


Asymptomatic Unilateral Duplex Collecting System with Complete Duplication of Ureters in Right Kidney: A Three-dimensional Computed Tomography Scan Findings

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ABSTRACT

Introduction: Most people with ureteral duplications never experience any symptoms, so the condition goes unreported despite being one of the most prevalent kidney anomalies. **Case**: A 31-year-old female visited our medical facility for a routine checkup. Kidney function and complete urine analysis were normal. Ultrasonography revealed what appears to be a duplex collecting system in the right kidney, with two distinct noncommunicating renal pelvices. A 3D computed tomography (CT) scan of the abdomen with contrast revealed a duplex collecting system in the right kidney. **Conclusion**: Radiologists play a crucial role in detecting these abnormalities.

Keywords: CT scan, duplex collecting system, ureteral duplications.

ABSTRAK

Pendahuluan: Kebanyakan orang dengan duplikasi ureter tidak pernah mengalami gejala apa pun, sehingga tidak dilaporkan meskipun merupakan salah satu kelainan ginjal yang paling umum. **Kasus**: Seorang wanita berusia 31 tahun mengunjungi fasilitas medis untuk pemeriksaan rutin. Fungsi ginjal dan analisis urin lengkap normal. Ultrasonografi ginjal kanan menunjukkan *duplex collecting system*, dengan dua *noncommunicating renal pelvis* yang berbeda. Tomografi komputer (CT) 3D abdomen dengan kontras, menunjukkan *duplex collecting system* di satu sisi di ginjal kanan. **Simpulan**: Radiologi memainkan peran penting dalam mendeteksi kelainan ini. **Luh Made Deasy, Putu Aditha, Kadek Budi. *Duplex Collecting System* Unilateral Asimtomatik dengan Duplikasi Komplit Ureter di Ginjal Kanan: Temuan *Computed Tomography* Tiga Dimensi.**

Kata Kunci: *CT scan, duplex collecting system*, duplikasi ureter.

Introduction

One of the most prevalent urinary tract anomalies is ureteral duplications. The overall incidence of ureteral duplication in the autopsy series was 0.8%, or one in 125 cases.[1] Hartman and Hodson discovered an increased incidence of 2%-4% in a clinical series of patients with urinary symptoms.[2] Despite being one of the most prevalent kidney abnormalities, few cases are reported because the majority of affected individuals do not experience any symptoms for the duration of their lives.[3]

Case

A 31-year-old female came for a check-up with no history of fever, urinary tract infection, or stomach pain. Her family did not have a history of illness or any inherited conditions. Ultrasonography, kidney function testing, and a comprehensive urine analysis were among the examinations. Kidney function tests and a complete urine analysis were normal. The results of the ultrasonography scan of the right kidney revealed what appears to be a duplex collecting system with two distinct, noncommunicating renal pelvices **(Figure 1).** Further assessment with a 3D CT abdomen scan with contrast revealed an intriguing result. The contrast-enhanced 3D CT scan of the abdomen revealed a unilateral duplex collecting system as well as a full duplication of the ureters in the right kidney. Two ureters and two calyces were noted. Two ureters, one located at the hilum and the other 3.6 cm below it **(Figure 2).** Each branch of the ureter empties into the bladder in its own unique way; U1 empties in the upper pole and U2 empties in the middle and lower poles. The U1 passes inferiorly and medially into the lower pole part near the ureter. U2 inserts laterally and superiorly next to the ureter of the upper pole portion.

Discussion

Kidneys with a duplex system have two pelvicalyceal systems, known as the lower and upper poles. A full duplication of the kidney is present when each of its two ureters empties into the bladder independently.[4]

The urinary system develops throughout the fourth to tenth weeks of gestation. A structure known as intermediate mesoderm develops

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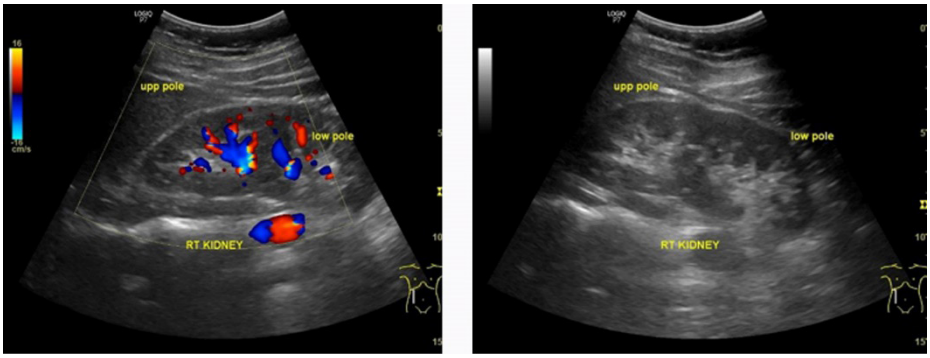

Figure 1. The right kidney ultrasonography revealed what appears to be a duplex collecting system; the two noncommunicating renal pelvices are seen as independent organs.

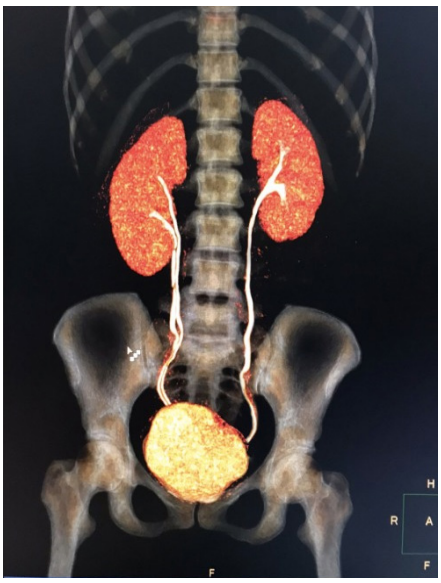

Figure 2. The contrast-enhanced 3D CT scan of the abdomen revealed a right kidney with a unilateral duplex collecting system and a full duplication of the ureters, with the first ureter (U1) projecting from the hilum and the second ureter (U2) located 3.6 cm below it.

in the embryo's dorsal region; it is from this region that the kidneys and ureters emerge. As embryos grow from the metanephric mesenchym and ureteric buds, the renal pelvis, collecting tubules, ureters, and major and minor calyces, are formed. As the permanent kidney moves to its final location, these structures move cranially. Congenital anomalies of the kidney and urinary tract (CAKUT) can occur if there is an abnormal interaction between the metanephric mesenchyme and the ureteric bud during development. Examples of these pathologies include kidney agenesis, polycystic kidneys, horseshoe kidneys, duplex collecting systems, and duplicated ureters, among many others that affect the anatomy and histopathology of the urinary tract. The abnormal interaction between the metanephromesenchyme and the ureteric bud determines the clinical manifestations of CAKUT. Problems with gene signaling in the ureteric bud can cause a duplicated ureter. A duplex kidney or a full or partial ureter duplication can develop.[5]

The overall incidence of ureteral duplication in the autopsy series was 0.8%, or one in 125 cases.[1] In a clinical series of patients with urinary symptoms, Hartman and Hodson found an increased incidence of 2-4%.[2] Eight percent of the 700 children who presented with a UTI in a big study had ureteral duplication. In duplex system anomalies, both the right and left kidneys are affected to the same extent.[1]

There is usually no outward sign of a duplex abnormality. Only in cases where complications and related anomalies are present do symptoms of duplex kidneys manifest.[1] There are three times as many cases of incomplete duplication as complete ones. Less than one percent of the population have a complete duplication, affecting more women than men. Only 25% are bilateral.[6]

The case is a 31-year-old female without any urological problems. The fact that the ureters in the right kidney were identical to those in the left is an intriguing feature of the unilateral duplex collecting system. One type of duplex collecting system is the duplex kidney, which is formed when one kidney is completely duplicated and then split into two ureters. Another type is the incomplete duplication, which results in a Y-shaped ureter. Another type is blind ureter, which is not draining into the bladder. The last type of ureteral duplication is the extremely unusual inverted Y-ureteral duplication, where the two ureters join together prior to reaching the kidney.[7]

The lower part is usually more noticeable and is in charge of draining most of the kidney. A large renal pelvis drains into the lower half via multiple calyces. There might be no renal pelvis and just one infundibulum and calyx in the upper portion. The vascular orifices in each ureter are unique. A lower, more medial ectopic location is reached by the ureter that drains the lower portion of the organ, which crosses over and empties into the bladder in a lower position, contrary to the Weigert-Meyer rule. A variety of outflow channels can be found in the male reproductive tract from the ureter, including the seminal vesicles, vas deferens, ejaculatory duct, and posterior urethra. It is very uncommon for a female ureter to open into her rectum, but it can also open into her uterus, vagina, lateral vulvar wall, or urethra.

The ureter, which originates at the base of the kidney and passes more laterally and superiorly into the bladder, has a short intramural course and is thus more likely to reflux, according to the Weigert-Meyer rule, which is applicable to an entirely replicated collecting system. In many cases, a ureterocoele forms and becomes clogged when the ureter that emerges from the upper pole moeity inserts more inferiorly and medially.[8]

Common imaging modalities used for the diagnosis and evaluation of ureteric duplication include computed tomography (CT), voiding cystourethrography (VCUG), intravenous pyelography (IVP), and magnetic resonance urography (MRU). The presence of ureterocele, particularly in females, is strongly associated with a duplicated collecting system; further evidence of duplication can be examined through ultrasonography, which may reveal separated renal pelvises, asymmetry in renal lengths, and an uneven dilation of the pelvis at the top and bottom. Ultrasonography is thus the first-line imaging modality for this condition. In addition, vesicoureteral reflux (VCUG) is the gold standard imaging technique for evaluating cases of duplicated collecting systems. IVP has been used to assess the morphology and function of the urinary tract. Radiographs and

fluoroscopy are used to visually examine the kidneys, ureters, and bladder for abnormalities such as blockage or scarring following the administration of an intravenous contrast agent. And while CT has better spatial resolution, the urine in the collecting system acts as a contrast agent, allowing MRU to have better contrast resolution.

The primary results of renal collecting system duplication on computed tomography (CT) are identical to those on ultrasonography. However, CT reconstruction software is capable of producing high-quality images. Duplex anomalies can be better understood with the help of each imaging modality.[9] No surgical intervention was necessary for asymptomatic duplex kidney anomalies that were discovered by chance. To ascertain the necessity of surgical interventions, additional symptomatic patients with variants of duplex kidney anomalies were assessed.[1]

In adult symptomatic duplex collecting systems, unilateral nephrectomy and ureterectomy of the affected pole are performed if necessary. Although there are only a few cohorts of data investigating unilateral nephrectomy for double kidneys in adults, the procedure is associated with complete resolution of symptoms and a low risk of complications in most patients.[10]

Conclusion

Surgical intervention was not needed for asymptomatic patients with variants of duplex kidney anomalies who were discovered by chance. Radiologists play a crucial role in detecting these abnormalities prior to surgery, which improves patient outcomes and increases the likelihood of a successful operation.

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