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Original Research Article

A study on postnatal evaluation and follow-up of infants with antenatally detected hydronephrosis

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ABSTRACT

Background: Antenatal hydronephrosis(ANH) has now become a frequent diagnosis with the increasing use of antenatal ultrasonography. Objective of present study was to evaluate and follow up infants with antenatally detected hydronephrosis and to determine whether there is significant correlation between anteroposterior renal pelvic diameter detected in antenatal USG and urinary tract anomalies detected postnatally.
Methods: After obtaining an informed consent, all neonates with antenatal ultrasound showing hydronephrosis (n=80) were enrolled in the study. Postnatal ultrasound was done at 3 days ,1 month and 6 months of postnatal life. Atleast 6 months followup was done to look for spontaneous resolution or other significant pathology. Micturating cystourethrography/radionuclide scan done in selected cases.
Results: Out of 80 cases ,43 had mild,24 had moderate and 13 had severe degrees of hydronephrosis.31 of them (9 mild,10 moderate and 12 with severe hydronephrosis) had postnatal anomaly detected.14 of them (1 mild, 4 moderate and 9 with severe hydronephrosis) underwent surgery. As the grade of antenatal hydronephrosis increases from mild, moderate to severe, the relative risk of postnatal anomaly and requirement of surgical intervention also increased (p value<0.0001).
Conclusions: Antenatal hydronephrosis may be associated with significant postnatal urinary tract anomaly with risk quantified by the measurement of anteroposterior renal pelvic diameter(APPD).

Keywords: Antenatal hydronephrosis, Anteroposterior pelvic diameter

INTRODUCTION

Antenatal hydronephrosis (ANH) has now become a frequent diagnosis with the increasing use of antenatal ultrasonography. The estimated incidence of antenatal hydronephrosis is 1-5% and this is one of the most common antenatally detected ultrasound anomalies.[1-4]

Though majority of the cases of antenatally detected hydronephrosis resolves spontaneously, some may be a marker of serious underlying urinary tract abnormalities such as pelviureteric junction obstruction (PUJO), vesicoureteralreflux (VUR), urethral obstruction, megaureters, posterior urethral valve etc. Hence strict postnatal followup becomes a necessity to prevent the subsequent morbidity and mortality due to chronic kidney diseases. Earlier these anomalies were detected only when the child becomes symptomatic. Now ultrasound has emerged as a boon for their early detection and hence possible intervention.

Clinical practice widely varies regarding the evaluation and follow-up of antenatal hydronephrosis. There is no uniform definition or grading available for antenatal

hydronephrosis detected in the antenatal or postnatal period. The most widely used objective parameter in the current literature is the measurement of the fetal renal pelvis anteroposterior diameter (APD).

Table 1: Definition of antenatal hydronephrosis by renal pelvic anteroposterior diameter.

Classification	Renal pelvic anteroposterior diameter, APD	
	Second trimester	Third trimester
Mild	4-6 mm	7-9 mm
Moderate	7-10 mm	10-15 mm
Severe	>10 mm	>15 mm

The number of previous studies in this aspect of postnatal followup of antenatally detected hydronephrosis are limited. Because of the lack of proper consensus regarding assessment and followup of these infants, the postnatal approach to fetal renal pelvis enlargement remains controversial.

This study was conducted in this background to evaluate the outcome of infants with antenatally detected hydronephrosis based on anteroposterior renal pelvic diameter. Further studies are required to clarify the role of prenatal intervention, frequency of follow up investigations and indications for surgery in these patients.

Aims and objectives of present study were to evaluate and follow up infants with antenatally detected hydronephrosis and to determine whether there is significant correlation between anteroposterior renal pelvic diameter detected in antenatal USG and urinary tract anomalies detected postnatally.

METHODS

It was a prospective analytical study carried out from October 2014 to August 2016 on 80 infants (Neonates delivered at Government Rajaji Hospital, Madurai with antenatal USG (after 20 weeks of gestation) showing presence of anteroposterior renal pelvic diameter >4mm).

Inclusion criteria

- All neonates delivered at GRH/ Madurai with antenatal USG (after 20 wks of gestation) showing presence of anteroposterior renal pelvic diameter >4mm.
- Following an informed parental consent, clinical history and relevant data regarding prenatal investigations was collected for all neonates with antenatal USG showing hydronephrosis. Postnatal USG was done on day 3, 1 month and 6 months of postnatal life. Atleast 6 months follow up was done to look for spontaneous resolution or other significant pathology. MCU/Renal Scintigraphy was done in selected cases.

Statistical analysis

Data analysis was done with the help of computer using SPSS v16 software. Using this software range, frequencies, percentages, means, standard deviations, chi square and p values were calculated. Kruskul Wallis chi square test was used to test the significance of difference between quantitative variables. A p value less than 0.05 is taken to denote significant relationship.

RESULTS

Out of 80 infants, 58 (72.5%) were male and 22 (27.5%) were female infants. Among them 46 (57.5%) were diagnosed by late second trimester and 30 cases (37.5%) by third trimester. In 4 cases, the exact time of diagnosis was not known. Out of the 80 cases, 51 (63.8%) were unilateral and 29 (36.2%) cases were bilateral.

Table 2: Severity of antenatal hydronephrosis.

Severity	N	%
Mild	43	53.8
Moderate	24	30
Severe	13	16.2

Out of the 80 cases, 49 (61.2%) cases had transient hydronephrosis.

Table 3: Postnatal provisional diagnosis.

Diagnosis	Frequency	Percent
Transient hydronephrosis	49	61.2
PUJO	13	16.2
PUV	3	3.8
Extrarenal pelvis	5	6.2
VUR	6	7.5
PCKD	1	1.2
MCDK	2	2.5
VUR+double moeity kidney	1	1.2

13 (16.2%) cases had pelviureteric junction obstruction. 6 (7.5%) cases had vesicoureteric reflux. 5 (6.2%) cases had extrarenal pelvis. 3 (3.8%) cases had posterior urethral valve. 2 (2.5%) cases had multicystic dysplastic kidney. 1 (1.2) had polycystic kidney disease. Out of the 56 cases with transient hydronephrosis, 34 (69.4%) had mild, 14 (28.6%) had moderate and 1 case (2%) had severe grades of hydronephrosis.

Out of the 13 cases of PUJO, 2 (15.4%) had mild, 5 (38.5%) had moderate and 6 (46.2%) had severe hydronephrosis. Out of the 3 cases of posterior urethral valve, 1 (33.3%) had moderate and 2 (66.7%) had severe hydronephrosis. Out of the 5 cases of extrarenal pelvis, 3 (60%) had mild and 2 (40%) had moderate hydronephrosis. Both the cases of multicystic dysplastic kidney and 1 case of polycystic kidney disease showed severe grade of hydronephrosis.

Table 4: Postnatal provisional diagnosis and their severity of presentation.

Provisional diagnosis	Hydronephrosis severity			Total
	Mild	Moderate	Severe	
Transient hydronephrosis	34 (69.4)	14 (28.6)	1 (2)	49
PUJO	2 (15.4)	5 (38.5)	6 (46.2)	13
PUV	0	1 (33.3)	2 (66.7)	3
ERP	3 (60)	2 (40)	0	5
VUR	4 (66.7)	2 (33.2)	0	6
PCKD	0	0	1 (100)	1
MCDK	0	0	2 (100)	2
VUR+Double moeity kidney	0	0	1 (100)	1

Table 5: Type of management based on severity of hydronephrosis.

Hydronephrosis severity	Follow up without surgical intervention	Surgical intervention	Total
Mild	42 (97.7%)	1 (2.3%)	43
Moderate	20 (83.3%)	4 (16.7%)	24
Severe	4 (30.8%)	9 (69.2%)	13
Total	66 (82.5%)	14 (17.5%)	80

Out of the 6 cases of vesicoureteric reflux, 4 (66.7%) had mild and 2 (33.2%) had moderate grades of hydronephrosis. One case of vesicoureteric reflux with double moiety kidney had severe hydronephrosis. Out of the total 80 cases, 14 (17.5%) cases underwent surgical intervention. Out of the 43 cases of mild hydronephrosis, only 1 (2.3%) underwent surgery.

Table 6: Type of management of cases- diagnosis wise.

Diagnosis	Follow-up without surgery N (%)	Surgery N (%)
Transient hydronephrosis	49 (100)	0
PUJO	3 (23.1)	10 (76.9)
PUV	0	3 (100)
Extrarenal pelvis	5 (100)	0
VUR	6 (100)	0
MCDK	2 (100)	0
VUR+double moeity kidney	0	1(100)

Out of the 24 cases of moderate hydronephrosis, 4 (16.7%) underwent surgery. Out of the 13 cases of severe hydronephrosis, 9 (69.2%) underwent surgery. Out of the 49 cases of transient hydronephrosis, all case were under follow up without surgery.

Out of the 13 cases of PUJ obstruction, 10 underwent surgeryand 3 were under follow up without surgery. All cases of posterior urethral valve underwent surgery. 1 case of VUR associated with double moiety kidney underwent surgery. All cases of vesicoureteric reflux, mulicystic dysplastic kidney and extrarenal pelvis were under follow up without surgical intervention.

Table 7: Association between RPD (renal pelvic diameter) and postnatal provisional diagnosis in unilateral hydronephrosis.

Diagnosis	Renal pelvic diameter (median)	Renal pelvic diameter (IQR)	Chi square	P value
Transient hydro-nephrosis	8	5.25	19.094	0.002
PUJO	16.5	10.75		
Extrarenal pelvis	7.4	6.05		
VUR	9			
MCDK	28			

The antenatal renal pelvic diameter differed significantly across the different postnatal diagnosis categories (p value 0.002).

Table 8: Association between antenatal renal pelvic diameter and postnatal significant uropa

Significant uropathy	N	Mean	Std. deviation	T statistic	P value
Present	31	14.64	6.72	6.51	<0.0001
Absent	49	7.53	2.92		

A statistically significant association was found between antenatal renal pelvic diameter and development of significant postnatal uropathy (p value <0.0001).

Gender did not have any statistical significance in predicting risk of development of significant postnatal uropathy.

Similarly, side of hydronephrosis did not have any statistical significance in predicting risk of development of significant postnatal uropathy.

Severity of hydronephrosis proved to be a definite factor in predicting risk of development of significant postnatal uropathy which was statistically significant (p value <0.0001).

Compared to the group with mild antenatal hydronephrosis, the group with moderate hydronephrosis had a relative risk (RR) of 1.99 (0.94, 4.21) for developing significant uropathy (p=0.13) and the group with severe hydronephrosis had a relative risk (RR)=4.41 (2.42,8.05) with p <0.0001 for developing significant uropathy.

Table 9: Factors predicting risk of development of significant uropathy.

Variable	Groups	Significant uropathy n (%)	Transient hydronephrosis	Chi square n (%)	P value
Gender	Male	26 (44.8)	32 (55.2)	3.282	0.07
	Female	2 (22.7)	17 (77.3)		
Side	Unilateral	18 (35.3)	33 (64.7)	0.708	0.4
	Bilateral	13 (44.8)	16 (55.2)		
Severity	Mild	9 (20.9)	34 (79.1)	21.55	<0.0001
	Moderate	10 (41.7)	14 (58.3)		
	Severe	12 (92.3)	1 (7.7)		

DISCUSSION

This study confirmed that infants with moderate and severe antenatal hydronephrosis are at a greater risk of postnatal urinary tract anomalies. The risk of pathologic postnatal outcome of antenatal hydronephrosis may be quantified by the measurement of anteroposterior renal pelvic diameter (APPD). The relative risk of postnatal urologic abnormality increased in the order mild>moderate>severe.

In present study, out of the 49 cases of transient hydronephrosis,12 cases (24.5%) resolved by day 3 of postnatal life, 28 (57.2%) cases resolved by 1 month and 9(18.3%) cases resolved by 6 months of postnatal life. Cheng et al in his study reported ultrasonographic outcome of 57 patients with isolated antenatal hydronephrosis and found out that 82% of children presented with normal renal pelvic diameter or mild pelviectasis during a followup time of 23 months.[6]

However, the relative risk of urologic abnormality was not significant in the group with mild hydronephrosis. Nevertheless, an infant with mild hydronephrosis should not be considered clinically insignificant, but can be categorized as carrying a low risk of surgical intervention. We would like to point out that among 43 infants with mild hydronephrosis, 9 (20.9%) had postnatal urinary tract anomaly detected and 1 underwent surgery.

It was also observed that infants with moderate and severe antenatal hydronephrosis presented a higher risk of surgical intervention. But, Gotoh et al suggested that surgery would not be necessary if APD was <20 mm between 30 to 40 weeks of gestation.[7]

The risk of postnatal uropathy and need for surgical intervention correlated with magnitude of fetal anteroposterior pelvic diameter. A cut off of antenatal RPD=8.5 predicted the development of significant uropathy postnatally with a sensitivity =87.1% and specificity=67.3%. In Halek and colleagues study, a 7-mm renal pelvic diameter cutoff was considered ideal for detection of significant uropathy.[8]

In present study, a cut off of antenatal RPD =9.5 had 92.7% sensitivity and 72.3 % specificity in predicting the need for surgical intervention. In Bouzada and colleagues study, renal pelvic diameter15 mm was foundout as cutoff for determining those infants requiring surgery.[9]

The limitations of our study were the study population is small. Ultrasonography was performed by different sonologists. Hence inter-observer variation need to be considered. The follow up period was short.

We conclude with the recommendations that infants with antenatally detected hydronephrosis should undergo postnatal ultrasound scan before discharge from the hospital and follow up scans at regular intervals to look for any anomalies or subsequent morbidities. Other investigations like radionuclide scan and MCU should be done as indicated. Infants with severe hydronephrosis should undergo a comprehensive diagnostic approach and management as soon as possible.

We would like to stress the importance of quantification of fetal renal pelvis dilatation and the importance of regular ultrasound surveillance for possible progression of APD during infancy.

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