Original Article

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Ureteropelvic Junction Obstruction in Children: Is Antibiotic Prophylaxis Really Necessary?

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Abstract

Background: To assess the risks of developing of urinary tract infection in children with ureteropelvic junction obstruction, depending on the grade of hydronephrosis. **Materials and Methods.** The present retrospective study, which was conducted from 2013 to 2018 years, includes data of 131 children with antenatally diagnosed grade III and IV hydronephrosis (SFU). All patients underwent surgical treatment at the age from 3 months to 3 years and did not receive antibiotic prophylaxis. Urinary tract infection was diagnosed in the presence of WBC in urine sample (> 10 WBC/field of view), positive bacterial growth (≥105 CFU/ml) and fever (≥38.5 ° C). Children with duplex system, obstructive megaureter, vesicoureteral reflux, posterior urethral valve, and neurogenic bladder were excluded from this study. **Results.** Grade III hydronephrosis was detected in 113 children and grade IV in 18 patients. The total incidence of urinary tract infection was 9.2% (12 patients), while in the group of children with grade IV hydronephrosis it was higher (in 3 of 18 - 16.7%) than in children with grade III (in 9 out of 113 - 7.9%) (P <0.05). The incidence of urinary tract infections did not differ significantly depending on the sex or age of the patients. In 7 (58.3%) patients, urinary tract infection was noted before the age of 6 months, with an average age of 2.7 months. A bacteriological study revealed that in eight (66.7%) patients, E. Coli was the causative agent of urinary tract infection. **Conclusion**. Children with antenatal diagnosed and postnatal confirmed ureteropelvic junction obstruction do not need antibiotic prophylaxis because of the low incidence of urinary tract infection. However, patients with grade IV hydronephrosis under the age of 6 months should be closely follow-up by physicians for the early diagnosis and treatment of urinary tract infection.

Keywords: Prenatal, hydronephrosis, urinary tract infection, child.

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Introduction

Antenatal hydronephrosis is a fairly common congenital anomaly of the urinary tract and is detected in 1-5% of fetuses by ultrasound screening.[1] In about half of them, hydronephrosis develops due to obstruction of the pyeloureteral segment.[2] In most cases, the clinical picture of obstruction of the pyeloureteral segment is poor and may be asymptomatic.[3] At the same time, pathology is often accidentally detected during ultrasound examination (US) of the abdominal organs for other reasons at an older age.[4] Also, obstruction of the pyeloureteral segment often tends to spontaneously regress during the first two years of life. Thus, B. Chertin et al. report that only about 50% of children with antenatally diagnosed hydronephrosis and postnatally confirmed obstruction of the pyeloureteral segment required surgical treatment.[5] At the same time, according to diuretic renography data, intact differential renal function (> 40%) and non-obstructive type of the curve are independent factors indicating the absence of the need for surgical intervention.[6–8] Consequently, most of these patients undergo dynamic observation and conservative therapy (antibiotic therapy), due to the absence of signs of decreased renal function. Despite the fact that prophylactic antibiotic therapy is empirical in nature and is widely used in children with vesicoureteral reflux and megaurethra, there is no evidence of its high effectiveness in children with pyeloureteral segment obstruction. Moreover, the growing concern about the development of antibiotic resistance casts doubt on the need and effectiveness of prophylactic antibiotic therapy in this group of children.[9,10]

Purpose of the study. Risk assessment of urinary tract infection development in children with pyeloureteral segment obstruction depending on the degree of upper urinary tract dilatation.

Materials and Methods

The present retrospective study, which was conducted from 2013 to 2018, included data from 131 children with obstruction of the pyeloureteral segment. When determining the severity of dilatation of the renal pyelocaliceal system, we used the classification proposed by the Fetal Urology Society.[6] All patients underwent surgical treatment at the age of 3 months to 3 years (10.05–9.1 months) and did not receive prophylactic antibiotic therapy. In the distribution of patients by sex, there was a predominance of boys - 100 (76.3%), compared with girls - 31 (23.7%). Among the patients, right-sided hydronephrosis was detected in 49 (37.4%) patients, left-sided obstruction in 73 (55.7%) children, and in 9 (6.9%) cases there was bilateral lesion. Urinary tract infection was diagnosed with leukocyturia (> 10 leukocytes / field of view), bacterial growth in urine samples (≥105 (CFU) / ml) and high body temperature (≥38.5 C). Children with concomitant malformations such as upper urinary tract doubling, obstructive megaureter, vesicoureteral reflux, ureterocele, posterior urethral valve, and neurogenic bladder dysfunction were excluded from this study.

The obtained data, in the course of the study, were subjected to statistical processing using the SPSS Statistics 20 software packages from StatSoft (USA). At the same time, the critical value of the level of significance of the results was taken equal to p = 0.05.

Results and Discussion

According to ultrasound data, grade III hydronephrosis was detected in 113 children and grade IV in 18 patients. The majority of patients were in infancy (up to 1 year) and amounted to 91 (69.5%), and the number of patients aged 1 to 3 years - 40 (30.5%) [Figure 1].

As follows from the data presented in [Table 1], obstruction of the pyeloureteral segment was asymptomatic in 114 (87%) children. Four (3%) patients were examined for a palpable abdominal mass. A characteristic clinical sign of the defect in one (0.8%) case was the child's anxiety without a clear localization, which was stated as a pain syndrome. The overall incidence of urinary tract infection was 9.2% (12 patients), while in the group of children with grade IV hydronephrosis it was observed more often (in 3 of 18 - 16.7%) than in children with grade III (9 of 113 - 7.9%) (P <0.05). The incidence of urinary tract infection did not differ significantly depending on the sex or age of the patients [Table 2].

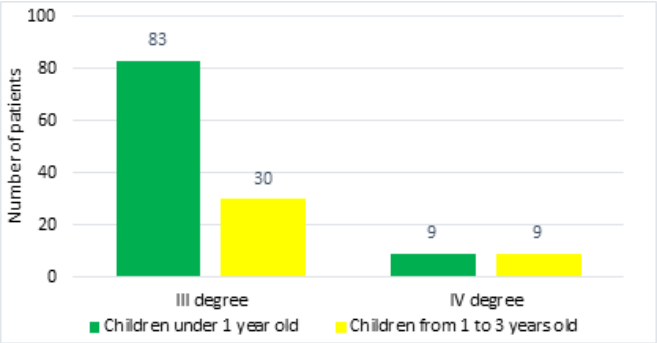

Figure 1: Distribution of patients depending on the severity of hydronephrosis

Table 1: Distribution of patients depending on clinical manifestation

Clinical course	Number of patients	
	Abs	%
Asymptomatic course	114	87
Palpable mass	4	3
Child's anxiety (abdominal / lumbar pain)	1	0,8
Urinary tract infection	12	9,2
Total amount	131	100

In 7 (58.3%) patients, urinary tract infections were observed before the age of 6 months, with an average age of 2.7 months. Two out of 9 children with bilateral hydronephrosis suffered repeated episodes of urinary tract infection.

Bacteriological examination revealed that Escherichia coli was the causative agent of urinary tract infection in eight (66.7%) patients [Table 3].

It is important to note that antenatal hydronephrosis due to obstruction of the pyeloureteral segment is in most cases a benign condition with a high likelihood of spontaneous regression. Realization of this possibility led to the development of conservative therapies using antibiotics to prevent upper urinary tract infections. Unfortunately, questions about the incidence of urinary tract infections, as well as the effectiveness of using prophylactic antibiotic therapy in children with antenatal hydronephrosis remain highly controversial [Table 4]. Thus, at present, prophylactic antibiotic therapy is widely used in children with antenatal hydronephrosis, until vesicoureteral reflux is excluded, since children with a high degree of reflux are at greatest risk of developing urinary tract infections.[11] Nevertheless, Lee J. H. et al., Having examined 430 children with antenatal hydronephrosis without vesicoureteral reflux, found a fairly high incidence of urinary tract infections (19%) in chil-

Table 2: Distribution of patients depending on the degree of hydronephrosis, gender and age

	Number of patients	Number of urinary tract infections /%	P-Value
Degree of hydronephrosis			<0,05
III degree	113	9/7,9%	
IV degree	18	3/16,7%	
Sex			>0,05
Boys	100	10/10%	
Girls	31	2/6,5%	
Age			>0,05
Up to 1 year	91	8/8,8%	
1 to 3 years old	40	4/10%	

Table 3: Causative agents of urinary tract infection in children with obstruction of the pyeloureteral segment

	Pathogen	Number of patients	%
1	Escherichia coli	8	66,7%
2	Pseudomonas aeruginosa	1	8,3%
3	Klebsiella	1	8,3%
4	Enterobacter	1	8,3%
5	Enterococcus	1	8,3%

dren with obstruction of the pyeloureteral segment.[12] And according to Song S.H. et al., 30% of children with obstruction of the pyeloureteral segment have urinary tract infections. Therefore, the authors are deeply convinced of the need for prophylactic antibiotic therapy during follow-up.[13] However, studies by other authors indicate an extremely low incidence of urinary tract infection in children with obstruction of the pyeloureteral segment.[14,15] Moreover, Islek A. et al. When studying data from 84 children with antenatally diagnosed hydronephrosis and postnatally confirmed obstruction of the pyeloureteral segment, no signs of urinary tract infection were found in any patient.[16]

In our study, the overall incidence of urinary tract infection in children with pyeloureteral segment obstruction remains at a relatively low level. However, in children with IV degree of hydronephrosis, infection was found much more often than in children with III degree. More than half of the patients had the infection before the age of 6 months. Escherichia coli was the most common uropathogen in children with urinary tract infection and pyeloureteral segment obstruction, which is consistent with the data of other authors.[17]

Conclusion

Children with antenatally diagnosed hydronephrosis and obstruction of the pyeloureteral segment do not need prophylactic antibiotic therapy due to the low incidence of urinary tract infections. However, patients with grade IV hydronephrosis under the age of 6 months should be closely monitored by specialists for the timely diagnosis and treatment of urinary tract infections. If an infection is detected in this category of children, antibiotic therapy should be carried out taking into account the spectrum of action of antibacterial drugs on possible uropathogens.

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Table 4: The incidence of urinary tract infections in children with antenatal hydronephrosis according to various data

	Total number of patients (N)	Number of patients with pyeloureteral segment obstruction (N)	Follow-up period (months)	Urinary tract infection rate (%)	Average age at the time of urinary tract infection (months)	Prophylactic antibiotic therapy during the observation period	Indication for prophylactic antibiotic therapy
Song S.H. et al. 2007	105	75	12	30,7	2,6	No	Yes
Lee J.H. et al. 2008	430	-	12	19	4,1	No	Yes
Roth C.C. et al. 2009	92	56	24	1,8	-	No	No
Islek A. et al. 2011	84	84	18	0	-	No	No
Visuri et al. 2016	192	135	30	6	3-12	Yes	No

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