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The Course of Congenital Hydronephrosis in Infancy

Süt Çocukluğu Döneminde Konjenital Hidronefrozun Seyri

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ABSTRACT

Objective: The aim of our study is to examine the spontaneous resolution rates of congenital hydronephrosis from a recent perspective.

Material and Methods: Sixty-nine pediatric patients (M/F=46/23) with congenital hydronephrosis were enrolled in this study.

Results: The mean age at the first postnatal examination was 10.8±7.6 days, and the mean age at the time of the final examination was 9.5±3.2 months. Forty-eight patients' renal anteroposterior diameters (APD) (69.5%) improved while 8 (11.6%) patients' APDs worsened during the follow-up period. However, MAG3 of these 8 patients was normal. The remaining thirteen (18.9%) patients had congenital anomalies of the kidney and the urinary tract (8 vesicoureteral reflux, 5 cases of ureteropelvic junction obstruction). The mean baseline APD was 9.1±2.8 mm in the group with reduced APD, and 9.7±2.8 mm in the one with increased APD (p=0.461). The mean APD at the final visit was significantly lower in the group with reduced APD than that in the group with increased APD (5.1±1.8 mm vs 17.9±12.6 mm; p=0.001). The anteroposterior diameter of 26 (81.25%) patients with left-sided hydronephrosis and 10 (71.4%) patients with right-sided hydronephrosis regressed spontaneously. The rate of spontaneous resolution was relatively low in patients with bilateral hydronephrosis (n=13; 56.5%) compared to unilateral ones.

Conclusion: Our study indicates that an initially mild hydronephrosis does not exclude a pathological course in cases of congenital hyronephrosis. Therefore, in such patients, routine ultrasonography should be done regularly.

Key Words: Antenatal, Congenital hydronephrosis, Infant, Renal pelvic diameter

ÖZ

Amaç: Çalışmamızın amacı, konjenital hidronefroz vakalarında spontan düzelme oranlarını güncel bir bakış açısıyla incelemektir.

Gereç ve Yöntemler: Konjenital hidronefroz tanılı 69 hasta (E/K=46/23) çalışmaya dahil edildi.

Bulgular: Doğum sonrası ilk kontrolde bebeklerin ortalama yaşı 10.8 ± 7.6 gün iken çalışma sonunda yaşları 9.5±3.2 ay'dı. Takipte 48 (%69.5) hastanın renal pelvis anteriör-posteriör çapı düzelmişken, 8 (%11.6) hastanınki artmıştı.

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Ancak bu 8 hastanın MAG-3 görüntülemesi normaldi. Diğer 13 (%18.9) hastada, CAKUT (Böbrek ve üriner sistem konjenital anomalileri) tanılarından olan vezikoüretral reflü (n=8), üreteropelvik bileşke obstrüksyonu (n=5) saptandı. Ortalama başlangıç anteriör-posteriör çap ölçümü, çapı azalmış grupta 9.1±2.8 mm ve artmış grupta 9.7±2.8 mm'di (p=0.461). Son ölçümdeki ortalama anteriör-posteriör çapı ölçümü, çap ölçümü azalmış grupta, artmış gruba göre daha düşüktü (5.1±1.8 mm'ye karşılık 17.9±12.6 mm; p=0.001). Sol tarafta hidronefrozu olan hastaların yirmi altısında (%81.25) ve sağ tarafta hidronefrozu olan hastaların onunda (%71.4) anteriör-posteriör çapı ölçümü spontan olarak azaldı. Bilateral hidronefroz olan hastalarda spontan düzelme, tek taraflı olgulara göre daha düşük orandaydı (n=13; %56.5).

Sonuç: Çalışmamız şunu göstermiştir ki konjenital hidronefroz vakalarında, doğum sonrası yapılan ilk ultrason görüntülemede, hafif düzeydeki hidronefroz varlığı, patolojik seyri dışlamamaktadır. Bu nedenle bu hastalarda ultrason görüntüleme işlemine belli aralıklarla devam edilmelidir.

Anahtar Sözcükler: Antenatal, Konjenital hidronefroz, Süt çocuğu, Renal pelvis çapı

INTRODUCTION

The prevalence of Congenital Hydronephrosis (CH) is 1-5% in the neonatal period (1). Most cases ultimately resolve during follow-up. However, congenital anomalies of the kidney and urinary tract (CAKUT), such as ureteropelvic junction obstruction (UPJO) and vesicoureteral reflux (VUR), are the most common underlying conditions in CH (2). In the last decade, the ultrasonographic examination has become more widely available in comparison to previous years. Hence, we expect to diagnose CH more often than before. The aim of our study is to examine the follow-up period of CH by a routine ultrasonographic examination and to evaluate spontaneous resolution rates in infants from a recent perspective.

MATERIALS and METHODS

This retrospective study was conducted at Kırıkkale University Faculty of Medicine Department of Pediatrics between January 2015 and December 2017. All newborn patients born in our center who had a prenatal history of congenital hydronephrosis were included. The exclusion criteria included the presence of neurological lesions, bilateral small kidneys, horseshoe kidneys, or multi-cystic dysplastic kidneys. Infants were followed with serial ultrasonographic examinations and adjunctive imaging studies. All patients were followed up until 12 months of age. During the study period, ultrasonography (US) was repeated four times, with the first being performed in the first month of life and the last at the twelfth month of life. The second and third USs were performed at 3-4 months intervals. Antenatal hydronephrosis was defined as a dilatation of the renal pelvicalyceal system so that the anteroposterior diameter (APD) exceeded 7 mm in the third trimester; the maximum axial length observable at the level of the renal hilum was also recorded (3,4). Of note, the greater one of the two APD measurements was chosen for comparison in patients with bilateral hydronephrosis. A urinary tract infection (UTI) was diagnosed on the basis of positive nitrite and leukocyte esterase in a urine sample combined with a positive urine culture during the course of illness (5). Voiding cystourethrography (VCUG) was performed according to the standard protocols and indications described by the NICE guidelines (6,7). Bladder catheterization was performed by a physician. Contrast material is infused into the bladder through the catheter and as the bladder fills, x-rays are taken in different positions and times; especially during urination. Voiding cystourethrography was performed and interpreted by an experienced radiologist, and diuretic renography with 99mTc-MAG-3 (mercaptoacetyltriglycine) was performed and interpreted by an experienced nuclear medicine consultant; both of these clinicians were blinded to all other clinical and imaging data.

The ethics committee approval of the study was obtained from Kırıkkale University Clinical Research Ethics Committee (Date: 01.10.2018, No:15/05).

Statistical Analysis

Study data were analyzed by SPSS (Statistical Package for Social Science) 16.0 software package. Statistical analyses were performed with the Mann Whitney–U test. Cox regression analysis was used to assess the association between baseline APD and disease progress. Associations are presented as Odd's ratios with their corresponding 95% confidence intervals (CIs). The level of significance was set at $p<0.05$.

RESULT

Sixty-nine pediatric patients (M/F=46/23) with CH were enrolled in this study. The mean age at the first postnatal examination was 10.8±7.6 days, and the mean age at the time of the final examination was 9.5±3.2 months. Fourteen (20.3%) patients had right-sided hydronephrosis; 32 (46.4%) patients had left-sided hydronephrosis; and 23 (33.3%) patients had bilateral hydronephrosis. Forty-eight patients' APDs (69.5%) improved while 8 (11.6%) patients' APDs worsened during the follow-up period. MAG-3 of these 8 patients was normal. The remaining thirteen (18.9%) patients had CAKUT (8 cases of VUR, 5 cases of UPJO). None of the patients with reduced APD had any type of CAKUT. Four (17.3%) patients with bilateral hydronephrosis had VUR; 2 patients with right-sided and 2 patients with left-sided hydronephrosis had VUR (Table I). Eleven (15.9%) patients had a history of urinary tract infection, four of whom

Table I: The results of renal ultrasonography and VCUG.

	n	Baseline	Final
Number of patients	69		
M/F	46/23		
Mean age		10.8 ±7.6 days	9.5±3.2 months
Side (left/right/bilateral)	32/14/23		
APD (mm)			
Improved	48 (69.5%)	9.1±2.8	5.1±1.8
Worsened	8 (11.6%)	9.7±2.8	17.9±12.6
CAKUT (8 VUR, 2 UPJO)	13 (18.9%)		

**Mean±SD*

had CAKUT. Two of the 4 patients with bilateral hydronephrosis and VUR had no history of urinary tract infection.

The mean baseline APD level was 9.1±2.8mm in the group with reduced APD and 9.7 ± 2.8mm in the one with increased APD (p=0.461). However, the mean APD at the final examination was significantly smaller in the group with reduced APD than that measured in the group with increased APD. (5.1±1.8 mm vs 17.9±12.6 mm; p=0.001).

The mean baseline APD was greater in girls than boys although the difference did not reach statistical significance (9.8±2.1 vs 9.0±3.0 mm; p=0.176) but the final APD was significantly greater in girls (10.1±2.5 vs 7.0± 4.5 mm; p=0.001). Two patients with VUR and 4 patients with UPJO were boys; the remaining 7 patients were girls.

The APD of twenty-six (81.25%) patients with left-sided hydronephrosis and 10 (71.4%) patients with right-sided hydronephrosis regressed spontaneously. In comparison, the rate of the spontaneous resolution was relatively low in patients with bilateral hydronephrosis (n=13, 56.5%).

The regression analysis showed that a greater baseline APD is a risk factor for a greater follow-up APD (OR=0.353, 95% CI: 0.044-0.204; p=0.003).

DISCUSSION

Postnatal evaluation of CH is an advancing field in recent years. This study describes our experience in the evaluation of CH in the postnatal period. The majority of cases of hydronephrosis are transient or ultimately resolve with conservative management or during follow-up, meaning that a considerable proportion (60-90%) of CH eventually regresses (8, 9). Herein, we reached a similar conclusion. The spontaneous resolution rate in our patients was 69.5%. The finding that we particularly stress is that a mild baseline hydronephrosis does not exclude a pathological underlying condition.

In our cohort study, males were more commonly affected by CH than females, with a ratio of 46/23. This gender bias confirms the high prevalence of fetal urinary tract obstruction in males as reported previously in the literature (10).

Most studies suggest that patients with bilateral hydronephrosis should undergo VCUG (11-13). Our study showed a VUR prevalence of 17.6% that cannot be ignored in patients with bilateral hydronephrosis. Thus, we also recommend that VCUG be performed in patients with bilateral hydronephrosis even in the absence of a history for urinary tract infections. Vesicoureteral reflux is detected in 20% to 30% of neonates with CH (14). We found approximately the same rate.

The predictive value of APD is also an important issue to mention. The authors use APD to determine patients in need of close follow-up. An APD of 15–30 mm is an indication for a close follow-up (15). Kandur et al. (16) reported that an APD threshold of 20 mm can be used for predicting future obstruction and a low differential renal function (DRF). However, they showed that an APD of 15 mm was not a risk factor for a future low DRF. It can be concluded that an APD above 20 mm should alert clinicians about future obstruction and functional loss. In our study, mean baseline APD was not significantly different between the groups with regressed and increased hydronephrosis. Thus, every case of hydronephrosis should be carefully followed as a potential CAKUT.

The primary limitation of our study is the lack of the analysis of the correlation between APD and the Society for Fetal Urology (SFU) grade. There is a great variety of terms used to describe urinary tract dilation using the SFU grading system and APD of the renal pelvis.

CONCLUSION

Our study indicates that an initially mild CH does not exclude a pathological course. Even if renal pelvis APD is small in the first postnatal US imaging, it is essential to continue serial US process examinations at regular intervals,. Therefore, in such patients, routine US should be done regularly.

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