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Research Article

Study on ureteral duplication with its clinical significance in North Indian Population

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ABSTRACT

Objectives: The aim of present study is to highlight incidence and clinical significance of bilateral variations of ureter in North Indian Population. The ureters are both sided thin tubular structures that connect the kidneys to the urinary bladder, convey urine from the renal pelvis of kidneys to the bladder. The human ureter is roughly 25-30 cm long in adults. The human ureters begin at the ureteropelvic junction of the kidneys, which lie posterior to the renal vein and artery in the hilum. **Material and Methods**: The present study comprises 44 kidneys (22 adult cadavers) of both sexes (12 males and 10 females) from North Indian origin. During routine abdominal dissection conducted for medical undergraduates at the department of Anatomy, The ureters were carefully dissected; observed and explored the variations of ureters were photographs and recorded. **Results**: We found unilateral double ureter in right side were (4.5%) and in left side (2.2%) in the cadavers of North Indian population. In this present study we did not found bilateral double ureter in the dissection of all cadavers. **Conclusion**: Ureteral duplication may potentially have urinary stones, ureterocele, vesicoureteral reflux and obstructive uropathy. The urologist and radiologist should be aware about variations in ureter is necessary for surgical management during renal transplantation, urological procedures, diagnosing urological images and preventing accidental injury during surgery

Key Words: *Ureteral duplication, Variations, Clinical significance*

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INTRODUCTION

The anomalies of ureter such as double ureters are uncommon embryological anomalies of the renal system. An unusual branching pattern of ureteric bud results in the formation of duplication ureter. This study examined the incidence of duplication of ureter in cadavers of a North Indian Population. The length of ureters is around 25-30 cm with narrow lumen. These ureters transfer urine from the corresponding kidney to the urinary bladder. The ureters have two parts: abdominal and pelvic. The abdominal part of the ureters adhere closely to the parietal peritoneum and are retroperitoneal throughout their course, and the pelvic part enter the pelvis by passing over the pelvic brim at the division of the common iliac arteries before entering the urinary bladder [1]. The duplication of the ureter is a developmental anomaly of the urogenital system. The possible developmental reasons for the formation of a duplicated ureter could be splitting of ureteric bud, resulting two ureters draining into single kidney. The prevalence occurs in approximately 1% of the population. It may be associated with or without other birth defects. The anatomical variations of the ureter and its relationship to surrounding structures are therefore important in academic as well as clinical perspective to preserve renal functions. The single kidney drained by double, triple, and quadruple ureters has been reported and the double ureters may be associated with double renal pelvis in single kidney or double kidney [2]. The symptomatic patients usually have complete ureteric duplication, in which the ureters are prone to develop inhibition, reflux, and infection [3]. The double ureter may be discovered in childhood less frequently, in later life often accompanied by various complications, or they may be supernatural and discovered at autopsy [4, 5].

MATERIALS AND METHODS

In our current present study observations were made on the cadavers while they were used for routine dissection classes for medical undergraduate students over a period of five years comprise of 44 kidneys (22 adult cadavers) of both sexes (12 males and 10 females) from North Indian origin in the department of anatomy Govt. Medical College Budaun and Govt. Medical College Ambedkar Nagar. The embalmed cadavers' dissections were performed according to the guidelines by Cunningham's Manual of Practical Anatomy [6] in the abdomen and posterior abdominal wall carefully. The both sides kidneys and its surrounding structures of the posterior abdominal wall were studied for the presence of

bilateral and unilateral variation in ureters. This was an observational study with no usage of experimental instruments. The appropriate measurements were taken by calipers and measuring tape, the specimens were photographed and the findings were appropriately documented.

RESULTS

In the present study out of 44 kidneys (22 adult cadavers) of both sexes (12 males and 10 females) showed the presence of variations of ureter in that we found unilateral double ureter in right side were (4.5%) and in left side (2.2%) in the cadavers of North Indian origin. In this present study we did not found bilateral double ureter in the dissection of all cadavers. In our current study on North Indian origin cadavers we found 41 kidneys (93.1%) ureters were normal. We found unilateral variations in 03 kidneys (6.9%) in which right side duplication of ureter were in 2 kidneys (4.5%) and Left side in 1 kidney (2.2%). In our current study we did not identified bilateral double ureter showing in table 1

Table 1 Showing incidence of presence duplication of ureters in North Indian population**.**

	Normal Ureters (%)	**Bilateral Variations (%)**	**Unilateral Variations (%)**	
Cadavers Studied 22 (44 kidneys)	**41(93.1%)**	**0 %)**	**03 (6.9%)**	
			Right side	**Left side**
			2 (4.5%)	**1 (2.2%)**

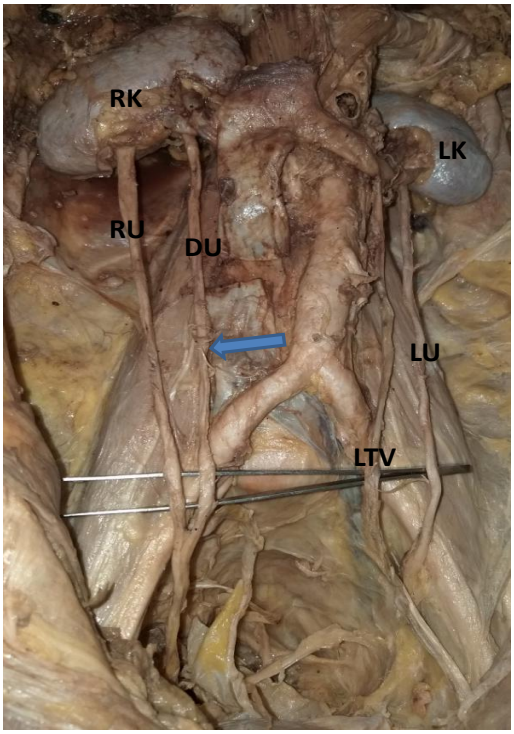

Figure 1 Right side kidney showing double ureter with arrow. RU- Right Ureter , LU- Left Ureter, RK – Right kidney, LK- Left Kidney, LTV- Left testicular vein.

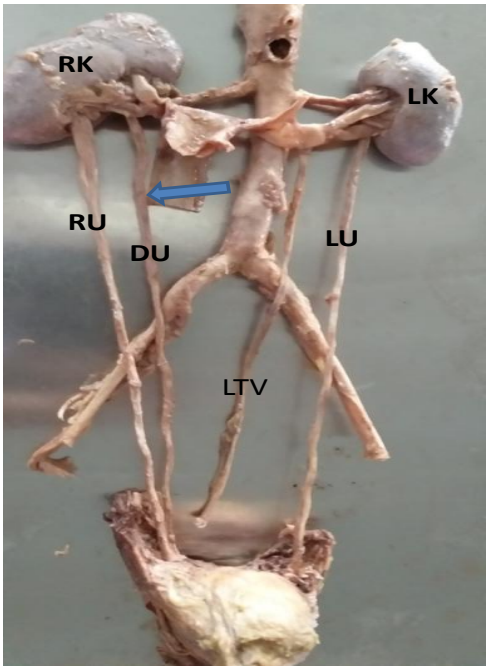

Figure 2 Right side kidney showing double ureter with arrow. RU- Right Ureter , LU- Left Ureter, RK – Right kidney, LK- Left Kidney, LTV- Left testicular vein.

DISCUSSION

The anatomical variations of the ureter such as incomplete or complete duplications are some reported irregularity that has been known since ages. One of the study conducted by Kulkarni *et al.* reported that duplication in the human ureter occurs in an incidence of 0.5% and ranges from 0.5% to 3.0% and it is two to five times more common in females, common in Caucasian race [7]. Lowsly and Kirwori observed that out of 4215 cadavers studied, 18 showed duplication of ureter. Among those 18 specimens, 8 were unilateral complete duplication i.e., 0.19% [8]. A cadaveric study conducted by Deka and Saikia examined out of 60 specimens, 56 (93.3%) cadaver with normal ureter and renal pelvis, whereas 4 (6.7%) specimens reported with abnormalities of the renal pelvis and ureter. Out of these, 2 (3.3%) specimens observed with unilateral abnormalities of ureter [9]. As per the study of Moore and Persuad, the double ureters may join together before reaching the bladder or remain separate while entering the bladder at two distinct sites [10]. A kidney is the most common points of congenital variations. The birth anomalies of the kidney and urinary tract found approximately 20 to 30% of all embryological variations reported in the prenatal period [11]. During fetal life; smultiple lobulations of kidney are examined [12]. The most of them disappear during the first year of birth. If there is incomplete fusion of developing renal lobules varying degrees of lobulations may occurs in the adult life. The cadaveric study is very important and relevant even in the modern era of imaging techniques. There are studies have shown that patients with an incomplete duplication of ureter are predisposed to ureteroureteric reflux, whereas a complete double ureter is usually associated with vesicoureteric reflux. Secondary to reflux, urinary tract infection (UTI) and obstructive uropathy may occur [13, 14]. Hence, we conclude that incomplete double ureters are diagnostically more significant than complete duplication of ureters due to the complications associated with them. Ureteric injuries are a possible complication of any open or laparoscopic surgical procedure involving the abdomen and pelvis [15]. Varlatzidou et al studied the presence of a complete duplication of ureter as an incidental finding during surgery for colorectal cancer in a female patient [16]. The number of ureter may be duplication which is a defect in development. In the present study 98.75% of specimens showed normal single ureter. Two unusual cases of double ureter one right sided complete and one left sided incomplete double ureters were observed in two of the perinatal female specimens (1.25%) [17]. The congenital variations of the kidney and urinary tract occur in approximately 3.3–11.1% of the population and account for about 50% of all congenital abnormalities [18]. The duplication of the ureter is the frequent variations among congenital abnormalities of the urinary tract and kidneys occurs with the population frequency of 0, 3 to 3, 0%, depending on the data collection methods [19].

CONCLUSION

The knowledge about ureteral duplication is of utmost importance to the urologist, surgeons dealing with kidney retrieval and transplantation, radiologists, persons performing various endourologic procedures and innumerable interventional techniques.In the majority of such situations it is the comprehensive knowledge of the renal arterial variation that remains the key issue in determining the technical feasibility of surgical interventions as well as the post operative management and preventing accidental injury while performing surgery.

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