled via the urethra during urination. Anatomically, a ureter is 20–30 cm long and 3–4 mm in diameter. Radiologically, the ureter is divided into several segments: abdominal, pelvic, and intramural.

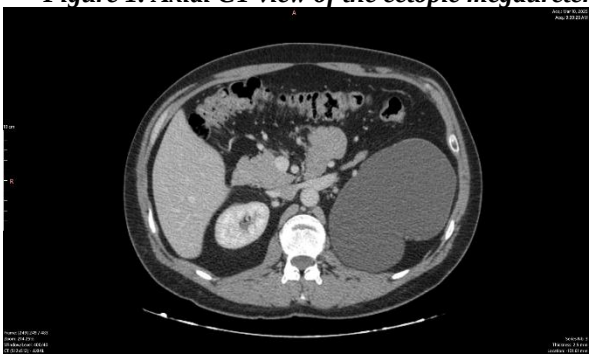
There are several anatomical variations of the ureters, including duplex collecting systems, bifid ureters, ureteroceles, and ectopic ureters. In clinical practice, numerous sub-variations or combinations of these anomalies may be observed. Among them, the duplex collecting system is one of the most frequently encountered, with a prevalence of 0.7% in the general population and 2–4% among individuals presenting with urinary symptoms. Ectopic ureters are less common, with a prevalence of 0.025–0.05%, occurring more frequently in females than males at a ratio of 10:1.

These anomalies are often asymptomatic and detected incidentally during routine imaging. However, in certain cases, they may give rise to clinical conditions such as hydronephrosis, urinary tract infections, vesicoureteral reflux, or urinary incontinence, the latter being more common in females. Diagnostic modalities for identifying such anatomical variations include ultrasound of the urinary tract and abdomen, intravenous urography, CT urography, voiding cystourethrography (VCUG), and MR urography.
If these anomalies do not result in clinical symptoms, no treatment is usually required. However, if symptomatic, management may involve surgical intervention such as cutaneous ureterostomy, ureteral reimplantation, or ureteropyelostomy. In differential diagnosis, ectopic ureters can resemble ureteroceles or bladder diverticula.

2. CASE PRESENTATION

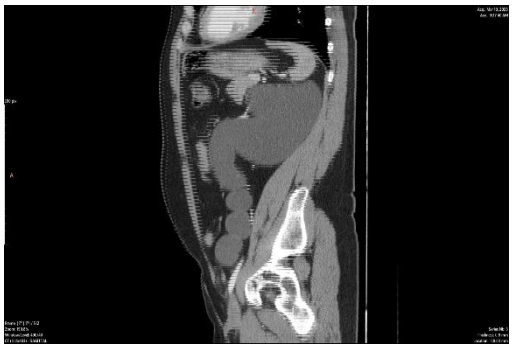
A 36-year-old male presented to the Radiology Department at the University Clinic for Surgical Diseases "St. Naum Ohridski" with a referral from his primary care physician for CT urography. During a routine check-up, a dilated tubular structure was detected on ultrasound, raising suspicion of a congenital megaureter.
CT urography was performed. On the non-contrast (native) series, a tubular structure originating from the upper pole of the left kidney was observed, extending distally and posterior to the ureterovesical junction. Upon administration of intravenous contrast, normal accumulation, absorption, and excretion were noted. A clearly delineated duplex collecting system was visualized in the left kidney. From the upper calyceal group, a significantly dilated ectopic ureter—measuring up to 4.5 cm in diameter—was traced distally to its insertion into the prostatic segment of the urethra.

Figure 1. Axial CT view of the ectopic megaureter



Source: Author's research

Figure 2. Sagittal CT view of the ectopic ureter



Source: Author's research

Figure 3. Coronal CT view of the ectopic ureter

Source: Author's research

Figure 4. Ectopic ureter inserting into the prostatic urethra

Source: Author's research

Due to retained content within the ectopic ureter and impaired elimination, the upper group calyces showed notable dilation, with an anteroposterior diameter of up to 10 cm, and the initial urethral segment was dilated to 13 mm.
A second pyelocaliceal system was identified draining the middle and lower calyces, with its ureter inserting normally into the bladder and demonstrating contrast excretion.
The left kidney was also found to have dual renal arterial supply from the abdominal aorta, with arterial branches spaced 8 cm apart. The proximally dilated calyx of the upper pole caused anterior displacement of the pancreatic tail, while the distal pelvic segment of the ectopic ureter caused impression on the posterior bladder wall.

The right kidney displayed normal morphology and parenchymal architecture, with a well-visualized pyelocaliceal system and ureter throughout its length. Other abdominal parenchymal organs appeared normal on CT.

3. DISCUSSION

This case highlights a rare anatomical variation involving a duplex collecting system with an ectopic ureter terminating in the prostatic segment of the urethra. While duplex systems are among the most common congenital anomalies of the urinary tract, affecting approximately 0.7% of the general population, the occurrence of an ectopic ureter—particularly one inserting into the male urethra—is exceedingly rare, with an estimated prevalence of 0.025–0.05% and a marked predilection for the female population (female-to-male ratio of 10:1).

The clinical significance of these anomalies lies in their typically asymptomatic nature, often being discovered incidentally during imaging for unrelated conditions. In this patient, the ectopic ureter was first suspected during routine ultrasound due to the presence of a dilated tubular structure, subsequently confirmed by CT urography, which remains the gold standard in visualizing complex urinary tract anatomy.

In males, ectopic ureters can terminate in various locations distal to the bladder, including the prostatic urethra, seminal vesicles, ejaculatory ducts, or vas deferens. These insertions are usually not associated with incontinence, unlike in females where ectopic ureters may bypass the external sphincter. However, they can still lead to complications such as urinary tract infections, obstruction, or hydronephrosis, as seen in our patient, who exhibited significant upper pole calyceal dilation and ureterectasia.

The detection of dual renal arteries supplying the left kidney further complicates the anatomical landscape, underscoring the importance of detailed vascular mapping, particularly in planning any surgical intervention. Compression effects on adjacent structures, such as the displacement of the pancreatic tail and posterior bladder wall impression, also illustrate the mechanical consequences of severe ureteral dilation.

Management strategies are dictated by symptomatology and functional assessment. In asymptomatic cases without renal compromise, conservative monitoring is often sufficient. In contrast, symptomatic patients or those with declining renal function may require surgical correction, such as ureteral reimplantation, ureteropyelostomy, or nephroureterectomy, depending on the degree of renal contribution and obstruction.

This case emphasizes the importance of considering anatomical variants in patients with atypical urinary tract findings and the value of high-resolution imaging in diagnosis. Early recognition and individualized treatment planning can prevent long-term complications and preserve renal function.

4. CONCLUSION

Congenital anomalies of the urinary tract, such as duplex collecting systems and ectopic ureters, although often clinically silent, can pose significant diagnostic and therapeutic challenges when symptomatic. This case underscores the importance of detailed imaging in identifying such variations, particularly when they present atypically, as in the male patient described, with an ectopic ureter inserting into the prostatic urethra.

While many anatomical variants remain incidental findings, the presence of ureteral dilation, impaired drainage, and compression of adjacent structures—as seen in this patient—warrants clinical attention and often necessitates further intervention. Recognizing these anomalies early enables timely management, which can prevent complications such as infection, hydronephrosis, and renal function loss.

Ultimately, this case adds to the limited body of literature on male ectopic ureters and highlights the need for continued awareness and reporting of rare urinary tract variations to guide future diagnosis and treatment strategies.

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