

CASE REPORT

Case of reno-ureteral duplication with permanent urinary incontinence

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ABSTRACT

Introduction: Duplex renal collecting system in children is a common urinary malformation, a clinical entity which often eludes diagnosis because of its lack of pronounced symptomatology, resulting in its true prevalence being uncertain.

Case presentation: We present a case of a 17-year-old female admitted to the Pediatric Surgery department of Emergency County Clinical Hospital in Targu Mures with acute onset urinary incontinence. Due to her non-contributory medical history, they decided to proceed with an ultrasonography and a three-dimensional urography which indicated two distinct ureters exiting the right kidney, one of them with an ectopic insertion into the vaginal vault. The management of the case was a to proceed with a distal ureteroureterostomy, a sparing kidney surgery, with an end-to-side anastomosis. Following the surgery, the patient had a quick recovery and a complete resolution of her urinary incontinence.

Conclusions: In conclusion, this malformation can be clinically silent, but once diagnosed, a surgical management should be taken into account, keeping in mind that urinary incontinence can have a psychological and social impact on the well-being of the patient.

Keywords: duplex collecting system, urinary incontinence

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Introduction

Duplex renal collecting system is one of the most frequent congenital abnormalities affecting the urinary tract. [1] The true prevalence of this condition remains unknown, as a significant number of patients remain asymptomatic or the anomaly is frequently identified incidentally during radiological investigations for unrelated reasons. [1] The pathogenesis of a duplex collecting system occurs during early embryonic development and is dictated by the timing and nature of the ureteric bud's emergence. [2] If a single ureteric bud branches before making contact with the renal mesenchyme, it results in an incomplete (bifid) system. [2] However, if two separate buds emerge from the Wolffian duct, the result is a complete duplication of the collecting system, [2] often characterized by the anatomical relationship described by the Weigert-Meyer Law. This principle dictates that the ureter draining the upper pole inserts into the bladder inferiorly and medially to the lower pole ureter, often resulting in obstruction or ectopic insertion. In contrast, the lower pole ureter enters the bladder at a higher, more lateral position. This results in a shorter path through the bladder wall, which fails to create an effective one-way valve. This structural variation compromises the anti-reflux mechanism, effectively predisposing the system to vesicoureteral reflux.

There are some possible particularities according to the

different age groups. Infants under one year can present with antenatal symptoms such as hydronephrosis or hydroureter caught on a routine maternal prenatal ultrasound, systemic symptoms such as irritability, high fever, poor weight gain, poor feeding or a palpable abdominal mass caused by a severely obstructed, dilated upper kidney pole. Young children between the ages of 1 and 5 years old can present with recurrent urinary tract infections due to stasis, vesicoureteral reflux or defective urinary drainage or the pathognomonic presentation of continuous dribbling or constant dampness in female patients. For children over the age of six, symptoms become more localized, complex, or distinct by gender. Ureteral ectopia should be highly suspected in any toilet-trained female presenting with constant urinary incontinence, as well as in young boys presenting with unexplained or recurrent epididymitis. [3] Up to the age of five, urinary incontinence is considered physiological. But after this point, urinary incontinence is most frequently caused by functional disorders, whereas structural defects and neurological diseases (which form the organic type) remain relatively uncommon underlying causes.

Urinary incontinence in children can be evaluated by a series of basic tests such as a medical history, bladder diary, urinalysis and physical examination. More detailed tests consist of ultrasonography for abnormalities and uroflowmetry. [4]

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Case presentation

We present a case of a 17-year-old female patient whose informed consent was obtained from her legal guardians for the publication and the study was conducted with the approval of the Ethics Committee of Emergency County hospital in Târgu Mureș. She was admitted to the Paediatric and Orthopaedic Surgery department accusing urinary incontinence, this being the first and only symptom she presented with. Upon admission, an extensive medical history, physical exam and a comprehensive laboratory evaluation were performed. The urine analysis upon arrival in the Emergency department showed a significant hematuria with the number of erythrocytes being 300 per microliter (normal range 0-5 per microliter of urine), a slightly elevated white count with 25 leukocytes per microliter (normal range 0-20 per microliter) indicating an inflammatory response or a mild urinary tract infection, specific gravity of 1.030 (normal range being 1.015-1.025) meaning that the urine is highly concentrated.

The diagnostic pathway began with a renal ultrasound to evaluate for a possible malformation. However, because ultrasound has limitations in tracing the distal ureter, a three-dimensional urography was required as the gold-standard confirmatory test. This allowed for precise visualization of the ectopic ureter's course, which is essential for planning the distal uretero-ureterostomy. The investigation, shown in Figure 1 confirms a complete right-sided duplex collecting system. Two distinct ureters are visualized exiting the right kidney, the upper pole ureter is moderately dilated (hydroureter) and follows a tortuous, serpentine course and is seen bypassing the typical bladder insertion point, extending lower and medially into the pelvic floor, wrongly draining into the vagina. But for a more thorough investigation, we identified the ectopic opening directly during a simple vaginoscopy. We didn't ask for a gynecological consultation nor used methylene blue tracing of the urine leakage because direct visual inspection under magnification gave us a clear view of the orifice and the results of the 3D urography didn't show any anomalies of the genital tract.

After admitting the patient on 9th of May 2025 and confirming the diagnosis, she underwent right end-to-side uretero-ureterostomy using a 5-6 cm long incision in the right lower quadrant, ligation of the right ectopic ureter and urethral catheterization. The surgeon opted for a stented anastomosis to ensure the new connection remained open, by using a Double J stent, which offers protection against temporary blockage caused by surgical inflammation, allowing the upper pole kidney to drain freely into the bladder. Ureteral reimplantation was deemed unfavourable due to the technical complexity of common-sheath dissection in the deep pelvis and the associated risk of ischemic injury to the healthy lower-pole ureter. Given that 3D CT urography confirmed contrast excretion from the upper pole moiety, a kidney-sparing ipsilateral distal uretero-ureterostomy was selected as the safest reconstruc-

tive approach, avoiding extensive trigonal dissection while preserving functional renal parenchyma. Post surgery, the patient was transferred to the ICU department where her evolution was favourable, she was hemodynamically stable and active urine outflow was noted via the urinary catheter. The following day, she was transferred back to the Paediatric Surgery department where analgesics, antibiotic prophylaxis, diuretics and intravenous electrolyte and fluid replacement were administered. After three days bowel movements were restored. On 16th of May, with the successful resolution of the clinical symptoms, it was decided to perform a cystoscopy for the removal of the Double J stent from the right ureter and a retrograde pyelography to assess the anastomosis and to evaluate any possible post-operative complications. In this patient, the double-J stent was removed only after a few days, rather than maintaining it for the conventional 4 to 6 weeks. This decision was taken to mitigate the risk of anastomotic stricture and stenosis triggered by chronic foreign-body tissue irritation. The stent serves essentially as a temporary intraoperative splint, preventing the ureter from kinking and maintaining luminal patency while primary tissue alignment occurs. Keeping the stent in place for just a few days allows the initial, necessary submucosal fibrotic bridging to establish itself safely.

Considering the outstanding recovery of the patient, she was discharged three days later. The follow-up of the patient demonstrated a great recovery. Functionally, she remained asymptomatic with normal voiding patterns and without any episodes of urinary incontinence or urinary tract infections, now after more than a year post surgery.

Discussions

Selecting the optimal surgical intervention for a duplex system remains a subject of ongoing debate. For a better understanding of the surgical management of this case, we should explore all the options we have for this type of malformation and the advantages and disadvantages for each one. There are three types of surgical techniques. The first one is represented by the upper pole heminephrectomy which has historically served as the preferred surgical intervention for ectopic upper pole ureters. [5] It prioritizes the excision of a non-functional segment over the complexities of lower urinary tract reconstruction, and it is the first choice if the functional scans show that the upper pole has very little to no function (less than 10%). [5] The second option is represented by proximal uretero-ureterostomy which can be taken into consideration if the upper pole ureter is dilated, as it allows a straightforward bypass into the healthy lower system. While this site offers a favourable diameter for the anastomosis, it presents greater surgical complexity than a distal approach. The proximity to the renal hilum requires meticulous dissection to avoid compromising the delicate vascular supply and parenchymal integrity. The third option consists of the distal uretero-ureterostomy in which case the surgeon connects the up-



Figure 1. Three-dimensional urography

per-pole ureter to the side of the lower-ureter in the pelvis, which is generally considered the safest “sparing kidney” surgery, which is one of the reasons it was chosen for this particular case. Moreover, another advantage of the distal approach which was taken into consideration is the fact that it leaves a small lower stump, in comparison with the higher approach in which a very long unused ureter is being left out, resulting in a higher risk of kinking the ureter post intervention. The main benefit of this technique is that it allows us to save any functioning part of the upper kidney. By avoiding more invasive surgery on the kidney itself, we also protect the healthy lower portion from any accidental damage or complications.

Now in the minimally invasive surgical techniques world, one study showed that the laparoscopic approach for a distal uretero-ureterostomy resulted in less trauma, decreased hospital stay and shorter recovery time compared to the open technique used in this case. But in this particular case, there was only one small incision needed, making this the preferable approach rather than multiple incisions for the trocars that would have been necessary if the laparoscopic surgery was chosen. [6]

In recent pediatric urological literature, robot-assisted laparoscopic ureteroureterostomy, particularly via a distal pelvic approach, has gained significant attention. It combines the minimally invasive benefits of conventional laparoscopy (small incisions, rapid recovery) with the dexterity, 3D visualization, and wrist articulation of robotic platforms (such as the da Vinci system), which are especially valuable

when performing fine anastomoses deep within the confined infant or pediatric pelvis. The robotic approach ensures optimal pelvic exposure and microsurgical precision with minimal surgical disruption. [7] Clinical outcomes demonstrate marked resolution of hydroureteronephrosis, preservation of split renal function, and minimal postoperative morbidity paired with rapid recovery. [7] These findings confirm that this type of technique is a dependable, kidney-sparing intervention for the management of complete duplex collecting systems in children. [7]

Statistically, vaginal ectopic ureters are almost universally diagnosed during early childhood due to continuous, refractory urinary incontinence following toilet training. In contrast, this patient remained completely asymptomatic for 17 years, making her presentation uncommon in adolescent urological practice and highlighting the fact that congenital urinary anomalies can remain hidden a long period of time, without causing functional or infectious symptoms.

Conclusions

In conclusion, this case underlines the importance of considering ureteral ectopia in a later-onset urinary incontinence, while the patient maintained a clinically silent course for 17 years. The selection of a distal uretero-ureterostomy proved to be an optimal, kidney-sparing intervention, achieving the dual goals of anatomical correction and the preservation of renal function. Postoperatively, the patient experienced the complete resolution of clini-

cal symptoms, facilitating a profound improvement in her psychosocial well-being and a successful return to her baseline quality of life.

Authors' contributions

AMA (Data curation; Writing-original draft; Investigation)

GHG (Conceptualization; Resources; Supervision)

Conflict of interest

There is no conflict of interest.

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