

Renal scarring in children with urinary tract infections

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(Key words: Urinary tract infections, children, renal scarring)

Objective To assess factors associated with renal scarring in children with urinary tract infections.

Design Prospective study.

Method Tc 99 DMSA scan was done to detect renal scars in 290 children below the age of 12 years with a proven urinary tract infection. They were also screened to detect underlying abnormalities by ultrasonography, micturating cystourethrogram (MCUG), Tc DTPA scan and intravenous pyelography (IVP) when indicated.

Results Out of the 290 children studied 114 (39%) had detectable renal scars on Tc 99 DMSA scan. 59 (52%) of them were males and 55 (48%) were females. Right kidney was affected in 36 (31%) patients and left kidney was affected in 56 (49%) patients and both kidneys were affected in 22 (19%) patients. Multiple renal scars involving both kidneys were detected in 8 patients.

Of the 114 patients with renal scarring, 105 (92%) patients presented to us with the first episode of urinary tract infection. Out of the nine patients who presented with recurrent attacks, 8 showed multiple scarring of both kidneys. Specific urinary symptoms was the presenting feature in 75 (66%) of patients with renal scars and 39 (35%) presented with non specific symptoms.

Underlying urinary tract abnormalities were detected in 48 (42%) of patients with renal scarring and the main abnormality detected was the vesico-ureteric reflux in 36/48 (73%) of patients. *E. coli*, sensitive to most of the commonly used antibiotics, was the commonest organism identified in 99% of patients.

Conclusions Rate of scarring of kidneys in proven urinary tract infections is similar to studies done in other countries. Recurrent episodes resulted in multiple scarring of kidneys.

Introduction

Urinary tract infections (UTI) are among the common acute bacterial infections in childhood accounting for a significant amount of morbidity. Concern with childhood UTI focuses not so much on the morbidity of acute infections but on the risk of delayed clinical outcome resulting from renal parenchymal damage. Chronic atrophic pyelonephritis is the main cause of sustained hypertension and renal insufficiency in children and young adults.

Objective

To assess factors associated with renal scarring in children with urinary tract infections.

Design

A prospective study.

Method

This study was done in the Professorial Paediatric unit, Teaching Hospital, Peradeniya since September 1993 to date. During this period 290 children below the age of twelve years with a bacteriological proven urinary tract infection were screened to detect renal scars and underlying abnormalities.

Imaging studies done on children with UTI

- Ultra sound (US) scan of genitourinary tract
- Tc 99 DMSA scan
- Micturating cystourethrogram (MCUG)
- Tc 99 DTPA
- Intravenous pyelography (IVP) in selected cases

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Selection criteria for MCUG

< 3 years

- All cases

3-7 years

- Recurrent UTI
- Renal scarring
- Abnormal US scan / DMSA scan
- F/H of vesico-ureteric reflux (VUR)

Results

A total of 290 children with bacteriologically proven urinary tract infections were screened. Of the total sample 114 (39%) had detectable renal scars. 59 (52%) of them were males and 55 (48%) were females. The male to female ratio was almost 1:1

Patterns of renal scars observed in these patients are shown in Table 1. The left upper pole was more frequently scarred than the right. 50(43%) Vs. 36(31%) while a quarter had multiple bilateral scars. 70% of those patients with scarred kidneys were below the age of 5 years (Table 2).

Table 1
Renal scarring patterns

Right upper pole scarring	36 (31%)
Left upper pole scarring	50 (43%)
Multiple scars	28 (24%)

Table 2

Age distribution of patients with scarred kidneys

0 – 1 year	21 (18%)
>1 – 2 years	38 (23%)
>2 – 5 years	34 (30%)
>5 – 10 years	19 (17%)
>10 – 12 years	02 (02%)

Out of the 114 patients with scarred kidneys 105 (92%) have had no previously recorded urinary tract infections (Table 3). Of those with scarred kidneys 75 (66%) patients presented with specific symptoms and 39 (34%) presented with non specific symptoms (Table 4).

Table 3
Episode at presentation

1 st episode	105 (92.1%)
2 nd episode	07 (6.1%)
3 rd episode	02 (1.7%)

Table 4
Non specific symptoms

Fever	86 (81%)
Vomiting	31 (29%)
Excessive crying	25 (24%)
Diarrhoea	13 (12%)
Neonatal jaundice	05 (04%)
Febrile convulsions	04 (03%)

Vesico-ureteric reflux was the main underlying abnormality detected in patients with scarred kidneys (Table 5). Coliforms sensitive to most of the commonly used antibiotics was the commonest organism identified in 99% of patients with scarred kidneys (Table 6).

Table 5
Underlying abnormalities in patients with scarred kidneys

Vesico-ureteric reflux	38 (72%)
PUJ obstruction	05 (9%)
Posterior urethral valves	05 (9%)
Neurogenic bladder	02 (4%)
Horse shoe kidney	02 (4%)
Duplex system	01 (2%)

Table 6
Bacterial pathogens found in patients with scarred kidneys

Coliforms	110 (95%)
Klebsiella	04 (05%)

Discussion

39% of children in our study group had detectable renal scars. Permanent renal damage in children after acute pyelonephritis has been estimated to occur in 5-20% of cases¹. These numbers are based on findings seen in IVP which is a less sensitive method for detecting renal scars than Tc 99 DMSA scan. Recent studies done in Sweden by Jacobson et al² with the use of Tc 99 DMSA scans show a higher incidence (37%).

70% of children with renal scars in the study group were below the age of five years and more than 50% were below the age of two years. This finding is in keeping with previous studies which have shown that infants and children younger than 5 years are at greater risk of developing renal scars¹.

90% of children with renal scars presented with the first episode of urinary tract infection. A thorough evaluation of the histories showed that some of them have had recurrent febrile episodes in early infancy. It is possible that they may have had UTIs during infancy which were undetected and masked by indiscriminate use of antibiotics for febrile episodes. Even through 65% of those with scarred kidneys presented with specific symptoms related to the urinary tract it is important to note that 34% presented with non specific symptoms. Therefore a high degree of suspicion of urinary tract infection is necessary to identify these patients who are at risk of renal damage.

Underlying abnormalities were detected in 45% of patients with renal scars and the main abnormality detected was vesico-ureteric reflux (VUR) in 75% of patients. Although vesico-ureteric reflux or structural abnormality has been considered as a prerequisite to the development of renal scars only 33% of patients in our study group had demonstrable VUR. This study confirms the observations made by Jacobson et al² that renal scarring occurs more often without demonstrable reflux or obstruction and there may be other unidentified host or bacterial factors responsible. In some of these patients VUR may have resolved before they presented to us.

E. coli was the commonest organism cultured from these patients. This is in agreement with other studies. Four patients who have had Klebsiella infection had underlying abnormalities. Previous observations have shown that children with underlying urinary tract abnormalities are susceptible to get infections by more virulent organisms.

Conclusions

A high degree of suspicion, early detection and treatment, identifying risk factors and prevention of recurrences are important to prevent permanent renal damage in children with urinary tract infections.

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