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Original Research Article

Congenital Double Ureter and Its Clinical Significance

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Abstract:

Introduction: Congenital ureter anomalies like double ureter and double pelvicalyceal system are uncommon variations and they remain asymptomatic in majority cases. These variations are encountered during an abdominal or incidentally in any other routine abdominal and pelvic investigations or during educational cadaveric dissection in medical colleges.

Aims and Objectives: To study the congenital ureteric variations in cadaveric kidney and ureter specimens.

Materials and Methods: In Department of Anatomy, Bangalore Medical College and Research Institute, Bangalore, 50 cadaveric specimens of kidney and ureter were noted and observed for congenital variations

Results: Out of 50 specimens observed, a rare case of incomplete double ureters with double pelvicalyceal system was seen in left kidney of an adult 60 year old female cadaver.

Conclusion: Duplication of ureter can be found alone or with any other congenital anomalies. Duplex ureteric system can lead to certain complications like recurrent urinary tract infections, renal calculi hydronephrosis, vesicoureteric reflux, ureterocoele, etc. Knowledge of anatomical variations of ureter is very important to the concerned urologists, operating surgeons and gynaecologists to avoid the accidental injury to this anomalous system. Radiologists should be aware of these variations for the correct interpretation of varied anatomy.

Keywords: Renal variations, incomplete double ureter, double pelvicalyceal system.

Introduction

The ureters are narrow thick-walled muscular tubes, measuring around 25-30 cm in length. The ureters drain urine from the kidney to the urinary bladder through peristaltic contractions. The ureters have abdominal and pelvic parts. The abdominal segment of ureter is closely related to parietal peritoneum and is retroperitoneal all along their course.

The pelvic segments enter the pelvis by passing over the pelvic brim at the bifurcation of the common iliac arteries before entering the urinary bladder.[1] Congenital ureteric anomalies like double ureter and double pelvicalyceal system are uncommon variations.[2] Clinically, patients with a double ureter may be asymptomatic or may present with lumbar or lower abdominal pain or hematuria.[3]

This condition can lead to complications like ureteral obstruction, uretero-ureteric reflux, and recurrent urinary infections.[4,5] Autopsy studies have suggested that the incidence of unilateral bifid ureter is 1 in 125 cases (0.8%).[6] These variations are encountered during an abdominal surgery or incidentally in any other routine abdominal and pelvic investigations or during educational cadaveric dissection in medical colleges.

Materials and Methods

This study was done on 50 cadaveric kidney and ureter specimens available in Department of Anatomy in Bangalore Medical College and Research Institute, Bangalore. Out of 25 human adult cadavers observed, 21 were males and 4 were females. The dissection was done following the guidelines outlined by Cunningham's Manual of Practical Anatomy.[7] The posterior abdominal wall is properly dissected. The kidneys, along with the ureters and bladder, after removal were washed thoroughly in running water and observed for congenital ureteric variations. Kidneys having gross deformity were excluded from the study.

Results

In the present study 50 cadaveric kidney and ureter specimens were observed. Only a single specimen showed variation in the observed specimens. In the left kidney of a 60 year old female, incomplete double ureter with duplex pelvicalyceal system was present. The kidney on the left side was hypertrophied and double the size of right side normal kidney.(figure 1) There was an accessory renal artery which was supplying the inferior pelvicalyceal system.

In the origin of bifid ureters, it was thought to be completely duplicated variety.(figure 2) Upper ureter was having diameter 1cm and lower one was having 0.8 cm diameter. Ureters travelled a course of 19cm & 17cm respectively before their termination. The duplex ureter in the left kidney 2.5cm before its termination fused together as a single ureter measuring 1.7cm in outer diameter. There was only a single intra ureteric opening present inside the bladder on the left side. (figure 3)On inspecting the interior parenchymal architecture of left kidney showed double pelvicalyceal system. One ureter was arising from upper pole and it was connected to three major calyces and seven minor calyces. While the lower pole was connected to one major calyces and three minor calyces (figure 4) the hilar structures in the same specimen consist of an accessory renal artery which was found close to the lower pole of kidney at a level of L2 vertebral body. It was found to arise as a direct branch from abdominal aorta and in front of renal artery proper (figure 5)

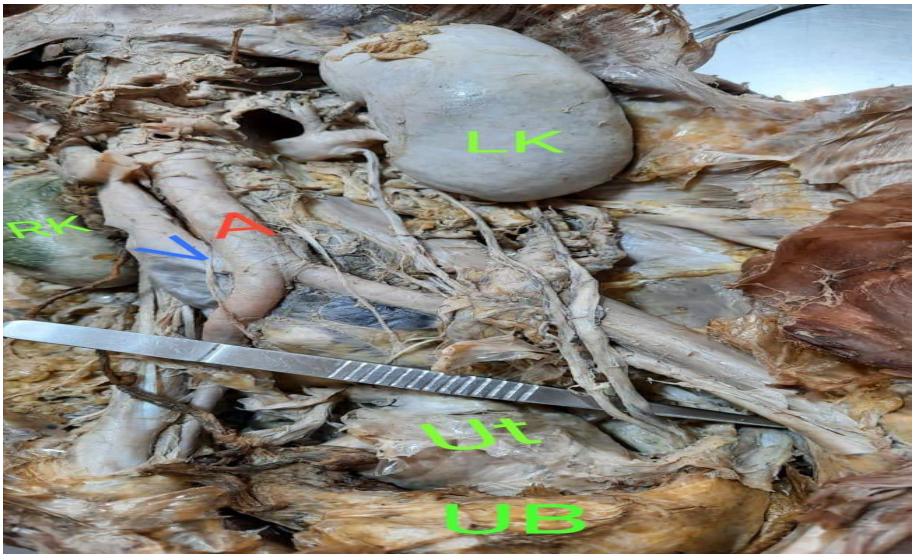

Figure 1: LK-Left Kidney, RK-Right Kidney, A -Abdominal Aorta, V-Inferior Venacava, Ut-Uterus, Ub-Urinary Bladder

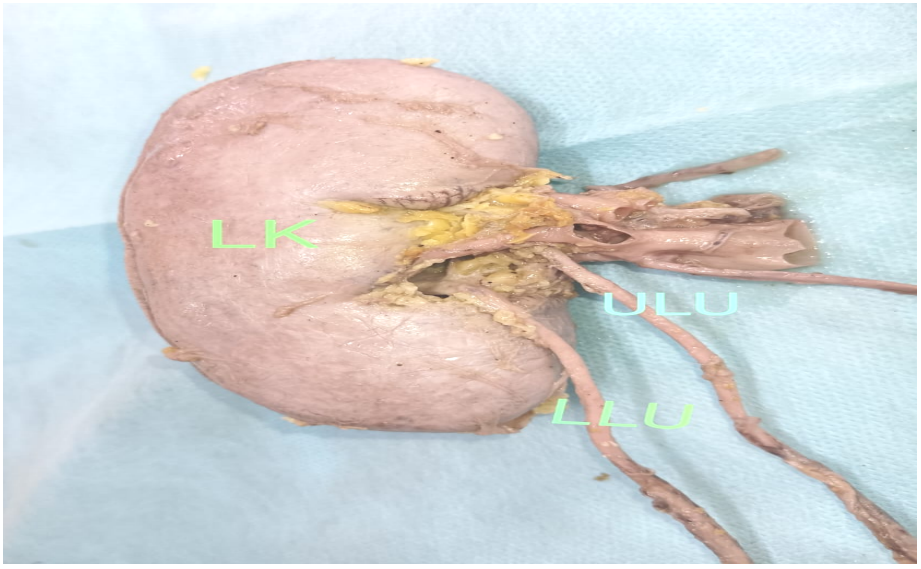

Figure 2: LK-Left Kidney, ULU-Upper Left Ureter, LLU-Lower Left Ureter

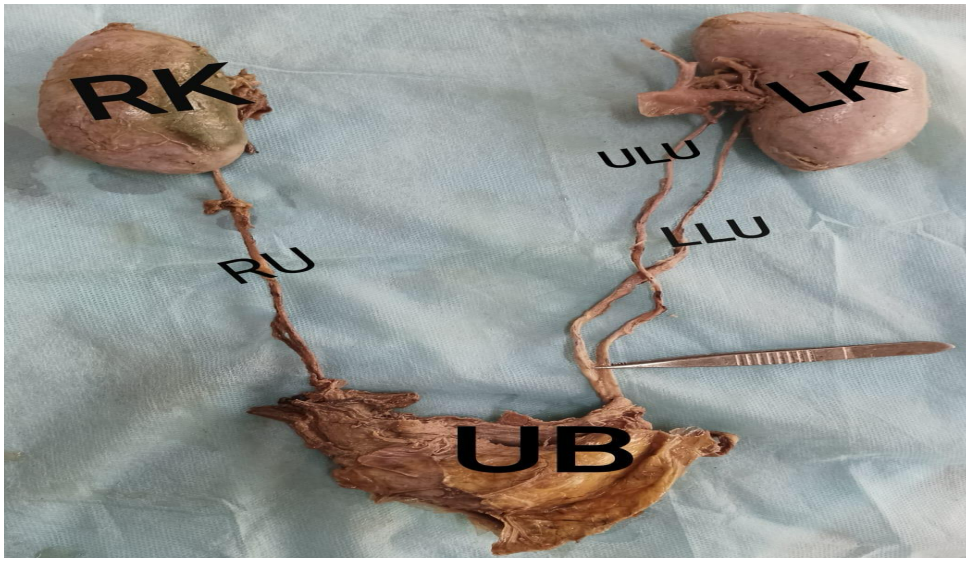

Figure 3: LK-Left Kidney, RK- Right Kidney, UB- Urinary Bladder, ULU-Upper Left Ureter, LLU-Lower Left Ureter, RU- Right Ureter

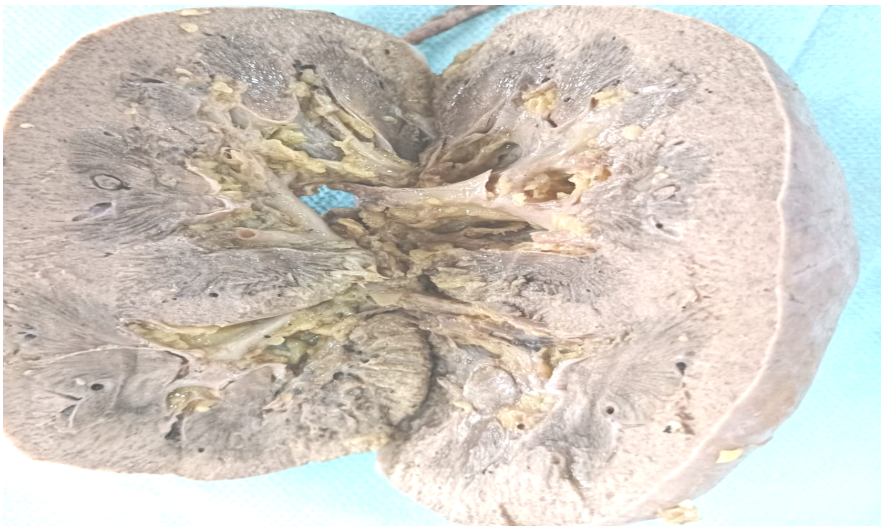

Figure 4:

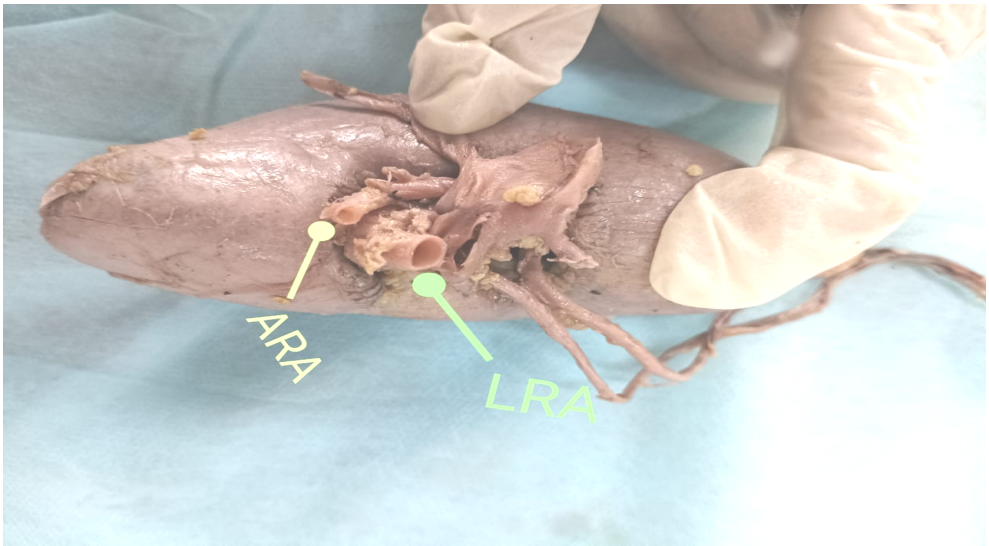

Figure 5: ARA- Accessory Renal Artery, LRA- Left Renal Artery

Discussion

Urinary system develops from metanephric blastema and mesonephric duct. Ureteric bud arises from caudal end of the mesonephric duct as a diverticulum. Then ureteric bud elongates and fuses with the metanephric blastema and lead to the formation of renal pelvis, major and minor calyces. Duplication of ureter results from the early splitting of the ureteric bud. If this splitting is complete, it forms a complete duplex ureter and if it is incomplete, it will form incomplete double ureter. The associated metanephric tissue may be divided into two parts with its own renal pelvis and forms the double pelvicalyceal system.[1,8]

Padmaja et al in a descriptive study done in 120 kidney and ureter specimens observed a variation of incomplete double ureter with double pelvicalyceal system in the left kidney. An accessory renal artery was also seen on the left kidney. One ureter was towards the upper pole of left kidney and other towards lower pole. Both ureters joined just before opening to the bladder and only a single ureteric opening was seen on interior aspect.[2]

Arumugam et al in a descriptive study of 50 kidney and ureter specimens, three types of variations in ureter were noted. Incomplete double ureter which are forming Y-shaped pattern was noted in different levels of ureters, two of them on right side and one on the left.[3]

Vasudha et al observed incomplete duplication of right sided ureter in upper portion of its course bilaterally in a 58 year old male cadaver. Right kidney was found to be contracted and granular. Accessory renal arteries were seen on both kidneys.[4]

Nagpal et al observed a case of unilateral bifid ureter with two pelvicalyceal system in the kidney on the right side in a 60 year old female cadaver during routine educational dissection. Both ureters joined 3 cm away from urinary bladder.[5]

Ojha et al in a routine abdominal & pelvis dissection has observed duplex ureteric variation in the right kidney. The type of duplication was incomplete. Here presence of two renal veins which joined before draining into inferior venecava were also noted. Double ureters were joined just before their entry into the urinary bladder.[6]

A cadaveric study by Deka and Saikia revealed out of 60 specimens, 56 (93.3%) cadaver with normal ureter and renal pelvis, whereas 4 (6.7%) specimens presented with variations of the renal pelvis and ureter. Out of these, 2 (3.3%) specimens presented with unilateral variations of ureter. Double ureters in 1.67% of 60 specimens, and, incidentally, all were on the left side.[9]

Choudhary et al. studied 32 specimens, of which two (6.25%) kidneys showed unilateral incomplete duplication.[10]

Roy et al. reported double ureters in 0.64% of 156 kidney specimens.[11]

Dähnert studied excretory urograms and reported that incomplete duplication of the ureter was three-fold more common than complete duplication.[12]

Lowsly and Kirwori revealed that out of 4215 cadavers studied, 18 showed duplication of ureter. Among those 18 specimens, 8 were unilateral complete duplication.[13]

Ennaciri S et reported a case of bilateral incomplete duplex collecting system with duplex ureter in a 60 yr old woman presented with lower back pain without urinary symptoms. Both kidneys had a moderate hydronephrosis in inferior pelvicalyceal system [14]

Literature also states that the incidence of duplicated ureter is ranging from 0.4% to 6.0%.This are two to five times more common in females, common in Caucasian race. [15] Complete duplication of ureter is seen more common on the right side, while incidence of left incomplete ureteric duplication is higher as compared to incidence of right incomplete ureteric duplication.[16,17]

In the present study we have found incomplete double ureter variation on the left side of the cadaver. As we found from other studies the predominance of double ureter found more in females, same as seen in our case. Incidence of double ureter in 50 specimen observed is 2%. We have found the double pelvicalyceal system and accessory artery along with bifid ureters same as that many authors study. We have found colonic variation suggestive of congenital megacolon in the same cadaver. The significance of this has to be studied later.

Conclusion

Duplication of ureter is found alone or with any other congenital anomalies. Complete duplex ureters are rarely seen compared to the incomplete ureters. Unilateral variations are more common. The most common presentation is in females and right side is predominantly seen than left side. Duplex ureter is mostly associated with double pelvicalyceal system and an accessory renal artery.

Duplication may be either complete or incomplete and is often accompanied by various complications. Incomplete duplication is most often associated with uretero-ureteral reflux or ureteropelvic junction obstruction of the lower pole of the kidney. Complete duplication is most often associated with vesicoureteral reflux, ectopic

ureterocele, or ectopic ureteral insertion. Vesicoureteral reflux frequently affects the lower pole and ectopic ureterocele and ectopic ureteral insertion affect the upper pole. The ectopic ureterocele produces a filling defect in bladder, and identified with contrast material studies or ultrasound imaging methods.

Duplex ureteric system can lead to certain other complications such as renal calculi, recurrent urinary tract infection, hematuria, pyuria, hydronephrosis, etc. Adequate knowledge on anatomical variation of ureter is immensely important to the urologists, surgeons and gynaecologists to avoid the accidental injuries to this anomalous system. Radiologists should be aware of these variations for the correct interpretation of the varied anatomy

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