

DIAGNOSTIC MODALITIES OF CHILDHOOD URINARY TRACT INFECTION : CLINICAL VERSUS IMAGING

M.Fathalla 1, M.Y. Hussein 1, W. Tantawy 2, H.M. Abo Senna 2, I. Bassyuni 3

From the departments of Pediatrics 1, Radiology 2 and Pediatric Surgery 3 Ain Shams university

ABSTRACT

Seventy six infants and children with febrile urinary tract infection (UTI) were studied aiming at investigating the most reliable imaging approach for febrile UTI and to evaluate the reliability of clinical and laboratory diagnosis of acute pyelonephritis (APN) versus imaging diagnosis using renal scan with dimercaptosuccinic acid labeled with technetium 99m (99mTc-DMSA) as standard reference. Positive radiological findings were documented in 36 out of the 76 studied patients (47.37%). Out of the 76 studied patients APN was confirmed in 28 patients (36.84%) by 99mTc-DMSA scanning. Renal ultrasonography (US) detected upper urinary tract abnormalities in 19.74% (15/76) of patients, all of them had DMSA positive scan for APN. Micturating cystourethrography (MCUG) demonstrated vesicoureteral reflux (VUR) in 23.68% (18/76) patients. Positive DMSA scan for APN was documented in 61.11% (11/18) of patients with VUR.

The sensitivity of US compared to 99mTc-DMSA scan for detection of acute renal parenchymal changes was 53.57%, the specificity was 100% and the accuracy was 76.79%. Compared to 99mTc-DMSA scan, clinical and laboratory diagnosis of APN had a sensitivity of 67.85%, specificity of 72.92% and accuracy of 70.39%. In conclusion: the diagnosis of APN among infants and children with febrile UTI based on clinical and laboratory observations is insufficient and requires imaging studies. The three imaging modalities chosen are complementary and are needed for establishing a diagnostic approach for childhood UTI. The results of this study also emphasize the value of 99mTc-DMSA scintigraphy in the initial evaluation of febrile UTI.

INTRODUCTION

Urinary tract infection (UTI) is one of the most common serious bacterial diseases among infants and young children, with a reported prevalence between 4.1% and

7.5% (Crain et al 1990, Hoberman et al 1993). While UTI in general cause discomfort to patients and expense to the family, pyelonephritis can damage the

kidneys, leading to complications such as renal scarring that can lead to chronic hypertension and eventually renal insufficiency (Holland et al 1990, Conway and Cohen 1994).

Early and accurate diagnosis of acute pyelonephritis (APN) among children with febrile UTI is of extreme importance. Accurate diagnosis together with prompt antibiotic therapy may reduce the incidence of scarring and complications of APN. At the same time if APN could be excluded at the onset, therapy could be significantly reduced and hospital stay could be minimized (Heldrich 1995).

The differentiation of APN from lower UTI on the basis of clinical and laboratory findings is difficult, especially in children (Busch and Huland 1984, Winberg 1986). Different imaging modalities for the urinary tract are available. Three of these modalities are commonly used nowadays in the diagnosis of UTI these are, renal ultrasonography (US), micturating cystourethrography (MCUG) and renal cortical scintigraphy with dimercaptosuccinic acid labeled with technetium 99m (^{99m}Tc -DMSA). Renal ultrasonography (US) has become the examination of the first

choice, it is non invasive and should be able to detect abnormalities demanding surgical correction (Sherwood and Whitake 1984, Jequire et al 1985). Micturating cystourethrography (MCUG) is the only method to detect vesicoureteral reflux (VUR). Renal cortical scintigraphy with dimercaptosuccinic acid labeled with technetium 99m (^{99m}Tc -DMSA) has been shown to be more sensitive than IV urography (IVU) in visualization of renal parenchyma and detection of renal scars, in addition information on the relative function of the kidneys can be obtained (Rickwood et al 1992). ^{99m}Tc -DMSA scan is now widely used to confirm the diagnosis of APN in adults and children (Jakobsan et al 1992, Connor, 1995).

This study was conducted aiming at assessing the value of the three chosen imaging modalities in establishing a diagnostic approach to childhood febrile UTI, as well as to determine the prevalence of APN in children with febrile UTI using ^{99m}Tc -DMSA scan as the reference diagnostic technique. The study also aimed at evaluating the diagnostic accuracy of clinical and laboratory findings used for diagnosis of APN compared to renal DMSA scan.

PATIENTS & METHODS

One hundred and three infant and children with febrile UTI were recruited from the pediatric clinics of Ain Shams university hospitals. Inclusion criteria included:

1. Fever (body temperature $>38.0\text{ }^{\circ}\text{C}$) together with one or more symptoms of UTI: vomiting, poor feeding, lethargy, irritability, malodorous urine in in-

- fants, dysuria, frequency, enuresis, hematuria, abdominal pain in older children.
2. One or more urine culture of a single organism $>100,000$ Col/ml in a clean-catch specimen or $>10,000$ Col/ml in a catheter specimen.

Patients were subjected to the following:

1. Through history and clinical examination.
2. Laboratory studies including: complete blood count (CBC), erythrocyte sedimentation rate (ESR) estimation by Westergren method, C-reactive protein (CRP) determination by nephelometry, urine analysis and culture for identification of the causative organism, the blood urea nitrogen and serum creatinin were also measured.

Upper UTI was considered if the following criteria were present:

- * Signs and symptoms suggestive of upper UTI including fever, vomiting, abdominal tenderness in infants or renal angle tenderness in older children
- * Two of the following abnormal laboratory investigations: increased leucocytic count higher than normal for age, elevated CRP >10 mg/dl and elevated ESR >25 mm/h.

Lower UTI was considered if the above 3 laboratory criteria were normal. Non-classifiable were used if only one laboratory criterion was normal (Jodal et al 1975).

3. Imaging study of the urinary tract included: renal ultrasonography (US), renal cortical scintigraphy with dimercaptosuccinic acid labeled with technetium 99m (^{99m}Tc -DMSA) and micturating cystourethrography (MCUG). Renal US and ^{99m}Tc -DMSA scan were performed in all studied cases within few days of commencing antibiotic treatment for the UTI, MCUG was done at least one month after the treatment of the UTI.

* Renal US was performed without fluid restriction using a 5-MHZ sector phased array scanner (Aloka 2000 and Toshiba 270 α). Children were examined in the supine position. The kidneys were evaluated for size, shape, echogenicity, hydronephrosis, cortical scars, and other structural abnormalities.

* Renal cortical DMSA scan were obtained 3 hours after intravenous injection of an age adjusted ^{99m}Tc -DMSA (minimum dose 20 MBq, maximum dose 100 MBq). Examination was performed with a rectangular gamma camera (Sophy DSX, General Electric) with a low energy, all-purpose collimator coupled to a computer. Scans were taken in the posteroanterior and right and left oblique views to visualize the parenchyma, in order to detect evidences of APN and cortical scarring. IN addition general evaluation for renal size, shape, loca-

tion and differential function were done. The criterion for APN was the presence of area of focal or diffuse decreased cortical uptake of ^{99m}Tc -DMSA without evidence of cortical loss. Defects in uptake associated with cortical thinning and decreased volume were considered chronic scars (Verber et al 1988).

- * Micturating cystourethrography (MCUG) were performed after bladder

catheterization using iodinated water soluble diluted contrast medium. The cystograms were evaluated for the presence and grade of reflux by using the International grading system 1988.

Only 76 out of the 103 case of established febrile UTI completed the three imaging techniques and were considered as our study group. Results were analyzed statistically using SPSS computer program (Chicago-USA).

RESULTS

Results are illustrated in tables (1 - 4) and figures (1 - 2)

1) Study population

Seventy six infants and children with established febrile UTI were included in the study. They were 29 infants (16 males and 13 females), their age ranged from 4 months to two years (mean 14 ± 5.7 month) and 47 children (10 males and 37 females), their age ranged from >2 years to 12 years (mean 5.96 ± 2.23 years) (table 1). The sex distribution did not differ significantly among studied infants ($P>0.05$), while in the group of children studied a statistically significant sex distribution was encountered with a female predilection ($p<0.01$).

2) Imaging results

Urinary abnormalities were detected in 36 out of the 76 studied patients (47.37%) by the different radiological techniques used as shown in table (2).

A) Renal DMSA scan findings: ^{99m}Tc -DMSA scan revealed APN in 28 out of the 76 studied patients (36.84%). They were 12 infants and 16 children, (11 males and 17 females). 92.85% (26/28) of patients with positive DMSA scan for APN were below the age of 5 years compared to 64.58% (31/48) of patients with negative DMSA scan .The difference was statistically significant $P< 0.01$ (table 3) . Unifocal lesions were present in 19 and multifocal involvement was present in 9 patients. Bilateral involvement was noticed in 7 patients. Cortical scarring was present in 5 patients, all of them had also APN. (table 2).

B)Micturating cystourethrogram findings: vesicoureteral reflux (VUR) was detected in 18 out of the 76 studied patients (23.68%). Eleven out of these 18 patients (61.11%) had significant

VUR (5 with grade III, 4 with grade IV and 2 with grade V). All had positive DMSA scan for APN. Hydro-nephrosis was detected by renal US in 9 out of these 11 patients (81.81%). Negative DMSA scan and renal US studies were encountered in the rest of patients 7/18(38.88%). All 7 patients had minor grades of reflux (5 with grade I VUR and 2 case with grade II VUR). Reflux was bilateral in 44.44% (8/18) and unilateral in 55.56% (10/18) (table 2). The prevalence of reflux was 22% (11/50) in female patients and 26.92% (7/26) in male patients. The difference was statistically insignificant $P > 0.05$. The prevalence of reflux was 39.28% (11/28) in the group of patients with positive DMSA scan for APN and 14.58% (7/48) in the group of patients with negative DMSA scan for APN. The difference was statistically significant ($p < 0.01$).

- C) Renal ultrasonographic findings: abnormal renal sonograms were detected in 15 out of the 76 studied patients (19.74%), all of them had positive DMSA scan for APN. Nine out of these 15 patients (60%) had bilateral hydronephrosis with increased parenchymal echogenicity. All of them had VUR as detected by MCUG. Six out of the 15 patients with abnormal renal sonograms (40%) had focal areas of increased echogenicity of renal parenchyma without change in kidney size (table 2). The sensitivity of renal US

compared to ^{99m}Tc -DMSA scan in detection of renal parenchymal inflammatory changes was 53.57% (15/28) while the specificity was 100% (48/48) and the accuracy was 76.79%.

3. Clinical and laboratory results versus

^{99m}Tc - DMSA scan findings: Initial maximum body temperature ranged from 38 to 41°C (mean $39.1 \pm 0.9^\circ\text{C}$). 78.57% of patients with positive DMSA scan for APN had body temperature higher than the mean value compared to 41.66% of patients with negative DMSA scan the difference was statistically significant $p < 0.05$. 85.71% of patients with positive DMSA scan for APN had a duration of fever more than 5 days compared to 39.58% of the negative scan group, the difference was statistically significant, $p < 0.05$. The initial peripheral leucocyte count ranged from 7.30 to $38.10 \times 10^9/\text{l}$ (mean value $18.60 \pm 6.30 \times 10^9/\text{l}$). 75% of patients with positive DMSA scan for APN had a mean leucocytic count higher than $18.6 \times 10^9/\text{l}$ compared to 37.5% of patients with negative DMSA scan, the difference was statistically significant, $p < 0.01$. CRP ranged from 6 - 88 mg/dl (mean $28 \pm 9.4 \text{ mg/dl}$). 71.43% of patients with positive DMSA scan for APN and 25% of DMSA scan negative group had CRP $> 10 \text{ mg/dl}$ the difference was statistically significant, $p < 0.01$. ESR ranged from 11 - 75 mm/h (mean 38.9 ± 7.3). 85.72% of patients with positive

DMSA scan for APN had ESR higher than 25 mm/h compared to 22.92% of DMSA scan negative group. The difference was statistically significant, $p < 0.01$, (table 3).

The organisms isolated from the urine cultures of the 76 studied patients were as follow: *Escherichia coli* (*E.coli*) in 60 patients, *Klebsiella* species in 8 patients, *Proteus* in 4 patients, *Pseudomonas* in 2 patients and *Citrobacter* in 2 patients. 92.85% of patients with positive DMSA scan for APN had *E.coli* in their urine cultures compared to 70.83% of scan negative patients. The difference was statistically significant, $p < 0.01$, (table 3).

Clinical manifestations were rarely distinctive in the 29 studied infants, all had fever and 20 of them (68.96%) had also vomiting. ^{99m}Tc -DMSA scan proved the diagnosis of APN in only 41.38% (12/29) of infants studied. In the whole group of studied infants and children vomiting was present in 67.85% (19/28) of patients with positive DMSA for APN (12 infants and 7 children) compared to 43.75% (21/48) of patients with negative DMSA study (8 infants and 13 child). The difference was statistically significant, $p < 0.05$, (table 3). Abdominal and renal angle tenderness were elicited in 12 out of 16 children (75%) with positive DMSA scan for APN compared to 14 out of the 31 child with negative DMSA study

(45.16%). The difference was statistically significant, $p < 0.05$, (table 3). Symptoms of bladder irritability (frequency, dysuria, suprapubic pain and secondary enuresis) were found in 36 out of 48 studied children (76.50%), 16 of these patients had positive DMSA scan for APN. Sensitivity, specificity, and accuracy of different studied clinical and laboratory parameters used for diagnosis of APN were calculated in relation to ^{99m}Tc -DMSA scan diagnosis as a standard reference (table 4).

Using the combined clinical and laboratory criteria for differentiation between upper UTI (APN) and lower UTI according to the method of Jodal et al 1975, APN was diagnosed in 32 out of the 76 (42.11%) studied patients. They were 15 infants and 17 children. Lower UTI was diagnosed in 28 (36.84%) patients, they were 3 infants and 25 children. The remaining 16 (21.05%) patients could not be classified, they were 11 infants and 5 children.

Out of the 32 patients diagnosed clinically as APN only 19 (59.39%) had positive DMSA scan for APN. Nine out of the 16 patients (56.25%) who could not be classified clinically using Jodal criteria had positive DMSA scan for APN. Thus clinical diagnosis of APN had a sensitivity of 67.85% (19/28), specificity of 72.92% (35/48) and accuracy of 70.39% compared to ^{99m}Tc -DMSA scan diagnosis. (table 3).

Table (1) Age and sex distribution among studied patients

Age	Males	Females	Total
4 months-2 years	16 (21.05%)	13 (17.11%)	29 (38.16%)
>2 - 12 years	10 (13.16%)	37 (48.68%)	47 (61.84%)
Total	26 (34.21%)	50 (65.79%)	76 (100%)

Table (2) Urinary abnormalities detected in 76 infants and children with febrile UTI.

Imaging technique	Abnormality	N0 (%) of patients	Comments
^{99m} Tc-DMSA scan	Decreased cortical uptake of ^{99m} Tc-DMSA Without cortical loss(= positive DMSA scan for APN) a) unifocal b) multifocal	*28 (36.84%) 19 9	* bilateral involvement in 0.25% (7/28) of patients
	Decreased cortical uptake of ^{99m} Tc-DMSA with cortical loss (= scarring)	* 5 (0.066%)	* All had positive DMSA scan for APN
MCUG	VUR Grade I. II. III. IV. V.	* 18 (23.68%) NO 5 2 5 4 2	* 11 patients had positive DMSA scan for APN (61.11%) * 9 patients had hydronephrosis detected by US. * 8 patients had bilateral VUR worse grade of reflux was listed when non-concordant (3 patients)
Renal US	Abnormal renal US. A) Hydronephrosis with increased echogenicity. B) Increased echogenicity without change of kidney size	* 15 (19.74%) **9 6	* all had positive DMSA scan for APN. ** all the 9 patients had VUR

Table (3) Clinical and laboratory characteristics of patients with positive (+ve) and negative (-ve) DMSA scan.

Characteristics (No & %)	DMSA +ve No = 28	DMSA -ve No = 48	Significance
sex (M/F)	11/17 (64.70%)	15/33 (45.45%)	P > 0.05
Age < 5 ys	26/28 (92.85%)	31/48 (64.58%)	P < 0.01
T _{max} > 39.1°C	22/28 (78.57%)	20/48 (41.66%)	P < 0.01
Fever > 5 days	24/28 (85.71%)	19/48 (39.58%)	P < 0.01
Vomiting	19/28 (67.85%)	21/48 (43.75%)	P < 0.05
Renal / abdominal tenderness	12/16 (75%)	14/31 (45.16%)	P < 0.05
WBC count > 18.60 x 10 ⁹ /l	21/28 (75%)	18/48 (37.50%)	P < 0.01
CRP > 10 mg/dl	20/28 (71.43%)	12/48 (25%)	P < 0.01
ESR > 25 mm/h	24/28 (85.72%)	11/48 (22.92%)	P < 0.01
Positive E-Coli urine culture	26/28 (92.85%)	34/48 (70.83%)	P < 0.01

P > 0.05 = Non significant, P < 0.05 = S ignificant, P < 0.01 = Highly significant.

Table (4) Sensitivity, specificity and accuracy of studied clinical and laboratory parameters used for clinical diagnosis of APN

Parameter	Sensitivity	Specificity	Accuracy
T _{max} > 39.1°C	78.57% (22/28)	58.33% (28/48)	68.45%
WBC count > 18.60 x 10 ⁹ /l	75% (21/28)	62.50% (30/48)	68.75%
CRP > 10 mg/dl	71.43 (20/28)	75% (36/48)	73.22%
ESR > 25 mm/h	85.72% (24/28)	77.10% (37/48)	81.40%
Vomiting	67.85 (19/28)	56.25% (27/48)	62.05%
Renal / abdominal tenderness	75% (12/16)	54.84% (17/31)	64.62%
Combined Jodal criteria	67.85% (19/28)	72.92% (35/48)	70.93%

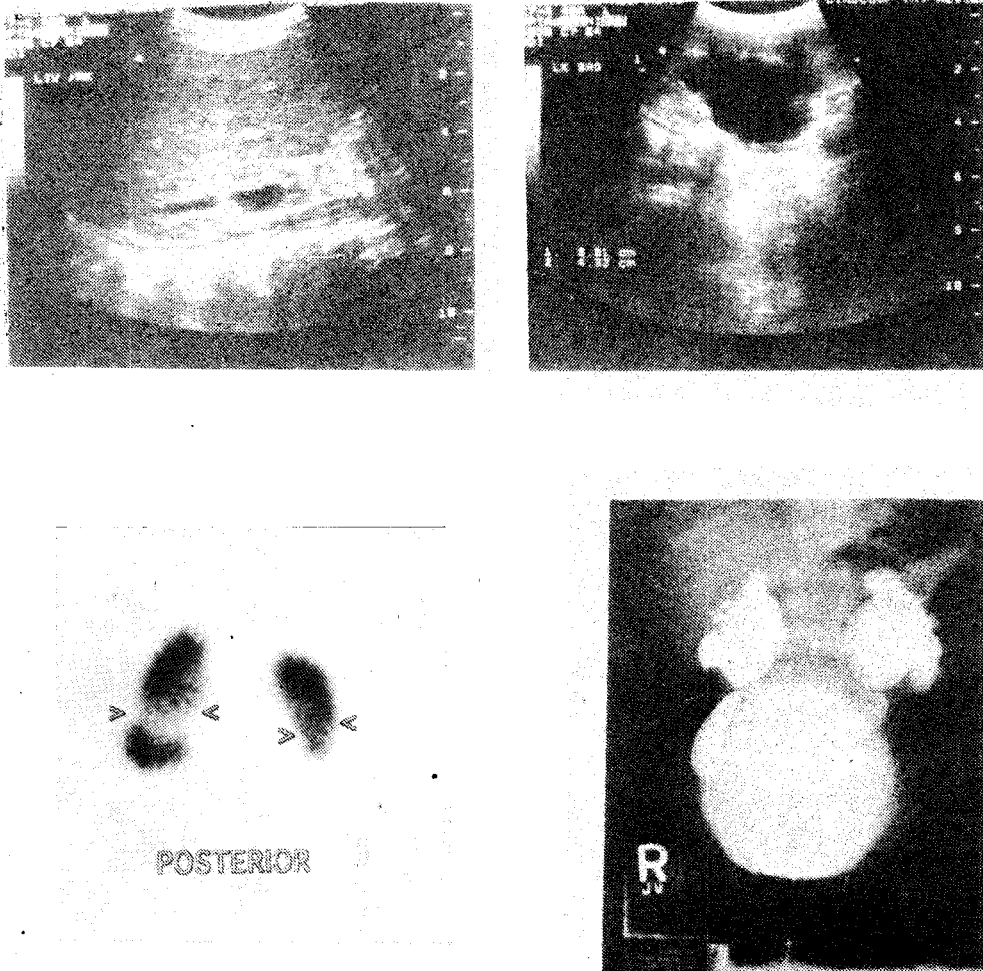


Fig (1) A male child 1.5 years old presented with febrile UTI, Renal US showing bilateral hydronephrosis more in the left (B) than the right (A), with diffuse increased echogenicity of the renal parenchyma. Posterior view on DMSA scan (C) reveals a band of perfusion defect in the middle part of the left kidney and in the lower part of the right kidney (arrow heads). MCUG (D) confirms the presence of VUR grade V, more severe on the left side.

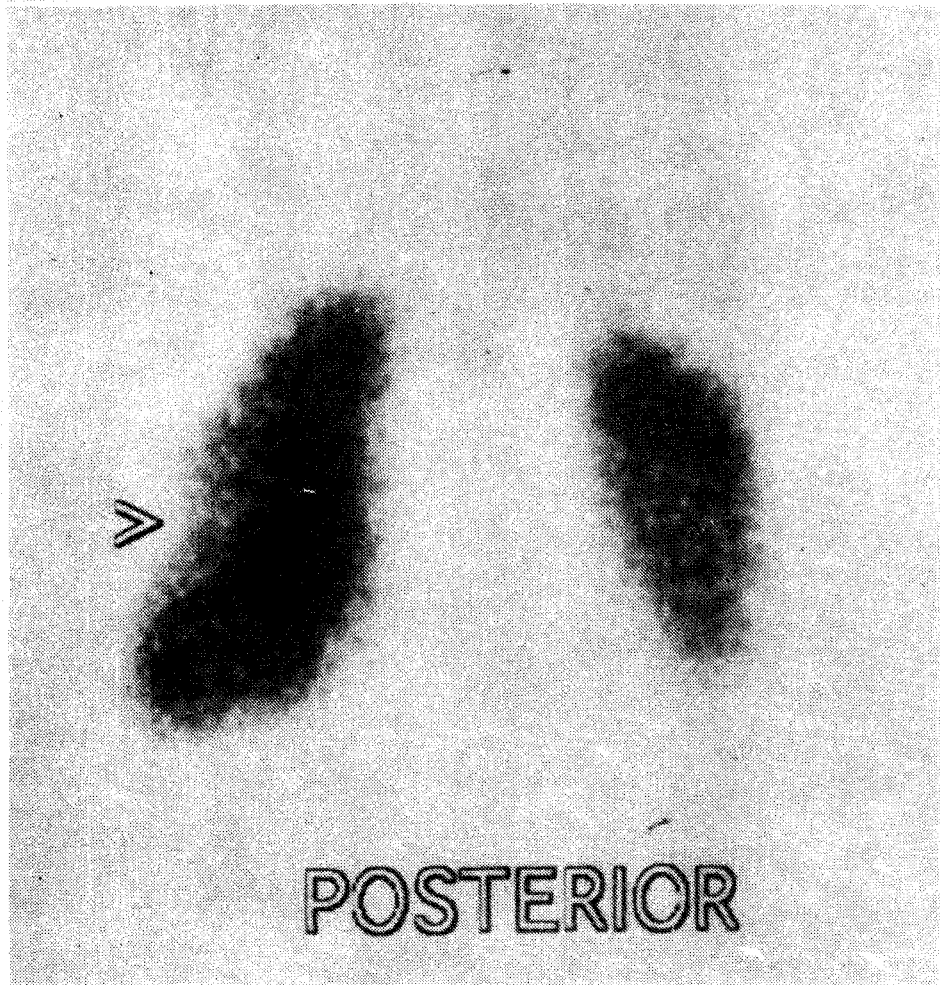


Fig (2) A case of febrile UTI , Posterior view on DMSA scan at diagnosis reveals scar in the lateral aspect of the left kidney (arrow head) and impaired uptake in the lower half of the right kidney

DISCUSSION

Bacterial infections of the urinary tract are a significant cause of illness in infants and children, ranking second in frequency only to bacterial infection of the respiratory tract (Stickler 1979, Hoberman et al 1993). Despite the frequency with which UTI is diagnosed, treatment results, as determined by recurrence rates are poor (Heldrich 1995). Physicians may share responsibility for this through delayed diagnosis and inadequate evaluation, treatment and follow up. Prompt, accurate diagnosis followed by a thorough evaluation of the patient should result in better management and fewer recurrences, relapses or complications (Vickers et al 1991).

Of great concern to physicians who care for children are that the incidence of UTI is highest in the first several years of life and that the initial infection is usually pyelonephritis (Jodal 1987, Roberts et al 1990). The results of this work confirm the previous statement, 92.85% of patients with positive DMSA scan for APN were below the age of 5 years.

In this work the three chosen imaging modalities were able to direct the diagnostic approach of febrile UTI. Thirty six out of the 76 studied patients (47.37%) had abnormal radiological findings. In this study ^{99m}Tc -DMSA scan was used as the standard reference for diagnosing APN. ^{99m}Tc -DMSA scan proved to be the most sensitive examination for detection and localization of acute inflammatory changes

of APN (Rosenberg et al 1992). Rush-ton et al 1988 evaluated the reliability and accuracy of ^{99m}Tc -DMSA scan for detection of experimental APN in piglets by comparing scan results with strict histopathological criteria. They found ^{99m}Tc -DMSA cortical scan to be highly reliable in detection and localization of acute inflammatory changes of APN, with a sensitivity of 91% and 100% specificity, furthermore the only undetected lesions were grossly inapparent microscopic clusters of inflammatory cells involving less than 1% of renal parenchyma. Accordingly ^{99m}Tc -DMSA scan was used in this study as the standard reference for diagnosing APN. A positive DMSA scan for APN was documented in 28 out of the 76 studied patients with febrile UTI (36.48%). Compared to ^{99m}Tc -DMSA scan renal US was found to be less accurate in detection of renal parenchymal inflammatory changes of APN. The sensitivity of renal US was modest (53.57%), while the specificity was (100%). This high specificity signifies that abnormal ultrasonographic results always merit further investigations. These results are in agreement with the studies done by Gleeson and Gordon 1991, who found that ^{99m}Tc -DMSA scan was more superior than renal US in detecting upper renal defects.

The results of this work also confirm that MCUG is the only reliable technique for detection for VUR. Out of the 76 stud-

ied patients VUR was detected in 18 patients (23.68%). Seven (38.88%) of these patients had only VUR without any other abnormalities detected by ^{99m}Tc -DMSA scan or renal US. All the 7 patients had mild grades of reflux (5 grade I and 2 with grade II). Several studies have documented that looking for VUR is of little value if there is no renal cortical defect, scars or impairment of renal function (Verber et al 1988, Jakobson 1992 et al, Rosenberg et al 1992). All the 11 patients with significant reflux had positive DMSA scan for APN and 9 of them had also hydronephrosis detected by renal US. Thus combination of renal US and ^{99m}Tc -DMSA scan identified all patients with significant reflux. These results suggest that not all young children presenting with UTI require MCUG. Renal US and early ^{99m}Tc -DMSA scan studies could be used as a reliable noninvasive screening to determine which children need to perform MCUG. However, in patients with negative ultrasonographic and DMSA scan studies repeated UTI is an indication for MCUG.

The results of this work emphasize the role played by VUR and E-Coli infection in the pathogenesis of APN. The prevalence of VUR was significantly higher (39.28%) in patients with positive DMSA scan compared to those with negative DMSA scan (14.58%) , ($p < 0.01$).

92.85% of patients with positive DMSA scan for APN had E-coli in their urine culture compared to 70.83% of scan negative patients .the difference was statistically significant, ($p < 0.01$). These results are in agreement with work done by several authors (Lerner et al 1987, Israel et al 1987 and Hoberman et al 1994).

The results of this work show that differentiating upper from lower UTI based solely on clinical and laboratory findings is insufficient. Acute pyelonephritis was correctly picked up by the combined clinical and laboratory criteria in only 67.85% of patients with positive DMSA scan for APN, also 56.25% of patients who could not be classified clinically using these criteria proved to have APN by DMSA scan. Thus, the sensitivity of the clinical diagnosis of APN using these criteria compared to DMSA scan diagnosis was 67.85% ,the specificity was 72.92% and accuracy was 70.93%.

IN conclusion: the differentiation between upper and lower UTI based on clinical and laboratory findings is inaccurate. The three imaging modalities chosen in this study are complementary and are needed in establishing a diagnostic approach for childhood UTI. The results of this study also emphasize the value of ^{99m}Tc -DMSA scintigraphy in the initial evaluation of febrile UTI.

REFERENCES

- Busch R, Huland H. Correlation of symptoms and results of direct bacterial colonization in patients with urinary tract infection. J Urol 1984; 132:282-285*
- Connor JP. DMSA scanning: a pediatric urologist's point of view. Pediatr Radiol 1995; 25:550-551*
- Conway JJ, Cohen RA, . Evolving role of nuclear medicine for the diagnosis and management of urinary tract infection. J Pediatr 1994;124:87-90*
- Crain EF, Gershel JC, Robert KB. Prevalence of urinary tract infection in febrile infants younger than 8 weeks of age. Pediatrics 1990; 86:363-367.*
- Gleeson FV, Gordon I. Imaging in urinary tract infection . Arch Dis Child 1991; 66:1282-1283*
- Heldrich FJ. Urinary tract infection diagnosis: Getting it right the first time. Contemporary Pediatrics 1995; 12:110-133*
- Hoberman A, Chao HP, Keller DC et al . Prevalence of urinary tract infection in febrile infants. J Pediatr 1993; 123:17-23*
- Hoberman A, Wild ER, Reynolds EA et al. Pyuria and bacteruria in urine specimens obtained by catheter from young children with fever. J Pediatr 1994 124: 513-519*
- Holland NH, Jakson EC, Kazee M et al. Relation of urinary tract infection and vesicoureteral reflux to scars: Follow up of thirty eight patients. J Pediatr 1990;116:565-571*
- International system of radiographic grading of VUR: International reflux study in children. Pediatr Radiol 1985; 15:105-109*
- Israele V, Drabia A, McCrackain GH. The role of bacterial virulence factors and Tamm-Horsfall protein in the pathogenesis of E-Coli urinary tract infection in infants. AM J Dis Child 1987; 141:1230-1234*
- Jakobson B, Soderlundh S, Berg U. Diagnostic significance of 99mTc-DMSA scintigraphy in urinary tract infection . Arch Dis Child 1992; 67:1338-1342*
- Jequir S, Forbes PA, Nogrady MB. The value of ultrasonography as a screening procedure in a first urinary tract infection in children. J Ultrasound Med 1985; 4:393-400*
- Jodal U, Lindberg U, Lincoln K. Level diagnosis of symptomatic urinary tract infection in childhood. Acta Paediatr Scand 1975; 64:201-208*

- Jodal U. *The native history of bacteruria in children*. *Infect Dis Clin North Am* 1978; 1:713-719
- Lerner GR, Fleishmann LE, Perlmutter AD: *Reflux nephropathy*. *Ped Clin North Am* 1987; 43:747-751
- Rickwood AMK, Carty HM, McKendrick T, et al. *Current imaging in childhood urinary tract infection*. *BMJ* 1992; 304:663-665
- Roberts Kg, Charney E, Sweren RJ et al. *Urinary tract infection in infants with unexplained fever: A collaborative study*. *J Pediat* 1990, 103: 864-866
- Rosenberg A R, Rossleigh MA, Brydon MP et al. *Evaluation of acute urinary tract infection in children by 99mTc-DMSA scintigraphy*. *J Urol* 1992; 118:1746-1749
- Rushton HG, Majd M, Chandra R. *Evaluation of 99mTc-DMSA renal scan in experimental acute pyelonephritis in piglets*. *J Urol* 1988; 140:1169-1174
- Sherwood T, Whitake RH. *Intial screening of children with urinary tract infection: Is plain film radiology and ultrasound enough?* *BMJ* 1984; 288:827
- Stickler GB. *Urinary tract infection in children*. *Postgrad Med* 1979; 66(4):159-164
- Verber TG, Strudley MR, Miller T. *99mTc-DMSA scan as first investigation of urinary tract infection*. *Arch Dis Child* 1988; 63:1320-1325
- Vickers D, Ahmad T, Coulthard MG. *Diagnosis of urinary tract infection in children: fresh urine microscopy or culture?* *Lancet* 1991; 338:767-770
- Winberg J. *Urinary tract infection in infants and children*. In Walsh PC, Gittes RF, Stamey TA eds. *Campbell's urology Vol. 7, 5th ed. Philadelphia: WB Saunder, 1986; 831-886.*

دراسة لوسائل التشخيص المختلفة لعدوى الجهاز البولي عند الأطفال : مقارنة بين التشخيص الإكلينيكي والتصوير الطبى

محمد فتح الله ، ماجدة يحيى حسين ، وحيد طنطاوى ،

هالة أبو سنة وإبراهيم بسيونى

من أقسام الأطفال ، الأشعة التشخيصية وجراحة الأطفال بكلية الطب جامعة عين شمس

تم فى هذا البحث دراسة ستة وسبعين رضيعا وطفلا مريضا بالتهابات المسالك البولية المصحوبة بارتفاع فى درجات الحرارة وذلك بهدف دراسة أنسب وسائل التصوير الطبى لتشخيص تلك الحالات وكذا تقييم مدى دقة التشخيص الإكلينيكي والمعملى للالتهابات الحوض كلوية الحادة مقارنة بالمسح الذرى للكلى (دمسا) كمرجع أساسى لتشخيص تلك الحالات . ولقد أثبتت وسائل التصوير الطبى المستخدمة فى البحث أن ٣٦ من ال ٧٦ حالة قيد البحث (٣٧ ، ٤٧٪) لديهم تغيرات غير طبيعیه بالجهاز البولى . كم أثبت المسح الذرى للكلى (دمسا) أن ٢٨ من تلك الحالات (٨٤ ، ٣٦٪) يعانون من الالتهابات الحوض كلوية الحادة . كما جاء فحص الكلى بالموجات فوق الصوتية غير طبيعيا لدى ١٥ مريضا (٧٤ ، ١٩٪) ، جميعهم أثبت المسح الذرى للكلى (دمسا) أصابتهم بالالتهابات الحوض كلوية الحادة . كما وجد ارتجاع حالبى مثانى لدى ١٨ مريضا (٦٨ ، ٢٣٪) وذلك باستخدام أشعة بالصيغة هابطة على المثانة وقناة مجرى البول وقد أثبت المسح الذرى للكلى (دمسا) أصابة ١١ من هؤلاء المرضى (١١ ، ٦١٪) بالالتهابات الحوض كلوية الحادة ، وثبتت نتائج البحث أنه مقارنة بالمسح الذرى للكلى (دمسا) فأن فحص الكلى بالموجات فوق الصوتية له نسبة حساسية ٥٧ ، ٥٣٪ وخصوصية ١٠٠٪ كما بلغت دقته التشخيصية ٧٩ ، ٧٦٪ .

كم وجد أن التشخيص الإكلينيكي والمعملى للالتهابات الحوض كلوية الحادة مقارنة بالمسح الذرى للكلى (دمسا) له نسبة حساسية ٨٥ ، ٦٧٪ وخصوصية ٩٢ ، ٧٢٪ كما بلغت دقته التشخيصية ٣٩ ، ٧٠٪ .

ويخلص البحث إلى أن التشخيص الإكلينيكي والمعملى للالتهابات الحوض كلوية الحادة لدى الرضع والأطفال الذين يعانون من التهابات المسالك البولية المصحوبة بارتفاع فى درجات الحرارة غير كافى مما يستلزم الاستعانة بوسائل التصوير الطبى . كما أن الثلاثة وسائل التشخيصية المستخدمة فى البحث يكمل بعضها بعضا مما يستلزم ضرورة استخدام تلك الوسائل فى تشخيص التهابات المسالك البولية لدى الأطفال . كما يؤكد البحث الدور الهام الذى يلعبه المسح الذرى للكلى (دمسا) فى التشخيص المبدي للالتهابات المسالك البولية المصحوبة بارتفاع فى درجات الحرارة .