The Evaluation of Postnatal Follow-Up Results of the İnfants with Mild and Moderate İsolated Antenatal Hydronephrosis

Hafif ve Orta Dereceli İzole Antenatal Hidronefrozlu Süt Çocuklarının Postnatal İzlem Sonuçlarının Değerlendirilmesi

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Abstract: Antenatal hydronephrosis is one of the most common congenital urological anomalies identified on prenatal ultrasound. There are controversial results in the postnatal management of mild-moderate isolated antenatal hydronephrosis. The purpose of this study was to investigate the clinical outcome and the frequency of urinary tract infection in infants with mild-moderate isolated antenatal hydronephrosis during the first year of life. The patients with mild-moderate hydronephrosis on the first renal ultrasonography done between seven days and two weeks of age were included in this study. The patients with other kidney abnormalities other than hydronephrosis, ureteral dilatation or bladder abnormalities were not included in the study. Hydronephrosis was classified as mild (5-9.9 mm), moderate (10-14.9 mm) by anterior-posterior pelvic diameters. 140 patients [96 boys (68.6%), 44 girls (31.4%)] were included in the study. Sixty (42.9%) patients had mild hydronephrosis and 80 (57.1%) patients had moderate hydronephrosis. The rate of spontan resolution was higher in patients with mild hydronephrosis than other group [n=58 (96.6%), n=48 (60%), respectively, p<0.01]. The median regression time was shorter in patients with mild hydronephrosis [median regression time; 4 (3-5.25); 6 (5-7) months, respectively, p<0.01]. The frequency of urinary tract infection did not differ between the patients with mild and moderate hydronephrosis patients (p>0.05). There was no evidence of acute pyelonephritis and obstructive or progressive hydronephrosis. Mild and moderate isolated antenatal hydronephrosis is often a self-limited condition. Children with mild and moderate isolated antenatal hydronephrosis might be followed without antibiotic prophylaxis.
Key Words: urinary tract infection, antibiotic prophylaxis, isolated antenatal hydronephrosis, infant.

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Özet: Antenatal hidronefroz doğum öncesi yapılan ultrasonografik incelemede en sık saptanan konjenital ürolojik anomalilerden biridir. Hafif ve orta dereceli izole antenatal hidronefrozun doğum sonrası dönemdeki yönetimi hakkında çelişkili sonuçlar bulunmaktadır. Bu çalışmanın amacı hafif ve orta dereceli izole antenatal hidronefrozlu süt çocuklarında ilk bir yılda idrar yolu enfeksiyonu (İYE) sıklığını ve klinik seyri araştırmaktır. Bu çalışmaya doğum sonrası 7 gün ile 2 hafta arasında yapılan ilk böbrek ultrasonografisinde hafif ve orta dereceli hidronefrozu olan hastalar dahil edildi. Hidronefroz dışında böbrek anomalisi olan, üreteral dilatasyonu ya da mesane anomalisi bulunan hastalar çalışmaya dahil edilmedi. Hidronefroz ön-arka pelvis çapı ölçülerek hafif (5-9.9 mm) ve orta (10-14.9 mm) dereceli olarak sınıflandırıldı. Çalışmaya 140 hasta [96 erkek (%68.6), 44 kız (%31.4)] dahil edildi. Altmış hasta (%42.9) hafif dereceli, 80 hasta (%57.1) orta dereceli hidronefroza sahipti. Spontan gerileme oranı hafif hidronefrozlu hastalarda diğer gruptan daha yüksekti [sırası ile n=58 (%96.6), n=48 (%60), p<0.01]. Ortanca gerileme zamanı hafif hidronefrozlu hastalarda daha kısa idi [ortanca gerileme zamanı; sırası ile 4 (3-5.25); 6 (5-7) ay, p<0.01]. İYE sıklığı hafif ve orta dereceli hidronefrozlu hastalar arasında farklı değildi (p>0.05). Hafif ve orta dereceli izole hidronefroz sıklıkla kendini sınırlayan bir durumdur. Hafif ve orta dereceli izole hidronefrozlu çocuklar antibiyotik profilaksisi başlanmadan izlenebilir.
Anahtar Kelimeler: İdrar yolu enfeksiyonu, antibiyotik profilaksisi, izole antenatal hidronefroz, süt çocuğu.

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1. Introduction

Hydronephrosis (HN) is defined as dilatation of the renal pelvis and/or calyces (1). The incidence of hydronephrosis that is detected by prenatal ultrasonography (US) is 1-5% (2). Hydronephrosis not associated with other urinary tract abnormalities is described as isolated antenatal hydronephrosis (IAHN) (3). Mild and moderate grade HN means that the anterior-posterior pelvic diameter (APPD) is between 5 and 15 mm without calyceal dilatation and with normal cortical thickness on prenatal and postnatal US (4). The optimal follow-up and treatment of children with IAHN is a controversial issue (5). The patients with antenatal HN prone to have the risk of permanent renal damage due to the increased risk of urinary tract infection (UTI). But, recent studies suggested that the use of antibiotic prophylaxis is not necessary in children with antenatal HN (6, 7). In this study, we aimed to evaluate the rates of resolution and UTI in children with mild and moderate isolated antenatal hydronephrosis (MMIAHN) during the first year of life.

2. Material and Methods

We evaluated retrospectively the data from children with MMIAHN in our Pediatric Nephrology Clinic, from January 1, 2009, through December 1, 2016. Hydronephrosis was classified as mild (5-9.9 mm), moderate (10-14.9 mm) by APPD (8). The rates of resolution and UTI were determined in patients with MMIAHN during the first year of life.

The diagnosis of isolated AHN was made in children without other urinary tract anomalies such as vesico-ureteral reflux, cystic dysplasia, urinary tract obstruction. The inclusion criteria were: 1) Persistent mild-moderate grade hydronephrosis on the first US done between seven days and two weeks of age. 2) No other US findings such as ureteral dilatation, duplication anomalies or bladder abnormalities.

The rate of UTI were identified through medical records of patients with MMIAHN. Symptomatic UTI was defined as symptoms consistent with such an infection together with a positive urine culture [Growth of a single bacterial strain of 10^5 colony-forming units per milliliter in a mid- stream urine sample] and positive urinalysis (positive leukocyte esterase or nitrite and ≥5 white blood cells per high-power field). Recurrent UTI (RUTI) was defined as two or more episodes of acute pyelonephritis or acute pyelonephritis plus one or more episode of cystitis or three or more episodes of cystitis. Urine cultures and urine analysis were obtained routinely at monthly intervals.

The patients with mild and isolated antenatal hydronephrosis were followed without antibiotic prophylaxis. Renal US examination was performed at 1, 3, 6, 9 and 12 months. The resolution of hydronephrosis was defined as APPD <5mm. The rate of resolution, stability or progression and the frequency of UTI were determined. 99mTc-dimercaptosuccinic acid (DMSA) scintigraphy was performed 6 months after the episode of UTI. A diuretic renal scintigraphy was performed if progression was observed. Voiding cystourethrography (VCUG) was done only in children with RUTI or renal scarring.

The study has been approved by the Local Ethics Committee according to the Helsinki Declaration (date: 04.17.2017, number: 80558721/G-115).

Statistical analysis

Data were analyzed using the SPSS (Statistical Package for the Social Sciences) software version 11. Values are expressed as mean and SD for continuous variables and interquartile range (IQR) for qualitative variables. The Shapiro–Wilk test was used to determine normality of data. The comparison of the non-normally distributed data were done by using the Mann-Whitney U test. Qualitative variables were compared by using the chi-square test. A p value <0.05 was considered significant.

3. Results

The records of 152 patients with MMIAHN were retrospectively investigated in the present study. The data of 12 patients were excluded from the study due to the accompanying urinary tract anomalies. A hundred and forty patients with MMIAHN were included in this study [96 boys, 44 girls]. Male:Female ratio was 2.1:1 in our study. One hundred fifteen patients had unilateral hydronephrosis. There was family history in 38 patients. Sixty patients had an APPD of 5-9.9 mm and 80 patients had an APPD of 10-14.9 mm. Spontan resolution was observed in 106 patients. The rate of spontan resolution and total resolution were higher in patients with mild grade hydronephrosis than patients with moderate grade hydronephrosis (spontan resolution: n=58, n=48, OR = 0.052 (0.01-0.22); total resolution: n=49, 11, respectively, p<0.01 for both). The median regression time was shorter in patients with mild grade hydronephrosis (p<0.01). (Table 1). The anterior-posterior pelvic diameter was normal (APDD ≤5 mm) in 13 patients on the renal US examination at the end of the first month. The total resolution rate in the first month was higher in mild HN than moderate HN [n=11, n=2, respectively, p<0.01]. There was progression in 2 patients with moderate grade HN. But, diuretic renal scintigraphy revealed normal drainage and differential renal function in these patients.

A diagnosis of UTI was made in 16 patients. There was no UTI in patients whose APDD was normal at the end of first month. The frequency of UTI were similar between unilateral and bilateral hydronephrosis (p>0.05). The frequency of UTI was similar between patients with mild and moderate grade hydronephrosis [n=4, n=12, respectively, p>0.05]. There was no significant difference between patients with and without resolution (p>0.05, Table 2). But, the frequency of UTI were higher in patients with partial resolution than those of total resolution group [n=9; n=2, respectively, p=0.007].

Table 1.
Outcome of mild-moderate isolated antenatal hydronephrosis

	Mild hydronephrosis	Moderate hydronephrosis	p
	(n= 60)	**(n=80)**	
Resolution (n, %)	58 (96.6)	48 (60)	<0.001
Total resolution (n, %)	49 (81.6)	11 (13.75)	<0.001
The resolution time (months)	4 (3-5.25)	6 (5-7)	<0.001
Urinary tract infection (n, %)	4 (6.6)	12 (15)	0.131

Values were expressed as mean ± SD or median (interquartile range) or proportion. A p value <0.05 was considered significant.

Table 2.
The features of patients with and without urinary tract infection.

	Urinary tract infection (+)	Urinary tract infection (-)	p
	(n=16)	**(n=124)**	
Resolution (n, %)	(68.8)11	95 (76.6)	0.491
Median resolution time (months)	6 (5-7)	5 (3-6)	0.041
Unilateral hydronephrosis (n, %)	12 (75)	103 (83.1)	0.421
Moderate hydronephrosis (n, %)	12 (75)	68 (54.8)	0.121

Values were expressed as median (interquartile range) or proportion. A p value <0.05 was considered significant.

Median resolution time was longer in patients with UTI than those of patients without UTI [6 (5-7) ; 5 (3-6) months, respectively, p=0.041]. There was no evidence of acute pyelonephritis in patients with UTI. Three patients had RUTI in with moderate grade HN. Renal scarring was detected by DMSA scintigraphy in only one patient with RUTI. None of the 3 patients performed VCUG had vesicoureteral reflux (VUR).

4. Discussion

The results of our study showed that the patients with mild and moderate grade antenatal hydronephrosis have a benign course. And also, the postnatal management without antibiotic prophylaxis is safe in these patients during the first year of life.

The management of antenatal hydronephrosis is still a controversial issue. There are conflicting views on the treatment and follow-up of the MMIAHN (9, 10). Isolated antenatal hydronephrosis spontaneously regresse in the majority of patients (11). Sidhu G et al. (3) indicated that 98% of patients with mild antenatal hydronephrosis have spontaneous resolution or stabilization. In addition, 90% of cases of moderate antenatal hydronephrosis regresse spontaneously by 12 to 14 months of life (12). Transient hydronephrosis is seen between 41% and 88% in newborn (13, 14). The regression of antenatal hydronephrosis generally occurs during in the first year of life (15). In our study, spontan resolution was observed in the majority of patients with MMIAHN during the first year of life. Additionally, there was total resolution in 13 patients in the end of first month. The rate of spontan resolution and total resolution were higher in patients with mild grade hydronephrosis than patients with moderate grade hydronephrosis. Transient hydronephrosis caused by the uncoordinated peristalsis of the smooth muscle of the renal pelvis may lead to development of isolated hydronephrosis. The children with MMIAHN should be followed by regular ultrasonic examination before performing invasive studies.

Hydronephrosis may be caused by obstructive kidney/urinary tract anomalies such as ureteropelvic/uretero-vesical junction obstruction. Dynamic renal scintigraphy may be helpful in diagnosing the obstructive pathology (16). But, radiocontrast and radionuclide studies have a risk of radiation exposure which is several fold higher than a chest radiograph (17, 18). In our study, the progression in APPD was observed in only 2 patients with moderate grade hydronephrosis without parenchymal thinning and calyectasis. Dynamic renal scintigraphy did not show obstruction image in these patients. Our findings might suggest that the children with MMIAHN had a benign course. The routine application of radionuclide studies should be avoided in patients with MMIAHN in during first year.

Urinary stasis may predispose to UTI in children with HN. A systematic review reported that the frequency of UTI was 10.5% for low-grade hydronephrosis (19). The children AHN have the highest incidence of UTI during the first year (20). The children less than one year of age are more likely to develop pyelonephritis (21). Prophylactic antibiotic use is recommended for children with AHN to reduce the frequency of UTI during the first 2 years of life (22). There are different applications for the use of prophylaxis antibiotics. Also, the duration of prophylaxis varies among centers (23). But, recent studies reported conflicting results about the use of antibiotic prophylaxis in infants with AHN. Several studies showed that the monitoring without prophylactic antibiotic in these patients is safe (12, 23). Alconcher et al. (24) reported that the incidence of UTI were similar between with and without prophylactic antibiotic in infants with APDD $\leq$15 mm. Lidefelt et al. (25) stated that antibiotic prophylaxis is not necessary in children with mild grade hydronephrosis in a 2-year follow-up period. Braga et al. (26) suggested that the use of prophylactic antibiotic is beneficial only in children with severe hydronephrosis. In our study, the frequency of UTI was 11.4%. There was no statistically significant difference between groups. Bilateral hydronephrosis was not a risk factor for UTI. The frequency of

UTI was similar between patients with and without resolution. In addition, renal scarring and VUR did not detect in children with UTI. Our data might suggest that antibiotic prophylaxis was not necessary in children with mild and mild hydronephrosis in the first year of life.

Vesicoureteral reflux which is the most common urinary system anomaly in childhood is detected in 10-15% of children with AHN (27, 28). The grade of VUR does not correlate with the degree of AHN. The patients with severe VUR usually have APDD >10 mm (29). Also, it has been reported that children with antenatally presenting VUR have a low risk of UTI (30). In this study, none of the children with UTI or renal scarring had VUR. Thus, we thought that VCUG examination should be performed in patients with findings suggestive of VUR such as parenchymal thinning, progressive hydronephrosis and dilate ureter.

There are some limitations in our study regarding the clinical outcome of MMIAHN. First, this study was a single-center, retrospective review. Second, we could not provide information on the degree of antenatal renal pelvic dilatation as a predictor of clinical outcome of MMIAHN.

In conclusion, the results of our study might suggested that mild and moderate grade antenatal hydronephrosis were often a self-limited conditions. The degree of hydronephrosis should be taken into account for the further diagnostic imaging. The postnatal management should be individual in children with MMIAHN. Children with mild and moderate grade antenatal hydronephrosis might be followed without antibiotic prophylaxis. Multicenter studies are needed on the postnatal management of MMIAHN.

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