

Diagnostic Role of Renal Ultrasonography in Children with Urinary Tract Infection

Urinary Tract Infection in Children

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ABSTRACT

Objective: This study was designed to evaluate renal Ultrasonography in children having simple urinary tract infections.

Study Design: Retrospective study

Place and Duration of Study: This study was conducted at the Department of Radiology, Bahawal Victoria Hospital, Bahawalpur from August, 2017 to April 2018.

Materials and Methods: In our study 350 patients were included. All the cases with positive urine cultures were included in our study. Positive urine cultures were defined as 100,000 CFU/mL in midstream samples or urine bags or 10,000 CFU/mL in suprapubic samples. Sex, age, ultrasound performance, VCUG, and DMSA scan results were recorded. SPSS 21 was used for data interpretation, percentages, frequencies were calculated and table was formed.

Results: The initial diagnosis of urinary tract infection was performed in 350 patients (male=165, female=185), and 220 urine cultures were positive. Out Of 220 patients with urinary tract infections, 159 (78%) were females and 59 (22) were males (P 0.001). The age distribution is shown in . Children less than 5 years old, hydronephrosis were the most common. The thickening of the bladder wall in older children was the most common abnormal finding. Abnormal renal ultrasound was significantly associated with VUR (Table 3). The sensitivity, specificity, positive predictive value and negative predictive value of RUS for VUR were 42%, 79%, 38% and 82%, respectively. Hydronephrosis was a more common ultrasound result in VUR cases. There was no significant correlation between abnormalities in renal ultrasound images and VUR (P = 0.43).

Conclusion: Most UTI patients have normal renal ultrasonography. Hydronephrosis is the most common abnormality in VUR cases.

Key Words: Sonography, Urinary tract infection, vesico urethral reflux, VUR

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INTRODUCTION

Urinary tract infections are common in young children, and the overall morbidity prevalence in children with UTI is 0.7%¹. In daily practice, it is recommended that the kidneys ultrasonographically abnormal in the upper urinary tract. Non-invasive, Low radiation makes it an ideal tool for initial assessment². However, recent publications have questioned the importance of routine renal ultrasonography (RUS) in the treatment of children with uncomplicated urinary tract infections (UTI)³⁻⁵.

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MATERIALS AND METHODS

In our study 150 patients were included. This study was conducted in Bahawal Victoria Hospital, Bahawalpur. The study period was august, 2017 to April 2018. All the cases with positive urine cultures were included in our study. Positive urine cultures were defined as 100,000 CFU/mL in midstream samples or urine bags or 10,000 CFU/mL in suprapubic samples. Sex, age, ultrasound performance, VCUG, and DMSA scan results were recorded. SPSS 21 was used for data interpretation, percentages, frequencies were calculated and table was formed.

RESULTS

The initial diagnosis of urinary tract infection was performed in 350 patients (male=165, female=185), and 220 urine cultures were positive. Out Of 220 patients with urinary tract infections, 159 (78%) were females and 59 (22) were males (P 0.001). The age distribution is shown in Table 1. Children less than 5 years old, hydronephrosis was the most common Abnormal results. The thickening of the bladder wall in older

children was the most common abnormal finding (Table 2).

Abnormal renal ultrasound was significantly associated with VUR (Table 3). The sensitivity, specificity, positive predictive value and negative predictive value of RUS for VUR were 42%, 79%, 38% and 82%, respectively. Hydronephrosis was a more common ultrasound result in VUR cases. There was no significant correlation between abnormalities in renal ultrasound images and VUR (P = 0.43).

34 (57%) of the men had normal renal ultrasonography and 25(43%) had abnormal ultrasound findings. In girls, 125 cases (79%) had normal ultrasound, and 34 cases (21%) were abnormal. Abnormal results were more common in men than women (P=0.001). hydronephrosis was the most common abnormality in ultrasound examinations for men and women (Table 4). There was no significant difference in ultrasound findings between patients with and without circumcision.

Of the circumcised boys, 34 (68%) had E. coli in the urinary system and 61 (70.9%) had E. coli-negative (P = 0.797). A vesicourethral reflux occurred in 5 (26.3%) circumcised boys and 17 (30.9%) uncircumcised boys (P = 0.706). In 625 urine cultures, E. coli (83.3%) was the most common pathogen, followed by Klebsiella pneumoniae (9%); Proteus (2.8%); Enterobacteriaceae (1.5%); and coagulase-negative staphylococci (1.2%).

Of the 434 E. coli-positive UTIs, 103 (23.73%) were abnormal in ultrasound examinations, 331 (76.27%) were normal in renal ultrasound examinations, 24 (29.62%) were abnormal ultrasound examinations in 81 patients, and 57 were performed by ultrasonography. 70.37% %) There is normal ultrasound. There was no significant difference between E. coli positive and other abnormal ultrasound examinations (P = 0.2). In E. coli and non-E enterobacteriaceae. In E. coli-positive cases, normal ultrasound was significantly higher than abnormal ultrasound (P < 0.001).

Table No.1: Age distribution among children admitted with urinary tract infection

Age	Number	Percentage
< 1 yr	20	9 %
1-2 yr	95	43%
2-5 yr	55	25%
5-10 yr	35	17%
>10 yr	15	6%

Table No.2: Ultrasound findings among children < 5 yr and children > 5 yr

Age	Hydroureter (%)	Hydronephrosis (%)	Stone (%)	Bladder Wall thickness	Ectopic Kidney (%)	Increased Parenchymal echogenicity	Other (%)	Total
<5 yr	9	48	7	10	7	7	11	100
>5 yr	3	7	0	23	2	3	2	40

Table No.3: Vesicourethral reflux among cases with normal or abnormal sonography

Renal Ultrasound	Reflux (+)	Reflux (-)	Total
Normal	42 (20%)	168(80%)	210
Abnormal	51 (36%)	89 (64%)	140
Hydroureter	6	6	
Hydronephrosis	23	32	
Stone	3	4	
Bladder Wall thickness	7	16	
Ectopic Kidney	3	6	
Increased Parenchymal echogenicity	4	6	
Other	9	4	

Table No. 4: Distribution of ultrasound findings among males and females

Ultra Sound Finding	Male (%)	Female (%)
Hydronephrosis	24 (44%)	29 (34%)
Bladder Wall thickness	13 (23%)	19 (23%)
Hydroureter	8 (15%)	6 (7%)
Increased Parenchymal echogenicity	5 (9%)	11 (13%)
Ectopic Kidney	2 (4%)	9 (10%)
Renal Stone	5 (9%)	4 (5%)
Other		7 (8%)
	55	85

DISCUSSION

In this study, the most common infection age was less than 12 months. This finding was similar to the study by Wagenlehner et al.⁶. However, our results were contradictory with Yuksel et al study⁷. In our study, 77.92% of were females. In a study by Zamir et al., 75.3% were females from all cases⁸. In the Heberman et al. study, there were 89.32% females⁹. Our results were similar to these studies and are slightly different because of the age of the cases.

The main pathogenic factors in this study were Escherichia coli, Klebsiella pneumoniae and Proteus. Our findings are similar to that of Zamir et al study

A study conducted in Saudi Arabia¹⁰ total 130 , 92 (69.7%) had normal sonography and 38 (30.3%) had normal renal ultrasound. In their study, 38 patients had abnormal renal ultrasound and 50% VUR VCUG. In our study, 92 cases of abnormal ultrasound, 38% had VUR is in VCUG. The results of the two studies are slightly different, but our study has more samples (625 cases) comparing Alshamsan et study¹⁰ and 130 cases.

In a prospective study by Hebermann et al⁹ of 309 children were 1-24 month old by, 88% (272,309) of the renal ultrasound findings were normal. 41 abnormalities

were found in 37 cases. Most of the malformations were pelvic dilation (13 cases), pelvocaliectsis (12 cases), ureteral dilatation (9 cases), hydronephrosis (2 cases). In Montini et's study, there were 300 children with the first fever and 13% (38) cases,¹¹ with renal ultrasound abnormalities.

In a study in Finland, 399 ultrasounds of kidneys, 31 boys and 40 girls had abnormal USG findings¹². In Zamir et, 255 cases of renal ultrasound studies, 85.8% of cases had normal USG⁸. In 219 cases of normal ultrasound examination, 38 cases had abnormal VCUG⁸.

DiPietro et al. studied 70 children with age less than 5 years using VCUG and RUS. Five patients had abnormal renal ultrasonography and 65 patients had normal renal ultrasonography¹³.

In a study by Smellie and Rigden 58 children with UTI, VUR was found in VCUG in 62% of cases, but only 8 cases had abnormal RUS¹⁴. Their conclusion is that RUS is an unreliable method for detecting VUR¹⁴. In our study, hydronephrosis was the most common finding in VUR cases. Alshamsan et al.¹⁰ reported similar results In the study of Montini et al The authors concluded that ultrasound has the least benefit in the acute phase of the disease.¹¹

In studies from Saudi Arabia, ultrasonography did not have much value in treating children with the first fever UTI¹⁰. Hoberman et al. believe that renal ultrasound is not of much value in the treatment of children with urinary tract infections⁹. As most studies mention, in most cases of UTI^{8,9}, renal ultrasound findings were normal.

CONCLUSION

Most of the UTI patients have normal ultrasound findings. Ultrasound has little therapeutic value for children with uncomplicated urinary tract infections. Hydronephrosis is the most common abnormality in the cases with VUR. Another study is recommended to determine role of renal ultrasound in the management of urinary tract infection.

Author's Contribution:

Concept & Design of Study:	Malik Mudasir Hassan
Drafting:	Sadia Riaz
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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