

# Improvement in radiodiagnosis of vesicoureteral reflux in children

**Sharofiddinov Alisher, Islamov Rasuljon, Zulunov Azizbek**  
Andijan State Medical Institute Department of Medical Radiology

**Abstract:** This study aimed to identify the differences between primary and secondary vesicoureteral reflux (VUR) and the effect of associated bladder abnormalities on kidney function. We retrospectively reviewed the medical records of children with VUR who were followed up at Andijan state medical Institute Hospital. The review included results of radiological investigations and kidney function tests.

**Keywords:** Neurogenic bladder, primary reflux, vesicoureteral reflux

## Introduction

To date, it is generally accepted that vesicoureteral reflux is a violation of urodynamics in the vesicoureteral segment, which is caused by a variety of congenital and acquired causes. Studies of vesicoureteral reflux revealed the presence of significant abnormalities in the urodynamics of the lower urinary tract, which are associated with neurogenic dysfunction of the bladder, detrusor-sphincter dyssynergy of a congenital and acquired nature. The presented qualitative hydraulic model of the function of the vesicoureteral segment makes it possible to explain the pathofunctional essence of the clinical and radiological manifestations of reflux, to determine the differential diagnostic criteria for various types of disorders and to outline ways for their correction. X-ray examination for vesicoureteral reflux is one of the most important diagnostic methods. Its paramount importance lies in the unequivocal proof of the presence of reflux. In the complex of diagnostic methods for the detection of vesicoureteral reflux, the leading place belongs to excretory urography and voiding cystourethrography. Also, other methods of medical imaging are used: radionuclide studies, ultrasound diagnostics, endoscopy. Despite the large number of research methods, there are currently no complete methods for the early detection of vesicoureteral reflux. Existing methods of cystography: descending; voiding; delayed (slow) or cystography with fractional filling of the bladder have a number of serious disadvantages: relatively low image contrast of the lower urinary tract, due to the ongoing process of excretion of the contrast agent by the kidneys; long study time; the need to perform a large number of x-rays, which exposes the patient to additional radiation. In addition, these methods of cystography do not detect intermittent forms of VUR and do not always state low degrees of reflux. Thus, a fairly high frequency and a high percentage of cases of late diagnosis of vesicoureteral reflux, not always satisfactory results of standard X-ray examination in detecting low-grade reflux, the possibility of improving the efficiency of diagnosis of vesicoureteral reflux due to modified cystography, the development of a rational set of diagnostic measures to detect vesicoureteral -ureteral reflux determine the relevance of the planned study.

## Epidemiology

Vesicoureteral reflux occurs in 1% of the entire pediatric population and 30-50% of children with urinary tract infections (UTIs). The frequency of detection of bilateral and unilateral reflux is approximately the same - 51% and 49%, respectively. The vast majority of patients are girls, the ratio of girls and boys among patients with bilateral reflux is 6.9:1, with unilateral - 6:1. Currently, the leading role in the occurrence of VUR is established by urinary tract infections, which are among the most common diseases, both in outpatient and in nosocomial practice. According to various authors, the frequency of detection of vesicoureteral reflux in girls with a verified urinary tract infection is 3-4 times higher than in boys. The authors attribute this to the anatomical and physiological features of the structure of the urinary system in females (shorter and wider urethra, closer to the anus), which contributes to easier and more frequent infection of their urinary tract. The diagnosis of UTI is based on the analysis of urine with its bacteriological examination, which is the most informative. An error in the diagnosis is undesirable, since with overdiagnosis, the child is in vain subjected to examination, including invasive, as well as treatment, including antibiotics. If symptoms are

underestimated, the risk of disease progression increases. The mechanisms that contribute to the occurrence of reflux in this pathology are not fully understood. The violations of the urodynamics of the upper urinary tract observed in this pathological condition are closely related to the processes of formation and development of the act of urination. For the most part, the latter is functionally obstructive in nature and in the accumulation phase is due to detrusor-sphincter dyssynergy. These forms are characterized by disorders of the act of urination in the form of pollakiuria, imperative urges, imperative urinary incontinence, enuresis, etc. Registered dysfunction is the basis for the occurrence of severe disorders of urodynamics, the formation of cystitis, vesicoureteral reflux and other complications. The pathogenesis of these disorders is extremely complex and, despite the large number of experimental works, many issues remain debatable and still unresolved.

## Material & methods

In the complex of diagnostic methods for the detection of vesicoureteral reflux, the leading place belongs to excretory urography and voiding cystourethrography. Their rational use allows to identify and study in detail the anatomical and functional changes in the bladder and ureters. The possibilities of traditional X-ray examination in the diagnosis of vesicoureteral reflux are widely covered in the medical literature. Along with the above methods, radionuclide studies, ultrasound diagnostics, and endoscopy remain quite important. Excretory urography - in the complex of diagnostic methods for diseases of the urinary system, an important role belongs to excretory urography (EU) and its modifications. ES makes it possible to assess the anatomical state and functional abilities of the urinary tract, to identify signs of damage to the kidneys, pyelocaliceal system and ureters, and with long-term observation of the patient - to control the dynamics of the pathological process. Along with this, ES makes it possible to obtain a number of very important quantitative indicators of the functional ability of the nephron under load, which is the excretion of a radiopaque agent. In a pediatric clinic, urographic examination is carried out in the form of two main modifications - one-stage and infusion. Indications for performing simultaneous urography in childhood are: 1. persistent changes in urine sediment in the form of leukocyturia, proteinuria or erythrocyturia; 2. recurrent abdominal pain syndrome of unclear etiology; 3. incontinence or incontinence of urine, as well as prolonged changes in the rhythm of urination; 4. hypertension of unknown etiology. The main requirement for urography is to obtain an informative x-ray picture of the kidneys and upper urinary tract with the registration of individual phases of the evacuation process. The most valuable are the images exposed in the so-called phase of tight execution of the pelvicalyceal system during the period of excretion of the most concentrated contrast agent by the kidneys. It is at this time interval that all the details of the structure of the organs of the urinary system are available for visualization. In cases where the patient has a significantly reduced glomerular filtration rate, impaired concentration ability of the kidneys, or an obstructive process with symptoms of hydronephrosis, infusion urography is indicated - drip or jet variant. The good tolerance of modern contrast agents by patients makes it possible to use extremely high doses of them (up to 10 ml per 1 kg of body weight) for infusion urography. The drip method of administering a contrast agent has proven itself well when examining children in the first year of life. Among other modifications, the technique of bolus urographic examination deserves some attention. Bolus urography is indicated for suspected kidney tumor, cystic dysplasia, and arterial hypertension of unknown etiology. Difficulties arising in the interpretation of excretory urograms, the desire to clearly distinguish between anatomical and functional changes, as well as the desire to turn urography into a prognostic test, led to the development of a pharmacourography technique. It is based on the use of certain pharmacological agents at certain points in the urographic study. The most commonly used are diuretics (furosemide, mannitol) and drugs that stimulate the production of the pituitary antidiuretic hormone (adiurecrine). It should be emphasized that along with a positive assessment of the use of urography in the clinic, there are more and more reports of the dangers arising from these studies.

## Results

The results of studies that included more than 2.1 million patients indicate the occurrence of adverse reactions to the introduction of radiopaque agents in approximately 6% of individuals, the development of serious side effects in 1 in 1000-2000 and the risk of death due to an allergic reaction in 1 case in 100000-200000. The diagnostic efficiency of any RCS is determined by the number of iodine atoms in the substance

molecule. The toxicity of iodinated contrast media is determined by the ion balance, chemotoxicity, and osmotoxicity of the compound. Chemotoxicity is related to the ability of a substance to bind proteins and increases as the hydrophobicity of a substance increases. Ion toxicity results from the direct effects of the anionic contrast agent or its conjugated cation on cell walls or cellular function. Osmotoxicity can lead to pain upon injection, disruption of the blood-brain barrier, stimulation of the vagal and vomiting centers, decreased myocardial fibrillation threshold, renal artery vasoconstriction, elevated pulmonary artery pressure, and decreased vascular resistance and peripheral vasodilation. Injection of contrast agents can lead to patient discomfort during the examination. Most often it is pain and an unpleasant sensation of heat. This can cause involuntary movements of the subject, which in turn can lead to a decrease in image quality and the appearance of artifacts. Despite improved chemical structure, radiopaque injections are still the third leading cause of hospital-acquired acute kidney injury. Radiocontrast-induced nephropathy is commonly defined as impaired renal function and is characterized by an increase in serum creatinine concentration within three days after contrast medium administration. ARF is usually temporary and does not lead to oliguria. The use of low-osmolar agents increases the safety of studies by 6 times compared to high-osmolar ones. In addition, the use of low osmolar agents in patients with renal insufficiency reduces the likelihood of developing nephrotoxicity. A report from 24 urology centers in the UK showed that 21 used intravenous urography. This practice is also typical for the USA. The most general argument in favor of the routine use of ES is "not to miss anything". In general, according to the data of 74.3% of excretory urography, no pathological changes were detected. It should be added that the works of recent years have convincingly proved the possibility of refusing excretory urography due to renoscintigraphy. An isotope study allows not only to assess the violation of the evacuation function of the kidney, but also to quantify the cumulative function of the affected kidney, which is of great importance in severe degrees of kidney anomalies. It is at severe degrees of hydronephrotic changes that EI may not provide an objective assessment of the state of the kidney, a significant dilatation of the PCS leads to a strong dilution of the excreted contrast agent, and the renal cavitory system may not be contrasted on an x-ray. From a clinical point of view, excretory urography is useless and should be abandoned in the following cases: - in the first week of a child's life (with a few exceptions); - in children with urinary incontinence, suffering from frequent urination or other urinary disorders; - with anomalies associated with congenital malformations (ultrasound should be preferred). Thus, excretory urography is the most common X-ray method for examining the urinary tract, but in which too many pictures are taken and with ureterohydronephrotic changes, megaureter and VUR, it does not provide additional information and has practically no advantages over other methods, and is inferior to them in many characteristics.

## Conclusion

Children with primary VUR and normal bladder had a good prognosis with a normal kidney function, while children with secondary VUR associated with abnormal bladder caused by NNB, spina bifida or PUV had abnormal kidney functions. DMSA scans were useful in predicting higher grades of VUR

## Acknowledgements

The study was supported generously by the Department of Urology in Hospital of Andijan State Medical Institute and Department of Pediatrics.

## References

1. Murawski IJ, Gupta IR. Vesicoureteric reflux and renal malformations: A
2. Murawski IJ, Gupta IR. Vesicoureteric reflux and renal malformations: A developmental problem. *Clin Genet* 2006;69:105-17.
3. Mattoo TK. Vesicoureteral reflux and reflux nephropathy. *Adv Chronic Kidney Dis* 2011;18:348-54.
4. Ansari MS, Gulia A, Srivastava A, Kapoor R. Risk factors for progression to end-stage renal disease in children with posterior urethral valves. *J Pediatr Urol* 2010;6:261-4.
5. Kari JA, Safdar O, Jamjoom R, Anshasi W. Renal involvement in children with spina bifida. *Saudi J Kidney Dis Transpl* 2009;20:102-5.
6. Rubben I, Goepel M, van Gool JD. Non-neurogenic bladder dysfunction and vesicoureteral reflux in children. *Urologe A* 2011;50:551-6.

- 
7. Hansson S, Dhamey M, Sigstrom O, Sixt R, Stokland E, Wennerstrom M, et al. Dimercapto-succinic acid scintigraphy instead of voiding cystourethrography for infants with urinary tract infection