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Morphological characteristics of the double ureter from its origin up to the end

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ABSTRACT

Duplication of the ureters is a common anomaly and is frequently encountered by radiologists. Duplication may be either complete or incomplete and is often accompanied by various complications. Incomplete duplication is most often associated with ureteroureteral 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, all of which are more common in girls than in boys. Vesicoureteral reflux affects the lower pole

Keywords: double ureter, morphology, anatomical variation

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Introduction

Our results on the morphology of the double ureter were obtained from the study of the upper urinary tract: major and minor calyces, pelvis and ureter. Among the upper urinary system abnormalities that we encountered in this study we quote: duplicity of the pyelo-calyceal system, bifid ureter and double ureter. These morphological variations are closely interrelated; the duplicity of the pyelo-calyceal system is accompanied by bifid or double ureter. The ureteral bifidity and duplicity are relatively rare abnormalities [1], frequently encountered by radiologists [2]. The cases of ureteral duplicity or bifidity with a blind branch are exceptionally rare [1]. According to Gatti [quoted by 3] is more common in women and is associated with ureterocele. The occurrence of these anomalies can be embryologically explained; if the pathological division of the ureteral bud occurs too late, the origin of the division will

not be included within the urogenital sinus and an ureteral bifidity will occur, with a single ureteral orifice in the future bladder trigone. If the division occurs too early, a bifidity occurs and the ureteral division will be incorporated in the posterior face of the urogenital sinus, resulting in an ureteral duplicity, with an opening for each ureter. In this case, the medial rotation of the duplicated ureteral bud will move the cranial ureteral orifice caudally than the caudal ureteral orifice, hence the frequency of clinical vesicoureteral outflows towards the superior pelon within the upper ureteral duplicity [4,5].

Material and Methods

Our cases were described upon the study of the upper urinary system on a number of 264 cases, with 5 cases of double ureter, being discovered by dissection on cadavers and eviscerated samples (1 case) and CT urography (4 cases). CT urography was performed on a GE LightSpeed VCT 64 Slice CT scanner. In cases detected by CT, we also evaluated the ureters ending into the urinary bladder.

Results

Of the 5 cases of double ureter, 4 cases were located on the right and one case on the left. In 2 cases (dissection and CT) the two ureters (both on the right) showed an oblique infero-medial trajet.

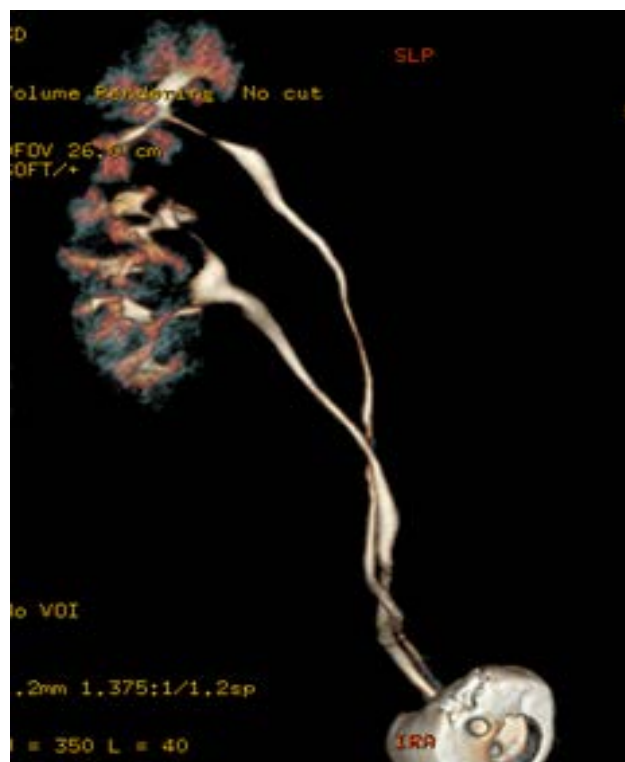


Figure 1 - Right double ureter, with crossed trajet; the upper ureter is initially medial and crosses two times the lower one, first on its posterior face and then on the anterior one.

In one case (by dissection) the ureters were parallel but spaced and in other case the paths were parallel, closed one another, with the superior ureter located medially. In the other three cases, the two ureters were crossed, presenting, in two cases, a double cross and one case with four crosses, the upper ureter describing a spiral around the lower one. In this case the upper ureter was located slightly posterior, initially disposed laterally, and, after four crosses, at the level of the urinary bladder, becoming medial. Among the three cases with crossed ureters, in two cases the upper ureter spiraled around the lower one and only in one case the lower ureter crossed posteriorly the upper one, the latter being a megaureter with sinuous trajectory at the level of the curves and bladder, showing a marked decrease in caliber. Usually, the first crossing of the two ureters is midway kidney – urinary bladder.



Figure 2 - Right double ureter and left bifid ureter. On the right, the upper ureter, sinuous, crosses four times the lower one, up to the level of the urinary bladder. The left bifid ureter confluence is at the mid-distance kidney-bladder.



Figure 3 - Right kidney. Double pyelo-calyceal system and double ureter; the two ureters are parallel and separated one from another. The upper ureter (left) passes posterior to the single renal artery (with the aortic origin above the upper ureter).

In one case the right double ureter was accompanied by a bifid ureter on the left, their confluence being made midway kidney – urinary bladder.

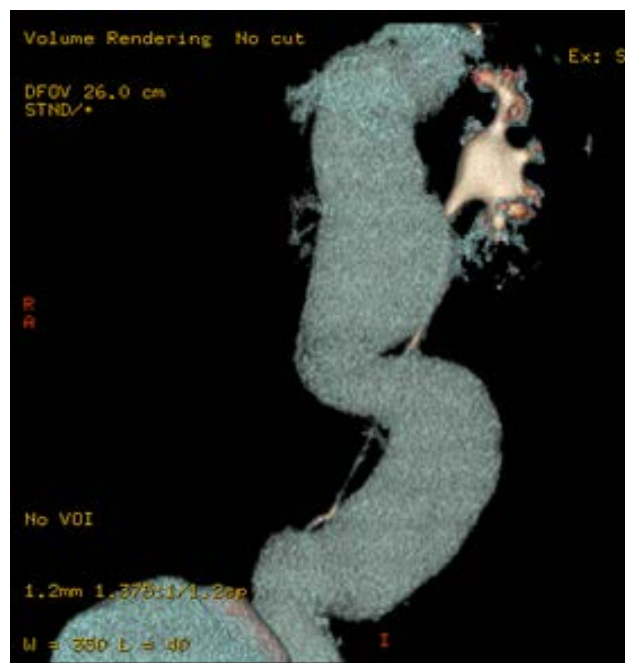


Figure 4 - Left double ureter, with voluminous upper ureter (megaureter), with the origin at the upper renal pole, covering large portions of the straight lower ureter, placed posteriorly.

The ureteral end into the bladder was, in 4 cases, on the supero – lateral side of the posterior face and in one case on the infero – lateral side of this surface, where the upper ureter ended above about 1 cm, but on the same vertical line with the end of the lower ureter. Next to the bladder, the two ureters showed a closed, parallel trajet, either vertically or obliquely infero - medial. The termination of the two ureters was described with three variations: a. in two cases they opened one above the other (on the same vertical line) closer or farther apart, while the opposite ureter opened on the transverse line crossing the ends of the double ureters; b. in one case the two ureters ended at the same level, one medial and one lateral; c. also in one case, the two ureters ended one supero- medial and the other infero-lateral.

In our study, among the five cases described, we encountered one case of double ureteral duplicity

(0.38% of cases), which one was complete on the right side (double ureter) and an incomplete (ureter in Y) on the left.



Figure 5 - Posterior view. Both ureters end one above the other on the supero-lateral part of the posterior wall of the urinary bladder; the upper ureter ends above the lower one. The left ureter ends into the bladder on a transverse plane that passes mid-distance between the ends of right ureters.



Figure 6 - Posterior view. Behind the bladder the two ureters showed a parallel trajectory, oblique infero-medially; both ureters end onto the infero-lateral side of the bladder, one above the other.

Discussions

Although frequently the ureteral duplicity progresses asymptotically, according to [2] it can be associated, when incomplete, with uretero-ureteral reflux or uretero-pelvic junction obstruction, and if the duplicity is complete and with vesicoureteral reflux, with ectopic ureterocele or ectopic ureteral insertion.

The ureteral duplicity coexist with pyelocalyceal duplicity, with two variations: single, large renal hilum or, rarely (we met one case only) or a double renal hilum, when the formation of both ureters is always extrarenal, a variation reported by [1].

The ureteral bifidity and duplicity are relatively rare ureteral abnormalities: 0.65% of 51880 autopsies [6] and 1.8% of 5196 urographies [Privett, quoted by 1]. [7] noted a frequency of 0.1-3% and Nation [cited by 7], on 16000 autopsies, founds 109 cases of ureteral duplicity (0.68% of cases). Among the data in the literature, [8] described 18 cases of kidney with double ureter, using as study methods the pyelography and corrosion.

So our only percentage for the ureteral bifidity (1.89% of cases) is higher than in literature, compared to that of [7] by 1.24%, to Nation [cited by 7] with 1.21% and greater than that encountered by Privett [quoted by 1] with only 0.08%. According to [1] are exceptional cases of ureteral duplicity or bifidity with a blind branch. The two ureters will drain each a proper number of renal segments but drainage of a common segment it may appear (when upper ureter is formed of 2 or 3 calyces), an aspect mentioned by [1]. [4 and 5] states that, in rare cases, while one ureter ends into the bladder, the other may end in the vagina, urethra, vestibule or epididymis. This is due to the fact that while one of the buds has a normal situation, the other is moving down along with the mesonephrotic duct, thus explaining its ectopic end.

Conclusions

The variability of the anatomical aspects and variations of the upper urinary system shows a major surgical importance, both for the renal transplant (mostly in duplicity) but also for segmental nephrectomy or pyelotomy.

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