Bilateral triple renal pelvis: A case report

Obostrani trostruki pijelon

Tomislav Pejić*, Miodrag Aćimović*, Zoran Đazmić‡, Helena Maksimović‡, Biljana Marković‡, Jovan Hadži-Djokić§

*Urological Clinic, ‡Center for Radiology and Magnetic Resonance Imaging, Clinical Center of Serbia, Belgrade, Serbia; †Faculty of Medicine, University of Belgrade, Belgrade, Serbia; §Serbian Academy of Sciences and Arts, Belgrade, Serbia

Abstract

Introduction. Triple renal pelvis is an extremely rare variation of the renal collecting system. To the authors’ knowledge, bilateral triple renal pelvis has not yet been described in the literature. Case report. A 55-year-old man was hospitalized due to papillary bladder cancer, detected on ultrasonography. As incidental finding, intravenous urography revealed bilateral triple renal pelvis. Six weeks after transurethral resection of the bladder tumor (TURB) the patient was admitted again, for the second TURB. Computed tomography-urography confirmed the presence of bilateral triple renal pelvis. Conclusion. The unique case of bilateral triple renal pelvis was presented as an extremely rare variation of the renal collecting system.

Key words: urinary tract; congenital abnormalities; diagnosis.

Introduction

The prevalence of congenital anomalies of the kidney and urinary tract (CAKUT) in children is relatively high, 0.3–0.96% 1, 2. In the prenatal period, CAKUT comprise about 20–30% of all identified anomalies 3. The most frequent CAKUT in children are vesicoureteral reflux (VUR) and ureteropelvic junction (UPJ) obstruction.

All CAKUT can be anomalies of the kidney (anomalies of the number, ascent, rotation, form and fusion, anomalies of renal vasculature), anomalies of the renal collecting system (RCS) and anomalies of the ureter and the lower urinary tract.

The most common anomalies of the RCS are: absent, rudimentary, double or multiple pelvis, intrarenal and extrarenal pelvis, congenital hydronephrosis and diverticulum of the pelvis, which can occur unilaterally, or bilaterally 4. The prevalence of unilateral duplex kidney is 1.8%, while the prevalence for bilateral condition is 0.3% 5. Some of the anomalies of RCS are associated with the organ dysfunction, while other can be considered as anatomical variations 6.

The variations of the collecting system development can be explained by various embryological events; at the 4th week of gestation, ureteric buds grow from the distal portion of the nephric or Wolffian duct and come in contact with the metanephric mesenchyme. This contact induces the so-called mesenchymal-epithelial interaction in which the metanephric mesenchyme induces the ureteric bud to branch and divide. In the same time, the ureteric bud induces the metanephric mesenchyme to induce the formation of nephrons. From the 20th to the 22nd week, ureteric bud branching is completed. After that, peripheral branch segments extend to form the collecting ducts. From the 22nd to the 24th week, the central segments of the collecting system continue to grow and dilate, forming the renal pelvis and calyces.

The duplication of the renal pelvis might be the result of early beginning of ureteric bud branching (pyelum fissus);
in some cases, the ureteric bud branches very early, so the two ureteral buds are moving toward the metanephric blastema (ureter fissus) (Figure 1). If the two ureteric buds arise from the nephric duct, the result is complete duplication, or a duplex renal pelvis with two separate ureters (Figure 2). The triplication of renal pelvis is the result of the additional division of the ureteric branches that make the renal pelvis. This variation is known as triple or trifid renal pelvis and it is extremely rare.

Case report

A 55-year-old man from southern Serbia was hospitalized due to a 2 cm large papillary bladder tumor, detected on ultrasonography. As incidental finding, intravenous urography (IVU) revealed a bilateral triple renal pelvis. The patient underwent complete transurethral resection of bladder (TURB) tumor, located on the bladder base, on the left side. The pathological examination confirmed low grade transition cell cancer (TCC), stage T1. Six weeks after TURB, patient was admitted again, for second TURB. Computed tomography-urography confirmed the presence of bilateral triple renal pelvis (Figure 3).

Discussion

Current classification of RCS branching variations makes a difference between terms “duplex kidneys” and “duplex RCS” 8. Duplex kidney denotes two separate pelvicalyceal systems, while duplex RCS denotes pelvicalyceal systems which can drain into single, bifid or two separate ureters. Two RCSs can join at the level of the pelviureteric junction and drain into the single ureter (bifid pyelon, or pyelon fissus); bifid ureter, or ureter fissus, denotes the two ureters that unite.
proximally to the bladder. Double RCS denotes the two pelvicalyceal systems with the two separate ureters that open separately in the bladder (complete duplication).

The duplex kidney has nine times higher risk for developing pelvicalyceal dilation and chronic pyelonephritis, than the non-duplex kidney. This could be explained by the higher prevalence of reflux in patients with duplex kidneys in the childhood. In adults, duplex kidney is seldom associated with pathological conditions. In some cases, urine can move from one branch to another, producing the phenomenon, called “yo-yo” effect or “saddle reflux”. It is possible that this phenomenon can sometimes be associated with the flank pain 9.

The etiology of duplex or multiple RCS is still poorly understood, as in all CAKUTs. It is clear that it is associated with the pattern of the ureteral bud branching, in various branching generations. However, exact signalling pathways that determine the branching morphogenesis of the ureteric bud during the mesenchymal-epithelial interaction are still unclear. It is possible that the most important signalling for ureteral branching is bone morphogenetic protein-activin like kinase 3 (BMP-ALK3) signalling 10. The pattern of ureteric bud branching depends on ALK3: activation of ALK3 induces bifid ureteric branching, while inactivation of ALK3 promotes trifid branching and increases the number of first and second-generation branches 11,12.

It is known that a variety of CAKUTs share common genetic etiology; the gene encoding the nuclear steroid hormone receptor ESRRG is a candidate gene for CAKUT 13.

From the clinical point of view, anomalies like duplex or multiple RCS are significant only if they are associated with some pathological conditions; in their absence, they may be considered as anatomical variations. Generally, complete RCS duplicity may be associated with VUR and dilated pyelocalyceal system, while partial RCS duplicity is usually of no clinical significance.

Triple renal pelvis was described for the first time by Feilden 14 in 1929. So far, only few cases have been published, describing triple renal pelvis associated with UPJ, double ureters and solitary kidney 15,17. In the presented case, the right kidney was hypoplastic, probably due to a common genetic cause that led to RCS triplicity. Also, there is a possibility that the patient had transient VUR and/or pyelonephritis in the early childhood.

Conclusion

Triple renal pelvis is an extremely rare variation of the renal collecting system. Like the other cases of partial renal collecting system duplicity/multiplicity, it is seldom associated with pathological condition in adults. However, if associated with vesicoureteral reflux or pyelonephritis in the early childhood, it can be followed by renal function impairment. The presented case is interesting because to the authors’ knowledge, bilateral triple renal pelvis has never been described in the literature before.

REFERENCES

7. Wein AJ, Kavoussi LR, Novick AC, Partin AW, Peters CA. Cam-
12. Hindryckx A, van Hoock K, de Catte L. Embryology of the urogenital tract and antenatal diagnosis of urorinary tract malforma-
17. Kumar G-A, Nertil RB, Desaiji S, Hiremath MB. A trifid pelvis in a patient with a solitary kidney with LUTS: An unusual presen-

Received on November 14, 2013. Accepted on December 19, 2013.