Research Article

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http://www.imedpub.com

Annals of Clinical and Laboratory Research
ISSN 2386-5180

2016
Vol. 4 No. 1:58

Outcome of Antenatal Hydronephrosis

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Citation: Conkar S, Memmedov V, Mir S. Outcome of Antenatal Hydronephrosis. Ann Clin Lab Res. 2016, 4:1.

Abstract

Objective: The aim of this study was to report the outcome of infants with antenatal hydronephrosis.

Methods: All patients diagnosed with isolated fetal renal pelvic dilatation (RPD) were prospectively followed between January 2009 and December 2010. The events of interest were the presence of uropathy, requiring surgical intervention, RPD resolution and urinary tract infection (UTI). The diagnosis was established by ultrasound in 49 neonates with antenatal hydronephrosis (ANH) and they were submitted to a specific post-natal evaluative protocol with a follow-up period of 2 years. RPD was classified as mild (5-9.9 mm), moderate (10-14.9 mm) or severe (≥15 mm).

Results: A total of 49 patients were included in the analysis; 32 were allocated to the group of non- significant findings (65.3%) and 17 to the group of significant uropathy (34.6%). It was detected that 8 (16.3%) of the group of significant uropathy had ureteropelvic junction obstruction (UPJO), 3 (6.1%) had vesicoureteral reflux (VUR), and 3 (6.1%) had posterior urethral valves (PUV). 9 patients (18.3%) required surgical intervention because of obstructive uropathy. Of the 49 infants with RPD, 20 (40.8%) presented UTI and 32 (65.3%) presented RPD resolution during follow-up. In our prospective study, it was shown that 81.9% of infants with moderate RPD had UTI during follow-up.

Conclusion: Our findings suggested that, in contrast to patients with mild/severe RPD, infants with moderate RPD required a strict clinical surveillance for UTI.

Keywords: Fetal hydronephrosis, Urinary tract infection, Postnatal follow-up, Outcome

Received: January 08, 2016, **Accepted:** January 30, 2016, **Published:** February 03, 2016

Introduction

Collecting system dilatation, which may also involve the renal pelvis dilatation (RPD) and/or the ureter, is the most common abnormality detected by pre- or postnatal sonographic screening for congenital anomalies of the kidney and urinary tract (CAKUT), which may involve the renal pelvis dilatation (RPD) and/or the ureter [1,2]. A number of studies have investigated the significance of isolated antenatal RPD persistent after birth as an indicator of developmental abnormalities of the urinary tract, such as vesicoureteral reflux (VUR) and ureteropelvic junction obstruction (UPJO) [3,4]. For diagnostic purposes, it has been indicated that prenatal sonography is less sensitive than postnatal sonography [2,3], however; up to now, only few studies have reported neonatal screening [5,6]. Within our knowledge, no study has investigated the natural course of RPD detected during postnatal screening. Over the past 15 years, there has been ongoing progress in the understanding of the pathophysiology and natural history of urinary tract abnormalities [7,8]. Yet, there are still many challenges and controversies concerning the definition and clinical significance of mild isolated renal pelvic dilatation. It is obvious that not all dilatations have the same clinical relevance; moreover, their antenatal and postnatal evolution varies [9]. Therefore, there has been controversy in the literature over the best work-up and follow-up after birth [10,11]. A recent meta-analysis concluded that children with mild antenatal hydronephrosis may have a risk of postnatal anomaly, however; further prospective studies are required to determine the optimal management of these children [4]. We here in report a prospective study conducted to determine the incidence of postnatal urologic pathology of the infants diagnosed with RPD

during the antenatal period, and its natural course during the second year of life.

The objective of this present study was to assess the patients with persistent postnatal antenatal hydronephrosis, clinical outcome of infants with isolated antenatal hydronephrosis prospectively followed, and to establish prognostic data regarding antenatal hydronephrosis using the RPD.

Materials and Methods

69 subjects consulted by reason of antenatal hydronephrosis in the Division of Pediatric Nephrology at Ege University between January 2009 and December 2010 were enrolled in the study. The grades of ANH were recorded according to the week of gestation. This study has been approved by the ethics committee of our institution and has been performed in compliance with the ethical standards stipulated in the 1964 Declaration of Helsinki. Inclusion criteria were: presence of RPD equal to or greater than 5 mm on prenatal ultrasound after 28 weeks of gestation, at least 6 months of follow-up, and at least two postnatal ultrasound (US) scans. A total of 20 patients were excluded from the analysis, for 6 were lost to follow-up and others presented a duplex system with ureterocele (seven), hypoplastic kidney (five) and horseshoe kidney (two). A total of 49 infants were followed for 24 months.

RPD was defined as mild (5-9.9 mm), moderate (10-15 mm), and severe (>15 mm). Resolution was considered to occur when the anteroposterior diameter (APD) of the renal pelvis was ≤5 mm on two consecutive sonograms [12,13].

The postnatal US scans were performed by the same trained operator using a Siemens machine (Sonoline Prima SLC, 5 MHz probe, Erlangen, Germany). Evaluation of collecting system dilatation that is based on a single renal pelvis APD measurement can be influenced by dynamic and physiologic distension of the urinary collecting system, we examined all patients by considering the degree of bladder distension (empty/extended).

The first postnatal US scan was performed at a median time of 13 days of life (range 1-20 days). After the initial US, patients underwent urinary tract imaging according to a systematic protocol described in detail elsewhere [14,15]. Urine cultures were obtained at monthly follow-up visits. Also, it was recommended that urine samples should be collected during any unexplained febrile episode. Urinary tract infection (UTI) was defined as the presence of more than 100,000 cfu/ml in urine obtained by bag or from a midstream sample, with fever (38.0°C ≥) and/or urinary symptoms. VUR was classified into five grades using the classification proposed by the International Reflux Study Committee [12].

Antibacterial prophylaxis was not given to patients without VUR and those with RPD <10 mm. However, antibiotic prophylaxis was used until the end of the first year of life in patients with RPD >10 mm and until the resolution of reflux in patients with VUR.

UPJO was defined as the presence of isolated RPD associated with an abnormal diuretic renogram pattern. A non-operative treatment approach was attempted in patients with apparent UPJO, renal units with good function (>40%) as ascertained by a DMSA (technetium-99 dimercaptosuccinic acid) scan, regardless of the pattern on DTPA (intermediate or obstructed). Anderson-Hynes dismembered pyeloplasty was performed in surgical treatment of renal units with <40% uptake.

Renal scarring was defined as the image showing the distortion of renal contour, or a complete loss of radioactivity localization monitored on two Tc-99 DMSA scans performed at an interval of at least six months [10].

Patients were assigned to two groups according to presence of uropathy (non-significant findings vs. significant uropathy). Combined data obtained by voiding cystourethrogram (VCUG), renal scintigraphy, and sequential US were used as the reference standard. Significant uropathy was defined as the presence of urinary tract abnormality such as VUR, posterior urethral valves, ureteropelvic junction obstruction and ureterovesical junction obstruction. In the absence of recognized uropathy, renal pelvis dilatation was described as idiopathic dilatation and regarded as a non-significant finding in the analysis. Extra-renal pelvis was considered as a normal variant and included in the group of non-significant findings. Renal units with fetal renal pelvis dilatation not confirmed on postnatal ultrasound and negative findings on VCUG were labeled as transient dilatation and were included in the group of non-significant findings.

Statistical Analysis

Chi-square test was used for the statistical analysis. Normally distributed data were expressed as the mean ± standard deviation (SD). The t-test, analysis of variance (ANOVA), and Fisher's exact test were used for the comparison of parameters.

Results

Of 49 subjects diagnosed with ANH, 37 were boys and 12 were girls. The male to female ratio was found as 3/1. The gestational week at which ANH was detected ranged from 28 (the earliest) to 40 weeks (median 31th week). Nine patients (18.3%) had bilateral hydronephrosis, and 40 (1.6%) had unilateral hydronephrosis. The incidence of left-sided hydronephrosis was detected as 55.1% (n=27), right-sided hydronephrosis as 26.5% (n=13).

Out of 49 subjects, it was found that 32 had mild hydronephrosis (HN), 11 had moderate HN, and 6 had severe HN. During the postnatal follow-up, 32 patients were observed to have RPD resolution until the age of 2. The incidence of RPD resolution in patients with ANH was determined to be 65.3% until the age of 2.

Of 49 infants, 32 were assigned to the group of non-significant findings (65.3%) and 17 to the group of significant uropathy (34.6%). When 17 cases of ANH were examined, 8 (16.3%) were found to have UPJO (ureteropelvic junction obstruction), 3 (6.1%) had UVJO (ureterovesical junction obstruction), 3 had (6.1%) VUR, 3 had (6.1%) PUV (posterior urethral valves). 9 of 49 subjects underwent surgical procedures due to the presence of obstructive uropathy. The characteristics of these cases are depicted in **Table 1**. The incidence of development of renal scarring in ANH cases was found 12.2%.

Renal scarring was detected in 6 cases by DMSA scanning. These 6 subjects had severe hydronephrosis during the intrauterine period. Posterior urethral valve was detected in 3 subjects during

the examination performed by cystoscopy. Valve resection was performed in these subjects in the early postnatal period.

VUR was detected in 3, and all of them were female subjects. It was found that these 3 subjects had moderate hydronephrosis when their grades of hydronephrosis were examined. Of 49 cases, 20 were detected to have UTI at least once. The incidence of UTI in antenatal hydronephrosis was determined as 40.8%.

Mild, moderate and severe ANH incidence of renal skaring, UTI and need for surgical intervention was showed in **Table 2**.

Discussion

Hydronephrosis is the predominant prenatal ultrasound finding in mostly clinically asymptomatic individuals, and therefore counselling the parents of an affected child is a very important aspect of care. The prognosis is related to the degree of hydronephrosis and its spontaneously resolution. However, challenge in the management of urinary tract dilatation is to decide which child should be monitored, have medication or be operated on.

Our study confirms that children with any grade of ANH present a higher risk of postnatal urinary tract anomaly, as indicated by Lee et al. [4].

In our study, the incidence of significant uropathy in infants with isolated antenatal renal pelvic dilatation was found approximately 34.6%. Graziela et al. determined the incidence of significant uropathy as 40.6% during the follow-up of 192 cases [16]. The incidence of significant uropathy varied from 30% to 40% in other studies conducted, which is in concordance with our results [10,17].

Recently, Lee et al. [4] performed a meta-analysis in order to determine whether the degree of antenatal hydronephrosis and related antenatal ultrasound findings were associated with postnatal outcome. They concluded that patients with moderate or severe antenatal hydronephrosis have a significant risk of postnatal anomaly, indicating that comprehensive postnatal diagnostic management should be performed. However, they pointed out that the outcome was not clear for infants with mild antenatal hydronephrosis and further prospective studies are required to determine the optimal management of these children. In our study 34.3 % of infants with mild RPD presented UTI.

A small number of studies have been conducted on the incidence of UTI in children with antenatal hydronephrosis. As in other series, infants with severe RPD had a higher incidence of UTI throughout follow-up [18]. It may be remarked that, however; the cumulative incidence of UTI was divergent severe/mild/moderate RPD presented. Virtually only infants with severe RPD had no UTI, whereas children with moderate RPD presented incidence of episodes of UTI 81.8% **(Table 2)**.

During the follow-up of 146 subjects with antenatal hydronephrosis performed by Anderson et al., the incidence of UTI was found 8% [19]. In a study conducted by Graziela et al., the cumulative incidence of UTI was demonstrated as 39%, 18%,

Table 1 Characteristics of ANH Subjects with obstructive uropathy and had surgery.

No	Gestational week of ANH	Gender	ANH grade	RPD of The Affected Kidney (mm)	Diagnosis	Operation	Operation Time
1	32	E	severe	Right 20 mm	UVJO	Right pyeloplasty	1. month
2	40	E	moderate	Right 25 mm	UPJO	Right pyeloplasty	6. month
3	28	K	mild	Right 5 mm; Left 5 mm	UPJO	Left pyeloplasty	12. month
4	36	E	severe	Right 28 mm	UPJO	Right pyeloplasty	6. month
5	18	E	severe	Left 25 mm	UPJO	Left pyeloplasty	3. month
6	32	E	severe	Left 12 mm	UVJO	Left pyeloplasty	6. month
7	32	E	severe	Right 12 mm; Left 10 mm	PUV	Posterior urethral valve ablation	3. day
8	36	E	severe	Right 16 mm; Left 12 mm	PUV	Posterior urethral valve ablation	10.day
9	32	E	moderate	Right 11 mm; Left 12 mm	PUV	Posterior urethral valve ablation	15.day

ANH: Antenatal Hydronephrosis; RPD: renal pelvis dilatation; UVJO: ureterovesical junction obstruction; UPJO: ureteropelvic junction obstruction; PUV: Posterior Urethral Valves

Table 2 Postnatal Clinical Characteristics According to the Degree of Antenatal Hydronephrosis.

	Mild n (%)	Moderate n (%)	Severe n (%)
Degree of ANH	65.3%(32)	22.4%(11)	12.2% (6)
Month 12 Frequency of RPD resolution	31.2%(10)	27.2% (3)	26.5%(13)
Month 24 Frequency of RPD resolution	84.3% (27)	45.4% (5)	-
Frequency of renal scarring	3.1% (1)	9.09% (1)	66% (4)
Frequency of obstructive uropathy development and surgical intervention	3.1% (1)	18.1% (2)	100% (6)
Frequency of UTI	34.3% (11)	81.8% (9)	-
UTI: Urinary Tract Infection; ANH: Antennal Hydronephrosis			

and 11% at 36 months of age for severe, moderate, and mild RPD, respectively [16]. In another study, UTI was observed to occur in eight infants (3.6%) with isolated moderate RPD at 7-12 months of age [20,21]. In our study, the incidence of UTI in cases with mild ANH was determined as 34%, while it was found 81% in cases with moderate ANH. No UTI was detected in subjects with severe ANH.

Cheng et al. [20] reported ultrasonographic outcome of 57 patients with isolated ANH and suggested that, during a mean follow-up time of 23 months, 82% of children presented normal renal pelvic diameter or mild pelviectasis. In a study conducted on infants with moderate RPD, it was observed that 91.9% of the group study presented a spontaneous normalization on the renal US [22]. In another study, the incidence of resolution at 5 years of age was 60%, 44%, and 36% for mild, moderate, and severe RPD, respectively [16]. In our study, RPD resolution was present with an incidence rate of 84.3% in cases diagnosed with mild RPD, and 45.4% in those with moderate RPD until the age of 2 **(Table 2)**.

The incidence of postnatal significant uropathy was reported according to the degree of ANH as 11% in mild RPD, 45% in severe RPD, and 85% in severe RPD [21]. In our study, significant uropathy was detected in 21% of cases with mild RPD, in 54% cases with moderate RPD, and in 100% of cases with severe RPD.

To make an interpretation of ANH etiology is a hard task, however; UPD, considered as the most common etiological cause, can demonstrate a table of mild, moderate, and severe ANH.

The frequency of surgical intervention was found 15% during the follow-up performed by Graziela et al. [16]. Out of 49 subjects, pyeloplasty was performed in 6 (%12.2), and 3 underwent valve resection in our study. Clearly, this result shows compliance with that of Graziela, and 10-15% of patients with ANH require surgical intervention.

It was very interesting that in mild ANH UTI was high and the incidence of postnatal renal scarring was elevated with 12.2% in our study. During the follow-up of 146 cases with antenatal hydronephrosis, the incidence of postnatal renal scarring was determined as 2.4% in the literature. This can be explained by the frequency of UTI and showed us the necessity of postnatal antibiotic prophylaxis therapy.

It is important to point out the limitations related to the clinical design of our study. The possible main weakness is the inevitable complexity involved in classifying patients into groups such as “significant uropathy” and “idiopathic pelvic dilatation”. It is clear that there is an intermediate zone between an idiopathic pelvic dilatation and an apparent UPJO. On the other hand, the prospective design of the study may reinforce our findings and perhaps eliminates the misclassification of patients.

As a result, it was demonstrated that neonates diagnosed with hydronephrosis had non-significant findings with the frequency of 65.3%, and therefore; the least invasive intervention should be considered. During the antenatal period, RPD resolution accompanied by obstruction was not present in 84.3% of subjects with mild HN, and in 45.4% of those with moderate HN until the age of two. Patients with severe RPD presented a higher frequency of uropathy and need for surgical intervention and a slower rate of resolution of pelvic dilatation. Cases with moderate RPD should be closely followed in terms of UTI. This study analyzed the postanatal course of the cases diagnosed with HN and graded as mild, moderate, and severe during the prenatal period and in this respect, aimed to determine a prevision.

References

1 Riccipetitoni G, Chierici R, Tamisari L (1992) Postnatal ultrasound screening of urinary malformations. J Urol 148: 604-609.

2 Dremsek PA, Gindl K, Voitl P, Strobl R, Hafner E, et al. (1997) Renal pyelectasis in fetuses and neonates: diagnostic value of renal pelvis diameter in pre- and postnatal sonographic screening. AJR Am J Roentgenol 168: 1017-1019.

3 Mamì C, Paolata A, Palmara A, Marrone T, Manganaro R, et al. (2005) Comparison between pre- and postnatal echographic screening of malformativeuropathies. Minerva Ginecol 57: 185-188.

4 Lee RS, Cendron M, Kinnamon DD, Nguyen HT (2006) Antenatal hydronephrosis as a predictor of postnatal outcome: a meta-analysis. Pediatrics 118: 586- 593.

5 Miyakita H, Ueno S, Nomura M (2001) Neonatal hydronephrosis detected on routine health check-up. Tokai J Exp Clin Med 26: 101-105.

6 Wiesel A, Queisser-Luft A, Clementi M, Bianca S, Stoll C (2005) EUROSCAN Study Group. Prenatal detection of congenital renal malformations by fetal ultrasonographic examination: an analysis of 709.030 births in 12 European Countries. Eur J Med Genet 48: 131-144.

7 Becker A, Baum M (2006) Obstructive uropathy. Early Hum Dev 82: 15-22.

8 Belarmino JM, Kogan BA (2006) Management of neonatal hydronephrosis. Early Hum Dev 82: 9-14.

9 Avni FE, Cos T, Cassart M, Massez A, Donner C, et al. (2007) Evolution of fetal ultrasonography. Eur Radiol 17: 419-431.

10 Ismaili K, Avni FE, Piepsz A, Wissing KM, Cochat P, et al. (2004) Current management of infants with fetal renal pelvis dilation: a survey by French-speaking pediatric nephrologists and urologists. Pediatr Nephrol 19: 966-971.

11 Toiviainen-Salo S, Garel L, Grignon A, Dubois J, Rypens F, et al. (2004) Fetal hydronephrosis: is there hope for consensus? PediatrRadiol 34: 519-529.

12 Coelho GM, Bouzada MC, Pereira AK, Figueiredo BF, Leite MR, et al. (2007) Outcome of isolated antenatal hydronephrosis: a prospective cohort study. Pediatr Nephrol 22: 1727-1734.

13 Lebowitz RL, Olbing H, Pakkulaimen KV, Smellie JM, Tamminen-Mobius TE (1985) International system of radiographic grading of vesicoureteric reflux. International Study in Children. Pediatr Radiol 15: 105-109.

14 Becker AM (2009) Postnatal evaluation of infants with an abnormal antenatal renal sonogram. Curr Opin Pediatr 21: 207-213.

15 Bouzada MC, Oliveira EA, Pereira AK, Leite HV, Rodrigues AM, et al. (2004) Diagnostic accuracy of postnatal renal pelvic diameter as a predictor of uropathy: a prospective study. Pediatr Radiol 34: 798-804.

16 Coelho GM, Bouzada MCF, Pereira AK, Figueiredo BF, Leite MRS, et al. (2007) Outcome of isolated antenatal hydronephrosis: a prospective cohort study. Pediatr Nephrol 22: 1727-1734.

17 Coplen DE, Austin PF, Yan Y, Blanco VM, Dicke JM (2006) The magnitude of fetal renal pelvic dilatation can identify obstructive postnatal hydronephrosis, and direct postnatal evaluation and management. J Urol 176: 724-727.

18 Wollenberg A, Neuhaus TJ, Willi UV, Wisser J (2005) Outcome of fetal renal pelvic dilatation diagnosed during the third trimester. Ultrasound Obstet Gynecol 25: 483-488.

19 Anderson NG, Fischer J, Leighton D, Hector-Taylor J, McEwing RL (2010) Management in children of mild post- natal renal dilatation but without vesicoureteral reflux. Pediatr Nephrol 25: 477-483.

20 Cheng AM, Phan V, Geary DF, Rosenblum ND (2004) Outcome of isolated antenatal hydronephrosis. Arch Pediatr Adolesc Med 158: 38-40.

21 Kim HJ, Jung HJ, Lee HY, Lee YS, Im YJ, et al. (2012) Diagnostic Value of Anteroposterior Diameter of Fetal Renal Pelvis During Second and Third Trimesters in Predicting Postnatal Surgery Among Korean Population: Useful Information for Antenatal Counseling Pediatric Urology 79: 1132-1137.

22 Mamì C, Paolata A, Palmara A, Marrone T, Berte LF, et al. (2009) Outcome and management of isolated moderate renal pelvis dilatation detected at postnatal screening. Pediatr Nephrol 24: 2005-2008