Rare association of fetal posterior urethral valve with ureteric stricture

Mandakini Pradhan
Neeta Singh
Asha Kumari Singh
Neeraj Kumari

Department of Maternal and Reproductive Health, Sanjay Gandhi Post Graduate Institute of Medical Sciences, Uttar Pradesh, India

Corresponding author:
Mandakini Pradhan
Department of Maternal and Reproductive Health, Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow 226014. Uttar Pradesh, India
E-mail: mandakini_pradhan@rediffmail.com

Summary

Background: Amongst the various causes of obstructive uropathies, pelviureteric junction obstruction, bilateral ureterovesical junction obstruction and vesicoureteral reflux are common. The association of posterior urethral valve and ureteric stricture has not been reported so far.
Case: We report a rare case of fetal obstructive uropathy presenting as combination of ureteric stricture with posterior urethral valve and its consequences like cystic dysplastic kidneys and urinoma.
Conclusion: Combination of urinary malformation may be due to basic primary pathology and its secondary consequence at a distant site.

Key words: ureteric stricture, posterior urethral valve, urinoma.

Introduction

Neonates with end stage renal failure are born mostly with abnormal kidneys with fetal obstructive uropathy accounting for half of the cases. Various causes of obstructive uropathies include bilateral pelviureteric junction (PUJ) obstruction, bilateral ureterovesical junction obstruction, vesicoureteral reflux, duplex collecting system and posterior urethral valve (1). Posterior urethral valve (PUV) is most common specific diagnosis of lower urinary tract obstruction and is confined to boys (2). Ureteric stricture is a rare malformation with only four case reports in association with different urinary tract malformations. We report a case having combination of posterior urethral valve and ureteric stricture which has never been reported and discuss the possible etiologies.

Case report

A 26 year female (G3P1) was referred to Maternal and Reproductive Health Department of Sanjay Gandhi Post Graduate Institute of Medical Sciences at 20 weeks of gestation for ultrasonography (USG). She had no prior USG done. Her antenatal period, family history and past history were non-significant and couple was non-consanguineous.
USG at our hospital showed single live fetus of corresponding growth with severe oligohydramnios. Right fetal kidney showed features of grade III hydronephrosis. Left kidney showed a hypoechoeic lesion of 4.45 cm x 3.7 cm at upper pole suggestive of solitary renal cyst. Renal parenchyma of that side could not be visualized. Urinary bladder was dilated with wall thickness of 3 mm and 'keyhole sign' suggestive of dilated upper urethra (Fig. 1).
Couple was counseled about fetal prognosis and possible management options and they opted for termination of pregnancy. A 500 gm male fetus was delivered with no gross external congenital malformation. Gross examination of right kidney showed multiple small cysts on outer and cut surface. Left renal tissue was compressed and was connected with a cystic mass at its upper pole measuring 5.5 cm X 4.0 cm X 3.5 cm distended with clear fluid. Multiple small cysts were seen in the compressed renal parenchyma. Bilateral pelvicalyceal system and ureter were dilated. Upper part of left ureter showed a stricture at mid level. Urinary bladder was distended with thickened wall. Posterior urethral valves were identified in the membranous urethra (Fig. 2).
Microscopic examination showed multiple cysts with flattened epithelium and dysplastic tubules surrounded by immature mesenchyme. The stricture site showed sub epithelial and intramural fibrosis. Urinary bladder wall was thickened with fibrosis in lamina and muscle layer. All other organs were grossly and microscopically unremarkable (Fig. 3).

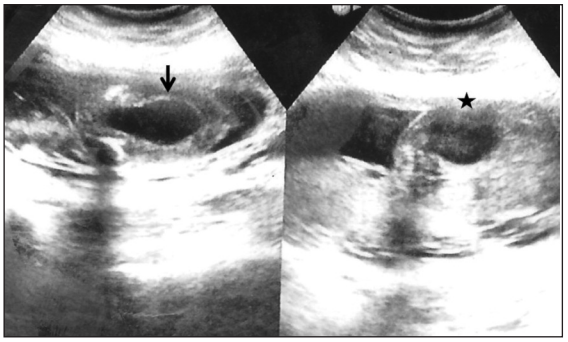

Figure 1. Ultrasound images of fetus showing dilated urinary bladder with key hole sign (↓) and urinoma (*).

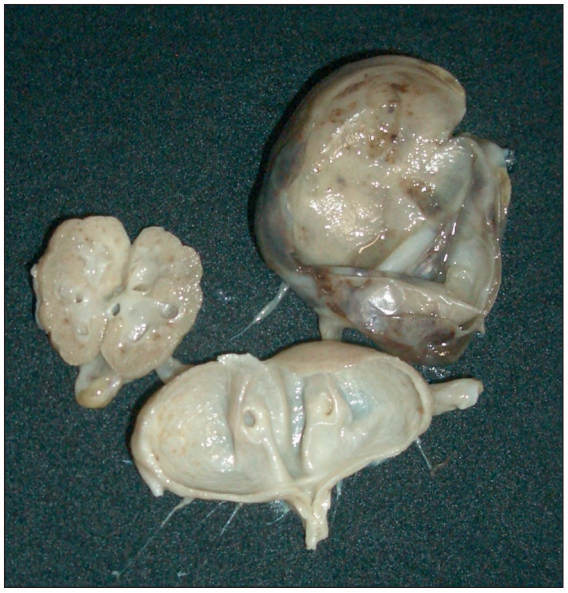

Figure 2. Gross photograph showing both kidneys and urinary bladder. Right kidney (RK) shows numerous small cysts on cut section. Left kidney is larger and shows opened up urinoma (LK with urinoma). Urinary bladder (UB) is enlarged with dilated ureteric openings and thickened ureter.

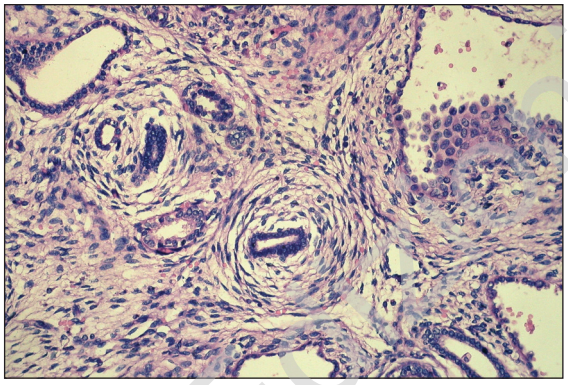

Figure 3. Microphotograph of kidney showing dysplastic immature tubules surrounded by mesenchymal collar. (Hematoxilin and eosin stain. 40X Magnification).

Radiological examination of fetus did not show any skeletal abnormality. Chromosomal analysis revealed normal male karyotype. Final diagnosis made after postmortem examination was posterior urethral valve with left sided ureteric stricture and urinoma with bilateral hydronephrosis.

Discussion

Human kidneys develop from metanephric blastema, differentiation of which is induced by the ureteric bud at 4 weeks of fetal life. Progressive growth and differentiation of metanephric blastema leads to formation of proximal tubule, loop of Henle and convoluted tubule.
On the other hand metanephric blastema induces development of ureteric bud which forms collecting tubules, minor calyces, renal pelvis and ureter. Urinary bladder is derived from anterior urogenital sinus and urethra develops from the caudal part of the sinus.
Depending on the time of insult during nephrogenesis, posterior urethral valve can lead to multicystic dysplastic kidney if insult occurs before 20 weeks and hydronephrosis if insult occurs at later stage. Sometimes due to backpressure, there can be extravasation of urine in perinephric space leading to the formation of urinoma.
Posterior urethral valve (PUV) is the most common cause of severe obstructive uropathy in fetus accounting for 9% of cases of fetal urinary obstruction. Though the approximate incidence of PUV is 1/5000-8000 live born fetus, the exact etiology of this condition is still eluding. One of the theories is anomalous insertion of mesonephric conduit in cloaca (3). PUV may be a part of various syndromes or may be due to chromosomal abnormalities in the fetus (4).
Urinoma are uriniferous perirenal pseudo cyst usually formed as pop off mechanism in obstructive uropathies and have been identified in 3-17% of neonates with posterior urethral valves (5). They can be of sub capsular or intra-renal type and localized or diffuse type. In the present case it was localized type. But there are case reports of presence of urinoma without obstruction either as a complication of amniocentesis or of unclear etiology (6).
Ureteral stricture is a rare congenital malformation caused either due to an ischemic damage or delay in canalization of ureter. Congenital ureteric stricture have been reported to be associated with other renal abnormalities like solitary kidney, contralateral blind ending ureter, midureteric stricture in an ectopic ureter of a duplex system and contralateral multicystic dysplastic kidney (7). However there is no report of its association with PUV.
The molecular interrelationships governing evolution and progression of obstructive uropathy involve fine balance between stimuli and inhibitors of inflammation, apoptosis and fibrosis (8). Obstructive uropathy leads to deregulation of cell turnover with enhanced proliferation in cystic epithelium associated with expression of PAX-2, BCL-2 and hepatocyte growth factor receptor expression and transdifferentiation of surrounding mesenchyme under influence of transforming growth factor β_1 into smooth muscle instead of forming nephrons (9). Generation of reactive oxygen species (ROS) in the kidney subjected to upper urinary obstruction (UUO) aggravates renal apoptosis while administration of exogenous antioxidants attenuates tubular apoptosis (10). Chronic UUO increases renal expression of tumor necrosis factor α (TNF-α), FAS ligand and caspase activity, all of which promote apoptosis. Human renal tubular cells subjected to mechanical stretching undergo caspase-dependent apoptosis (11). These findings suggest that fate of tubular cells in obstructive uropathy is determined by balance between survival and death signals, and that therapies designed to favor cell survival may improve renal outcome (8). Early diagnosis by antenatal ultrasound and developments in surgical technique may improve the final outcomes of fetuses affected by PUV (12).

Conclusion

Combination of urinary malformation may be due to ba-

sic primary pathology and its secondary consequence at a distant site. A combination of PUV with ureteric stricture and its consequences like cystic dysplastic kidney and urinoma is being reported for the first time which may point towards the theory of fetal urine flow impairment causing deregulation of renal precursor cell turnover and expression of growth factor/survival and transcription factor genes. This can lead to non/delay in canalization of fetal ureter.

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