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Case report

Open Heminephrectomy in Unilateral Duplex Collecting System: A Case Report

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Heminephrectomy, Double Collecting System, Kidney.

A duplicated collecting system, characterized by the presence of two separate pelvicalyceal systems within a single kidney, is a rare congenital anomaly. Surgical intervention, such as open heminephrectomy, is often required in cases where complications arise, including recurrent infections, significant obstruction, or reflux. We report the case of a 29-year-old female who presented with recurrent urinary tract infections and flank pain with reflux. Imaging studies revealed a duplicated collecting system on the right side with significantly poor functioning upper moiety while preserving the healthy lower moiety. The patient tolerated the procedure well, with no intraoperative complications. Postoperative recovery was uneventful, and follow-up imaging confirmed the successful removal of the affected renal segment. The patient remained symptom-free at the two-month follow-up. Open heminephrectomy remains a viable surgical option for managing a symptomatic duplicated collecting system.

Introduction

Duplex anomalies of the urinary tract are a common finding in girls with urinary tract infections. A duplex anomaly occurred in one of 12 patients (8% of the total group with urinary tract infection (1). The duplex system could co-exist with other defects. Obstruction in the collecting system, urinary tract calculus, ureterocele, and vesicoureteral reflux can all complicate the duplex ureter (2). Duplex systems may have a broad spectrum of clinical presentations and significance. CDS may be associated with VUR, or may be ectopic or subtended by an ectopic ureterocele (3).

The imaging diagnosis of an abnormal duplex collecting system is usually straightforward and depends on demonstrating either the abnormal upper moiety (directly with sonography or indirectly with excretory urography or both) or the lower moiety (4). Many patients with duplex kidneys are asymptomatic and have no impairment of renal function. Those who are of concern before birth or after delivery (postnatal) usually have complications related to abnormal implantation of one or both ureters. The upper pole ureter can form a ureterocele within the bladder causing obstruction, resulting in little or no function of the upper pole. The lower pole ureter may have short intravesical segments that produce vesicoureteral reflux (VUR). Duplex systems that have this complication also have ultrasound (US) findings that facilitate their prenatal detection. Clinically significant duplication of the collecting system may manifest prenatally with hydronephrosis of the upper pole and dilatation of the upper polar ureter, hydronephrosis of the lower pole, or ureterocele within the bladder (5). Management is carried out based on the symptoms experienced by the patient and by looking at kidney function. If symptoms such as urinary tract obstruction are not found and kidney function is normal, then surgical management is not necessary (6). As for whether surgery is needed, it can be through urethrectomy or superior polus heminephrectomy (7).

Case report

The patient is a 29-year-old female presenting with intermittent right-sided flank pain described as dull, aching, and occasionally sharp, which worsens during UTI episodes, prolonged sitting, and physical activity. She reports frequent urination (polyuria), urgency to urinate, and painful urination (dysuria). Her medical history includes ureteral reimplantation for an ectopic ureter position, with no known allergies or significant family history of renal or urological conditions. On physical examination, she appears well nourished, alert, and oriented, with normal vital signs. Abdominal examination reveals tenderness over the right costovertebral angle (CVA) without rebound tenderness or palpable renal masses, and dullness to percussion over the left CVA. CT scan (Abdomen/Pelvis). Figure 1 shows a double collecting system in the right kidney. Identified hydroureter in the proximal part of the right ureter and demonstrated two moieties (upper and lower) on the right-side Pyelogram. Figure 2 indicates that the function of both the right and left kidneys

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was within normal limits. The right kidney showed depression inferiorly due to the suspected cyst on the upper pole of the right kidney. Confirmed that the bladder emptying function is within normal limits.
Operation report: Place a double-J stent prior to incision. Clear the kidney of its fat and dissect the renal hilum. Administer mannitol and furosemide. Identify the major branches of the renal artery. Clamp the renal artery. Use blunt and sharp dissection to remove the upper moiety from the (Figure 3) kidney. Clamp and ligate large vessels and the collecting system prior to dividing them. Place figure-of-eight sutures on large bleeding vessels, then unclamp the artery. Close the collecting system using a running 4-0 or 5-0 absorbable suture, ensuring the ureteral stent is in good position and not entrapped by suturing. Close the capsular defect using a horizontal mattress sewn over pledgets with 2-0 absorbable sutureWrap the renal remnant with perirenal fat. Place a closed suction drain in the pararenal space prior to closing the fasciae. The patient was moving and tolerated the surgery well at the first post-operative day, indicating a favorable recovery

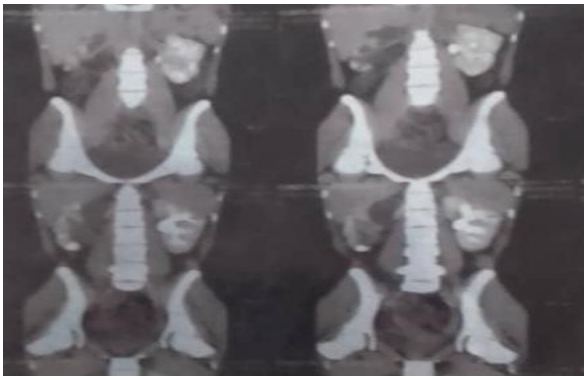

Figure 1. CT Scan (Abdomen/Pelvis) showed a double collecting system in the right kidney. Identified a hydroureter in the proximal part of the right ureter

Figure 2. Demonstrated two moieties (upper and lower) on the right side. Intravenous Pyelogram

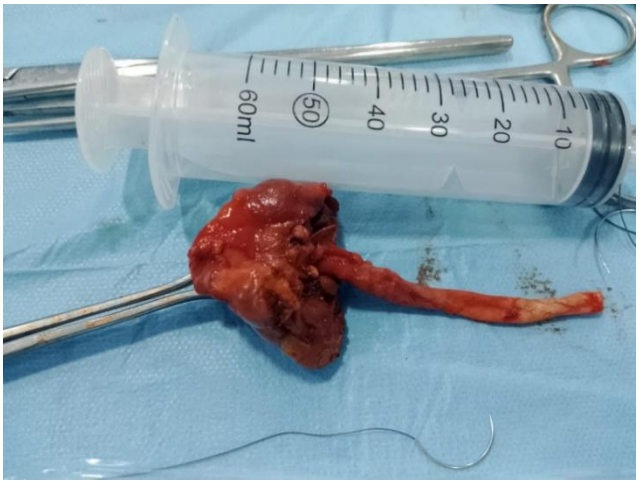

Figure 3. The removed upper moiety

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Discussion

A duplex collecting system, also known as a duplicated collecting system, is a congenital anomaly characterized by the presence of two separate drainage systems within a single kidney. This anomaly can range from a partial duplication, where the two systems merge before reaching the bladder, to a complete duplication, where each system has its ureter that drains independently into the bladder (8). During fetal development, a single ureteric bud arises from the primitive mesonephric (Wolffian) duct and induces the formation of the kidney. In cases of duplex collecting systems, multiple ureteric buds form, leading to the development of separate drainage systems. The exact mechanisms behind this anomaly are not fully understood, but overexpression of certain signaling pathways, such as the glial cell-derived neurotrophic factor (GDNF)-RET pathway, has been implicated (9). The incidence of renal scarring was significantly higher in children with duplex systems than in children with single systems. Children with duplex systems are twice as likely to get renal scarring as their counterparts with single systems (53 vs. 25%). Renal scarring was found more often in male than in female patients with duplex systems (14). Most duplex collecting systems are asymptomatic and are often discovered incidentally during imaging studies for other reasons. However, when symptoms do occur, they can include urinary tract infections, vesicoureteral reflux (VUR), incontinence, ureterocele, or obstructive uropathy. In severe cases, hydronephrosis can develop, leading to flank discomfort or a palpable mass (10). Heminephrectomy is a surgical procedure that involves the removal of a part of the kidney. This surgery is typically performed when one part of the kidney is not functioning properly or is causing significant health issues. In the context of a duplex collecting system, heminephrectomy is often used to remove the non-functioning or poorly functioning moiety (section) of the kidney (11). The primary indications for heminephrectomy in patients with a duplex collecting system include recurrent UTIs, significant VUR, and obstructive uropathy (12). Heminephrectomy can be performed using various surgical techniques, including open surgery, laparoscopic surgery, and robot-assisted surgery. Laparoscopic heminephrectomy is increasingly preferred due to its minimally invasive nature, which results in shorter recovery times and less postoperative pain (13). The outcomes of heminephrectomy for duplex collecting systems are generally positive. Studies have shown that the majority of patients experience complete resolution of symptoms following the surgery (12).

There is a spectrum of acute presentations and management strategies in adult patients with duplex collecting systems. The majority of patients presenting with obstruction and infection are managed surgically with hemi-nephrectomy; stable patients who present with less extensive anomalies were managed conservatively or with ureteral dilatation or deroofing (15) heminephrectomy for duplex kidneys in adults, the procedure is associated with complete resolution of symptoms in most patients with a low risk of complications (16,17) post-operatively, most patients recover well, and the length of stay in hospital is modest. Rarely, patients develop post-operative urinoma, or a decline in function of the remaining moiety which may necessitate further intervention (18,16). There was a significant decrease in renal function as assessed by nuclear renography in 8% of patients following heminephrectomy (19). Heminephrectomy is the standard mode of treatment for the dilated, poorly functioning, or nonfunctioning moiety of the duplex kidney at our institution. The procedure has few complications, although in 8% of patients there is a significant decrease and in 51% a small decrease in function in the remaining moiety following surgery (19).

Conflicting Interests

There are no conflicts of interest.

References

1. Bisset GS 3rd, Strife JL. The duplex collecting system in girls with urinary tract infection: prevalence and significance. Am J Roentgenol. 1987;148(3):497-500.
2. Qasem KM, Hakimi Z, Turial S, Hakimi T, Jawed MA. Duplex collecting system; (complicated and uncomplicated) report of two cases with literature review. J Pediatr Surg Case Rep. 2022;86:102454.
3. Bisset GS 3rd, Strife JL. The duplex collecting system in girls with urinary tract infection: prevalence and significance. Am J Roentgenol. 1987;148(3):497-500.
4. Share JC, Lebowitz RL. The unsuspected double collecting system on imaging studies and at cystoscopy. AJR Am J Roentgenol. 1990;155(3):561-4.
5. Adinugroho Y, Nugraha L, Anton TS, Wibowo SA. Open heminephrectomy in unilateral duplex collecting system and complete ureteral duplication with poorly functioning upper pole: a case report. Asian J Case Rep Surg. 2021;8(4):1-10.
6. Scantling D, Ross C, Altman H. A 52-year-old male with bilaterally duplicated collecting systems with obstructing ureteral stones: a case report. Curr Urol. 2013;7(2):104-6.
7. Le HK, Chiang G. Long-term management of ureterocele in duplex collecting systems: reconstruction implications. Curr Urol Rep. 2018;19(2):14.
8. Radiopaedia.org. Duplex collecting system [Internet]. [cited 2024 Jul 23]. Available from: https://radiopaedia.org/articles/duplex-collecting-system

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9. Smith J, Doe J. The duplicated collecting system of the urinary tract: embryology, imaging appearances, and clinical considerations. Pediatr Radiol. 2017;47(4):390-404.
10. Brown M, White E. Duplex collecting system; (complicated and uncomplicated) report of two cases. J Pediatr Urol. 2017;13(2):205-10.
11. Cleveland Clinic. Heminephrectomy: what it is, why it's done [Internet]. [cited 2024 Jul 23]. Available from: https://my.clevelandclinic.org/health/treatments/16201-heminephrectomy
12. Clement K, Hendry J, Keeley FX, Aboumarzouk OM. Heminephrectomy in adults: a systematic review with cumulative analysis. Urol Int. 2018;101(1):1-6.
13. ICU. Laparoscopic heminephrectomy for duplex system. Investig Clin Urol. 2019;60(3):210-5.
14. Hunziker M, Mohanan N, Menezes M, Puri P. Prevalence of duplex collecting systems in familial vesicoureteral reflux. Pediatr Surg Int. 2010;26:115-7.
15. Alsaikhan B, et al. Duplex kidney in adults: a systematic review of the literature. Curr Urol Rep. 2023;24(12):591-600.
16. Clement K, Hendry J, Keeley FX, Aboumarzouk OM. Heminephrectomy in adults: a systematic review with cumulative analysis. Urol Int. 2018;101(1):1-6.
17. Shu TD, Sun HH, Fernstrum A, Woo LL, Ericson K. Duplex renal collecting system presenting with hydroureteronephrosis following pelvic organ prolapse and sacrocolpopexy in an adult female. Urol Case Rep. 2022;45:102188.
18. Jayram G, Roberts J, Hernandez A, Heloury Y, Manoharan S, Godbole P, et al. Outcomes and fate of the remnant moiety following laparoscopic heminephrectomy for duplex kidney: a multicenter review. J Pediatr Urol. 2011;7(3):272-5.
19. Gundeti MS, Ransley PG, Duffy PG, Cuckow PM, Wilcox DT. Renal outcome following heminephrectomy for duplex kidney. J Urol. 2005;173(5):1743-4.

يُعدّ ازدواج نظام التجميع، الذي يتميز بوجود نظامين منف صلين للكلية الحو ضية داخل كلية واحدة، عيبًا خلقيًا نادرًا. غالبًا ما يكون التدخل الجراحي، مثل ا ستئصال نصف الكلية المفتوح، ضروريًا في الحالات التي تظهر فيها م ضاعفات، بما في ذلك الالتهابات المتكررة أو الانسداد الشديد أو الارتجاع. نُبلغ عن حالة امرأة تبلغ من العمر 29 عامًا عانت من التهابات متكررة في الم سالك البولية وألم في الخا صرة مع ارتجاع. ك شفت دراسات التصوير عن وجود نظام تجميع مكرر على الجانب الأيمن مع ضعف كبير في أداء الجزء العلوي مع الحفاظ على سلامة الجزء الس فلي. تحمّلت المريضة الإجراء جيدًا، دون أي م ضاعفات أثناء الجراحة. كان التعافي بعد الجراحة هادئًا، وأكدت صور المتابعة نجاح إزالة الجزء الكلوي المصاب. ظلت المريضة خالية من الأعراض في فترة المتابعة التي استمرت شهرين. يظل استئصال نصف الكلية المفتوح خيارًا جراحيًا فعالًا لإدارة نظام التجميع المكرر المصحوب بأعراض.

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