Resolved high grade vesical ureteric reflux following open Surgical ureteric reimplantation in an 18 months infant with solitary kidney. Case report and literature review.

CHARLES NHUNGO¹, KELVIN MWAKALUKWA¹, ERASTO WAMBURA¹, HERRY KIBONA², FRANSIA MUSHI³, NIMWINDAEL MSANGI², and Charles MKONY³

¹Muhimbili University of Health and Allied Sciences
²Muhimbili National Hospital
³Muhimbili University of Health and Allied Sciences School of Medicine

June 02, 2024

ABSTRACT.
Patients with vesical ureteral reflux (VUR) present with a wide range of severity. With an incidence of approximately 1%, Vesicoureteric reflux is a relatively common urological abnormality in children. Postnatal diagnosis of VUR is typically made following a diagnosis of a urinary tract infection (UTI) and less frequently following family screening. Voiding cystourethograms remain the gold standard for diagnosing VUR. To preserve the kidney and prevent the need for potential renal replacement therapy, infants with a single kidney require significantly more assessment and prompt urine diversion decisions. Surgical correction is advised for patients with VUR grades IV and V, while VUR grades I, II, and III are managed conservatively.

CLINICAL KEY MESSAGE.
Conservative nonsurgical therapy ensures that the resolution is nearly 80% for VUR grades I and II and 30-50% for VUR grades III-V within four to five years of follow-up. Open surgical reimplantation of ureters of grades IV and V is a highly successful procedure, with reported correction rates ranging from 95 to 99% regardless of the severity of VUR.

KEYWORDS: Vesical-ureteral reflux, voiding cystourethrogram, solitary kidney, ureteric reimplantation, spontaneous resolution.

INTRODUCTION.
Vesicoureteric reflux is an anatomical and/or functional disorder with potentially serious consequences, such as renal scarring, which increases with the severity of reflux, hypertension, recurrent pyelonephritis and renal failure(1). Many reflux patients do not develop renal scarring and most likely do not require intervention. Patients with vesical ureteral reflux (VUR) present with a wide range of severity. With an incidence of approximately 1%, Vesicoureteric reflux is a relatively common urological abnormality in children(2).

Neonates with prenatal hydronephrosis may have a 15% increased prevalence of VUR (1), and children with febrile UTIs may have a 30% to 45% increased prevalence of VUR (3). To preserve the kidney and prevent the need for potential renal replacement therapy, infants with a single kidney require significantly more assessment and prompt urine diversion decisions. Due to anatomical variations, girls experience urinary tract infections more frequently than boys. On the other hand, boys are more likely than girls to have VUR (29% vs. 14%) among all children with UTIs. Similarly, VUR in boys is more likely to resolve on its own, although they also typically have higher grades of VUR diagnosed at younger ages (4). Postnatal diagnosis
of VUR is typically made following a diagnosis of a urinary tract infection (UTI) and less frequently following family screening (5).

The goal of the diagnostic work-up should be to assess the child’s general health development, renal status, UTI history, presence of VUR, and Lower urinary tract function. A comprehensive physical examination for infants with bilateral renal parenchymal abnormalities or a solitary kidney includes measuring blood pressure, performing urinalysis to determine proteinuria, culturing the urine, and measuring serum creatinine(6).

The standard imaging tests include kidney, ureter, and bladder (KUB) ultrasound, VCUG and nuclear renal scans. KUB Ultrasound and VCUG could be considered complementary modalities(7). The voiding cystourethrogram (VCUG) remains the gold standard for establishing the presence and degree of VUR(7).

Refluxing ureterovesical junctions can be anatomically corrected through surgery. The surgical techniques employed are endoscopic correction and open surgery or robotically assisted laparoscopic reimplantation. There is a correlation between shorter hospital stays and the use of the extravesical bladder repair technique. Long-term catheterization for postoperative urine retention has been linked to bilateral extravesical ureteral reimplantation; however, this is an uncommon occurrence. Patients with grade I, II, and III VUR have a high chance of spontaneous remission and a low risk of renal scarring; therefore, surgical correction is not advised for these patients. For those with grade IV to V reflux, surgery might be recommended, as well as for patients who are unable to receive prophylactic antibiotic therapy or who develop new illnesses while receiving it(6). We present the case of an infant who presented with low urine output since the age of 4 months. Investigations revealed grade 5 VUR with a dilated megaureter and a solitary kidney. She was surgically corrected after a thorough examination and had good urine output afterwards. At the 6-month follow-up, the patient had no urological complaints.

CASE HISTORY.

We report a case of an 18-month-old female with a history of congenital heart disease who presented at our clinic with chief complaints of difficulty in passing urine since the age of 4 months. Her mother reported a normal voiding pattern at birth. Her condition was gradual in onset but progressive in nature and was associated with excessive crying while voiding and low-grade fever. Her mother reported some anuric episodes twice for 2 days prior admission. On different occasions, the patient had been treated for persistent fever and recurrent urinary tract infections with subtle improvements. Recently, the mother reported a history of failure to thrive with poor feedings. The mother reported normal prenatal events and had a successful spontaneous vaginal delivery, with a baby weighing 3.3 kg and an Apgar score of 8-10. The patient had no history of lower limbs oedema neither facial nor abdominal swelling.

On general examination, she was alert, tachycardic, afebrile, and not jaundiced and had no enlarged peripheral lymph nodes. Her vital signs included a BP of 75/40 mmHg and a PR of 135 beats/min with a normal respiratory rate and body temperature. Anthropometric measurements revealed a MUAC of 11.7 cm with features of moderate acute malnutrition.

Abdominal examinations revealed asymmetrical abdomen moves with respiration, mild distended right lumbar region, and no tenderness upon palpation, with normal external genitalia. Systolic heart sounds with increased precordial activity were noted on systemic cardiovascular examination.

Blood workups revealed leucocytosis, moderate anaemia of 8.2 g/dl, and thrombocytopenia of 511,000 mL, and biochemical analysis revealed elevated serum creatinine by 268 μmol/l and BUN of 34 mmol/l with normal electrolytes. The levels of inflammatory markers such as CRP and ESR were slightly increased. Urinalysis was positive for nitrates and leukocytosis. Urine culture and sensitivity revealed that Pseudomonas mirabilis and was sensitive to amikacin.

INVESTIGATIONS AND TREATMENT.

Kidney, ureter, and bladder (KUB) ultrasonography revealed right-sided renal parenchyma disease with thinned corticomedullary differentiation. The dilated ureter was visualized with grade 5 hydronephrosis,
and the urinary bladder was moderately distended and thickened, exhibiting a double wall sign. voiding cystourethrography (VCUG) revealed right vesicoureteral reflux grade 5 with severe tortuous of ureter with marked dilatation of collecting system and no contrast flow was observed in the left ureter or kidney (Figure 1). ECHO revealed peri membranous VSD, mild tricuspid regurgitation and mild right pulmonary artery stenosis with EF of 57%.

Serum creatinine and BUN resolved after 8Fr Foley catheter insertion, and a contrasted KUB CT scan revealed a solitary right kidney with physiological hypertrophy (8.9 x 4.53) and markedly diluted pyramids and a pelvic calyceal system. The left renal fossa was empty, and the left kidney was not visualized. The right ureter was severely tortuous and dilated with distal end widening at the UVJ (Figure 2A-C). After thorough radiological and physical examination, the patient was prepared for surgery to salvage the kidney. Through a sub-umbilical transverse incision via an extraperitoneal approach, the bladder was visualized with a large dilatated tortuous right ureter inserted superiorly anterior to the bladder wall (Figure 3). There was an outpouching of the bladder wall at the site of insertion of the right ureter with a stenotic distal ureter, and the contralateral ureter was not visible (Figure 4).

The right ureter was mobilized. The stenotic distal part was excised and spatulated. The megaureter was straightened and then tapered to facilitate the antireflux mechanism, right ureteric reimplantation was performed by using the Lich-Gregor extravesical technique (Figure 5), with Vicryl 6-0 and insertion of the DJ stent afterwards. The skin was closed with 2-0 prolene. The patient was placed on a 7-day antibiotic cover, and the DJ was removed after 6 weeks. A Foley catheter for urine drainage was left in situ for 21 days.

CONCLUSION AND RESULTS

It is always best to surgically repair vesical ureteral reflux under high-grade conditions because this leads to favourable surgical outcomes and may even prevent long-term renal replacement therapy and potentially dangerous renal consequences. Following ureteric reimplantation, our patient’s urine output increased to 2.1 ml/kg/hr from less than 0.5 ml/kg/hr. After 7 days, the control serum creatine, BUN, and electrolytes were all within the normal range. 6 months later, the patient reported a normal voiding pattern and no urological complaints. She was scheduled for a control MCUG and KUB CT SCAN, but the procedure was not successful due to budgetary constraints.

DISCUSSION.

Primary VUR is the most common form of reflux and is caused by incompetent or inadequate closure of the ureterovesical junction (UVJ), which contains a segment of the ureter within the bladder wall (intravesical ureter). Normally, reflux is prevented during bladder contraction by fully compressing the intravesical ureter and sealing it off with the surrounding bladder muscles. On the other hand, secondary VUR is caused by an unusually high bladder voiding pressure, which prevents the UVJ from closing during bladder contraction. It is frequently linked to functional bladder blockage (such as bladder bowel dysfunction [BBD] and neurogenic bladder) or anatomic abnormalities such as posterior urethral valves.

Many children present with symptoms of recurrent UTIs and high-grade/low fever, and few of them manifest with uremic symptoms such as nausea, vomiting, and hiccups. Comprehensive physical examination, including measurements of height, weight, and blood pressure, is paramount for patients suspected of having Vesicoureteral reflux disease. When a child with a first febrile UTI is diagnosed, the following risk factors can be used for the generation of a predictive score for VUR presence: age (> 6 months), presence of sepsis, WBC count (> 15 000/mm), and abnormal renal USG results.

laboratory evaluation, such as urinalysis to check for proteinuria, A first-morning urine protein/creatinine ratio should be measured if the urinalysis results are positive for protein, as proteinuria may be a marker of severe chronic kidney disease. Urine culture should be performed on a suitable specimen if pyuria or bacteria
Ultrasound of the kidney, ureter and bladder is the first standard evaluation tool for children with prenatally diagnosed hydronephrosis. It is non-invasive and provides reliable information regarding kidney structure, size, parenchymal thickness and collecting system dilatation(11). Ultrasound should be delayed until the first week after birth because of early oliguria in neonates(11). The presence of cortical abnormalities on ultrasound (defined as cortical thinning and irregularity, as well as increased echogenicity) warrants the use of VCUG for detecting VUR(7).

The voiding cystourethrogram (VCUG) remains the gold standard for establishing the presence and degree of VUR because it allows better determination of the grade of VUR (in a single or duplicated kidney) and provides precise anatomic details of the kidney, bladder and urethral configuration(7). On the other hand, radionuclide studies for the detection of reflux have shown less radiation exposure than the VCUG, but the anatomical details depicted are inferior(12).

Radionuclide cystogram (RNC) is an alternative modality. However, despite the increased radiation exposure associated with it, VCUG is still a solid option because it offers more anatomic detail. Specifically, RNC does not reliably show a bladder wall appearance, or Grade I reflux. The RNC also does not demonstrate urethral anatomy in boys, which may be important for secondary causes of VUR (e.g., posterior urethral valves). For this reason, in many centers, RNC was not used in the initial study but may be used to monitor for persistent reflux in follow-up studies.

Open surgical reimplantation of ureters is a highly successful procedure, with reported correction rates ranging from 95 to 99% regardless of the severity of VUR(13)(14). In the intravesical approach described by Politano and Leadbetter, the bladder is opened, and the ureters are reimplanted by tunneling a ureteral segment through the detrusor (bladder wall muscle), thereby creating a submucosal tunnel that is long enough to act as a flap valve. Modifications of the basic technique are named after surgeons who developed each of the variants (e.g., Cohen, Glenn-Anderson). In the extravesical approach, reimplantation is performed without opening the bladder and is known as the Lich-Gregoir procedure. If an extravesical procedure (Lich-Gregoir) is planned, cystoscopy should be performed preoperatively to assess the bladder mucosa and the position and configuration of the ureteric orifices. Overall, all surgical techniques offer very high and similar success rates for correcting VUR.

Conservative nonsurgical therapy ensures that the resolution is nearly 80% for VUR grades I and II and 30-50% for VUR grades III-V within four to five years of follow-up; however, spontaneous resolution is low for bilateral high-grade reflux(15). The conservative approach includes watchful waiting, intermittent or continuous antibiotic prophylaxis(CAP), and bladder and bowel rehabilitation in patients with lower urinary tract disease(10).

The spontaneous resolution of VUR is dependent on age at presentation, sex, grade, laterality, mode of clinical presentation, and anatomy. Faster resolution of VUR is more likely to occur at less than one year of age at presentation, with a lower grade of reflux (grades 1-3) and an asymptomatic presentation of prenatal hydronephrosis or sibling reflux(16).

For patients with a solitary kidney presenting with a tortuous megaureter, surgical correction is inevitable(17). Regardless of technique, patients may require postoperative bladder drainage via a urinary catheter and in-hospital admission, which usually lasts from one to several days(14). Our patient had a solitary kidney and was managed by surgical ureteric reimplantation with good surgical outcomes after surgery.

Other correction techniques include endoscopic sub-ureteral injection of bulking materials, a less invasive ambulatory procedure, and injection of a periureteral bulking agent via a cystoscope, which changes the angle and perhaps fixation of the intravesical ureter, thereby correcting VUR. The two most commonly used techniques use a copolymer of dextranomer/hyaluronic acid (Dx/HA or DEFLUX) but use different injection
sites(18). The hydrodistension implantation technique involves placing the bulking agent within the ureteral tunnel sub-ureteral transurethral injection, which places the bulking agent outside the ureteral orifice. The success rate for correcting VUR with DEFLUX in one or more procedures ranges from 75 to over 90%(19)

DISCLOSURE

This report has been published in accordance with the SCARE criteria (20).

Acknowledgements

We would like to thank the whole surgical and paediatric urological team for the total support of our patient recovery.

Ethical Approval

This case report study was exempt from ethical approval at our institution, as this paper reports a single case that emerged during normal surgical practice.

Funding

There was no funding concerning this article.

Availability of data and materials

This is not applicable to this article because it is a case report.

Informed Consent and Consent for publication

Written informed parental consent was obtained from the parents/guardians for publication of this case report and accompanying images. A copy of the written parental consent is available for review by the Editor-in-Chief of this journal upon request.

Competing interests

The authors declare that they have no competing interests.

REFERENCES.


Hosted file


Hosted file


Hosted file


Hosted file

Hosted file