Volume 6
Issue 1
January 2022
ISSN:5101195-3

KOSOVA JOURNAL OF SURGERY

PAPERS PRESENTED AT THE FIRST CLINICAL CONGRESS OF THE KOSOVA COLLEGE OF SURGEONS SEPTEMBER 24-26, 2021

Editorial: RIFAT LATIFI: The First Chapter of the New Book of Kosova College of Surgeons

RUSSELL ANDREWS: The Importance of Surgical Care to Achieve the United Nations Sustainable Development Goal for Healthy Lives by 2030

BELLAL JOSEPH: Breaking the Frailty Code: Emergency General Surgery in the Elderly

DEMETRIUS LITWIN: Hand-Assisted Laparoscopic Living Donor Hepatectomy

LIOR LEVY, ABASS SMILEY, RIFAT LATIFI: Independent Predictors of In-Hospital Mortality in Patients Undergoing Emergency Admission for Arterial Embolism and Thrombosis in the USA: A 10-Year National Dataset

LIOR LEVY, ABBAS SMILEY, RIFAT LATIFI: Mortality in Emergently Admitted Patients with Empyema: An Analysis of 18,033 Patients

KOLEGJI I KIRURGËVE TË KOSOVËS
KOSOVA COLLEGE OF SURGEONS
MMXVIII

www.koscs.org

Retrospective Study for Endoscopically-Treated Primary VUR in Pediatric Patients

Ass. Prof. D-r. Shaban Memeti M.D. PhD[1],
D-r. Radmila Mila Mihajlova Ilie, M.D. PhD candidate[2],
D-r. Dimitar Petrevski M.D[2]., D-r. Gani Çeku, M.D.[3],
Prof.D-r. Lazar Todorovikj, M.D. PhD[1], Prof. D-r. Mile Petrovski, M.D. PhD[1]

1. University clinic of pediatric surgery, Skopje
2. University Clinic of Traumatology, Ortopedic Surgery, Anestesia with ICU and Emergency Surgical Center, Skopje
3. University Clinic of Pediatric Surgery, Kosova

Abstract

Introduction

Vesicoureteral reflux is one of the most common pediatric urological anomalies and can be defined as "regurgitation of urine from the urinary bladder up the ureter into the collecting system of the kidneys".[1] Several anomalies related to the functional integrity of the ureter, the dynamics of the bladder, and the anatomic composition of the ureterovesical junction (UVJ) can lead to abnormal valve mechanism and VUR.

Materials and Methods

We retrospectively analyzed 32 children endoscopically-treated for primary VUR at the Clinic of Pediatric Surgery in Skopje in the period from 2017 to 2020, (47 ureters). Endoscopic treatment was done using subureteric Teflon injection "STING" technique. The evaluation of the results of the treatment was done mainly according to the following criteria: reduced grade of reflux, maintaining renal function, absence of urinary infection and postoperative complications. On the one week of intervention and six-weeks period post-intervention follow-up, ultrasonography evaluation, radio isotopic cystography, or voiding cystourethrogram at six months were done.

Results and Discussion

The reduction of 1-2 grades with VUR endoscopic procedure was observed. The "STING" technique was first described in 1984 by Puri P, O'Donnell B[4] and then modified into "hydrodistention-implantation technique-HIT." The safety and long-term effectiveness of the injectable agent is key for successful endoscopic treatment. There have been several bulking agents introduced. Minor and major complications are rare and can be easily managed which makes this technique a preferred modality of choice.

Conclusion

The safety, cost and long-term effectiveness of the endoscopic treatment makes it the first-line treatment of VUR. Long-term antibiotic prophylaxis should be avoided and ureteroneocystostomy remains reserved for cases of failed injection therapy or significant anatomical abnormalities associated with grade V bilateral reflux.

Key words: pediatric urology, VUR, STING procedure, endoscopic treatment

© 2022 The Author(s). Published by Kosova Journal of Surgery. This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

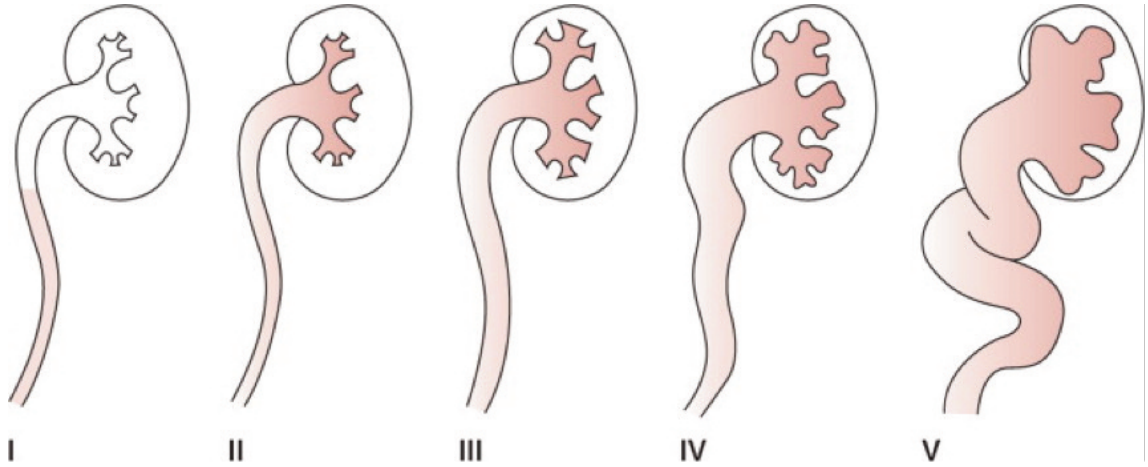


Fig. 1

Introduction

Vesicoureteral reflux is one of the most common pediatric urological anomalies and can be defined as "regurgitation of urine from the urinary bladder up the ureter into the collecting system of the kidneys".[1]

Several anomalies related to the functional integrity of the ureter, the dynamics of the bladder, and the anatomic composition of the ureterovesical junction (UVJ) can lead to abnormal valve mechanism and VUR. The ureter presents oblique insertion into the bladder wall, passing through detrusor muscle, continuing between the mucosa of the bladder and detrusor muscle as submucosal channel before entering into the lumen of the bladder. The flap-valve mechanism, which is responsible for continual flow of urine consists of stretching-distension, thinning of the bladder wall, and intramural portion of the ureter as the bladder fills. The latter leads to compression of the ureter against the detrusor backing. Reflux, then, occurs in cases where the channel between the submucosa and the detrusor muscle is short, absent, or with weak support from the detrusor muscle.

This situation is due to disturbed/decreased proportion of the length of the ureters' submucosal tunnel to the diameter of the ureter, which normally ranges between 4:1 and 5:1. Such decrease in ratio implies that the submucosal tunnel is short, the urethra has wider diameter, and the ureters' insertion is lateralized to the normal trigone of the bladder. This means that the physiological valve mechanism that prevents reflux is incomplete. Usually, its degree corresponds to the proportion of the uretero-vesical junction deformity. The incidence of VUR occurrence in the pediatric population is around 1%.[2] One-third of these patients experiences urinary tract infection (UTI). Acute pyelonephritis associated with VUR can lead to renal scarring and, ultimately, to chronic/end-stage kidney disease, known as reflux nephropathy. Low grade VUR tends to resolve thill adultery, but, in most of the cases, it will prograde to sever renal damage and dysfunction.[3]

Depending on the factors causing it, VUR can be divided into two groups. Primary VUR is the most common, caused by anomaly of the insertion of the ureter into the bladder, and tending for spontaneous resolution with maturation of the uretero-vesical circuit. Secondary VUR, on the other hand, is caused by obstruction of the urine evacuation from the bladder (rear valve ureter, neurogenic bladder, myelomeningocele, spine injuries, double ureter, ectopic ureter, sub vesical obstruction etc.), causing elevated pressure in the bladder. Diagnosis is made using prenatal ultrasound diagnostics, cystourethrogram, direct radioisotope voiding cystography, echo tomography, radioisotope methods - DMSA static scan, and dynamic DTPA renal scan, urodynamic examinations, CT and MRI.[4]

Treatment requires a multidisciplinary approach; starting from an accurate diagnosis based on heteroanamnestic data, pre-clinical, radiological, radio isotopic, and laboratory investigations. Selecting the correct treatment and follow-up of the affected child should be individualized. There are three main treatment approaches; active surveillance, continue antibiotic prophylaxis, and surgical treatment (endoscopic treatment and ureteroneocystostomy-ureter re-implantation).

The aim of this study is to examine the efficacy of the endoscopic treatment in correlation with VUR grade and renal status.

Materials and Methods

Patient Selection

We retrospectively analyzed 32 children endoscopically-treated for primary VUR at the Clinic of Pediatric Surgery in Skopje in the period from 2017 to 2020, (47 ureters). Diagnosis was made by prenatal ultrasound diagnostics, voiding cystourethrogram or direct radioisotope voiding cystography. Endoscopic treatment was done using sub-ureteric Teflon injection "STING" technique. Twenty-five patients were female (average age of 6.1 years) and 7 were male (average age of 4.7 years). All children had VUR grade II to V. This study included only children who were monitored for the overall protocol. Reflux was diagnosed on the right ureter in 7 patients, 10 children had reflux on the left ureter and 15 children had bilateral reflux. Of these, three presented grade II, 20 grade III, 6 grade IV and 3 children presented grade V VUR. One patient with grade IV VUR of the left ureter was diagnosed with hypoplasia of the left kidney. The average time of hospitalization for these patients was 1.5 days.[5]

Endoscopic Treatment

After receiving premedication, they were placed in lithotomy-position and introduced into general anesthesia. The operational field around the genitals and perineum was cleaned and isolated. Cystourethroscope was introduced, followed by application of Deflux®, with specially designed cannula sub-trigonaly. The puncture was 2-3 mm below the opening of the ureter, into 6 o'clock position. Cystoscope needle was used for injection (5F, 33 cm). It was coated with silicon. The amount of injected material was 0.3 -1.5 ml. Deflux® is a sterile, highly viscous gel of dextranomer microspheres (50 mg/mL) in a carrier gel of non-animal stabilized hyaluronic acid (15 mg/mL), constituting a biocompatible and biodegradable implant. The dextranomer microspheres range in size between 80-250 microns with an average size of about 130 microns. The stabilized hyaluronic acid acts mainly as a carrier, leaving the dextranomer microspheres at the implant site. Deflux is contained in a single-use disposable syringe. The syringe is equipped with a tip cap, plunger, and plunger rod.

The syringe is terminally sterilized. Deflux is injected submucosally in the urinary bladder in close proximity to the ureteral orifice. The injection of Deflux creates increased tissue bulk, thereby, providing coaptation of the distal ureter during filling and contraction of the bladder. The dextranomer microspheres are gradually surrounded by host connective tissue.

The intra-uretrical technique of application was used alternatively for grade four reflux and the insertion needle was directed into the bottom of the intravesical part of the ureter. The average time of intervention was 15 minutes. After the procedure, patients are catheterized. After several spontaneous micturition, the child was discharged from hospital on the same or the next day. Average time of hospitalization for these patients was 1.5 days.

Evaluation

Severity grading of reflux in all patients was made, according to the International Reflux Study Committees, in 5 groups. The degree of reflux is estimated after a voiding cystourethrogram. Children with high grade VUR presented progression of existing lesions in the renal parenchyma and/ or creating new arterial hypertension due to kidney changes, recurrent pyelonephritis, urinary tract infection with febrile episodes while receiving antibiotic prophylaxis and patients who had failure or lack of cooperation on the conservative treatment. They were treated surgically.

In the preoperative period, biological samples were taken for laboratory tests, such as: urine culture, blood test, blood group determination, C-reactive protein in serum, degradation products (urea and creatinine), examination of urinary sediment (color, odor density, proteinuria, leukocituria, and bacteriuria). The obtained results, together with other medical history of the patients were crucial for forming a general picture of health condition of the patient and evaluation of anesthesiology risk of surgery.[6] In endoscopic treatment, there was no need for postoperative antibiotic therapy or analgesics. There was no need to ordinate blood and/ or blood derivatives. Antibiotic prophylaxis was given before treatment. Patients receiving anticholinergics continued with their therapy.

The final result in these patients meant a decrease of 2 degrees of the initial degree of VUR, usually from grade IV to grade II or I. The evaluation of treatment

results was done mainly according to the following criteria: reduced grade of reflux, maintaining renal function, absence of urinary infection and postoperative complications (contralateral reflux, ureteral obstruction, additional disorders, and dysfunctional bladder).

After discharge from our department, all patients were monitored with ultrasonography review 7 days post-surgery (to verify the presence of a bolus) and six weeks after post-intervention (to determine the extent of possible hydronephrosis). Radio isotopic cystography was performed 6 months after surgery. In cases of inconclusive findings, voiding cystourethrogram was performed.

Results and Discussion

The reduction of 1-2 grades with VUR endoscopic procedure was observed. Endoscopy definitely solved the problem in 68.75% of the patients, 22 out of 32 patients. Three children had postoperative complications. Three patients were in need of re-urethrocystoscopy. They were successfully treated with re-endoscopy. Three patients at the age of 2 and 3 years were with VUR gradus 2, post endoscope procedure. It was resolved by itself, though, until the age of 4. Still, in four patients, a classic laparatomy for uretroreimplantation had to be done due to recurrent UTI.[7]

Due to low invasiveness and high success rates, endoscopic treatment is a very popular choice of treatment. There are studies reporting much higher overall success rates with endoscopic treatment, compared to antibiotic prophylaxis and open surgical technique with obvious learning curve, which needs to be taken into consideration.[8]

"STING" technique was first described in 1984 by Puri P, O'Donnell B.[5] Thanhas been modified by inserting the needle into the submucosal tunnel of the ureter via hydrodistention. This is called "hydrodistention-implantation technique-HIT" and it has been reported to have higher rates of success.

The safety and long-term effectiveness of the injectable agent is key for successful endoscopic treatment. There have been several bulking agents introduced for this purpose such as polytetrafluoroethylene, bovine collagen, polyacrylate-polyalcohol copolymer, polydimethylsiloxane, calcium hydroxyapatite and dextranomer/hyaluronic acid as Deflux ®.

Complications after endoscopic treatment include ureteral obstruction, which further needs ureteral stent

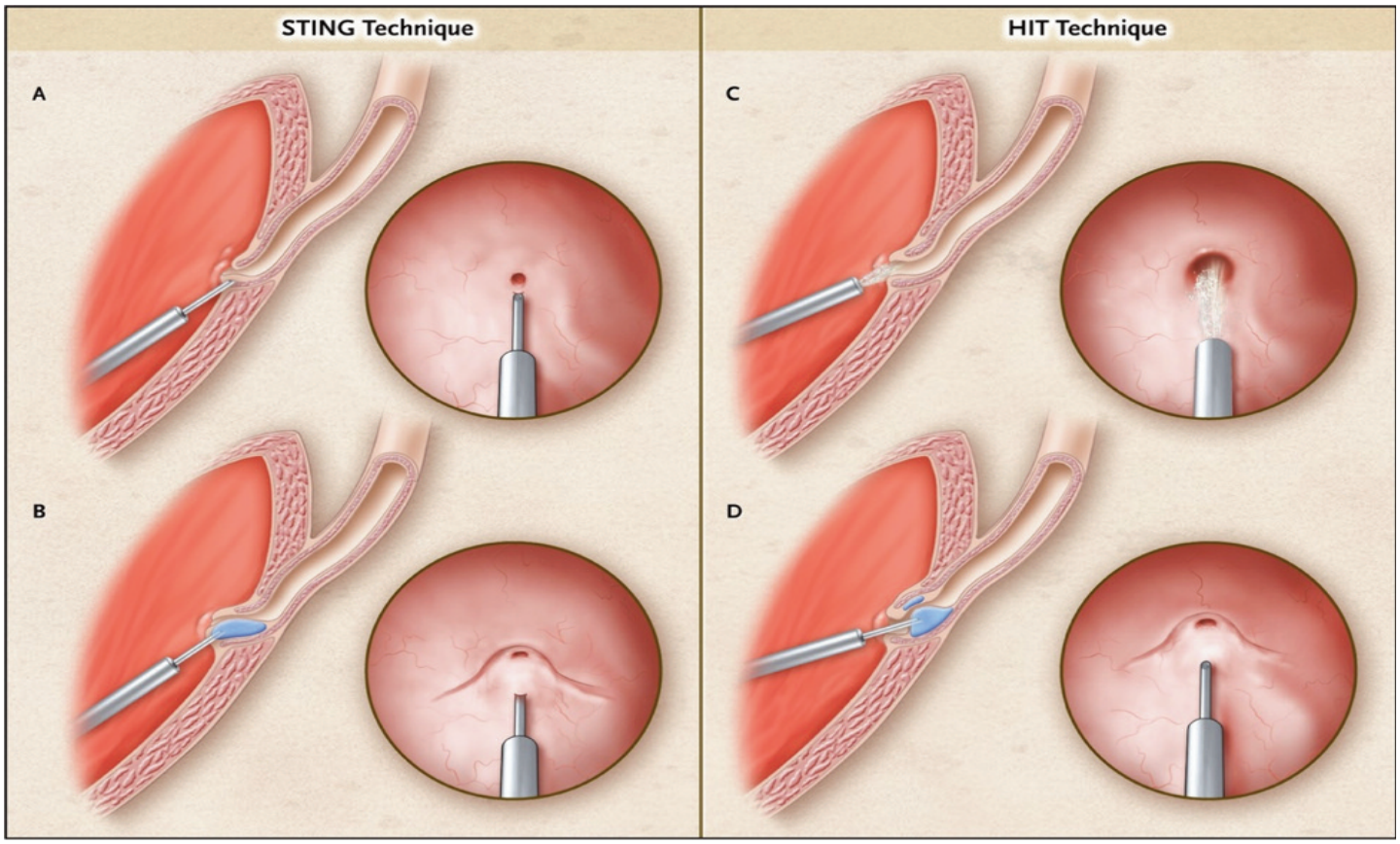


Fig.2

placement or surgical correction, new contralateral VUR and treatment failure. Several minor complications without long-term effect were also described, such as transient hydronephrosis, febrile urinary tract infection, hematuria, flank pain and emesis.[9]

Increasing evidence of high-grade VUR successful endoscopic treatment makes it an emerging modality of choice.

Conclusion

The safety, cost and long-term effectiveness of endoscopic treatment makes it first-line treatment of VUR. Long-term antibiotic prophylaxis should be avoided as it does not protect against UTI and contributes to bacterial resistance increase.[10] Ureteroneocystostomy remains reserved for cases of failed injection therapy or significant anatomical abnormalities. Newly developed bulking agents in combination with improvement of endoscopic techniques suggest a broader indication field for this technique in the future.

Conflict of Interest Disclosure Statement

The authors have no conflict of interest to declare.

REFERENCES

1. Blais AS, Bolduc S, Moore K. Vesicoureteral reflux: From prophylaxis to surgery. *Can Urol Assoc J*. 2017 Jan-Feb;11(1- 2Suppl1):13-18.
2. Jacobson SH, Hansson S, Jakobsson B. Vesico-ureteric reflux: occurrence and long-term risk. *ActaPaediatrSuppl.* 1999;88:22-30
3. Smellie JM, Jodal U, Lax H, Mobius TT, Hirche H, Olbing H. Outcome at 10 years of severe vesicoureteric reflux managed medically: Report of the international reflux study in children. *J Pediatr*. 2001;139:656–663
4. Hains DS, Cohen HL, McCarville MB, et al. Elucidation of Renal Scars in Children With Vesicoureteral Reflux Using Contrast-Enhanced Ultrasound: A Pilot Study. *Kidney Int Rep*. 2017;2(3):420-424. doi:10.1016/j.ekir.2017.01.008
5. O'Donnell B, Puri P. Treatment of vesicoureteric reflux by endoscopic injection of Teflon. *Br Med J (Clin Res Ed).* 1984;289(6436):7-9. doi:10.1136/bmj.289.6436.7
6. Prasad MM, Cheng EY. Radiographic evaluation of children with febrile urinary tract infection: bottom-up, top-down, or none of the above? *Advanc Urol*. 2012;2012:716739.
7. Ehrlich RM, Gershman A, Fuchs G. Laparoscopic vesicoureteroplasty in children: initial case reports. *Urology*. 1994. 43(2):255–261
8. Sergey NZ, Shakhnovsky DS, Turov FO, Galuzinskaya AT, Dyakonova EY.Efficiency of the endoscopic correction of high-grade vesicoureteral reflux in children. *Russian Journal of Pediatric Surgery.* 2020;24(5):292-296.
9. Cerwinka WH, Scherz HC, Kirsch AJ. Endoscopic Treatment of Vesicoureteral Reflux with Dextranomer/Hyaluronic Acid in Children. *Advances in Urology.* 2008. https://doi.org/10.1155/2008/513854
10. Elmore JM, Kirsch AJ, Heiss EA, Gilchrist A, Scherz HC. Incidence of urinary tract infections in children after successful ureteral reimplantation versus endoscopic dextranomer/hyaluronic acid implantation, *The Journal of Urology*. 2008;179(6):2364–2368.