How accurate is ultrasonography for the detection of renal cortical defects

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99mTc-DMSA scintigraphy is a sensitive test to detect inflammation or cortical defects of scar formation. Heterogeneous studies published in the literature have already compared photopenic lesions on renal 99mTc-DMSA scintigraphy with renal histopathology in experimentally induced pyelonephritis in pigs or rats. The 99mTc-DMSA scintigraphy planar technique has a good sensitivity and specificity (82% and 97%) for the detection of acute pyelonephritis as compared to SPECT DMSA (97% and 66%, respectively) that has a very low threshold for the detection photopenic lesions, which increases the false positive rate [1].

The manifestation of pyelonephritis on 99mTc-DMSA is decreased cortical uptake that can be limited to the poles or can be generalized. In contrast, ultrasonography shows an enlarged kidney due to inflammation. Scar formation is a late sequel either congenital or acquired. New American Academy of Pediatrics guideline recommends that renal ultrasonography should be the first step of investigation of children with age below 24 months with first febrile urinary tract infection. The guideline recommends no further investigation in the case of normal renal sonography in these children [2].

Mohkam et al. conducted a study to compare the strength of sonography with renal DMSA in the detection of scar formation in patients with pyelonephritis [3]. They concluded that both could detect renal scar with the same frequency. However, this is challenging that different studies have reported that sonography might miss renal scars; therefore, its equal value to DMSA is questionable [4,5]. The main weak point of their study was lack of a uniform definition for “DMSA changes” or “ultrasonographic changes” that the investigators were looking for.

Using 99mTc-DMSA scintigraphy in the acute phase of pyelonephritis and six months later to estimate scar formation in a clinical trial, we found acute pyelonephritis changes in almost two-thirds of kidney units in each group. Subsequently, the rate of renal scar formation was found to be 42% and 23% in participants in the control and vitamin A groups in contrast to none in the vitamin E group [6].

Temiz et al investigated 62 children with urinary tract infection and primary vesicoureteral reflux and evaluated DMSA and renal sonography in detection of renal cortical scar. They found renal sonography was less sensitive in reporting renal cortical scar irrespective of the grade of reflex [7]. On the other hand, Lee et al investigated the
predictive value of sonography and DMSA in 220 children below two years of age for the detection of VUR. They reported that in high grade VUR, both methods had higher predictive positive values (86-88%), but they had lower predictive values (30-41%) for low grade VUR. Patients with either high or low grade VUR and normal renal sonography and DMSA scan showed improvement in follow-up with no need for surgery [8]. Fouzas et al. studied children aged less than 24 months with the first febrile urinary tract infection for five years and interestingly, they found DMSA had limitations in the detection of vesicoureteral reflux [9]. Massanyi et al. reported the poor sensitivity of renal bladder sonography in diagnosing high grade vesicoureteral reflux [10]. In conclusion, it seems that the value of each imaging study with standard definition should be evaluated in a large prospective study, considering the limitations and restrictions that exist in each region.

References