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Prenatal detection and postnatal correction of the pyeloureteral segment stenosis

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Summary

The aim: The aim of the study was to determine if there is any influence of prenatal detection on postnatal correction of the fetal pyeloureteral segment stenosis. *Materials and Methods*: The study included 77 patients who were prenatally diagnosed with one of the urinary tract anomalies. *Results*: The Apgar (Ap) score mean value in seven patients where the anomaly was detected before the 30th week of pregnancy was 9.14 ± 0.37, while the Ap score mean value for eight patients after the 30th week of pregnancy was 7.87 ± 0.64. By testing these values, the authors have established that there was a significantly high difference for $t = 4.572$ and $p = 0.001$. *Discussion:* It is necessary for research to be carried with the objective to find the most simple and efficient methods of diagnosing and treating the obstruction of the pyeloureteral segment.

Key words: Prenatal detection; Pyeloureteral segment stenosis; Postnatal correction.

Introduction

The term pyelectasis originated as a term for mild hydronephrosis, with the dilation of the renal pelvis. When the hydronephrosis is diagnosed prenatally, it is called fetal hydronephrosis. There is a strong correlation between the prenatal detection of hydronephrosis and postnatal genitourinary pathology. Specifically, regarding the pyelectasis [1], the experts find it different from the normal renal pelvis. There are extreme controversies regarding which fetuses require postnatal monitoring. The present authors' intention is to describe the prenatal diagnosis, differential diagnosis. and the development of the hydronephrosis. Congenital hydronephrosis is often diagnosed prenatally, very early - in the 2nd trimester. If a mild form of hydronephrosis is detected in the 2nd trimester of the pregnancy and the evaluation takes place later during the pregnancy, we opt for postnatal treatment. Normal pelvis dimensions can change as the pregnancy progresses, so that hydronephrosis can be diagnosed in the third trimester. Neonatal monitoring is only recommended when the fetal pelvis dimensions are from 7 mm to 10 mm and above the 34th week. Measuring determines if the pyelectasis is physiological or normal. It is believed that the fetuses with early fetal dilation have a greater possibility to survive during the pregnancy. Hydronephrosis evaluation helps to prevent the congenital uropathy sequelae.

Thirty to fifty percent of fetuses with hydronephrosis are going to have a regular postnatal finding. Recent research shows that the hydronephrosis developed during pregnancy requires nothing but a simple ultrasound monitoring [2]. The presence of obstruction significantly affects the kidney filtration and to the contrary, the absence of the permanent obstruction, the function will remain unstable. Improvement of the function can be achieved in a few months or years, while the non-surgical treatment should be continued if the function remains unstable even below this value. If the patients' condition does not improve, it is necessary to approach surgical treatment and in most cases it includes the procedure Anderson-Hynes pyeloplasty.

The aim of the study was to determine if there is any influence of prenatal detection on postnatal correction of the fetal pyeloureteral segment stenosis.

Materials and Methods

The study was conducted at the Clinic for Gynaecology and Obstetrics of the Clinical Center of Serbia and the Children's University Hospital in the period between 2003 and 2013. Seventy-seven patients that were prenatally diagnosed with one of the urinary tract anomalies were treated in the study. According to the nature of their diseases, the patients were divided in the following

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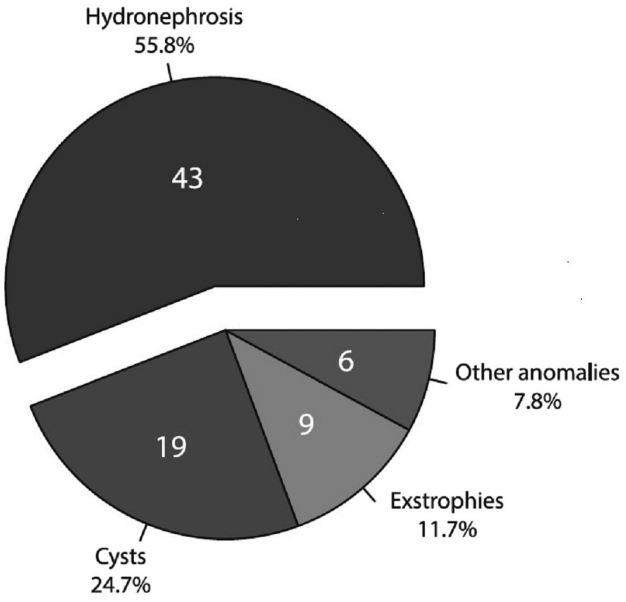

Figure 1. — Prenatally discovered anomalies: hydronephrosis, 43 (55.8%), kidney cysts in 19 (24.7%), bladder extrophies in nine (11.7%), and other anomalies six patients (7.8%).

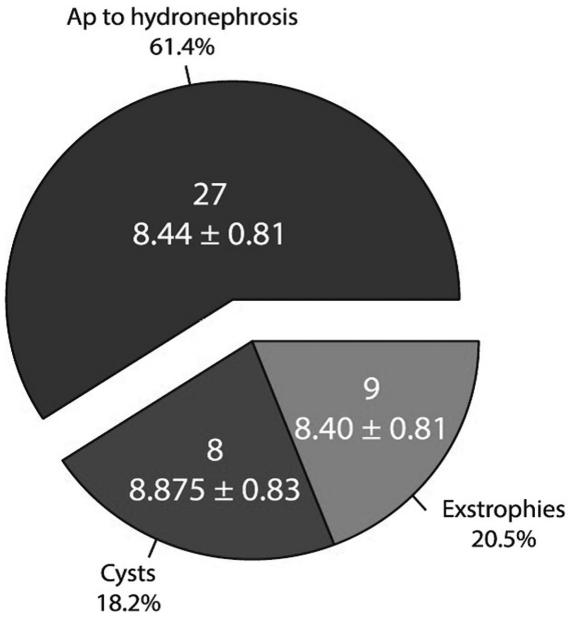

Figure 2. — Apgar score for the patiens with hydronephrosis (Ap 8.44 ± 0.81), cysts (Ap 8.87 ± 0.83), and extrophies (Ap 8.40 ± 0.81).

groups: A) diagnosed hydronephrosis, B) diagnosed kidney cysts, C) bladder exstrophy, and D) other anomalies.

Ultrasound measurements were performed with an ultrasound device, with an image resolution of 0.1 mm. Renal sonograms were performed with the linear transducers distribution of 5 and 7 MHz, while using it vaginally or with abdominal sectoral distribution of 3.75 MHz. The second mentioned method was used in pregnancies with smaller gestational age. The parameters examined in infants with hydronephrosis, kidney cysts, bladder exstrophy, and other anomalies, were the following: neonatal body mass at birth, neonatal body length, neonatal head circumference, Apgar (Ap) score, and ponderal index (PI). Apgar score shows the vitality of the fetus at birth. It determines the basic parameters of the newborn at birth (grading scale: from 0 to 2) which are added and then given a rating from 0 to 10. For each infant, the authors calculated the proportionality index at birth and PI, which indicate the nutritional status of the fetus at birth. During results' analysis, depending on the nature of the variables, the authors used only Pearson's chi-square test, in the form of tests using contingency agreements and tables, while for comparing the differences between frequencies of non-parametric features, mostly for one or two features were used. For comparing average values of parametric features the authors used Student's *t*-test. A rank sum test, as non-parametric supplement, was applied on independent samples and on dependent samples - a matched pairs test was applied. In all applied analytical methods, the significance level was 0.05.

Distribution by gender was such that there were 53 neonatal males or 68.8%, and 22 neonatal females or 28.6%, whereas there were no relevant data for two newborns. In the study the following next parameters were assessed: neonatal body mass at birth (average value is 3320.93 ± 477.88 grams), neonatal body length (average value is 50.94 ± 2.58 cm), neonatal head circumference (average value is 35.18 ± 1.51 cm), Ap (average value is 8.51 ± 0.80), and PI (average value is 2.51 ± 0,.22) (Table 1).

Table 1. — Parameters assessed in the study.

tt	td	OG	Ap	PI
3320.93±	50.94±	35.18±	8.51±	2.51±
477.88	2.58	1.51	1.51	0.22

Prenatally discovered anomalies: pyeloureteral segment stenosis, which manifested in hydronephrosis, was diagnosed in 43 (55.8%) patients, kidney cysts in 19 (24.7%), bladder extrophies in nine (11.7%) patients, and other anomalies were discovered in six patients (7.8%) (Figure 1).

Results

In the groups of patients, the following values for first parameter Ap score in newborns with pyeloureteral stenosis and hydronephrosis, amounted to 8.44 ± 0.81 in 27 patients, in eight patients with multicystic kidneys Ap was 8.87 ± 0.83, and in nine newborns with bladder exstrophy it is 8.40 ± 0.81 (Figure 2). The difference that was tested statistically with non-parametric tests for Ap score was the following: hi^2 test value was 5.025 and significance was 0.170. The division was made based on the score level: the authors established the high level of Ap score as 9 and 10, and a good level as 7 and 8.

The average value of the PI in newborns with hydronephrosis was 2.54 ± 0.20, in newborns with cysts it was 2.46 ± 0.21, and in he newborns with exstrophy it was 2.46 ± 1.64 (Figure 3).

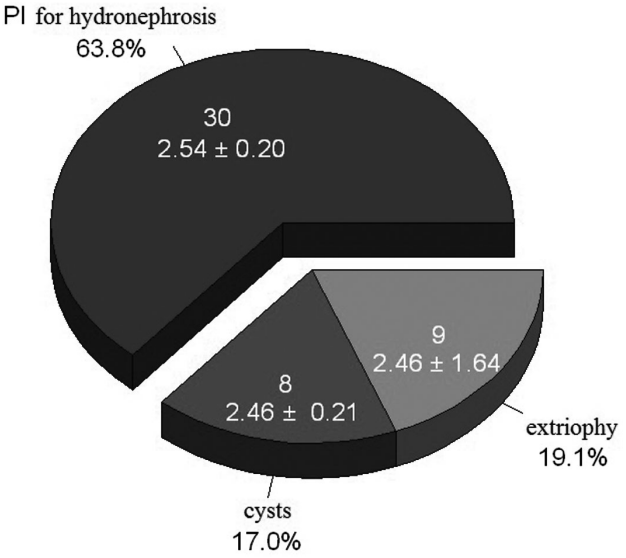

Figure 3. — Average for ponderal index (PI) in the patients with hydronephrosis cysts and extrophies.

The authors' intention was to show that the time of diagnosing the anomaly affected the postnatal therapeutic treatment. The division was based on timing of diagnosing the anomaly. Early establishment of diagnosis was the same for all newborns who had an urinary tract anomaly diagnosed before the 30th week of gestation, and the late anomaly diagnosis was in newborns after the 30th week of gestation. The Ap score mean value in seven patients where the anomaly was detected before the 30th week of gestation was 9.14 ± 0.37, while the Ap score mean value in eight patients after the 30th week of gestation was 7.87 ± 0.64. By testing these values, the authors established that there it was a significantly high difference for t = 4.572 and p = 0.001. The mean value of PI before and up to the 30th week of gestation (seven patients) was 2.49 ± 0.17, and for diagnosis and after the 30th week of gestation (eight patients) it was 2.516 ± 0.28. The value of the test showing the difference between Ap scores for these two groups was t = 0.218, and the significance levels was p = 0.83, and was of no statistical significance.

The mean value of Ap score in conservatively treated patients (21) was 8.76 ± 0.76, and in operated patients (22) it was 8.22 ± 0.80. Statistical data analysis showed the the following: t = 2.215 and p = 0.032. It is clear that there is a significantly high difference between these two values.The average PI value in conservatively treated patients was 2.55 ± 0.2. The mean value for operated patients is 2.49 ± 0.2. The authors performed a test to see if there was a difference between PI in these two groups of patients and they obtained the following values with the test: t = 0.91 and p = 0.367. It is clear that there is no statistical significance between these two groups.

With regards to pyeloureteral segment obstruction with hydronephrosis, the authors monitored the stated parameters based on the fact whether the patients were operated on or not, and also based on the type of operation. They had two types of operations in babies with hydronephrosis: pyeloplasty (in five patients) and ureterocutaneostomy (in five patients). Mann Whitney test analyzed the difference based on the operation type, and the value of test is t = 0.762 and p = 0.446 for the Ap score. While the cysts were mostly conservatively monitored, two patients underwent a surgery; test value was 6.4, and the level of probability was 0.1, while all the nine patients with exstrophies were operated.

Discussion

The primary question is how early diagnosis of the fetal pyeloureteral segment stenosis and other fetal anomalies of urinary tract have an impact on the postnatal therapeutic intervention, especially if the urinary tract anomaly is diagnosed before or after the 30th week of gestation. During this study, the authors especially analyzed the parameters such as Ap and PI, that gave an indication regarding postnatal treatment of urinary tract anomalies, which is a new approach in perinatology. The Ap value in conservatively treated patients was 8.76 ± 0.76, while the mean value of Ap score in operated patients was 8.22 ± 0.80. Statistical data analysis showed the value of the test was t = 2.215 and the level of the probability was p = 0.032. It is clear that there is a significantly high difference between these two values. This difference was not demonstrated when analyzing the data for the PI. Therefore, the authors came to the conclusion that the mean value of Ap is lower in babies that were operated afterwards. The difference in scores and the babies'' condition at birth indicates that the prenatal diagnosis of anomalies lead to the more cautious monitoring of these pregnancies and that the condition of babies at birth was better with the conservative approach in treatment, while the lower Ap score is present in babies that were afterwards treated operatively. The authors monitored the patients with pyeloureteral segment stenosis and hydronephrosis not only based on the fact if they had been operated on or not, but also on the operation type. They had two types of surgeries in these babies: pyeloplasty based on the Anderson-Hynes method [3-6] and ureterocutaneostomy. All the patients with bladder exstrophy were operated on.

Previously, it was generally accepted to operate on children born with pyeloureteral segment dilation in order to prevent renal tissue degradation. However, in a number of children with ureteropelvic junction, the hydronephrosis spontaneously recessed, with no signs of renal function loss or any anomalies in the kidney development. The adequate approach to the problem of children with anomalies enables giving correct advice to parents and realistic assessments

of the postnatal outcome, which can reduce their concern about hydronephrosis. Ap score is of high statistical significance in the babies with urinary tract anomalies [4], than in babies that were previously diagnosed during the pregnancy, and in ones that were postoperatively treated after birth. It is recommended that the patients, with diagnosed pyeloureteral segment stenosis be intensively monitored at the competent medical centers. The average Ap value in conservatively treated patients was 8.76 and in operated patients 8.22. Statistical data analysis showed the value of the test, namely t = 2.215 and $p = 0.032$. It is clear that there is a significantly high difference between these two values. During the phase of diagnosing the anomaly, the patients were divided into two groups: one group for patients up to the 30th week of gestation and the second group for patients after the 30th week of gestation. The statistical method showed that the timing of diagnosing the anomaly is in close relation to the further postoperative treatment. The values of the *t*- test = 1.986 and significance = 0.04 are statistically significant. Therefore, the authors came to the conclusion that active pregnancy monitoring and detecting anomalies before birth can greatly contribute to decreasing the number of newborns that have to be operated on, and enable conservative anomaly monitoring. Special attention has to be dedicated to the type of operation performed on newborns with hydronephrosis. According to the type of operation: pyeloplasty or ureterocutaneostomy, the results show that there was no significant statistical difference according to the type of the performed operation, with $hi^2 = 1.239$ and the level of probability $p = 0.266$. The diagnosis of ureteropelvic junction is based on the assumption that the presence of the obstruction can significantly affect kidney filtration and that the absence of the obstruction can enable kidney stability. It is also believed that the dilated pelvic system can hardly be the manifestation of individual self-limiting etiologies [5]. Relying on these possibilities is justifiable in an effort to continue with the treatment implementation, whether it be conservative or operative.

There is a long journey ahead when it comes to searching for comprehensive measures in preserving renal function in the obstruction of the ureteropelvic segment. In the meantime, it is necessary for research to be carried out with the objective in finding the most simple and the most efficient methods of diagnosing and treating the obstruction of the pyeloureteral segment.

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