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RESULTS OF THE TREATMENT OF CONGENITAL HYDRONEPHROSIS

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ABSTRACT — The paper evaluates the results of treatment in 92 children with congenital hydronephrosis of grades II and III. Plastic surgery of the adjuvant segment was performed in 67 patients using the Anderson-Hynes-Kucera pyeloplasty, while minimally invasive endoscopic treatment was performed in 25 patients. To diagnose nephrosclerosis in children with hydronephrosis and connective tissue dysplasia, urinary nephrosclerosis factor (TGF- β 1) and glycosaminoglycans were studied. Static nephroscintigraphy revealed changes in the contralateral organ with unilateral lesion.

KEYWORDS — congenital hydronephrosis, minimally invasive endoscopic treatment, nephrosclerosis, connective tissue dysplasia, children.

INTRODUCTION

The problem of treating children with prenatally established hydronephrosis is one of the leading ones in pediatric surgery and urology, due to the complications of its postnatal course. The urgency of the problem is determined not only by the prevalence of the disease (1:500–800 newborns), but also by the complexity of the treatment and diagnostic measures, especially in newborns and children of the younger age group. According to the literature, hydronephrosis tends both to spontaneous resolution with age (up to 1.5–3 years) and to progression with loss of kidney function, despite the elimination of urodynamic obstruction and stabilization of the inflammatory process [1, 2, 3]. In connection with the active development of antenatal diagnosis, treatment is carried out from the first months of the child's life. The priority is the restoration of urodynamics. Scientific information on the diversity of the pathogenesis of congenital hydronephrosis has changed the approaches to its treatment — from open surgical to minimally invasive endoscopic in the form of bougienage and stenting of the ureteral lining of the ureter with the simultaneous use of energy-producing ripening preparations [4]. The

recurrent course of an infection of the urinary system, the late start of treatment — all these are factors that adversely affect the result. Despite the elimination of obstruction, there are manifestations of nephrosclerosis in the renal parenchyma, which is formed in 30–60% of patients with impaired urodynamics. Timely diagnosis and treatment measures to stop the process of nephrosclerosis are important for the morphological and functional state of the kidney, which is especially important in a bilateral process [5, 6, 7]. The search for rational schemes for postnatal examination is an objective reality and it should be aimed at minimal invasiveness when performing both diagnostic and therapeutic procedures, taking into account the age of the main contingent of patients.

Purpose

analysis of hydronephrosis treatment methods and their results.

MATERIALS AND METHODS

The material of this work was the analysis of the results of examination, treatment and observation of 92 patients with grade 2 hydronephrosis (49%), grade 3 (51%) who were undergoing in-patient examination and surgical treatment from January 2016 to September 2018 at the Department of Urology of Children's Regional Clinical Hospital, Tver. The degree of hydronephrosis was established in accordance with the ultrasonic classification system for hydronephrosis developed by the Society of fetal urology (SFU) 1993. Patients were divided into two groups. The first — 67 patients aged from six months to 17 years, operated using the Anderson-Hynes-Kucera technique with the assessment of long-term treatment results from 1 year to 24 years. The second group consisted of 25 patients aged from three months to seven years with prolapse of the parietal segment managed by subsequent placement of a catheter-stent for a period of one to five months as an independent treatment method, which also evaluated the long-term results of treatment from six months to two years. By gender, boys made up 54%, girls — 46%. The average age of patients is 5.6 ± 1.8 years. Left-sided hydronephrosis was found in 62%, right-sided — 38%.

INSPECTION METHODS

The design of the examination of patients included a diagnostic complex that made it possible to verify

the diagnosis, assess the condition of the upper and lower urinary tract, the functional state of the kidneys in the preoperative and postoperative periods, and included: laboratory, ultrasound examination of the kidneys with dopplerography (ultrasound), intravenous urography or computed tomography with contrast amplification, diuretic ultrasonography, static nephroscintigraphy. To diagnose nephrosclerosis in children (37) with hydronephrosis and connective tissue dysplasia, the urinary nephrosclerosis factor (TGF- β 1) was studied. Urinary TGF β was determined by enzyme linked immuno-absorbent assay (ELISA) in children before and after surgery: after 1 year (18). In order to diagnose connective tissue dysplasia, a biochemical urine test was performed — glycosaminoglycans (GAG) — 37, which made it possible to determine the severity of dysplasia. When choosing treatment tactics, the degree of hydronephrosis, the state of the renal parenchyma, the age of the patient, and the degree of connective tissue dysplasia were taken into account. The method of choosing surgical treatment continues to be the Anderson-Hynes-Kucera operation, which was performed in 67 patients. Ureteral stent placement, as an independent method, was performed in 25 patients, of which 14 were young children. In 8 children, at first, the intravesical and parietal segments were bougiended with the ureteral catheter Ch — 3, 4, 5 with its subsequent replacement with the JJ stent Ch — 5 after 5–7 days. Stent patency was monitored using an ultrasound scan of the MVS for 1–3 days after the installation of a stent catheter, a month later, before and after its removal, with an assessment of the size of the CLS. All children were prescribed antibiotic therapy in the pre and postoperative periods to prevent exacerbation of secondary pyelonephritis, taking into account the sensitivity of microflora. The duration of standing of the catheter-stent in the urinary tract was 3 ± 2 months.

RESULTS

The results of treatment of patients with hydronephrosis were evaluated according to the following criteria: good, satisfactory and unsatisfactory. By good the preservation of the renal parenchyma and evacuation ability, remission of pyelonephritis was meant. Under satisfactory — moderate dilatation of the CLS with impaired evacuation function, latent pyelonephritis. Under unsatisfactory — the loss of the anatomical and functional state of the kidney. Good results after Anderson-Hynes-Kucera operation were achieved in 96%, in the 2nd group of patients in 68%. Examination after stenting for adequate assessment of its effectiveness was carried out in 1-3-6-9-12-18-24 months. Ultrasound showed an improvement

in blood flow and IR values ranged from 0.6 to 0.7. When analyzing GAG and urinary TGF β data, all children showed an increase in their level. The indicator of the biochemical marker of mesenchymal dysplasia (GAG) was within the normal range in only 5 (18%) cases, while no relationship was found between its level and age ($p = 0.348$) and the degree of hydronephrosis ($p = 0.857$). This indicator is not a reliable sign of the presence of DST in children with hydronephrosis, but an increase in its level indicates the immaturity of the child. The dependence of the indicator of urinary nephrosclerosis factor (TGF) and the degree of hydronephrosis before surgical treatment was determined: with an increase in the degree of hydronephrosis, the TGF indicator changes: Grade 2 — 10.73 ± 0.83 ; Grade 3 — 11.25 ± 0.64 . (norm 2.6 ± 0.9 pg/ml), in the comparison group 2.24 ± 0.2 , which is the norm of this indicator. An increase in hydrostatic pressure with an increase in the volume of the pelvis triggers the mechanism of pyelovenous, pyelotubular refluxes, contributing to the progression of damage to the parenchyma. A relationship has been established between the degree of hydronephrosis and the level of urinary factor hydronephrosis. This bond is of medium strength ($r = 0.571$; $p < 0.001$). Pearson's linear correlation between the degree of hydronephrosis and the level of urinary factor hydronephrosis was determined by the linear regression formula — level of urinary factor = $4.197 + 3.513 \times$ degree of hydronephrosis. The study of the indicator in the comparison group showed that in patients with hydronephrosis, urinary nephrosclerosis factor remains high compared with children without hydronephrosis 11.07 ± 0.50 and 2.24 ± 0.28 . The differences are statistically significant (Student's test for independent variables ($p < 0.001$)). The urinary TGF 1 year after surgery was reduced from 13.36 ± 0.70 to 11.07 ± 0.50 . Changes are statistically significant (Student's test for paired measurements, $p = 0.006$). For a qualitative assessment of static nephroscintigrams, a classification was used that took into account 3 types of parenchyma lesions [8]. Patients before ureteropyeloplasty (12) with hydronephrosis of 2 and 3 grades in the parenchyma of the hydronephrotic kidney had 2 types of lesions (85.71%) Changes also affected the contralateral kidney, 42.71%. After surgical restoration of the passage of urine, there was an improvement in the functional state of the parenchyma, both operated (type 2 — 55.56%) and the contralateral kidney, 22.22%. In all children, prior to the prolapse of the extracranial segment (25) with hydronephrosis of 2 and 3 grades there were signs of parenchyma lesion, type 2 was 92%, Type 1 — 8%, lesions of the parenchyma of the contralateral kidney were noted in about 36.4% patients. After stenting, the

parameters of static nephrosintigraphy improved in the operated kidney, type 2, 62.5%, type 1, 37.5%; in the parenchyma of the contralateral kidney, there was no positive dynamics, type 36.5%. Positive dynamics of the state of the parenchyma in both kidneys was noted after stenting, which can be explained by a large supply of *sleeping* nephrons due to the younger age.

CONCLUSION

The choice of treatment for hydronephrosis is objectified by the morphological and functional state of the renal parenchyma, the age of the child, and the presence of comorbid conditions. The use of endoscopic minimally invasive techniques is justified for hydronephrosis of 2–3 Grade in children of a younger age group. Anderson-Hynes-Kucera ureteropyeloplasty is the method of choice for grade 3 hydronephrosis in children older than 3 years. A marker for the development of nephrosclerosis in the renal parenchyma is an increase in TGF β , which correlates with the degree of hydronephrosis. Therefore, the study of this indicator should be included in the program of rehabilitation of children with hydronephrosis. An increase in glycosaminoglycans is a marker of the child's immaturity and should be taken into account when choosing a method of treatment and prescribing therapy for ripening, as these children are children of the *late start*.

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