Clinical note

Follow-up $^{99m}$Tc EC renal dynamic scintigraphy and DMSA-III SPECT/CT in unmasking a masqueraded case of Horseshoe kidney

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A B S T R A C T

Hydronephrosis is a common finding in urinary tract outflow obstruction. Chronically obstructed hydronephrotic system may be associated with parenchymal changes. Ultrasound, intravenous urography, micturating cysto-urethrogram and scintigraphy are commonly performed to evaluate the cause of obstruction. In childhood, pelviureteric junction obstruction is a common cause of the hydronephrosis. Hydronephrosis can also be present in horseshoe kidneys due to poor drainage. However, a large sized hydronephrotic cavity may obscure the finding of horseshoe kidney. A case was reported, and it was diagnosed as horseshoe kidney on follow-up renal dynamic scan and confirmed with the help of dimercaptosuccinic acid SPECT/CT.

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Seguimiento mediante gammagrafía renal dinámica con $^{99m}$Tc-EC y SPECT/CT con DMSA III para desenmascarar un riñón en herradura

R E S U M E N

La hidronefrosis es un hallazgo común en la obstrucción del tracto urinario. La obstrucción crónica del sistema urinario puede llevar asociados cambios en el parénquima renal. La ecografía, la urografía intravenosa, la cistouretroentografía miccional y la gammagrafía renal se realizan habitualmente para evaluar la causa de la obstrucción. Durante la infancia, la obstrucción de la unión pelvouretal es la causa más común de hidronefrosis. La hidronefrosis también se puede presentar en los riñones en herradura debido a un drenaje urinario escaso. Sin embargo, la presencia de una gran cavidad de hidronefrosis puede oscurecer el hallazgo de un riñón en herradura. Presentamos un caso clínico de un riñón en herradura detectado en el seguimiento mediante gammagrafía renal dinámica, y confirmado con la ayuda de la SPECT/TC renal con ácido dimercaptosuccínico.

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Introduction

Pelviureteric junction obstruction (PUJO) is a common cause of the hydronephrosis. PUJO can occur in any pediatric age group. Definitive cause of obstruction remains indefinable despite investigations. Early detection and proper management of hydronephrosis may improve the long term prognosis. Ultrasonography (USG) is the earliest and commonest modality to assess the hydronephrosis. Intrinsically PUJO commonly caused by vessels (normal or abnormal) crossing anteriorly to the PUJ or proximal ureter. Horseshoe kidney is the other anomaly which can produce hydronephrosis due to poor drainage however, they are commonly asymptomatic. Intravenous urography, computed tomography scanning, magnetic resonance imaging, and scintigraphy depict horseshoe kidney with a high degree of accuracy.

Case report

A 4-year-old boy presented with left flank swelling for 4 months and slowly increasing in size. He had a history of difficulty in voiding but no dysuria, hematuria and pyuria. On abdominal examination, a soft, non-tender lump was palpable in the left side of abdomen while the right side was soft. Blood urea and creatinine levels were 28 mg/dl and 2.0 mg/dl, respectively, and urine culture sensitivity was sterile. USG abdomen revealed normal sized right kidney and enlarged left kidney (14 cm) with dilated pelvic-calyceal system (3.2 cm) and thinned out renal parenchyma. Upper part of left ureter was also dilated and tortuous and final impression was left sided hydro-ureteronephrosis (HDUN). Intravenous urography and micturating cysto-urethrogram revealed HDUN with pelvic

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Fig. 1. Intravenous urography (IVU) images. (a) Plain film of KUB region shows no radio-opaque calculus. After intravenous bolus injection of water soluble contrast, sequential plain films were acquired at 7, 15, 60 and 120 min. Plain images (b–e) revealed normally located both kidneys with prompt extraction of contrast in adequate concentration. Right PCS is compact with sharp fornical angles and maintained papillary impression. Right ureter is normal in course, caliber and outline. Left PCS is dilated with blunting of fornical angles and ballooning of calices. Left ureter is not visualized. Plain image (f) acquired 5 min after intravenous injection of Lasix which revealed complete excretion of contrast from right PCS while persistence of contrast in left PCS (s/o left sided grade IV hydronephrosis with pelviureteric junction obstruction). Intraop micturating cysto-urethrogram (MCU) image (g) No e/o evidence of vesicoureteric reflux (VUR).

Fig. 2. \textsuperscript{99m}Tc-EC: Preop (a) Flow images show normal perfusion in right renal fossa and impaired perfusion in left renal fossa, (b) cortical uptake images revealed normal uptake in right kidney with impaired uptake in grossly enlarged left kidney. Pre-void (c), post-void (d), and delayed 3 h (e) static images show the progressive tracer clearance from right kidney while progressive tracer accumulation in left kidney (s/o – normal functioning right kidney while enlarged, hydronephrotic left kidney with impaired function and left PUJO). Postop (f) flow images show normal perfusion in right renal fossa and impaired perfusion in left renal fossa, (g) cortical uptake images revealed normal uptake in right kidney with impaired uptake in mildly enlarged left kidney. Pre-void (h), post-void (i), and delayed 3 h (j) static images show tracer clearance from right kidney while moderate tracer clearance in left kidney (s/o suggestive of – normal functioning right kidney while mildly enlarged, hydronephrotic left kidney with mildly impaired function and delayed drainage). In addition to these lower poles of both kidneys appears fused and giving appearance of horseshoe kidney.
ureteric junction obstruction (PUJO) on the left side (Fig. 1a–g). Dynamic renal scintigraphy revealed normal functioning right kidney while a large photopenic area with gradual tracer collection without significant tracer clearance was noted on the left side (Fig. 2a–e), suggestive of PUJO. Patient underwent modified Anderson Hyne's pyeloplasty of left side with double J stenting. Three weeks after stenting, there was significant symptomatic response and fall in blood urea and creatinine levels (16 mg/dl and 0.5 mg/dl, respectively). To assess the response, a follow up renal dynamic scintigraphy was performed two months after surgery (performed in same manner as pre surgery) (Fig. 2f–j). It showed a normal functioning right kidney and mildly enlarged hydronephrotic left kidney showing moderately impaired function and delayed clearance. Compared to the previous study, a significant decrease in size of left kidney and improvement in function and drainage was observed. Additionally, lower poles of both kidneys appeared to be fused in midline giving appearance of a horseshoe kidney. To confirm this additional finding, patient was subjected to renal cortical scintigraphy with $^{99m}$Tc-DMSA and SPECT/CT. DMSA SPECT/CT confirmed the diagnosis of horseshoe kidney with fusion of lower ends of the both kidneys and functional isthmus (Fig. 3a–g).

Discussion

may be either physiological or pathological, or can be acute or chronic or even unilateral or bilateral. Before performing the surgery, differential function and drainage are better assessed by renal scintigraphy and Intravenous urography. In our case, both the modalities revealed the left sided PUJO; however, both anatomical and functional modalities did not indicate the presence of horseshoe kidney, as previously described by Obermayr et al.5 Patient was managed by modified Anderson Hyne’s pyeloplasty with double J stenting. Follow up renal dynamic scintigraphy for response assessment performed after 2 months of surgery revealed reduction in size and hydronephrosis of the left kidney with improvement in function and drainage. The persistence of hydronephrosis in our patient even 2 months after surgery is a normal phenomenon as described by Park et al.7 In addition to this, a new finding of horseshoe kidney was also revealed, later confirmed on DMSA SPECT/CT. This finding of horseshoe kidney was obscured by huge size hydronephrosis in pre-surgery renal dynamic scintigraphy as well as intravenous urography. The ‘horseshoe kidney’ is the common congenital lesion with prevalence about 1 in 400–500 people renal fusion anomaly.1 Persons with horseshoe kidneys are, commonly asymptomatic and usually identified incidentally, however it can cause hydronephrosis, secondary to poor drainage, which may lead to clinical presentation. Scintigraphy plays an important role for determining function and drainage pattern of moieties. DMSA SPECT/CT cortical scintigraphy best demonstrates the fusion if the isthmus consists of functioning parenchymal tissue, because this imaging modality depends not only on the structure of the tissue but also on the function of the tissue. In our case DMSA SPECT/CT is clearly demonstrate the fusion of both moieties.

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References