

Renal cell carcinoma arising in ipsilateral duplex system *İpsilateral dupleks sistemde ortaya çıkan renal hücreli karsinom*

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ABSTRACT

Congenital anomalies of the kidney and urinary tract are common and include a wide anatomic spectrum. Duplex systems are one of the more common renal anomalies, with the majority being asymptomatic. Little is known about the molecular pathogenesis of these anomalies; however, certain causative genes have been implicated. The finding of renal cell carcinoma arising in a kidney with the duplication of pelvicalyceal system and ureters, as in the present case, is uncommon. The association between a duplex system and renal cell carcinoma may be more than a coincidence, requiring a deeper insight and further elucidation.

Key words: Anomalies; congenital; duplication; renal cell carcinoma; ureter.

ÖZET

Böbrek ve idrar yollarının konjenital anomalileri sık görülür ve geniş bir anatomik spektrum içerir. Dupleks sistemler sık görülen renal anomalilerden biridir ve çoğunluğu asemptomatiktir. Bu anomalilerin moleküler patogenezi hakkında çok az şey bilinmektedir; bununla birlikte, bazı genler neden olarak gösterilmektedir. Bu vakada olduğu gibi pelvikalikseal sistem ve üreterlerin duplikasyonu ile birlikte böbrekte ortaya çıkan renal hücreli karsinom bulgusu nadirdir. Dupleks sistem ile renal hücreli karsinom arasındaki ilişki bir tesadüften daha fazlası olabilir ve derin bir içgörü ve daha fazla açıklama gerektirir.

Anahtar kelimeler: Anomaliler; konjenital; duplikasyon; renal hücreli karsinom; üreter.

Introduction

Congenital anomalies of the kidney and urinary tract (CAKUT) exhibit a wide anatomic spectrum. These anomalies include renal anomalies and ureteropelvic anomalies, duplex collecting systems, and anomalies of the bladder and urethra. Often, these anomalies are present concurrently.^[1]

The ureteral anomalies can be of termination, structure, number or position.^[2] At times, the ureteral anomalies are associated with duplications of the kidney, with two separate pelvicalyceal systems. The development of renal cell carcinoma in duplex systems has not been reported in the English literature to date and hence requires documentation and further investigation.

Case presentation

We report case of a 49-year-old male who presented in an emergency with clot colic and intermittent hematuria. Hematological investi-

gations revealed a moderate degree of anemia. Urine examination revealed 40-60 red blood cells per high-power field. An abdominal ultrasound was followed by a computed tomography (CT) scan.

The abdominal contrast-enhanced CT scan revealed a large, well-defined lobulated mass in the lower pole of the right kidney, with solid and cystic components (Figure 1). A note was made of the double pelvicalyceal system and upper ureters, with a single ureter in the pelvic course. The left kidney, pelvicalyceal system and ureters were normal.

A right nephrectomy was submitted for pathologic examination. The specimen measured 13.5x5.5x3.5 cm and weighed 200 gm. The lower pole was expanded externally (Figure 2). The capsule was intact with no scars. A cut section revealed a tumor in the lower pole measuring 5.1x4.7x3.5 cm that was circumscribed and was grey-white to grey-brown in color, with areas of hemorrhage and necrosis (Figure 3). No capsular breach was observed. The remainder

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Figure 1. CECT axial scan of the abdomen revealing a mass lesion in the lower pole of the right kidney as well as a duplication of the pelvicalyceal system and upper ureters
CECT: contrast enhanced computed tomography



Figure 3. Sagittal section revealing a circumscribed, grey-white to grey-brown tumor in the lower renal pole with focal areas of hemorrhage and necrosis. The duplication of the ipsilateral pelvicalyceal system is noteworthy



Figure 2. Gross photograph revealing the incomplete duplication of the ureters and the expanded lower pole of the kidney

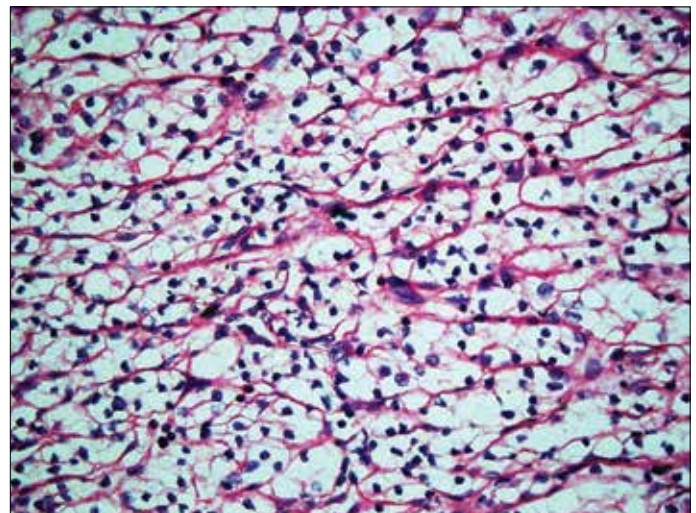


Figure 4. Photomicrograph revealing renal cell carcinoma, of the conventional type, with polygonal tumor cells with central nuclei and an abundant clear to granular eosinophilic cytoplasm (H&E, x400)

of the renal parenchyma was well preserved. However, there was a noteworthy duplication of the pelvicalyceal system and double upper ureters (Figures 2, 3). There was no pelvico-ureteric obstruction, hydronephrosis, hydroureter or calculi. The ureters, renal vessels and perinephric fat were free of tumors.

Representative sections of the tumor revealed a well-circumscribed tumor in the lower pole, exhibiting a glandular pattern. The cells were polygonal with central nuclei and an abundant clear to granular eosinophilic cytoplasm (Figure 4). Areas of cystic change, necrosis and hemorrhage were observed. Cholesterol clefts with multinucleated giant cells were also noted. The adjoining renal parenchyma exhibited several lym-

phocytes in the interstitium. The renal capsule, ureters, renal vessels, perirenal and hilar fat were devoid of tumor deposits. Renal cell carcinoma, of a conventional type, arising in the kidney with a duplication of the pelvicalyceal system and upper ureter was reported. The patient suffered no complications and is doing well to date, two years after surgery.

Discussion

Congenital abnormalities of the kidney and urinary tract are common in humans, occurring at a frequency of approximately 1 in 500 fetal ultrasound examinations.^[3] Duplex systems are one

of the more common renal anomalies, occurring in the general population, with an incidence of 1 in 25 in postmortem studies.^[4] Nearly 10% of all human beings are born with a congenital anomaly of the urogenital system; a duplication of the upper urinary tract occurs in approximately 1 in 160 individuals.^[5]

Urinary tract duplication is associated with a range of anomalies, and the usage of correct nomenclature or terminology is important.^[2] Recommendations for terminology have been devised to eliminate confusion. A duplex system describes a renal unit where the kidney is composed of two pelvicalyceal systems that are associated with the incomplete, partial or complete duplication of the ureters. Partial duplication occurs when two bifid ureters join prior to emptying into the bladder, as in the present case. In a case where there is double ureter, each ureter drains a separate pelvicalyceal system and opens separately into the urinary or genital tract. Duplex renal systems are commoner in females (65% of cases) and occur bilaterally in 20% of cases, although the present case is a male with a unilateral presentation. A total of 60% of duplex systems exhibit bifid ureters, with 40% exhibiting complete ureteral duplication. Embryologically, a single ureteric bud may divide before fusion with the mesenchyme to form a bifid ureter and a duplex kidney. Complete ureteral duplication will occur if two ureteral buds arise close together at the normal position on the mesonephric duct.^[4] The ontogenic mechanism for the diversity of CAKUT suggests that the ectopic initial budding of the ureter is important, as it can produce distinct clinical entities concurrently.^[6] Several gene mutations have been identified to date as the cause of human CAKUT. The genes include paired box gene 2 (PAX2), gene for X-linked Kalman syndrome (KAL), human homolog of the drosophila 'eyes absent' gene (EYA1), angiotensin II receptor type 2 (AGTR2) and hepatocyte nuclear factor 1 β (HNF-1 β).^[7] These anomalies may exhibit a familial pattern, with incomplete and variable penetrance.^[5,7]

Many individuals with renal duplex systems are asymptomatic and most likely remain undiagnosed throughout their life, but a fraction will present in childhood with complications, such as a urinary tract infection.^[4] Vesico-ureteric reflux is found more frequently (approximately 70%) in these patients who present with infection. Usually only the lower pole of ureter is involved by the reflux in 90% of cases due to its laterally ectopic situation, and in the remaining cases, both poles are involved if the upper pole ureter is also laterally ectopic. Contralateral reflux may occur in one-fifth of patients.

The development of a tumor within a duplicated collecting system is infrequent. The presence of urothelial cancer of the upper urinary tract in a duplex system has been reported previously.^[8] However, the presence of renal cell carcinoma in such

an anomalous kidney was interesting because there is no prior documentation of this association in the English literature. Our patient exhibited periodic hematuria as well as constitutional symptoms for one month. The patient reported to the emergency department with a clot colic. Hematuria is typically the presenting feature, sometimes with a clot colic, or the patient may detect a mass in cases with renal cell carcinoma.^[9] In men, a rapidly developing varicocele is rare, often on left side, and is an impressive sign. In 25% of patients, there are no local symptoms. Some patients present with secondary deposits in the bone or lung. Fever, anemia, polycythemia, constitutional symptoms and, rarely, nephritic and paraneoplastic syndromes can be the presenting features.

With recent improvements in equipment and technological advances in prenatal ultrasonographic diagnosis, CAKUT can be detected in utero so that the post natal management can be planned.^[10]

The coexistence of a unilateral duplex kidney with incomplete ureteral duplication and ipsilateral renal cell carcinoma on the lower pole could be more than a coincidence. However, the underlying pathogenesis of this association with the possibility of a common genetic and molecular basis requires further analysis.

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References

1. Ichikawa I, Kuwayama F, Pope JC 4th, Stephens FD, Miyazaki Y. Paradigm shift from classic anatomic theories to contemporary cell biological views of CAKUT. *Kidney Int* 2002;61:889-98. [\[CrossRef\]](#)
2. Schluskel RN, Retik AB. Anomalies of the ureter. In: Walsh PC, Retik AB, Vaughan ED, Wein AJ eds. *Campbell's Urology*. 7th ed., vol. 2. WB Saunders: Philadelphia, PA; 1998:1814-57.
3. Colodny AH. Antenatal diagnosis and management of urinary abnormalities. *Pediatr Clin North Am* 1987;34:1365-81.
4. Whitten SM, Wilcox DT. Duplex systems. *Prenat Diagn* 2001;21:952-7. [\[CrossRef\]](#)
5. Atwell JD, Cook PL, Howell CJ, Hyde I, Parker BC. Familial incidence of bifid and double ureters. *Arch Dis Child* 1974;49:390-3. [\[CrossRef\]](#)
6. Miyazaki Y, Ichikawa I. Ontogeny of congenital anomalies of the kidney and urinary tract, CAKUT. *Pediatrics International* 2003;45:598-604. [\[CrossRef\]](#)
7. Nakanishi K, Yoshikawa N. Genetic disorders of human congenital anomalies of the kidney and urinary tract (CAKUT). *Pediatrics International* 2003;45:610-6. [\[CrossRef\]](#)
8. Chen KS, Chuang CK, Wu CH, Liaw CC, Lee N. Upper urinary tract tumor in a duplicated collecting system: report of three cases and review of the literature. *Chang Gung Med J* 2003;26:377-82.
9. Fowler CG. The kidneys and ureters. In: Williams NS, Bulstrode CJK, O'Connell PR eds. *Bailey & Love's Short practice of surgery*. 25th ed. Edward Arnold Ltd: London; 2008:1285-92.
10. Tsuchiya M1, Hayashida M, Yanagihara T, Yoshida J, Takeda S, Tatsuma N et al. Ultrasound screening for renal and urinary tract anomalies in healthy infants. *Pediatrics International* 2003;4:617-23.