

## Pancake kidney: An unusual type of renal fusion anomaly found in $^{99m}\text{Tc}$ -DMSA renal scintigraphy

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### ABSTRACT

A 2.5-year-old boy with a history of the previous incidental finding of an ectopic kidney in ultrasonography was referred to our nuclear medicine center for  $^{99m}\text{Tc}$ -DMSA renal scintigraphy. The scan showed an unusual type of ectopic fused kidneys on the right side of the lower abdomen. In this anomaly, kidneys were fused completely across the medial portion of both upper and lower poles, as well as hilum with no septum. Each kidney, however, demonstrated separate collecting system.  $^{99m}\text{Tc}$ -DMSA renal scintigraphy is a valuable imaging detection of different shape anomalies such as pancake kidney. We report this extremely rare case of ectopic fused types of renal anomaly including pancake kidney.

**Key words:** Pancake kidney; Renal fusion anomaly; DMSA scintigraphy; Ectopic kidney

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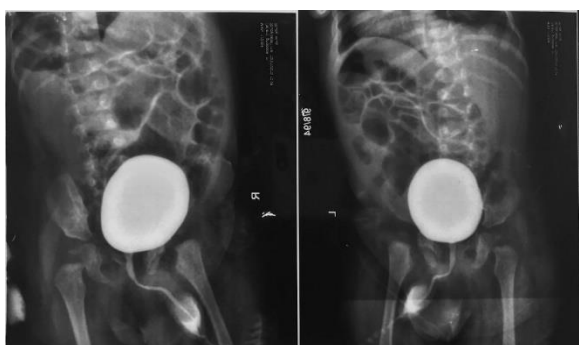
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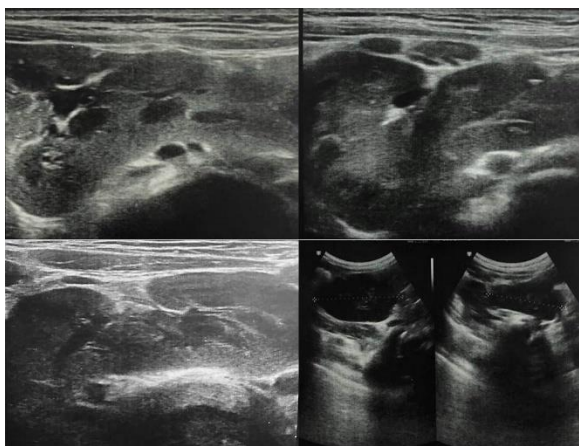
**CASE HISTORY**

A 2.5-year-old boy with a history of the previous incidental finding of an ectopic kidney on abdominopelvic ultrasonography was referred to our nuclear medicine center for <sup>99m</sup>Tc-DMSA renal scintigraphy. He was asymptomatic and his urine analysis and renal function tests were within the normal range. Voiding cystourethrography (VCUG) was done and revealed normal shaped urinary bladder with normal volume and no vesicoureteral reflux (Figure1).



**Fig 1.** Voiding cystourethrography (VCUG) revealed the normal shape and normal volume of the urinary bladder with no vesicoureteral reflux.

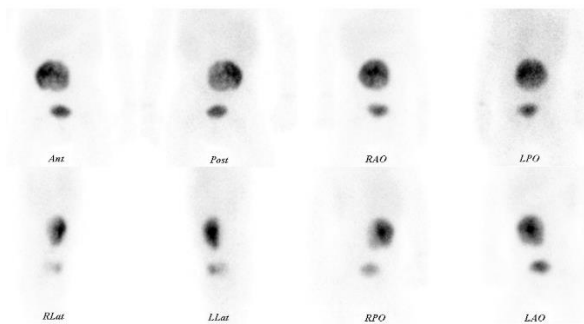
Abdominopelvic ultrasonography demonstrated fused ectopic kidneys located on the right side of the lower abdomen with separate pyelocaliceal (PC) systems. Only mild fullness in the right PC system (8 mm diameter) was noted (Figure 2).



**Fig 2.** Abdominopelvic ultrasonography showed fused ectopic kidneys located on the right side of the lower abdomen with separated pyelocaliceal (PC) systems and mild fullness in the right PC system (8 mm diameter).

Three hours after intravenous injection of 1 mCi (37 MBq) <sup>99m</sup>Tc-DMSA scanning was performed in

multiple static views, including anterior, posterior, right anterior oblique, right posterior oblique, right lateral, left anterior oblique, left posterior oblique and left lateral views using a dual-head variable angle gamma camera with a low-energy high-resolution parallel-hole collimator. The scan showed an unusual type of ectopic fused kidneys on lower abdominal region (Figure 3).



**Fig 3.** <sup>99m</sup>Tc-DMSA scintigraphy showed ectopic fused kidneys on the right side of the lower abdomen.

**DISCUSSION**

Renal fusion anomalies described as the congenital fusion of the kidneys either partially or completely occurs in the early embryonic period including abnormalities of position (ectopia), rotation, migration and vascular supply. Horseshoe kidney (HSK) and crossed fused renal ectopia (CFRE) classified as partial fusion anomalies, however, ‘cake’ kidney (fused pelvic kidney) represented as a complete fusion anomaly [1].

Different types of classification systems used for renal fusion anomalies in the literature.

Papin and Eisendrath’ classification system proposed three subtypes of location anomalies, as simple unilateral, simple bilateral renal ectopia and fused or non-fused crossed ectopia. Horseshoe kidney, L-shaped kidney, cake kidney and sigmoid kidney are four subtypes of fusion anomalies which are fused medially [2]. In the other system, Mc Donald and Mc Clellanin in 1957 explained four types of crossed renal ectopia as following: crossed fused ectopia (constitute 90% of all crossed ectopia), crossed non-fused ectopia, solitary crossed ectopia and bilateral crossed ectopia [3]. Also, six forms of crossed fused renal ectopia were described as inferior ectopia type with unilateral fused kidney, superior ectopia type with unilateral fused kidney, sigmoid or S-shaped kidney, lump kidney, L-shaped kidney and disc kidney [1].

Pancake kidney or fused pelvic kidney represents complete type of renal fusion anomaly, which is also

known as cake, disc, doughnut and shield kidney [4], however it is better to use the terms 'cake kidney' or 'fused pelvic kidney' for complete renal fusion anomaly and the terms 'lump' kidney and 'disc' kidney were limited to CFRE forms of fusion anomaly [1].

In this anomaly, kidneys were fused completely across a medial portion of both upper and lower poles, as well as hilum, without any septum. Also, each kidney consists of separate collecting system [5-9]. As in this case, the prevalence of this anomaly is more reported in males [9]. Early detection of possible associated complications including urinary tract infection, renal stones, and urinary obstruction is recommended. Most of the patients with renal fusion anomalies are asymptomatic and incidentally detected during the autopsy, surgery or radiological evaluation [1]. Over the past years, intravenous pyelography (IVP) was the method of choice for diagnosis of these anomalies, but nowadays, IVP is replaced by ultrasonography, computed tomography, and renal scintigraphy. These modalities are helpful either in detection or evaluation of different renal anomalies or exclusion of other related problems [10]. Besides the anatomical information, ultrasonography shows arterial supply and venous drainage of the fused kidneys [11, 12].

Moreover scintigraphic methods provide static and dynamic images for precise assessment of renal volume, function and possible concomitant defects due to the probable urinary tract infection or vesicoureteral reflux [13].

Although most of the patients are asymptomatic, regular long-term follow-up can be helpful in the management of these patients [11, 14, 15].

In conclusion, <sup>99m</sup>Tc-DMSA scanning is a valuable imaging method for detection of renal shape anomalies.

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