

CASE REPORT

Ureter Triplication with Contra-Lateral Partial Duplex System

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SUMMARY

Ureteral triplication is a rare congenital anomaly of the urinary tract. We report a case of ureteral triplication with contra-lateral partial kidney duplication in a patient with right loin pain. The development and types of ureteral triplication and the features of type 2 ureteral triplication on Intravenous Urography and Magnetic Resonance Urography are described.

KEY WORDS:

Ureter triplication, Intravenous Urography, Magnetic Resonance Urography

INTRODUCTION

Triplication of the ureter can be bilateral or unilateral. In unilateral cases, the contra-lateral kidney may have complete duplication, partial duplication or quadruplication. Radiological investigations help to identify the anomalies and the course of the ureters. Unlike complete duplication, most cases of ureter triplication do not follow the Weigert-Meyer law.

CASE REPORT

A 45 year-old man was referred from the surgical unit for an Intravenous Urogram (IVU). He had right loin to groin pain which was associated with microscopic haematuria for two weeks. He also had history of passing out calculus a week before. A Kidney-Ureter-Bladder (KUB) radiograph and Ultrasound (US) KUB scan were done prior to the IVU. The KUB radiograph was normal. The US scan showed mild dilatation of the right pelvicalyceal system and no renal calculus. The urine microscopic examination revealed minimal red blood cells.

The IVU was performed after intravenous injection of 90ml of 300mg I/ml Iohexol (Omnipaque). The left pelvicalyceal system had three separate moieties with three separate ureters. The upper moiety ureter united with the middle moiety ureter at the third sacral level to form a single ureter before insertion into the bladder. Within the pelvic cavity, the lower moiety that was more medial than the two other ureters; turned laterally and had a more inferior insertion into the bladder. There was no hydronephrosis and hydroureter. The right pelvicalyceal system was separated into the upper and lower moieties which unite at the renal hilum forming a single ureter (Figure 1).

Magnetic Resonance Urography (MRU) was done for the assessment of the individual ureters because of the ability to

produce images in multiple projections. The MRU was done using a 1.5T MR scanner (Gyrosan Intera, Philips Medical Systems). The scanning started with localizing sequences followed by heavily T2-weighted sequences before intravenous injection of furosemide (0.3 ml/kg) to dilate the collecting system. Gadolinium-DTPA (0.1ml/kg) was injected after two minutes of diuretic injection. Coronal scanning was performed using three-dimensional gradient-echo (3D-GRE) T1-weighted sequences at 15 seconds, 1, 2, 3, 5, 10, 15 and 20 minutes. The multislice heavily T2-weighted and 3D-GRE-T1-weighted images were converted by a maximum intensity projection (MIP) technique. The MRU revealed partial duplication of the right kidney and triplication of the left kidney. The course of lower moiety ureter and the fusion of upper and middle moiety ureters were similar as in IVU (Figure 2).

DISCUSSION

Ureter development starts as early as the fourth week of gestation. The ureteric bud arises as a diverticulum from the Wolffian duct and invades the nephrogenic blastema. The ureteric bud divides and branches to form the renal collecting system from the ureteric orifice to the collecting system of the kidney. Ureteral triplication might occur from the presence of three ureteral buds that arise independently from the Wolffian duct or early fission of one of the buds.

Triplication of the ureter is an extremely rare congenital anomaly. The first description was by Wrany in 1870 and a few types have been reported in the literature. Traditionally ureteral triplication has been classified into four subtypes by Smith: three ureters and three ureteral orifices (triple ureter), three ureters and two ureteral orifices (double ureter with one bifid), three ureters and one ureteral orifice (trifid ureter), and two ureters and three ureteral orifices (double ureter with inverted Y bifurcation of one ureter)¹. Our case is type 2 triplication.

In duplex system, the kidney contains two pelvicalyceal systems with single or bifid ureters (partial duplication) or two ureters that empty separately into the bladder. In complete duplication, by following the Weigert-Meyer law, the ureter from the upper pole usually inserts more medially and inferiorly than the ureter from the lower pole which drains superiorly into the bladder. In triplication, this principle does not uniformly apply^{1,2}. The lower pole ureter in our case did not conform to the principle. It is inserted more inferiorly than the other ureter.

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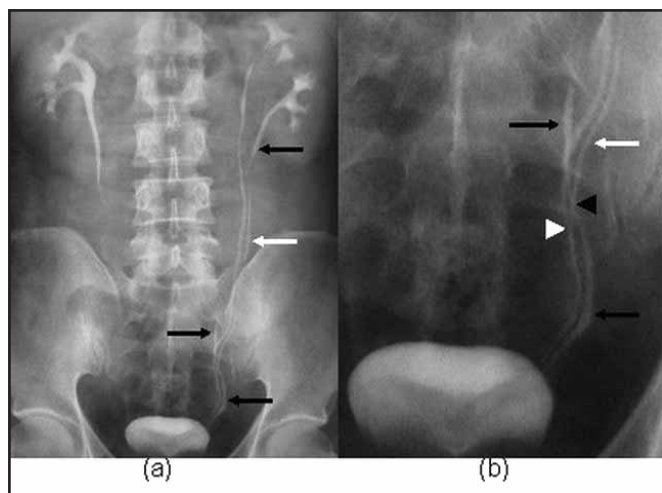


Fig. 1 (a) and (b):
5 minutes IVU film with enlarged view of pelvis. The right kidney has partial duplex system. Three ureters originate from the left kidney. The lower moiety ureter (black arrow) turned laterally at S3 (black arrow head). The upper moiety and middle moiety (white arrow) ureters merged at S3 (white arrow head)

Ureteral triplication is diagnosed incidentally during radiological examinations. Most patients are asymptomatic and common symptoms are abdominal pain, fever and haematuria. The age of presentation varies from toddler to adult. Triplication may be associated with urinary tract calculi, infection, obstruction, reflux and recurrent acute epididymitis. It was reported that ureteral triplication occurs more commonly in females. Our patient had no symptoms on the left side and he was treated conservatively and the haematuria had resolved at follow-up.

MRU is an emerging technique of MRI which provides a non-invasive visualization of the urinary tract. MRU can produce high-quality images and in multiple projections without the use of ionizing radiation. The course of the individual ureters and the level of fusion are better visualized and the type of

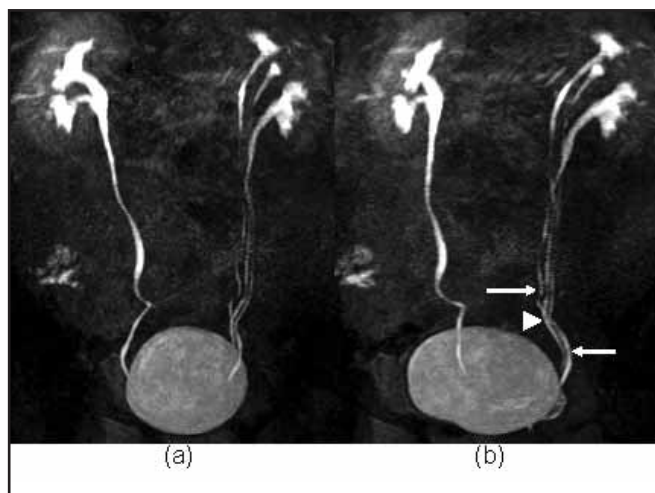


Fig. 2 (a) and (b):
MRU with MIP images. The site of upper and middle moiety ureters merged in the pelvis (white arrow head). The lower moiety ureter (white arrow) inserts more inferiorly into the bladder

triplication is easily determined. Previously, MRU was based on the static fluid in the urinary tract which exhibits higher signal intensity relative to the background. With the use of diuretic and contrast media, MRU can provide excretory functional information of the kidney as well as the morphological information³.

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