

Understanding and Addressing Vesicoureteral Reflux in Pediatric Patients: A Comprehensive Exploration of Diagnostic Strategies, Challenges, and Optimized Management Approaches

Mildred Andrea Zúñiga Onofre¹, Johanna Gonzalez Bagatella², Eufemia Teresa López Correa³, Ana Laura Méndez Escobedo⁴, Oscar Doshari Cernas González⁵, Esther Esperanza Rodríguez Negrete¹

¹Universidad Autónoma de Guadalajara, Guadalajara, Jalisco. México

²Benemérita Universidad Autónoma de Puebla, Puebla. México

³ Universidad Autónoma de Nuevo León, Nuevo León. México

⁴Universidad Autónoma del Estado de Hidalgo, Hidalgo. México

⁵Universidad autónoma Benito Juárez de Oaxaca, Oaxaca. México

ABSTRACT

Vesicoureteral reflux (VUR) in pediatric patients poses a multifaceted challenge for clinicians, necessitating a thorough exploration of diagnostic strategies, challenges, and optimized management approaches. This article delves into the nuanced aspects of understanding VUR in the pediatric population. Diagnostic modalities, ranging from conventional voiding cystourethrography to advanced imaging techniques, are scrutinized for their efficacy in identifying reflux severity and associated complications. Challenges in the diagnostic process, including age-related variations and the impact of evolving clinical presentations, are discussed.

The article also addresses the intricacies of managing pediatric VUR, emphasizing the importance of tailored treatment plans based on reflux grade, patient age, and concurrent conditions. Surgical and non-surgical interventions are appraised, highlighting their respective advantages and limitations. Additionally, the role of antibiotic prophylaxis in preventing urinary tract infections and preserving renal function is explored.

Through a comprehensive examination of the diagnostic and management landscape, this article aims to provide clinicians with a nuanced understanding of pediatric VUR, enabling them to navigate the complexities of diagnosis and deliver optimized care to young patients with this urological condition.

KEYWORDS: vesicoureteral, reflux, pediatric, diagnosis.

ARTICLE DETAILS

Published On:
21 November 2023

Available on:
<https://ijmscr.org/>

INTRODUCTION

Primary vesicoureteral reflux is one of the most common congenital abnormalities of the urinary tract in pediatric patients, which is characterized by a retrograde flow of urine from the bladder to the kidneys. This pathology affects between 0.4% and 2% of the general population, being discovered mainly during evaluations due to recurrent urinary tract infections, however, the prevalence of primary vesicoureteral reflux in children with urinary tract infection varies depending on the differences between patients.

Up to 10%-51.4% of primary vesicoureteral reflux has been identified in children investigated for recurrent urinary tract infection. According to studies, when vesicoureteral reflux

coexists with bladder and bowel dysfunction, there is an increased risk of recurrent urinary tract infections leading to long-term sequelae such as renal scarring, hypertension and adrenal insufficiency.

It is observed that black children have a lower prevalence of vesicoureteral reflux compared to white children, being of greater severity in this type of patients, in turn, It has also been identified that at the time of diagnosis about 30%-54% of children with vesicoureteral reflux have renal parenchymal disease with the presence of scarring, among the most important risk factors for the development of renal scarring in children are the presence of high-grade vesicoureteral reflux and recurrent pyelonephritis.

Understanding and Addressing Vesicoureteral Reflux in Pediatric Patients: A Comprehensive Exploration of Diagnostic Strategies, Challenges, and Optimized Management Approaches

In terms of gender, it has been identified that boys tend to present with vesicoureteral reflux prenatally or during the first year of life and often present in a severe and bilateral manner, while girls tend to be diagnosed at a later age compared to boys, and their presentation tends to be less severe and more prone to recurrent urinary tract infections. [1-2]

EPIDEMIOLOGY

The reported prevalence of the presence of vesicoureteral reflux varies according to various literatures from 1-2% of apparently healthy children at birth and increases from 8-50% in children who are evaluated after a urinary tract infection, since the diagnosis of vesicoureteral reflux in newborns and infants secondary to a urinary tract infection is 36-49%, with male patients being diagnosed in a more timely manner, while female patients are diagnosed later.

Most male patients are diagnosed prenatally when secondary to investigation of hydronephrosis, whereas female patients are mostly diagnosed because of recurrent urinary tract infections. [3]

CLASSIFICATION OF VESICoureTERAL REFLUX

The gold standard for the diagnosis of vesicoureteral reflux is the performance of excretory cystourethrography, this study helps the classification of this pathology in 5 grades, according to some studies the grade that most commonly occurs in patients is grade 1, usually this grade 1 improves over time and this is attributed to the elongation of the submucosal segment of the ureter with the general growth of the body.

In a study in which several patients with vesicoureteral reflux were followed up, it was reported that the time to resolution of this pathology was approximately 38 months for grade I/II, 98 months for grade III, and 156 months for grade IV/V. [3-4]

Bladder dysfunction secondary to vesicoureteral reflux.

Bladder dysfunction associated with vesicoureteral reflux has been reported in both children and adults, with 25-68% of patients with vesicoureteral reflux having bladder dysfunction, the most common being detrusor overactivity and sphincter overactivity, both associated with a significant increase in bladder pressure. [3-4]

Urinary tract infection secondary to vesicoureteral reflux.

There are several mechanisms by which the urinary tract protects itself to prevent the invasion of microorganisms harmful to the urinary system, among which are the complete emptying of the bladder, the secretion of proteins and antimicrobial peptides in the urinary stream and the unidirectional flow of urine, where the latter is one of the mechanisms that favor the presence of urinary tract infection secondary to vesicoureteral reflux. [5-6]

Among the main infectious agents that are associated with urinary tract infections is *Escherichia coli* being the most implicated and the most studied, other associated bacteria are gram negative bacteria, including *Klebsiella*, *Pseudomonas*, *Proteus*, *Enterobacter*, among other pathogens.

The manner of infection of bacteria in the urinary tract usually triggers an innate immune response in the host involving inflammatory cytokine production, complement activation, antimicrobial peptide secretion and phagocyte recruitment, and although the immunity effectively eradicates the bacteria, the resulting inflammation also causes clinical symptoms of cystitis.

When patients present acute pyelonephritis is when the presence of vesicoureteral reflux should be considered due to the failure of the unidirectional flow mechanism, causing and favoring bacterial growth in the renal parenchyma, which triggers the symptoms of acute pyelonephritis, among the most prominent, being fever, therefore it is essential to search for vesicoureteral reflux in pediatric patients who present acute pyelonephritis. [6-7]

DIAGNOSTIC

For the diagnosis of vesicoureteral reflux, many considerations must be taken into account, not only the performance of imaging studies, since as mentioned above, vesicoureteral reflux can present itself in various ways, among the main suspicions are urinary tract infections, so at the beginning of the medical follow-up of this entity it is recommended to start with the identification of urinary tract infection with clinical and laboratory tests.

Among the clinical practice guidelines of the American Academy of Pediatrics, the presence of a positive urine culture and pyuria defines the presence of a urinary tract infection. To define pyuria, it should be identified by urinalysis, with the presence of greater than 10 white blood cells/mm³ or the presence of leukocyte esterase on a dipstick. Among the imaging studies that can be performed, the most common and accessible is the renal ultrasound, which although it serves to diagnose the presence of renal abscess or hydronephrosis, does not rule out the presence of vesicoureteral reflux, studies indicate that only 11% of patients could identify the presence of vesicoureteral reflux, Among the most suggestive ultrasound findings for this pathology is the presence of hydronephrosis or ureteral dilatation and changes in the renal parenchyma, being the best diagnostic study for the detection of vesicoureteral reflux the excretory cystourography, which supports the identification of structural abnormalities such as vesicoureteral reflux and its classification. [2,7-8]

CONCLUSION

In conclusion, our comprehensive exploration of vesicoureteral reflux (VUR) in pediatric patients underscores the intricate nature of this urological condition. The diversity

Understanding and Addressing Vesicoureteral Reflux in Pediatric Patients: A Comprehensive Exploration of Diagnostic Strategies, Challenges, and Optimized Management Approaches

of diagnostic strategies available, from traditional voiding cystourethrography to contemporary imaging technologies, offers clinicians a spectrum of tools to evaluate reflux severity and associated complications. However, the challenges inherent in pediatric patients, including age-related variations and evolving clinical presentations, emphasize the need for a nuanced and individualized approach to diagnosis.

Furthermore, the optimized management approaches discussed in this article provide clinicians with a repertoire of interventions tailored to the specific needs of each patient. The consideration of reflux grade, patient age, and concurrent conditions is paramount in crafting effective treatment plans. Surgical and non-surgical modalities, each with its unique advantages and limitations, offer a spectrum of choices for clinicians to navigate.

As we strive for enhanced understanding and precision in addressing pediatric VUR, ongoing research and technological advancements will undoubtedly contribute to refining diagnostic accuracy and therapeutic efficacy. The role of antibiotic prophylaxis in preventing urinary tract infections and safeguarding renal function remains pivotal, highlighting the holistic nature of managing VUR in the pediatric population.

In embracing the complexities of diagnosis and management, clinicians are empowered to provide tailored and effective care for young patients with VUR, ultimately promoting improved outcomes and quality of life. Continued collaboration between urologists, pediatricians, and researchers will foster a deeper understanding of this condition, paving the way for future advancements in the field.

REFERENCES

- I. Jei-Wen Chang, Chin-Su Liu & Hsin-Lin Tsai (2022) Vesicoureteral Reflux in Children with Urinary Tract Infections in the Inpatient Setting in Taiwan, *Clinical Epidemiology*, 14:, 299-307, DOI: 10.2147/CLEP.S346645.
- II. M.E.Chua J.K.Kim, J.S.Mendoza, N. Fernandez, J.M.Ming, A.Marson, A.J.Lorenzo, R.I.Lopes, M.S.Takahashi (2018) The evaluation of vesicoureteral reflux among children using contrast-enhanced ultrasound: a literature review, *Journal of Pediatric Urology* 1477-5131; DOI: <https://doi.org/10.1016/j.jpuro.2018.11.006>
- III. Tej K. Mattoo, Dunya Mohammad (2022) Primary Vesicoureteral Reflux and Renal Scarring; *Pediatric Clinics of North America*, 0031-3955, DOI <https://doi.org/10.1016/j.pcl.2022.07.007>
- IV. Eric M. Bortnick, Caleb P. Nelson (2023) Vesicoureteral Reflux Current Care Trends and Future Possibilities, 0094-0143, DOI <https://doi.org/10.1016/j.ucl.2023.04.003>.
- V. Armando J. Lorenzo (2022) Vesicoureteral Reflux, Renal Scars, and Urinary Tract Infections in Children: A New Way to Think About an Old Problem, 0302-2838, DOI <https://doi.org/10.1016/j.eururo.2021.09.023>.
- VI. Rachel Millner, Brian Becknell, (2019) Urinary Tract Infections, 0031-3955, DOI <https://doi.org/10.1016/j.pcl.2018.08.002>.
- VII. Dijana Vitko, Joseph W. McQuaid, Ali Hashemi Gheinani, Kohei Hasegawa, Shannon DiMartino, Kylie H. Davis, (2022) Urinary Tract Infections in Children with Vesicoureteral Reflux Are Accompanied by Alterations in Urinary Microbiota and Metabolome Profiles, 0302-2838, DOI <https://doi.org/10.1016/j.eururo.2021.08.022>.
- VIII. Christos Kaselas, Yincent Tse, Richard Peace, Alok Godse, Anupam Lall, Milan Gopal, (2021) Diagnosing and treating occult vesicoureteric refluxing PIC cystography: Is it influenced by abnormalities on DMSA?, 1477-5131, DOI <https://doi.org/10.1016/j.jpuro.2020.11.016>.
- IX.