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Assessing the Effectiveness of Treatment for Congenital Hydronephrosis in Children

O. K. Sapayev
Urgench State Medical Institute
Urgench, Uzbekistan

I. B. Ruzmatov
Urgench State Medical Institute
Urgench, Uzbekistan

Q. O. Sapayev
Urgench State Medical Institute
Urgench, Uzbekistan

Abstract. Congenital hydronephrosis is one of the most frequently detected urinary tract abnormalities during the antenatal period. Its clinical significance ranges from mild, transient pyelectasis to obstructive uropathies that may lead to progressive deterioration of renal function. The widespread implementation of antenatal ultrasonography has substantially increased the detection of fetal urinary tract dilatation. Studies conducted in European countries have reported a prevalence of congenital hydronephrosis of 11.5 cases per 10,000 births; in 86% of affected children, the renal anomaly was isolated. Not all cases of antenatally detected hydronephrosis are associated with pathological obstruction. The literature indicates that approximately one-third of antenatal urinary tract dilatations may regress before birth, while another proportion may resolve spontaneously during the first years of life. However, persistent or high-grade dilatation may be associated with ureteropelvic junction obstruction, vesicoureteral reflux, and other congenital anomalies of the kidneys and urinary tract. Therefore, the key clinical issue is not merely early detection of hydronephrosis, but also accurate assessment of its clinical significance and timely identification of children at risk of renal functional impairment.

Keywords: High-grade dilatation, hydronephrosis, progressive dilatation.

1. Introduction

Primary Ureteropelvic junction obstruction is one of the principal causes of clinically significant hydronephrosis in children. Persistent obstruction may increase pressure within the renal pelvis, cause thinning of the renal parenchyma, and reduce the mass of functioning nephrons. Accordingly, the primary objective of modern treatment is not simply to eliminate hydronephrosis, but to preserve renal parenchyma and functional capacity to the greatest extent possible [1], [2], [3].

An important challenge is to distinguish patients who require surgical intervention from those who can be managed through conservative observation. In mild forms of antenatal hydronephrosis, dynamic follow-up is often sufficient because spontaneous reduction or stabilization may occur [4], [5]. In contrast, delayed surgery in children with severe hydronephrosis, progressive dilatation, thinning of the renal parenchyma, or functional findings consistent with obstruction may adversely affect renal function [6], [7].

Ultrasonography is currently the principal diagnostic method for assessing the severity of hydronephrosis. The assessment includes the anteroposterior diameter of the renal pelvis, the appearance of the calyces, parenchymal thickness, ureteral dilatation, and the condition of the urinary bladder. The Urinary Tract Dilation (UTD) classification was developed to standardize the assessment of antenatal

and postnatal urinary tract dilatation and to support clinical follow-up and risk stratification [8]. Nevertheless, ultrasonography cannot always establish the presence of obstruction or fully determine its effect on renal function. When clinically indicated, diuretic renography is therefore important for evaluating urinary drainage dynamics and differential renal function [9], [10]. Earlier recommendations identified an obstructive renogram and differential renal function below 35–40%, or a decline in function during follow-up, as important criteria for considering surgery [11]. Current approaches, however, recommend basing decisions on a combination of factors, including the child's age, symptoms, severity and progression of hydronephrosis, parenchymal appearance, and functional investigation results, rather than on a single functional measurement.

Anderson–Hynes dismembered pyeloplasty is the principal surgical procedure for ureteropelvic junction obstruction. The 2026 European Association of Urology (EAU) Guidelines on Paediatric Urology identify this procedure as the standard surgical method for correcting ureteropelvic junction obstruction, with a reported success rate of approximately 95%. Minimally invasive approaches, including laparoscopic and robot-assisted pyeloplasty, are also developing. Available evidence suggests that their effectiveness is comparable to that of open pyeloplasty, while they may offer advantages in length of hospital stay and postoperative recovery.

At the same time, the relationship between anatomical changes in hydronephrosis and recovery of renal function after pyeloplasty has not been fully established. In some patients, pelviectasis may persist on postoperative ultrasound even though urinary drainage has improved and renal function remains stable. Therefore, treatment effectiveness should be assessed not only by a reduction in the diameter of the renal pelvis, but also through changes in clinical, anatomical, and functional parameters [12]. Recent reviews have likewise emphasized the importance of accurate risk stratification in the management of antenatal hydronephrosis, avoiding unnecessary invasive investigations and operations, and identifying cases that threaten renal function in a timely manner.

Thus, optimization of treatment strategies for congenital hydronephrosis in children, clarification of indications for conservative follow-up and surgery, and objective assessment of treatment outcomes remain important issues in paediatric urology. In this context, early diagnosis, comprehensive evaluation of renal function, individualization of surgical indications, and long-term assessment of different treatment approaches are of substantial scientific and practical importance.

To analyse contemporary methods of treating congenital hydronephrosis in children, evaluate the effectiveness of conservative follow-up and surgical treatment, and outline the principal criteria for selecting an appropriate treatment strategy [13].

2. Materials and Methods

A total of 186 children diagnosed with congenital hydronephrosis were observed in the Department of Paediatric Surgery of Urgench State Medical Institute during 2020–2025. Of these patients, 112 (60.2%) were boys and 74 (39.8%) were girls. Antenatal screening centres identified the condition in 147 children (79%) at different stages of pregnancy, whereas in 39 children (21%) the diagnosis was established postnatally during medical examination using ultrasonography, after which they were referred to our institution.

In addition to general clinical examinations, the patients underwent ultrasonography, contrast-enhanced multislice computed tomography (MSCT), excretory urography, cystography, and nephroscintigraphy. The principal surgical method used was pyeloplasty. Treatment outcomes were assessed according to changes in clinical symptoms, ultrasonographic parameters, and renal function. Postoperative complications were classified using the Clavien–Dindo system.

3. Results and Analysis

Analysis of the patients confirmed unilateral congenital hydronephrosis in 148 children (79.6%) and bilateral congenital hydronephrosis in 38 children (20.4%). The clinical course of congenital hydronephrosis in children depends on the severity of the disease, the type of obstruction, and renal functional status. Early diagnosis and dynamic follow-up are crucial for preventing complications. Clinical manifestations vary according to the degree of hydronephrosis, whether the process is unilateral or bilateral, and the extent to which the renal parenchyma is preserved. In mild cases, the disease is often asymptomatic and is detected during antenatal or routine preventive ultrasonography. [14].

In moderate and severe cases, the following clinical manifestations may be observed: pain in the lumbar or abdominal region; recurrent urinary tract infections; dysuric disorders; episodes of haematuria; and signs of general intoxication in complicated cases.

In bilateral hydronephrosis, the risk of early impairment of renal function and development of chronic kidney disease is higher. Prolonged obstruction may lead to renal parenchymal atrophy and nephrosclerosis. Ultrasonography, excretory urography, voiding cystourethrography, and radionuclide nephroscintigraphy are important diagnostic methods because they make it possible to assess the severity of the clinical course and functional changes.

Pyeloplasty was used as the principal surgical method. Outcomes were evaluated according to the reduction of clinical symptoms, improvement in ultrasonographic findings, and recovery of renal function. During the early postoperative period, pain and urinary disturbances resolved in the majority of patients. Ultrasonographic findings demonstrated a substantial reduction in renal pelvic dilatation. Radioisotope investigations indicated improvement in the functional activity of the kidneys. Major complications were infrequent and were managed conservatively.

Assessment of early postoperative outcomes using the Clavien–Dindo classification showed grade I complications in 14 children (7.5%), grade II complications in 8 (4.4%), grade IIIa complications in 2 (1.0%), and grade IIIb complications in 1 child (0.5%). No complications were observed in the remaining 161 patients (86.6%). These complications were observed during exacerbations of chronic pyelonephritis, in children of younger age, and in severe forms of hydronephrosis, mainly on postoperative days 1–3. Therefore, timely surgical treatment of congenital hydronephrosis may help preserve renal function and improve quality of life in children. Positive early postoperative dynamics indicate treatment effectiveness. Regular instrumental assessment and dispensary follow-up remain essential [15].

4. Conclusions

The Clavien–Dindo classification is a useful tool for the early assessment of postoperative outcomes and for evaluating the effectiveness of surgical interventions. It supports systematic assessment of patients' condition and helps guide the selection of appropriate management strategies.

An individualized approach is a fundamental principle in the treatment of congenital hydronephrosis in children. In mild cases without evidence of obstruction, dynamic ultrasonographic follow-up is an effective and safe strategy. When ureteropelvic junction obstruction is clinically confirmed, hydronephrosis progressively worsens, or renal function declines, pyeloplasty is one of the principal treatment options. Current evidence indicates that after pyeloplasty, not only may urinary drainage improve, but renal functional parameters may also recover in some patients.

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