

가 ^{99m}Tc-DMSA 가?

: ^{99m}Tc-DMSA ()
)
 가 , VCUG
 가 :
 28; 15 -10) 134 67 (39,
 2 27 . DMSA 2 40 ,
 (VCUG) 1 . DMSA VCUG
 VCUG ,
 : 2 2 (38/54 (70%)
 vs 38/80 (48%)). (p
 <0.05), 가 (p <0.05),
 (p <0.05). 134 76 (57 %) VCUG
 , 30 (39.5 %) 가 . 134 VCUG
 가 36 (27 %) , 30 (83 %) VCUG
 39.5 %, 89.7 %, 83.3 %, 53.1 % ,
 가 (relative risk) 1.78 .
 : 2
 , 가 , 가 .
 VCUG 가 , 가
 가

가 (1-5).
 % , 18-20 40% 93 % ,
 가 ,
 가 .
 가 ^{99m}Tc-DMSA ,
 가 ,
 가 VCUG 가 .
 가
 gold standard

가 : 가 ^{99m}Tc-DMSA 가? 가?
 67 59 가 2
 가 39 , 가 28
 15 -10 (35.8), 2
 가 40 , 2 27 , 2
 10⁵ /ml
 10³ /ml ,
 Escherichia coli (26)
 Proteus (5), Pseudomonas (3), Entero-
 cocci (3) 67 (134)
 DMSA VCUg
 7 , VCUg 1
 E.cam (Siemens, Chicago, Illinois, U.S.A.)
 (supine) . ^{99m}Tc-DMSA
 50 μ Ci/Kg 3 high resolution

Table 1. Correlation of Cortical Defects and Age ($\chi^2, p < 0.05$)

Scintigraphic Findings	Age(yr)		Total
	< 2yr	2yr	
Defect	38	38	76
No defect	42	16	58
Total	80	54	134

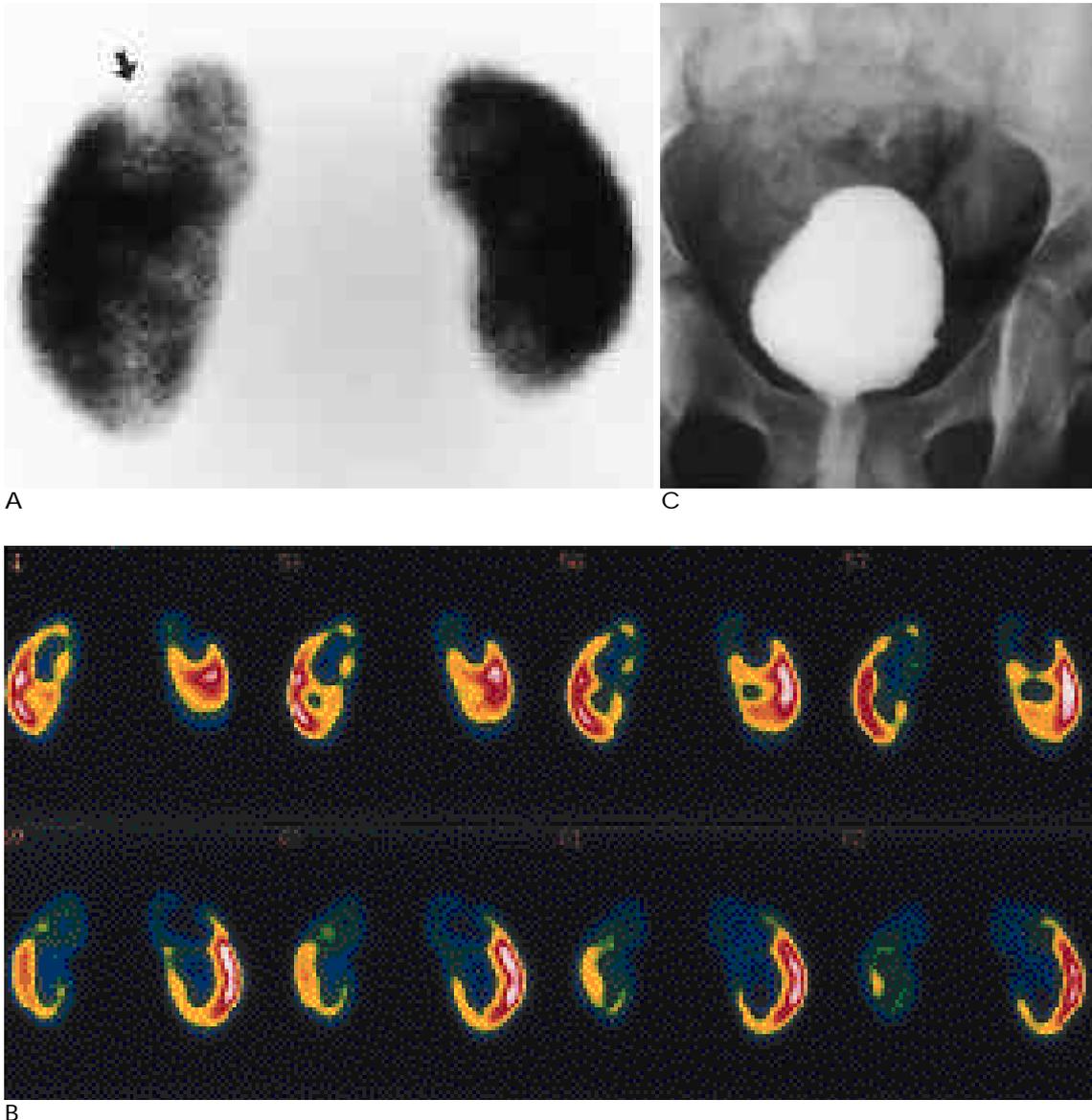


Fig. 1. A 7-year-old girl with first urinary tract infection
 A, B. Posterior view of DMSA planar imaging (A) and coronal view of SPECT(B) show a focal wedge shaped defect at the upper pole of the left kidney(arrow), corresponding to minor defect.
 C. VCUG obtained one month after infection shows no evidence of vesicoureteral reflux.

collimator 10 count, 128 × 128 matrix
 4 (planar image)
 (Single Photon Emission Computed Tomography,
 SPECT) (transaxial and
 coronal image)
 (mild),
 (moderate),
 가
 (gross) . VUCG
 (International Reflux Study)
 1 5 . DMSA VUCG

Table 2. Correlation of Cortical Defects and VUR (χ^2 , $p < 0.05$)

Scintigraphic Findings	VUR		Total
	Negative	Positive	
Defect	46	30	76
No defect	52	6	58
Total	98	36	134

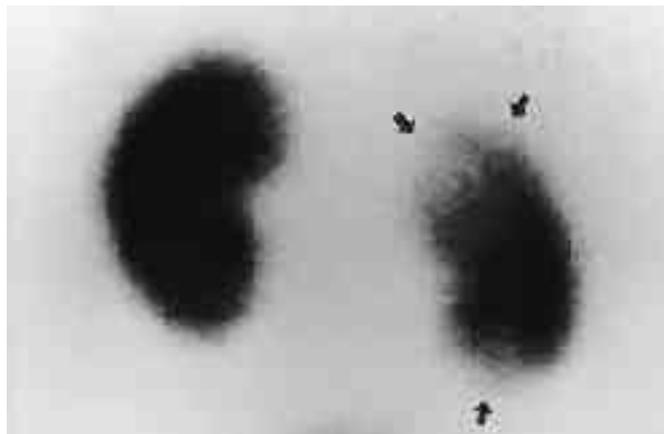
VUR : Vesicoureteral reflux

3 가
 3 가
 2 가
 2
 chi-square test
 Mantel-Haenszel chi-square
 test Spearman correlation test

Table 3. Correlation of Cortical Defects and Grade of VUR (M-H χ^2 , $p < 0.05$)

VUR Grade	Defect Grade				Total
	None	Minor	Moderate	Gross	
I	4	2	2	0	8
II	1	1	3	1	6
III	0	1	1	3	5
IV	1	1	2	7	11
V	0	0	0	6	6
Total	6	5	8	17	36

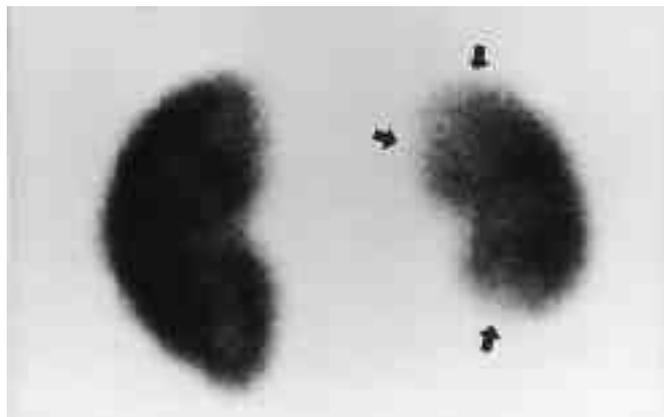
VUR : Vesicoureteral reflux



A



B



C

Fig. 2. A 4-month-old boy with recurrent urinary tract infection
 A. Posterior view of DMSA planar imaging demonstrate multiple diminished cortical uptakes of the right kidney (arrows) with normal size, corresponding to moderate defect. Left kidney shows normal cortical uptake.
 B. VCUG obtained one month later shows opacification of the right renal pelvis during voiding, suggesting grade III vesicoureteral reflux.

C. Follow-up DMSA scan taken 15 months later reveal diffusely decreased size of the right kidney compared with contralateral one. Again notes that the focal lesions (arrows) in the right renal outline show exactly same sites corresponding to previous cortical defects.

가 ^{99m}Tc -DMSA 가?

p value가 0.05

VCUG , , , 56 36 (64 %) 가

VCUG , , , 78 40 (51 %) 가

(; 가 가 ($p > 0.05$).

/ 가 가 (30/36)

) 가 (46/98) (Fig. 1)

($p < 0.05$) (Table 2),

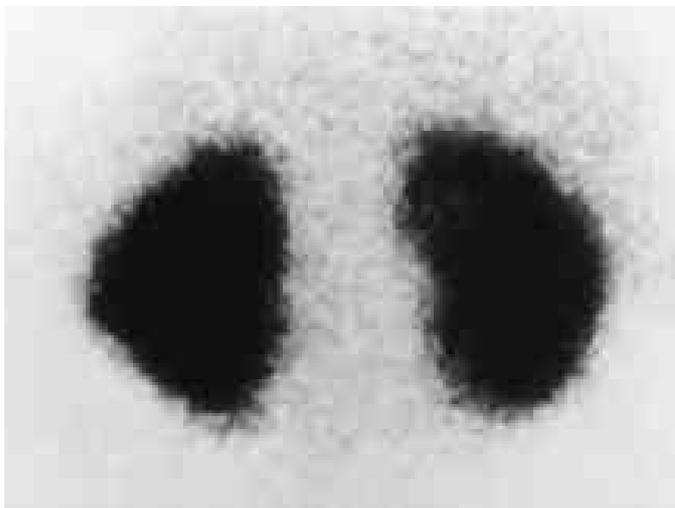
($r = 0.56, p < 0.05$) (Table 3)

DMSA 2 (Fig. 2). 134 76

54 38 (70 %) (56.7 %) , 30 (39.6 %)

80 38 (48 %) 2

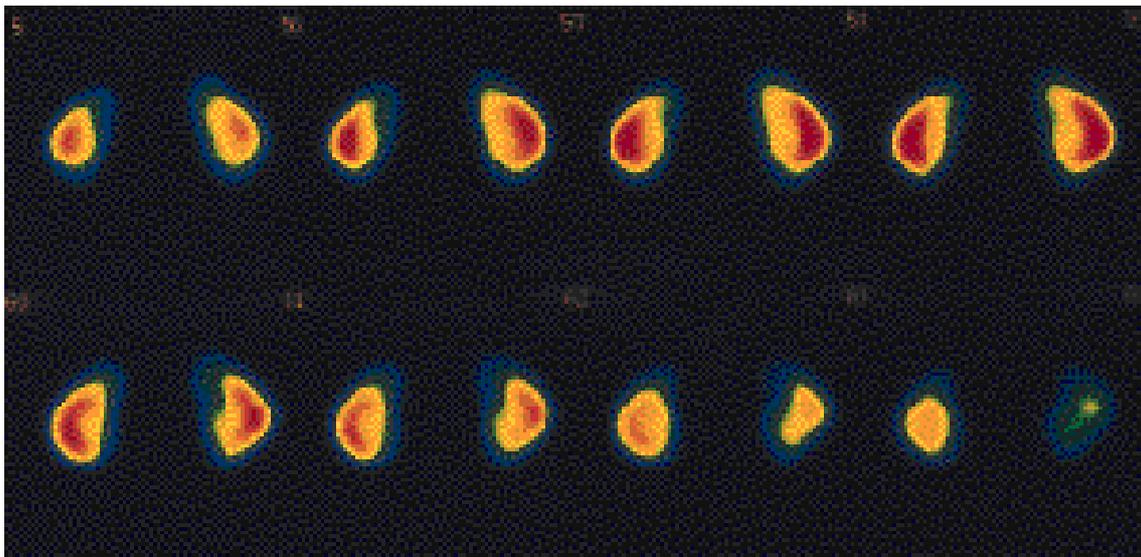
가 (p<0.05) (Table 1).



A



C



B

Fig. 3. A 3-month-old boy with first urinary tract infection
 A, B. DMSA planar imaging(A) and coronal SPECT(B) at the time of acute inflammation show symmetric and homogeneous isotope uptake without focal photopenic area.
 C. VCUG obtained three months after infection demonstrates bilateral vesicoureteral reflux with grade I.

VCUG 가 , 46 (60.5 %) Clarke (23) 1 DMSA
 가 58 5 ,
 6
 , grade IV 1 2 가
 grade 2 (Fig. 3). VCUG 2 , 2 2
 가 134 36 (26.8 %) 가 .
 , 30 (83 %) VCUG , 2
 39.5 %, 89.7 %, 83.3 %, 가
 53.1 % , 가 가
 (relative risk) 1.78 .
 가 , 가 가 가
 가 가 (23).
 가 ,
 , grade 2
 , (6-9). 가
 가 VCUG 38-57 %
 , 가 ,
 (cast)가 가 VCUG
 가 (1-3). (Escherichia
^{99m}Tc-DMSA Coli) P-fimbriae
 , SPECT (4, 5, 17, 18).
 50-91 % , SPECT (4, 5, 17, 18).
 (2,10-14). 가
 90 % (15) 1.8
 (16), (60.45 %) 가
 가 VCUG
 , 89.7 % 39.5 % ,
 가 가 58 가 6 ,
 1 grade 2
 (17-20). VCUG
 56.7 % 가 2 가 가
 2 , VCUG
 , 가 가 가
 , 가 가 VCUG
 (21), DMSA 가 가
 Benador (22) 1 40 가
 % , 1-5 86 % , 5 69 %가 가
 , 가 가 가
 가 가

가 : 가
 2 , 가 ,
 가 .
 VCUg 가
 가

^{99m}Tc-DMSA 가?

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Which are Risk Factors developing Renal Cortical Defects on ^{99m}Tc -DMSA Scintigraphy in Children with Acute Urinary Tract Infections?¹

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Purpose: To determine (1) the relationship between the cortical defects seen on ^{99m}Tc -DMSA renal scans and age, and (2) the presence and degree of vesicoureteral reflux, and then to depict the risk factors for cortical defects in children with acute urinary tract infection (UTI). Furthermore, to assess the diagnostic value of VCUG in predicting a defect on ^{99m}Tc -DMSA renal scans.

Materials and Methods: We studied 134 kidneys in 67 children aged 15 days-10 years (M:F= 39:28) in whom symptomatic UTI was present. In all these children, both DMSA renal scans and voiding cystourethrography (VCUG) were performed. Scanning took place within 7 days of diagnosis and VCUG was performed after one month of diagnosis. Scintigraphic findings were graded according to the extent and number of cortical defects. We evaluated the relationships between the cortical defects seen on DMSA scans and age, and the grade of vesicoureteral reflux. The diagnostic value of VCUG in predicting cortical defects was analysed.

Results: The prevalence of cortical defects was greater in patients older than two years (38/54, 70 %) than in those aged less than two (38/80, 48 %). The frequency of cortical defects was related to vesicoureteral reflux ($p < 0.05$) and grade of reflux ($p < 0.05$). As this latter increased, the extent of cortical defects also increased ($p < 0.05$), and DMSA scans revealed the presence of these in 76 of the 134 kidneys (57 %) with acute UTI. In 30 of these 76 (39.5 %), VCUG demonstrated the presence of vesicoureteral reflux. On the other hand, vesicoureteral reflux was found in 36 of the 134 kidneys (27 %), and in 30 of these 36 (83 %), cortical defects were noted. The sensitivity of VCUG in predicting cortical defect was 39.5 %, while specificity was 89.7 %. The positive predictive value for defects was 83.3 %, and the negative predictive value was 53.1 %. The relative risk of cortical defect in the presence of vesicoureteral reflux was 1.78.

Conclusion: Renal cortical defects are significantly related to age and grade of vesicoureteral reflux. Risk factors for developing cortical defects were older age (≥ 2 yrs) at the time of acute UTI, and high grade of vesicoureteral reflux. The specificity of VCUG in predicting cortical defects is relatively high but the sensitivity is low, and a significant proportion of cortical defects therefore occurred in the absence of vesicoureteral reflux.

Index words : Children, genitourinary system
Kidney, infection
Kidney, radiography
Kidney, radionuclide studies

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