

Original Research Article

To evaluate the importance of renal doppler ultrasonography in diagnosing obstruction in unilateral equivocal hydronephrosis cases in Paediatric Population

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Abstract:

Background & Method: The aim of the study is to evaluate the importance of renal doppler ultrasonography in, diagnosing obstruction, in unilateral equivocal hydronephrosis cases in Paediatric Population. Patients were selected as per the inclusion and the exclusion criteria. Two groups of the patients were made, one with obstructive unilateral hydronephrosis with or without a dilated ureter and other one with non-obstructive unilateral hydronephrosis with dilated urinary tract and bladder involvement.

Result: Out of 62 patients, 33 (53%) were having their right kidney affected (hydronephrotic), while 29 (47%) were having their left kidney affected. Renal length (of affected kidney) is increased as compared to the healthy kidney in 26 (42%) cases out of 62 patients. Renal parenchymal thickness of the affected kidney was decreased in 39 (63%) patients, out of 62 patients. Renal cortical thickness of affected side is decreased in 26 (42%) cases, thus indicating that the enlarged renal unit showed thinning of renal cortex too.

Conclusion: The most common age group of the patients (children) in our study, was between 1-6 months 16 (26%), followed by between 5-10 yrs, 14 (22%), between 0-1 month, 21 (21%), 1-5 yrs, 8 (13%), 6 months – 1yr, 6 (10%), 10-16 yrs, 5 (8%). The colour doppler ultrasonography of intrarenal renal arteries, holds a unique role in imaging workup as well as in optimal management planning, in cases of unilateral paediatric hydronephrosis. This is comparable to the other partly invasive /high cost higher modality of imaging.

Keywords: renal Doppler, ultrasonography, unilateral & hydronephrosis.

Study Designed: Observational Study.

1. Introduction

Hydronephrosis is usually detected on ultrasonography (USG-Gray scale), while neonates or young children with hydronephrosis may occasionally present with abdominal pain or a palpable abdominal mass or complications of obstruction such as urinary tract infection or haematuria^[1]. USG remains the first-line imaging modality for confirming hydronephrosis and for determining the severity of dilation, cause & level of obstruction in neonates and young infants^[2].

Over all unilateral obstructive dilatation of urinary tract is more common and more harmful than unilateral nonobstructive one. Unrelieved urinary tract obstruction has been shown to

interfere with normal development of the kidney in young children and almost always leads to permanent renal atrophy, termed obstructive uropathy^[3].

Colour Doppler imaging is able to demonstrate both normal and abnormal renal blood flow. Normal flow within the renal artery and its branches has a “low resistance” perfusion pattern, with continuous forward blood flow during diastole. Several Doppler parameters have been used to describe changes in Doppler arterial spectra that may accompany renal disease. The most common parameter is the resistive index (RI = peak systolic frequency– end diastolic frequency/peak systolic frequency). RI is an easily calculated, angle-independent measurement. Calculation software is available on even lower-level ultrasound plat- forms^[4]. However, it is recommended that averaging a number of RI measurements in a kidney before a single representative average is reported. An RI of less than 0.7 is reported as the upper threshold limit in normal adults, although renal RIs greater than 0.7 may be seen in children under 4 years of age and in elderly patients, despite normal renal function^[5].

2. Material & Method

This was a hospital based, time bound, and prospective study, done in the Department of Radio diagnosis of NMC Royal Hospital, Khalifa City, Abu Dhabi. The duration of this study was 01 Year.

Patients were selected as per the inclusion and the exclusion criteria. Two groups of the patients were made, one with obstructive unilateral hydronephrosis with or without a dilated ureter and other one with non-obstructive unilateral hydronephrosis with dilated urinary tract and bladder involvement. A written informed consent was taken from the parents/ guardian of the patients.

INCLUSION CRITERIA

- The subject of study is age specific. Only neonates, infants and children upto 16 years of age were included in the study.

1. All pre-diagnosed infants and children, with unilateral obstructive hydronephrosis.
2. All infants and children referred to the Department of Radiodiagnosis, with strong clinical suspicion of unilateral obstructive hydronephrosis.

EXCLUSION CRITERIA

1. Patients above 16 years of age.
2. Infants and neonates having bilateral hydronephrosis/ pyonephrosis.

3. Results

TABLE 1: AGE DISTRIBUTION OF THE CASES

Age group	No. of pts.	Percentage %
0-1 mths	13	21%
1-6 mths	16	26 %
6m- 1yr	06	10 %
1-5 yrs	08	13 %
5-10yrs	14	22 %
10-16 yrs	05	8 %
Total	62	100 %

The most common age group of the patients (children) in our study, was between 1-6 months, 16 (26%), followed by 5-10 yrs, 14 (22%).

TABLE 2: PRESENTING COMPLAINTS

Presenting Complaints (symptoms)	No. of pts.	Percentage %
Abdominal pain	38	61%
Dysuria	28	45%
Fever	20	32%
Pyuria	6	10%

TABLE 3: LATERALITY OF THE AFFECTED KIDNEY

Affected kidney (rt/lt)	No. of pts.	Percentage %
Right	33	53 %
Left	29	47 %
Total	62	100%

Out of 62 patients, 33 (53%) were having their right kidney affected (hydronephrotic), while 29 (47%) were having their left kidney affected.

TABLE 4: USG (GRAYSCALE) EVALUATION OF THE PAEDIATRIC UNILATERAL HYDRONEPHROSIS

S No.	Parameters of the affected kidney	USG findings	No of pts.	%
1.	Renal Length	Increased	26	42 %
2.	Renal Parenchymal Thickness	Decreased	39	63 %
3.	Renal Cortical Thickness	Decreased	26	42 %
4.	Renal pelvis	Dilated (Increased AP diameter of Renal Pelvis)	62	100%
		Grossly dilated	27	43 %
5.	Extrarenal Pelvis	Mild to moderately dilated renal pelvis outside the confines of the renal hilum with no calyceal dilatation	2	03%
6.	Calyceal system	Undilated	14	23 %

		Mildly dilated (few calyces only) without internal echoes		9	14%
		Moderately and mod. to	With internal echoes	14	23%
		grossly dilated all the calyces	Without internal echoes	25	40%
7.	Echogenicity	Increased		23	37 %
		At Renal Pelvis		0	0 %
8.	Calculus	At PUJ		2	3 %
		Ureteric		2	3 %
		Dilated		35	56 %
		Narrowing		25	40 %
9.	Pelvi Ureteric Junction	Calculus		2	3 %
10.	Ureter	Narrowing (focal)		1	2 %
		Undilated		29	46 %
		Dilated	Dilated without echoes	21	34 %
			Dilated with echoes	6	10%
			Ureterocele	2	3%
11.	Ureteric Duplication	Duplicated and dilated ureter		3	5 %
12.	Urinary Bladder	Uninvolved		34	55 %
		Involved	Symmetrical UB wall Thickening	22	35 %
			Trabeculations/sacculations	16	26 %
			Internal echoes	6	10%

Renal length (of affected kidney) is increased as compared to the healthy kidney in 26 (42%) cases out of 62 patients. Renal parenchymal thickness of the affected kidney was decreased in 39 (63%) patients, out of 62 patients. Renal cortical thickness of affected side is decreased in 26 (42%) cases, thus indicating that the enlarged renal unit showed thinning of renal cortex too.

4. Discussion

USG stays the first-line imaging methodology for identifying hydronephrosis and for deciding the seriousness of widening (level of deterrent), cause and level of obstacle in babies and youthful children[6]. Albeit dim scale USG of kidneys can dependably recognize

gathering framework dilatation, it is many times impractical to separate among obstructive and non-obstructive causes on dark scale sonography alone.

Delayed renal check actuates hormonal changes and in this manner causes diffuse vasoconstriction of the vascular bed, subsequently on assessing various examples of blood stream in intrarenal veins (on variety doppler) is useful in differentiating obstructive from non-obstructive pyelocaliectasis[7]. Unrelieved urinary lot deterrent has been displayed to slow down typical improvement of the kidney in small kids and quite often prompts super durable renal decay, named obstructive uropathy[8]. Subsequently, it is very important to recognize huge block, that requires careful mediation and nonobstructive cases in which just moderate methodology is fitting in the greater part of the cases[9].

The accessibility of doppler sonography is obviously a basic, harmless and well reproducible assistant to the next mostly obtrusive/significant expense demonstrative strategies, usually utilized in the radiological evaluation of the renal obstruction[10].

5. Conclusion

The most common age group of the patients (children) in our study, was between 1-6 months 16 (26%), followed by between 5-10 yrs, 14 (22%), between 0-1month, 21(21%), 1-5 yrs, 8 (13%), 6months – 1yr, 6 (10%), 10-16 yrs, 5 (8%). The colour doppler ultrasonography of intrarenal renal arteries, holds a unique role in imaging workup as well as in optimal management planning, in cases of unilateral paediatric hydronephrosis. This is comparable to the other partly invasive /high cost higher modality of imaging.

6. References

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