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Vesicoureteral Reflux in Children: Modern Diagnosis and Treatment

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Abstract Vesicoureteral reflux (in UR) occurs in about 1% of children and is associated with an increased risk of pyelonephritis and kidney scarring. Despite its prevalence and incidence, many aspects of the diagnosis and treatment of VUR are controversial. We objectively assessed the published data; the database for many of the current diagnoses and treatment regimens for VUR is limited. Recent research has focused on developing methods for identifying VUR-associated kidney disease, improved stratification tools to determine which treatment option for VUR will benefit children most, and improving reporting of long-term outcomes of VUR treatment in children at risk of VUR. In this review, advances in the diagnosis and treatment of VUR will be accompanied by current recommendations.

Keywords Ureter, Pelvis, Calyx, Vesicoureteral reflux, Ureterovesical

Vesicoureteral reflux (VUR) is a pathological process of retrograde (reverse) throwing of urine from the bladder into the upper urinary tract (ureter, pelvis, calyx). This is due to the failure of the valve mechanism of the ureterovesical junction (UVS) [7].

The reverse flow of urine subsequently leads to reflux nephropathy (nephrosclerosis, fibrosis). The essence of the pathology is that the structural and functional units of the kidney (nephrons) die and are replaced by connective tissue. As a result, the kidneys thicken, shrink, shrink in size and cease to perform their functions, up to the development of terminal renal failure.

Vesicoureteral reflux is a pathology characterized by a reverse flow of urine from the bladder to the ureter. It occurs with abnormalities of the excretory system, high pressure inside the bladder or against the background of inflammatory processes. Reflux can cause pyelonephritis, hydronephrosis, kidney failure. The main symptoms are pain in the lumbar region after urination, turbidity of urine, swelling, fever. Diagnostic methods: general urine, blood tests, kidney ultrasound, excretory urography, miction cystography. Treatment is reduced to the treatment of an inflammatory disease or surgical elimination of abnormalities of the urinary system.

Vesicoureteral, or vesicoureteral, reflux is one of the most common urological diseases, especially among children. It is found in 1% of urological patients, the proportion of the bilateral process is 50.9%. Urine regurgitation is detected in 40% of patients with infectious diseases of the urinary tract.

The prevalence of pathology, high risk of complications (renal insufficiency, secondary arterial hypertension, purulent kidney diseases) cause a large percentage of disability of patients. Congenital reflux is observed in 1 child out of 100, while the ratio of female and male children in the first year of life is 5:1. As they grow older, the incidence of pathology in boys increases with a change in the situation to the opposite.

The choice of therapeutic tactics depends on a number of factors: the cause of the disease, gender, age, severity, duration of conservative therapy. If inflammatory processes of the lower urinary system cause reflux, then most often the changes correspond to the I-II degree, do not affect the kidneys and make it possible to limit conservative therapy. With timely treatment for help and the absence of organic causes, this type of treatment can eliminate PMR in 60-70% of cases. Conservative reflux therapy includes the following components:

Diet. Special nutrition increases the excretion of metabolic products and has an anti-inflammatory effect. The patient is recommended to limit the intake of salt to 3 grams per day, significantly or completely exclude fatty dishes, but increase the amount of vegetables, fruits, grains. It is forbidden to drink alcohol, carbonated drinks, strong coffee.

Medications. In the presence of inflammatory or infectious foci, appropriate medications are indicated — antibiotics, anti-inflammatory, antispasmodic agents. High blood pressure figures require the use of antihypertensive drugs. In order to prevent stagnation in the organs of the

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excretory system, the patient is recommended to empty the bladder every 2 hours, for which it is possible to use medium-strength diuretics.

Physical therapy. Additionally, it is possible to use physiotherapy procedures: electrophoresis, magnetic therapy, and therapeutic baths. The effect of physical factors helps to eliminate the inflammatory process, spasm of the smooth muscles of the urinary tract, restores the physiological flow of urine. Persons with chronic renal insufficiency developed because of pyelonephritis are shown sanatorium treatment.

The absence of significant changes in the condition within six months or its possible deterioration (recurrent pyelonephritis, a decrease in kidney function by 30% or more, a high degree of pathology severity), requires planned surgical intervention in a urological hospital. The basic options for surgical treatment of reflux include:

Endoscopic correction. At the initial (I-II) stages of the process, endoscopic injection of volume-forming implants strengthening these structures into the ureteral mouth area is possible. The basis can be collagen, silicone, Teflon, which have a low risk of allergic reactions, strength, and biocompatibility.

Laparoscopic uretero cystone ostomy. It is carried out at the III-V degree of PMR. Severe changes in the ureter wall, organic pathology of the sphincter require the creation of a new artificial connection of the ureter with the bladder (ureterocystoanastomosis) and the removal of pathologically altered tissues. It is possible to combine surgery with resection of the distal part of the ureter or kidney transplantation.

Elimination of reflux and its consequences begins with a full-fledged diagnosis, establishment of the cause and degree of pathology. The first and second degrees of regurgitation are detected by urologists accidentally during a preventive examination or during an examination for another disease of the urinary system with similar symptoms. Diagnostics includes:

Objective examination of the patient. The anamnesis of the patient's life and illness is collected, the transferred pathologies of the excretory system are clarified to identify the probable etiology of reflux. An examination, palpation of the suprapubic region and the lower back is also performed. It is mandatory for any renal pathology to measure blood pressure to confirm or exclude renal hypertension.

Laboratory methods. A general urinalysis allows you to detect the presence of erythrocytes, leukocytes, bacteria in the urine, determine the amount of protein, glucose. An increase in the values of ESR, the number of leukocytes when interpreting the data of the general blood test indicates the presence of an inflammatory process in the body. Blood biochemistry allows to identify a low concentration of plasma proteins as a possible cause of edema, as well as to assess kidney function by the level of nitrogenous compounds, creatinine.

Contrast urography. The pattern of the X-ray contrast substance reveals indirect signs of reflux, the one- or two-sided nature of the process. Radiological markers of PMR are dilated distal sections and knee-shaped bends of the ureters, signs of pyelonephritis or hydronephrosis in combination with narrowing of the ureteral anastomosis. Excretory urography also helps in detecting developmental abnormalities — doubling of the ureter or kidneys.

Echography of the excretory system. Ultrasound of the kidneys and bladder before and after emptying the bladder helps to assess the size of organs, to identify the irregularity of their contours, the presence of sclerosis, neoplasms, omission, deformation of cavities, increased echogenicity of renal tissue, developmental abnormalities. After urination, the amount of residual urine is assessed to detect urethral stenosis.

Miction cystography. The technique is the "gold standard" for diagnosing the presence of reverse urine current and determining its degree. The obtained images assess the contour of the bladder, the uniformity of its wall, the vesicoureteral segment is visualized, the presence and level of urine injection with a contrast agent is diagnosed. Also, cystography allows you to identify urethral stenosis as a probable cause of high pressure in the bladder cavity.

Differential diagnosis of reflux is performed with ureteral stenosis, which gives a similar clinical picture. Urolithiasis, cancer of the uterus and prostate, tuberculosis of the excretory system are also excluded.

Endoscopic surgery is performed in order to strengthen the valve mechanism. To do this, a substance ("Urodex", collagen or "Vantris") is implanted into the submucosal part of the ureter's mouth. This technique is minimally invasive, children recover quickly, it is possible to carry out interventions repeatedly. The disadvantage is the gradual resorption or migration of the injected substance, which leads to the need to operate again.

The classical surgical operation can be, depending on the access, intravesical, extravesicular or combined. The general principle of all interventions is the creation of a valve mechanism by forming a submucosal tunnel. The ratio of the diameter of the ureter to the length of the tunnel is 1:5. The most common operations are Cohen, Politano-Leadbetter, Gilles-Vernet, Glenn-Anderson, Leach-Gregoire.

If reflux occurs a second time, then treatment is focused on eliminating the factors that cause it.

If a child has such a congenital pathology as the valve of the posterior urethra, then the valves of this valve are resected endoscopically. After that, a urethral catheter is installed and the bladder is drained. After 10 days, a control urethroscopy is performed to resolve the issue of further drainage.

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