A Child with Recurrent Urinary Tract Infection: Case Report

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ABSTRACT

Introduction: In paediatric practice, the underlying anatomical abnormalities of urinary tract need to be considered in recurrent urinary tract infection.

Case Report: A 5 year old girl presented with recurrent urinary tract infection. Ultrasonography revealed rounded anechoic lesion at the vesicle base continuous with dilated tubular structure inferolaterally to the left side of bladder suggestive of ectopic ueterocele. Intravenous urography demonstrated only two normal major calyxes with obliterated upper moiety calyx of left kidney and ectopic alignment of left ureter into the distended bladder. The cystic SOL in left inferolateral aspect of bladder was detected in CT scan. Upper moiety of left kidney was noted to be separated from the remaining left kidney by fat plane. Combination of radiological features suggests underlying duplex kidney, duplex ureter and ectopic ureterocele in this patient.

Conclusion: It is important to correlate the radiological findings systemically and logically to get the correct diagnosis of urinary tract abnormalities in paediatric practice.

Keywords: Urinary tract infection, Duplex kidney, Duplex ureter, Ureterocele

Introduction

Urinary tract abnormalities in cases of urinary tract infection are common in pediatric practice. Imaging is important to identify the underlying urinary tract abnormalities. This report presented a case of urinary tract infection with urinary tract abnormalities where imaging diagnostic decision making was not straightforward even with high index of suspicion according to theoretical knowledge.

Case Report

A 5 year old preschool girl presented with symptoms of recurrent urinary tract infection, confirmed by laboratory investigations (urine RE, Culture & Sensitivity). She had an Ultrasound Scan done at a private clinic. It showed anechoic cystic lesion in the upper pole of her left kidney. She was then referred to our radiology department for IVU.

At our department, standard IVU examination was done which showed equal nephrogram phase on both side. Calyxal forixes were sharp and extrarenal pelvis
(dilated pelvis outside the renal sinus) was noted on right side. Full bladder showed rounded filling defect in the neck of the bladder. But micturating cystogram and post micturating film showed no more evidence of filling defect. So US scan was repeated and rounded anechoic lesion noted at the vesicle base but it was continuous with dilated tubular structure inferolaterally to the left side of bladder and impressed as ectopic ureterocele of left ureter without duplication which prompted for subsequent cystoscopy. But it did not provide significant information. NECT spiral scan of abdomen and pelvic examination was done 2 days after cystoscopy and showed dilated tortuous structure as multiseptated cystic mass within the pelvis that protruded into the bladder from left side inferolaterally and it was continuing upward as rounded hypodense structure and, two rounded hypodense structure were visualized at the level of renal hilar, one was entering into the renal hila and the other was continuing upward to enter the upper pole of left kidney which also noted as cystic SOL like area. After reviewing the NECT scan, additional diagnosis was left ectopic ureterocele with duplex ureter and highly suspicious duplex left kidney that was obstructed.

After the first visit, the symptoms of urinary tract infection were relieved with antibiotic therapy according to C&S. But three month later, she had the symptoms of urinary tract infection such as dysuria and frequency and we reviewed the urinary tract studies to detect the classical cobra head appearance, duplication of ureter, drooping lily sign, etc in IVU, for showing accurately the duplication of collecting system. After the case discussion, we decided to repeat US, IVU and CT examinations. Additional information obtained from the examination were upper moiety calyx of left kidney was obliterated in IVU. Only two major calyxes were seen in left kidney which appeared normal. Ectopic alignment and insertion of normal size left ureter into the distended bladder was noted. Delayed IVU film was taken at 70 min and 8 hrs after contrast injection. The left upper moiety renal outline and pelvicalyceal system were faintly opaque in delayed IVU films. Contrast excretion into upper moiety of hydronephrotic pelvicalyceal system of left kidney was also detected in 70 min film after contrast CT scan. The density of upper moiety hydronephrotic calyx of left kidney was ~14 HU before contrast injection and 61 to 93 HU after 70 min of contrast injection. There was a thin fat plane between upper moiety renal tissue and remaining normal left kidney on coronal reconstruction images. The cystic SOL in left inferolateral aspect of bladder was also detected in CT scan. The SOL was continuous with tortuous hypodense tubular structure in left side of pelvic cavity, consistent with left hydroureter. The fluid density of the SOL was 1 to 5 HU before contrast injection and 45 HU in 70 min after contrast injection (35 HU in 8 hrs after contrast injection). The size of intravesicle SOL was changing, and gradually smaller along with bladder distension. The SOL, causing filling defect in the bladder, became obliterated in full bladder phase of IVU and micturating phase of IVU. The final impressions after reviewing the above radiological findings were:

- Duplex left kidney & Duplex left ureter.

- Ectopic insertion of normal size lower moiety ureter of left kidney.

- Hydronephrotic upper moiety kidney of left side.
-Ureterocele formation with tortuous hydroureter of upper moiety kidney on left side.

Discussion

Urinary tract infection (UTI) is common, accounting for 5% of febrile illness in childhood. It is recognized that although most children have an excellent prognosis following a single episode of UTI, those with associated abnormalities of the urinary tract are at increased risk of developing hypertension and chronic renal failure in later life. Urinary tract infection is an important indicator of underlying renal tract abnormality. Therefore there has been much debate as to the appropriate imaging protocol in this group of patient. M.J.Brindle mentioned that a protocol for the radiological investigation of children with urinary tract infection was introduced for a district general hospital in 1985. According to that protocol, every boy and every girl under 5 year was investigated after one documented infection and every girl over 5 years after two infections. A.M.Barnacle and K.McHugh also suggested that renal US is performed in all children with acute UTI as soon as possible following infection.

The urinary tract ultrasonography in our case showed anechoic lesion in upper pole of the left kidney but protruding rounded cystic SOL into the bladder was not detected at the first time in private clinic. However, subsequent IVU examination was suggested to detect other associated anomalies. At the first visit in our department we found the non contrast filling of rounded SOL in the neck of bladder area that disappeared during voiding and post-voiding films. We also performed US scan during IVU study which gave additional information of the presence of cystic SOL in bladder which was continuous with echolucent tubular structure, most likely dilated distal one third of the ureter. On spiral CT we also found hydronephrotic upper moiety of left kidney that was separated from the remaining left kidney by fat plane and it became more favorable for the diagnosis of duplex kidney with duplicating collecting system and ectopic ureterocele on the left side.

Ectopic ureterocele is a ureteral bud arising in an abnormal cephalad position from the mesonephric duct and moving caudally resulting in an ureteral orifice distal to trigone within or outside the bladder. Such ectopic ureteroceles are usually associated with partial or complete ureteral duplication. They are frequently symptomatic, and more commonly discovered in children. Prevalence of complete duplication of ureter is 0.2% of live births whereas male to female ratio is 1: 2 and 15-40% is bilateral. This may present with urinary tract infection, failure to thrive, abdominal mass, haematuria, or symptoms of bladder outlet obstruction.

In this case, the child presented with recurrent symptoms of urinary tract infection such as frequency and dysuria, and diagnosed as ectopic ureterocele by US, IVU, spiral CT scan examination. USG features showed cyst within a cyst appearance in bladder neck and it was continuous with dilated distal ureter. Its size was changing as a result of emptying and filling due to peristalsis. It was not seen in post voiding scan. Similarly, IVU also showed the filling defect in bladder, which could be detected apparently in early films but could not be seen in voiding and post voiding. Ectopic alignment of left lower moiety ureter in IVU may be due to dilated torturous distal part of left upper moiety ureter. But insertion point of left lower moiety ureter into the bladder could not be seen clearly.
Vesicoureteric reflux was not found in this case. Typical appearance of cobra head in bladder, obviously visible double ureter, spiral course of ureter and gross renal enlargement are not clearly depicted in this case.

The reported case of ureterocele with other urinary tract anomalies, is unusually found in practice and, presented with recurrent UTI without typical imaging appearance which had made a diagnostic problem. It had led to do unnecessary further investigations to get additional information.

Actually there were significant amount of radiological features to emphasize for the diagnosis of duplex kidney, duplex ureter and ureterocele in this case. For example,-

- The increase in distance from top of nephrogram to collecting system; mass in the upper pole caused by hydronephrotic upper pole moiety, diminished number of calyces compared to normal side were clearly seen on reviewing the case on second visit.

- Disappearing or effacement of ureterocele in bladder was more marked as increasing bladder distension could be realized in this case. The ureter itself has peristalsis movement which can alter in size. Furthermore, ureterocele may reduce in size when intravesicle pressure increases. Therefore we could not see the filling defect on micturating and post micturating films.

Although there was duplex ureter in this case, conventional IVU study could not depict two ureters on the left side because of poor function of upper moiety leading to unequal opacification of ureters simultaneously. The HU values detectable in CT scan helped to make the decision of presence of duplex ureter. Similarly, the fine fat plane in between the upper moiety and remaining left kidney detectable on coronal reconstruction images of CT scan made us easy to conclude the diagnosis of duplex left kidney. Because of very low opacification of upper moiety ureter, cobra head appearance could not be found in IVU.

The main objectives of reporting this case are to realize the underlying pathophysiology of the disorder and the anatomical location of the structures, to consider and correlate the radiological features systemically as well as logically to get the correct diagnosis, not to miss the diagnosis even without seeing the classical radiological appearances (eg. Cobra head appearance in IVU for diagnosis of ureterocele), and to look for other supporting features on further imaging modalities which can help us on the way to diagnosis.

Conflict of Interest: None declared.

References


**Figure (1) USG (Pelvis)**
Figure (2)  20 min IVU

1- Increase distance from upper pole of left kidney to its visible calyceal system
2- Faintly opaque upper moiety of left kidney
3- Reduced in number of major calyces compared to the other side
4- Ectopic alignment of normal size lower moiety ureter
5- Filling defect in the base of the bladder
Figure (3)  Micturating film shows disappearance of cystic SOL
Figure (4) (5) NECT scan shows rounded hypodense SOL like area noted in upper moiety of left kidney (arrows) and more or less rounded filling defect in left inferolateral aspect of bladder
Figure (6) (7) Upper moiety of left kidney that was separated from the remaining left kidney by fat plane (arrow) and contrast excretion into left upper moiety calyceal system.