Available online at www.medicinescience.org

ORIGINAL ARTICLE

Medicine Science International Medical Journal

Medicine Science 2021;10(4):1175-8

The relationship of renal pelvis diameters of fetus with pyelectasis observed with surgery requirements and neonatal complications in the postnatal period

Tufan Arslanca[1], Seyma Banu Arslanca[2], Ugurkan Erkayiran[3]

[1]Ankara Ufuk University, Faculty of Medicine, Department of Obstetrics and Gynecology, Ankara, Turkey
[2]Etlik Zubeyde Hanim Gynecology and Obstetrics Hospital, Department of Obstetrics and Gynecology, Ankara, Turkey
[3]Kahramanmaras Sutcu Imam University, Faculty of Medicine, Department of Obstetrics and Gynecology, Kahramanmaras, Turkey

Received 12 April 2021; Accepted 16 May 2021
Available online 01.08.2021 with doi: 10.5455/medscience.2021.04.119

Abstract

To observe whether there is any difference in terms of postnatal complications and surgical requirements of fetuses with fetal pyelectasis in their antenatal follow-ups. A total of 199 patients were included in the study. Those with an anteroposterior renal pelvis diameter of 4 to 7 mm were included in the mild pyelectasis group (group1) (n=129), those with 7 to 10 mm in the moderate pyelectasis group (group2) (n=26) and those with 10 to 15 mm in the severe pyelectasis (group3) (n=44). Information such as delivery type, birth week, birth weight and gender of baby were recorded. The diagnoses and surgical requirement rates of babies followed up after birth were obtained from the case record files. Differences between both groups were evaluated. When the complications in the groups were examined, the differences between the groups with multicystic dysplastic kidney (p=0.011) and left ectopic kidney (p=0.028) were found to be significant. Left ectopic kidney was observed only in group3 at a rate of 4.5%. While ureteropelvic stenosis showed a significant difference in group2 and group3 (p<0.0001), this complication was not encountered in group1 at all. While vesicoureteral reflux was observed significantly in group2 and group3 (p=0.003), it was not observed in group1 at all. Normal US findings were detected in 95.3% of the patients and were evaluated as statistically significant (p<0.0001). According to all these data, the total need for surgical procedures in the distribution of postpartum surgical requirements of the groups was found to be 15.6%. No statistical significance was found between the groups according to the pyelectasis grade (p=0.235). Prenatal follow-up of the renal pelvis diameter and the follow-up of the patient in the postnatal period are extremely critical in terms of preventing the development of possible complications. The early diagnosis of pyelectasis ensures that the decision of follow-up and surgery is made within the framework of a regular follow-up.

Keywords: Pyelectasis, ureteropelvic junction obstruction, vesicoureteral reflux, anteroposterior renal pelvis diameter

Introduction

Congenital anomalies of the genitourinary tract are the most common malformations seen with a frequency of 1 to 4 per 1000 births and defined by sonographic imaging technique. In other words, congenital anomalies of the genitourinary tract constitute 15-20% of all prenatal congenital anomalies (mostly obstructive uropathies). Prenatal diagnosis and early initiation of obstruction treatment are very important in terms of early prevention of urinary tract infections and loss of renal function. It is important that approximately 60% of children who have undergone surgery up to the age of 5, have had a previous prenatal diagnosis thanks to the developing screening programs and technology [1].

Diagnostic evaluations in the prenatal period through ultrasound can be used from the second trimester of pregnancy. Among all cases, mild pyelectasis or minimal hydronephrosis has the highest rate. According to the definition of this pathology, a certain rate of dilatation is observed in the anteroposterior renal pelvis diameter (APRPD). According to the classification of the Fetal Urology Association, dilatation in Stage 1 cases is 5 mm to 10 mm and its incidence varies between 1.1% and 3.3% [2]. Although mild pyelectasis does not cause a significant clinical problem, its detection on ultrasound is important because it is both a marker for aneuploidy and plays a precursor role for potential urinary tract pathologies. While it was considered as a physiological condition with no clinical significance in the previous years, today it is seen as a window of opportunity for a rapid surgical intervention to prevent irreversible damage to renal functions. Different approaches are still ongoing in this regard; there are clinicians who prefer follow-up only by considering pelvic dilatation below 15 mm as physiological and as well as surgeons who follow a much more proactive process. It should be remembered that the family factor also affects the treatment process. Many parents are uneasy about

***Corresponding Author:** Ugurkan Erkayiran, Kahramanmaras Sutcu Imam University, Faculty of Medicine, Department of Obstetrics and Gynecology, Kahramanmaras, Turkey, E-mail: ugurkanerkayiran@gmail.com

the follow-up process, so family counseling becomes important. Another aspect of the follow-up process is the increasing health system burden and costs [2].

In the previous years when prenatal ultrasound screening was not possible, pyelectasis or hydronephrosis could be diagnosed by looking at postpartum symptoms. We come across an interesting developmental process here; in male cases with suspected pyelectasis in week 19, it is seen that transient pyelectasis improved in the follow-up ultrasound between weeks 30 and 40. Bladder filling rate is also one of the variables affecting pyelectasis and normal sized pelvis is encountered in 53% of the cases with pyelectasis [3]. Gold standard assessment methods such as cysto-urethrography or scintigraphy may be considered unnecessary by a clinician for this age group due to the possibility of improvement of pyelectasis in young children [4]. There is also a consensus for postnatal evaluation in cases with >15mm pyelectasis. However, standardization criteria in pyelectasis and postnatal management of 5 to 10 mm pyelectasis are controversial. 90% of pyelectasis show spontaneous regressive findings. However, antenatal follow-up of cases with >5mm pyelectasis can be recommended at 4-week intervals. It should be taken into consideration that pelvic dilatation may increase in cases with pyelectasis below 10 mm and it should be intervened according to the follow-up findings of the patient.

In our study, cases suggestive of pyelectasis were evaluated in terms of unilateral or bilateral APRPD by antenatal examinations performed between weeks 20 to 24 of gestation. Those with 4 to 7 mm APRPD were included in the mild pyelectasis group, those with 7 to 10 mm in the moderate pyelectasis group, and those with 10 to 15 mm in the severe pyelectasis group, and the difference in surgical requirements was tried to be observed.

Materials and Methods

We applied to the local ethics committee to get approval and started the study after getting the approval of the ethics committee (dated 22/07/2020, Session No. 2020/14 and Decision No. 13). Patients who admitted to the pregnancy outpatient unit of the gynecology and obstetrics department on 01/01/2018 to 01/06/2020 were included in the study. The study was carried out within the framework of the Helsinki Declaration of Human Rights protocols. The data of the patients were obtained retrospectively from hospital records and files. Patients with unilateral or bilateral APRPD greater than 4 mm and those with less than 15 mm in routine antenatal follow-up in week 20 to 24 of pregnancy were included in the study. Notwithstanding, fetuses with isolated renal pyelectasis were included in the study. Since fetuses with other congenital anomalies in addition to pyelectasis were excluded from the study, invasive tests for genetic purposes were not applied. APRPD was determined by measuring the distance between the inner parts of the anterior and posterior walls of the renal pelvis in the horizontal plane. Those with an APRPD of 4 to 7 mm were included in the mild pyelectasis group (group 1) (n=129), those with 7 to 10 mm in the moderate pyelectasis group (group 2) (n=26) and those with 10 to 15 mm in the severe pyelectasis (group 3) (n=44) [5]. Patients who came for control at four-week intervals were included in the evaluation. Patients with singleton pregnancy and those with no abnormal amniotic fluid volume were included in the study. Information such as delivery type, birth week, birth weight and gender of baby were recorded. The diagnoses and surgical requirement rates of babies followed up after birth were obtained from the case record files. Differences between both groups were evaluated.

The collected patient data were analyzed using the IBM Statistical Package for the Social Sciences (SPSS) for Windows 23.0 package program. Frequency and percentage for categorical data and mean and standard deviation for continuous data were given as descriptive values. “Chi-Square Test” was used to compare categorical variables. The cut-off value for determining the renal pelvis age was calculated by “ROC Analysis”. Results were considered statistically significant in cases where the p value was less than 0.05.

Results

A total of 199 patients were included in the study. Consistent with the literature, of the total pyelectasis cases, group 1 patients constituted 65% (n=129), group 2 patients 13% (n=26) and group 3 patients 22% (n=44) (Table 1).

In demographic data, parameters such as maternal age and gestational week were found to be similar in all groups. While the average birth weight was 3093 gr in group 3, it was determined as 3198 gr in group 2, 3250 gr in group 1 and 3225 gr in the general average of all groups. According to these data, it is seen that the pyelectasis grade is directly proportional to low birth weight (Table 1).

According to the gender analysis of the born babies, 69.8% of the whole study group were male (n=139), while 30.2% (n=60) were female. According to the status of pyelectasis, births were 64.3% (n=83) male and 35.7% (n=46) female in group 1, 76.9% (n=20) male and 23.1% (n=6) in group 2 and 81.8% (n=36) and 18.2% (n=8) in group 3 (Table 1).

When the relationship between delivery type and pyelectasis was analyzed, 54.3% (n=108) of the cases were normal vaginal delivery while 45.7% (n=91) were by Cesarean section in the whole study population. According to the status of pyelectasis, vaginal delivery was 58.9% (n=76) and Cesarean section was 41.1% (n=53) in group 1, vaginal delivery was 46.2% (n=12) and Cesarean section was 53.8% (n=14) in group 2 and vaginal delivery was 45.58% (n=20) and Cesarean section was 54.5% (n=24) in group 3 (Table 1).

Apgar scores are among the other data of the study. In grading according to Apgar score, pyelectasis cases were observed more in babies with low scores. In the analysis of the correlation between parity and pyelectasis, while cases are clustered in 0-1-2 parities, it was low in 3 and 4 parities (Table 1).

The neonatal complications observed in the patients included in the study are given in detail in Table 2. No statistically significant result was found in the cases of bilateral collecting system (p=0.594), undescended testis (p=0.170) and posterior-urethral valve (PUV) (p=0.170). While phimosis cases were found in 7.5% (n=15) in total, this result was found to be clinically significant (p=0.006). The vast majority of phimosis cases were seen in group 3. Multicystic dysplastic kidney (p=0.011) and left ectopic kidney (p=0.028) were found to be significant among complications. Left ectopic kidney was observed only in group 3 at a rate of 4.5%

(n=2). Ureteropelvic junction obstruction (UPJ) (p <0.0001) was found to be significant among groups, but it was not observed in group 1 cases. Vesico-ureteral reflux (VUR) was not found in group 1 like in UPJ cases (p=0.003). Normal US findings were seen in 95.3% (n=123/134) of patients and a statistically significant result (p<0.0001) was obtained (Table 2).

According to all these data, the total need for surgical procedures in the distribution of postpartum surgical requirements of the groups was found to be 15.6% (n=31). No statistical significance was found between the groups according to the pyelectasis grade (p= 0.235) (Table 3).

Table 1. Distribution of demographic and clinical findings by groups

Characteristics	Total N=199 n (%) or Median (Min-Max)	4-7 mm N=129 n (%) or Median (Min-Max)	7-10 mm N=26 n (%) or Median (Min-Max)	10-14 mm N=44 n (%) or Median (Min-Max)
Mother Age, years	29 (18-44)	28 (18-44)	27 (22-37)	32 (18-42)
Birth week, week	39 (27-41)	39 (27-41)	39 (32-41)	38 (29-40)
Delivery type				
Vaginal	108 (54.3)	76 (58.9)	12 (46.2)	20 (45.5)
Cesarean section	91 (45.7)	53 (41.1)	14 (53.8)	24 (54.5)
Fetal birth weight, gr	3225 (1085-4670)	3250 (1085-4670)	3198 (1960-4160)	3093 (1620-3890)
Baby's Gender				
Boy	139 (69.8)	83 (64.3)	20 (76.9)	36 (81.8)
Girl	60 (30.2)	46 (35.7)	6 (23.1)	8 (18.2)
Gravidity				
1	76 (38.2)	47 (36.4)	11 (42.3)	18 (40.9)
2	77 (38.7)	52 (40.3)	8 (30.8)	17 (38.6)
3	39 (19.6)	24 (18.6)	7 (26.9)	8 (18.2)
4	6 (3.0)	5 (3.9)	-	1 (2.3)
6	1 (0.5)	1 (0.8)	-	-
Parity				
0	79 (39.7)	48 (37.2)	12 (46.2)	19 (43.2)
1	78 (39.2)	53 (41.1)	8 (30.8)	17 (38.6)
2	39 (19.6)	25 (19.4)	6 (23.1)	8 (18.2)
3	2 (1.0)	2 (1.6)	-	-
4	1 (0.5)	1 (0.8)	-	-

Table 2. Distribution of neonatal complications by groups

Characteristics	Total N=199 n (%)	4-7 mm N=129 n (%)	7-10 mm N=26 n (%)	10-14 mm N=44 n (%)	p
Neonatal Complications					
Duplication of the collecting system	2 (1.0)	1 (0.8)	-	1 (2.3)	0.594
Phimosis	15 (7.5)	4 (3.1)	4 (15.4)	7 (15.9)	0.006
Undescended testis	1 (0.5)	-	-	1 (2.3)	0.170
Infantile polycystic renal disease	6 (3.0)	1 (0.8)	3 (11.5)	2 (4.5)	0.011
Normal outcome	134 (67.3)	123 (95.3)	3 (11.5)	8 (18.2)	<0.0001
Posterior urethral valve	1 (0.5)	-	-	1 (2.3)	0.170
Ectopic kidney (left)	2 (1.0)	-	-	2 (4.5)	0.028
Ureteropelvic junction obstruction	32 (16.1)	-	14 (53.8)	18 (40.9)	<0.0001
Vesicoureteral reflux	6 (3.0)	-	2 (7.7)	4 (9.1)	0.003

Table 3. Distribution of postpartum surgical requirements according to groups

Characteristics	Total N=199 n (%)	4-7 mm N=129 n (%)	7-10 mm N=26 n (%)	10-14 mm N=44 n (%)	p
Postpartum surgical requirement	31 (15.6)	16 (12.4)	6 (23.1)	9 (20.5)	0.235

Discussion

Urinary system anomalies are the most common prenatal malformations. Diagnosis during prenatal period is of great importance in preventing the process from infection to kidney failure in the future. Minimal pyelectasis is very common in fetuses older than 24 weeks and is independent of maternal hydration level [6]. Previous studies on this matter stated that there is no need for any postnatal intervention by predicting a physiological condition for patients with APRPD<10 mm, while some studies recommended follow-up [7]. In a study, Adra et al found that there were continuing pathologies during delivery in cases of pyelectasis that continued after 28 weeks. VUR was observed in 33% and UPJ was observed in 37% of these patients [6]. In our study, we observed UPJ in 16.1% (p<0.0001) and VUR in 3% of patients and a significant difference between groups.

According to the analysis of pyelectasis cases, it has been reported that one third of them are transient and show spontaneous regressive findings. However, cases with bilateral involvement and those with persistent dilatation after week 28 should be included in a comprehensive urological examination and evaluation. Thus, the complications that may arise will be reduced or minimized [6]. In a study, Ahmad and Green reported that 74% of pregnancy cases with pyelectasis had spontaneous recovery in the antenatal or postnatal period. No surgical requirement or renal dysfunction has been reported for any of the cases with mild pyelectasis. Unlike Ahmad and Green's study, 16 (12.4%) of 31 operated patients (n=31/199, 15.6%) were in the mild pyelectasis group and also there was no significant difference between the groups of mild, moderate and severe pyelectasis in our study (p=0.235). In the same study, 34% of the cases with moderate and severe pyelectasis showed spontaneous recovery in the postnatal period, while 10% required surgical treatment. [8]. We found the need for a surgical procedure as 15.6% (n=31) in our study.

Muhcu et al., found fetal pyelectasis in 46 cases (1.9%) in a study on 2470 pregnant women who were followed up antenatally. Symptoms of urinary obstruction were detected in 10% of all cases, surgical treatment was planned and a possible loss of kidney function was prevented early. In the post-natal period, VUR was detected in 4 of 29 patients with persisting pyelectasis (13.8%, 8.7% of all those with antenatal mild-moderate pyelectasis) and surgical procedures were performed in 3 of 5 patients who had an increase in APRPD and 2 of 27 babies with no change (p=0.003). The APRPD of 3 of these cases was found to be more than 10 mm and the surgical requirement was found to be statistically significantly higher than the group without progressive findings [9]. According to Muhcu et al, all newborns with an indication for surgical treatment were cases with progressive findings in the fetal period [9]. The total need for surgical procedures was found to be 15.6% (n=31) in our study when the distribution of postpartum surgical requirements of the groups was analyzed. No statistical significance was found between the groups according to the pyelectasis grade (p=0.235).

It is extremely important to follow up the cases with pyelectasis properly and to make a surgical decision when necessary, before complications occur. The occurrence of kidney damage is one of the most undesirable complications. VUR can cause dilatation in the pelvis [10]. When previous studies on this subject were reviewed, Marra et al., detected VUR during delivery in one third of patients with mild pyelectasis (4 to 10 mm) in the prenatal period, but most of them recovered spontaneously at the age of 1.5 years [11]. In a study, Scott et al reported the rate of cases with mild pyelectasis in the renal pelvis as 8.5% according to prenatal ultrasonography records of children with VUR [12]. In our study, VUR was seen in 6 patients in total, and all of them were included in group 2 (n=2/26, 7.7%) and group 3 (n=4/44, 9.1%) (p=0.003).

The limitation of our study is the lack of long-term follow-up of fetuses with pyelectasis found in the second trimester of the intrauterine period.

Conclusion

As a conclusion, prenatal follow-up of the renal pelvis diameter and the follow-up of the patient in the postnatal period are extremely critical in terms of preventing the emergence of possible complications. Pyelectasis should be diagnosed in early period and the decision of follow-up and surgery should be made within the framework of a regular follow-up.

Conflict of interests
The authors declare that they have no competing interests.

Financial Disclosure
All authors declare no financial support.

Ethical approval
The ethics committee decision was obtained from the Ethics Committee of Kahramanmaras Sutcu Imam University with Session No. 2020/14, Decision No. 13 on 22.07.2020.

References

1. Hindryckx A, Catte LD. Prenatal diagnosis of congenital renal and urinary tract malformations, Facts Views Vis Obgyn. 2011;3:165–74.
2. Signorelli M, Cerri V, Taddei F, et al. Prenatal diagnosis and management of mild fetal pyelectasis: implications for neonatal outcome and follow-up, Eur J Obstet Gynecol Reprod Biol. 2005;118:154-9.
3. Wilson RD, Lynch S, Lessoway VA. Fetal pyelectasis: Comparison of postnatal renal pathology with unilateral and bilateral pyelectasis, Prenat Diagn. 1997;17:451-5.
4. Ismaili K, Avni FE, Wissing KM, et al. Brussels Free University Perinatal Nephrology Study Group, Long-term clinical outcome of infants with mild and moderate fetal pyelectasis: validation of neonatal ultrasound as a screening tool to detect significant nephrouropathies, J Pediatr. 2004;144:759-65.
5. Nguyen HT, Benson CB, Bromley B, et al. Multidisciplinary consensus on the classification of prenatal and postnatal urinary tract dilation (UTD classification system). J Pediatr Urol. 2014;10:982-98.
6. Adra AM, Mejides AA, Dennaoui MS, et al. Fetal pyelectasis: Is it always "physiologic"? Am J Obstet Gynecol. 1995;173:1263-6.
7. Grignon A, Filion R, Filiatrault D, et al. Urinary tract dilatation in utero: Classification and clinical applications. Radiology. 1986;160:645-7.
8. Ahmad G, Green P. Outcome of fetal pyelectasis diagnosed antenatally, J Obstet Gynaecol. 2005;25:119-22.
9. Muhcu M, Gonen G, Akyol I, et al. Ikinci trimester hafif fetal pyelektazi olgularinda antepartum seyir ve postpartum yonetim. Perinatoloji Dergisi 2007;15:2.
10. Thomas DF. Fetal uropathy. Br J Urol. 1990;66:225-31.
11. Marra G, Barbieri G, Moioli C, et al. Mild fetal hydronephrosis indicating vesicoureteric reflux. Arch Dis Child Fetal Neonatal Ed. 1994 Mar; 70:F147-149; discussion 149-50.
12. Scott JE, Renwick M. Screening for fetal urological abnormalities: How effective? BJU Int. 1999;84:693-700.