



**EFFICIENCY OF ENDOSCOPIC TREATMENT
COMPARED TO OPEN SURGICAL MANAGEMENT
OF THE VESICoureTERAL REFLUX**

**EFIKASNOST ENDOSKOPSKE METODE LEČENJA U
ODNOSU NA OTVORENU HIRURŠKU KOREKCIJU
VEZIKoureTERALNOG REFLUKSA**

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Abstract

Introduction: Vesicoureteral reflux (VUR) represents the retrograde flow of urine from the bladder to the upper urinary tract. It can be managed by continuous antibiotic prophylaxis of the urinary tract infections until spontaneous resolution occurs, surgical ureteral reimplantation (ureteroneocystostomy), or endoscopic treatment by injecting bulking agents.

The aim: To assess the efficacy of the endoscopic treatment of VUR in comparison to the ureteroneocystostomy.

Material and methods: The first group included 300 children with VUR, II to IV grades managed by endoscopic injection from 2005 to 2015, and second group included 300 patients who underwent surgical treatment for the IV or V grade of VUR from 1997 until 2009. The results of treatment and complication rate were analysed and compared. We did the same analysis considering the total number of ureteral units.

Results: Of total of 300 patients treated endoscopically, in 281 (93.67%) patients the reflux was completely resolved; in 10 (3.33%), the reflux was downgraded (decreased for one or two grades) and in 9 (3%) the intervention was unsuccessful. In 430 ureteral units, full resolution was achieved in 402 (93.49%) units; in 10 (2.33%), the reflux was downgraded and in 18 (4.65%) the reflux didn't resolve. In 300 patients who underwent open surgery, in 290 (96.7%) the reflux was resolved; in 8 (2.67%), the reflux was downgraded from the V/IV to the grades I to III; in 2 (0.66%) the operation was unsuccessful. Out of 480 ureteral units, in 463 (96.46%) units the reflux was resolved; in 13 (2.71%), the grade of reflux was reduced, while in 4 (0.83%) units the reflux was persistent. Recorded success rate didn't show any statistically significant difference between these two groups. The length of hospital stay was significantly shorter and the number of complications was lower in the group of patients treated by endoscopic injection.

Conclusion: Comparable success rate, shorter hospital stay, and fewer complications make the endoscopic treatment more preferable option.

Keywords:

Vesicoureteral reflux,
Endoscopic treatment,
Ureteral reimplantation

Sažetak

Uvod: Vezikoureteralni refluks (VUR) predstavlja retrogradni tok urina iz bešike do gornjih delova urinarnog trakta. Može se lečiti kontinuiranom antibiotskom profilaksom urinarnih infekcija do spontane rezolucije, otvorenom hirurškom reimplantacijom uretera ili endoskopskim tretmanom pomoću injekcije endopaste.

Cilj: Studije efikasnosti endoskopske metode lečenja VUR-a u odnosu na otvorenu hiruršku korekciju VUR-a.

Materijal i metode: Prvu grupu pacijenata čini 300 pacijenata tretiranih endoskopskom injekcijom zbog VUR-a II do IV gradusa od 2005. do 2015.god. Drugu grupu pacijenata sačinjava 300 pacijenata lečenih od 1997. do 2009. god. otvorenom hirurškom reimplantacijom uretera zbog VUR-a IV i V stepena. Rezultati lečenja i učestalost komplikacija kod ove dve grupe pacijenata su analizirani i upoređeni. Takođe, urađena je i analiza u odnosu na ukupan broj ureteralnih jedinica.

Rezultati: Od ukupno 300 pacijenata koji su tretirani endoskopski, kod 281 (93,67%) pacijenta refluks je kompletno saniran; kod 10 (3,33%) pacijenata smanjen je stepen refluksa (za jedan ili dva stepena) i kod 9 (3%) pacijenata intervencija je bila potpuno neuspešna. Od 430 ureteralnih jedinica, uspešan tretman refluksa je postignut kod 402 (93,49%) uretera; kod 10 (2,33%) stepen refluksa bio je snižen i kod 18 (4,65%) refluks je i dalje bio prisutan. Od 300 pacijenata podvrgnutih otvorenoj hirurgiji, kod 290 (96,67%) refluks IV/V gradusa je kompletno izlečen; kod 8 (2,67%) slučajeva snižen je stepen sa IV/V na I, II ili III stepen refluksa i kod 2 (0,66%) pacijenta operacija je bila neuspešna. Od 480 ureteralnih jedinica, kod 463 (96,46%) jedinica refluks je izlečen, kod 13 (2,71%), operacija je smanjila stepen VUR-a, dok je kod 4 (0,83%) uretera refluks ostao perzistentan. Rezultati nisu pokazali statistički značajnu razliku između ove dve grupe pacijenata u stepenu uspešnosti lečenja refluksa. Dužina boravka u bolnici je kraća, a učestalost komplikacija manja kod pacijenata lečenih endoskopskom intervencijom.

Zaključak: Podjednaka uspešnost lečenja, kraći boravak u bolnici i manje komplikacija dovelo je do toga da endoskopski tretman postane metod izbora u lečenju VUR-a u odnosu na klasični hirurški tretman.

Ključne reči:

vezikoureteralni refluks,
endoskopski tretman,
reimplantacija uretera

Introduction

Vesicoureteral reflux (VUR) represents the retrograde flow of urine from the bladder to the upper urinary tract, and the most common and important pediatric anomaly of the urinary tract (1, 2). In most children, reflux is a birth defect and is caused by an abnormal attachment between the ureter and bladder, the ureterovesical junction (UVJ), with a short, ineffective flap valve. It is most readily considered a clinical accelerant of bacteriuria, by mechanically delivering infected urine to the renal pelvis and so, acting as a reservoir for the repeated antegrade reintroduction of pathogenic organisms to the bladder which may cause recurrent UTI if any prophylaxis therapy is used. The relationship between infection, reflux, and pyelonephritic scarring was described in 1979 by Ransley and Risdon (3) and demonstrated in 1991 by Smellie and colleagues (4). Reflux nephropathy remains the most common causes of end-stage kidney disease in childhood (5). The International Reflux Study Committee grades reflux from I to V (6). VUR tends to resolve spontaneously over time, particularly in children with low-grade reflux and normal kidneys. However, in many patients it can persist for a number of years, in some cases into adulthood (7).

The voiding cystourethrogram (VCUG) is the common form of direct cystography and constitute the present-day gold standard approach to reflux detection. Voiding disturbances, fever and family histories should be

noted, and a sonographic study of the bladder and kidneys can be considered a reasonable minimal evaluation in the infant or child following a UTI. Febrile UTI, particularly in first year of life, warrants further evaluation, and VCUG should be considered.

In order to prevent VUR-related complications, patients can be managed by continuous antibiotic prophylaxis (CAP). However, surgical ureteral reimplantation or endoscopic injection of bulking agents can be performed as a permanent solution of reflux. Currently, a long-term antibiotic prophylaxis to prevent pyelonephritis while awaiting spontaneous resolution of lower grades of reflux is used as a first line therapy. Contrariwise, higher grades of reflux have a low rate of spontaneous resolution and patient's compliance to medication may become a problem (7, 8) and cause a breakthrough febrile UTIs (9). Surgical correction of VUR (open or laparoscopic surgery) is another option; even though it has good success rates, it is invasive and is not without complications. Over the last few decades, endoscopic subureteric injection with bulking agents has gained popularity in the treatment of VUR. Many authors have recommended endoscopic treatment (ET) as the first line of treatment (10-15).

This study was performed to assess the efficacy of the endoscopic treatment of VUR in comparison to the open surgical correction of VUR.

Material and Methods

This was a study on 300 patients with VUR, grades II to IV, who were managed from 2005 to 2015 by endoscopic injection the bulking agents -Deflux (Hyaluronic acid and dextromer). As controls, we used 300 patients with IV or V grade of VUR treated by open surgery (Ureteral Reimplantation Surgery “detrusor tunnelling”) in the period from 1997 until 2009. The study was conducted at the Institute of Mother and Child Health Care of Serbia “Dr Vukan Ćupić” in Belgrade. All patients underwent follow-up that included ultrasound of the bladder and kidneys, urine and urin-culture sampling and follow-up

VCUG, as the final evaluation, three to six months after treatment. Success was defined as complete resolution for reflux, partial success as downgrade of reflux and failure as persistent grade of VUR.

Results

Presented methods of treatment of VUR were analysed and compared. The results of treatment in two groups of patients, those treated endoscopically and by open surgery are presented in **Table 1**, while the results per ureteral units are presented in **Table 2**.

Table 1. Results of the endoscopic and the open surgical management in all patients.

Treatment results	Number of patients			
	Endoscopic correction of the VUR		Surgical treatment of the VUR	
	N	%	N	%
Resolved reflux	281	93.67	290	96.67
Downgraded reflux	10	3.33	8	2.67
Unresolved reflux	9	3	2	0.66
Total	300	100	300	100

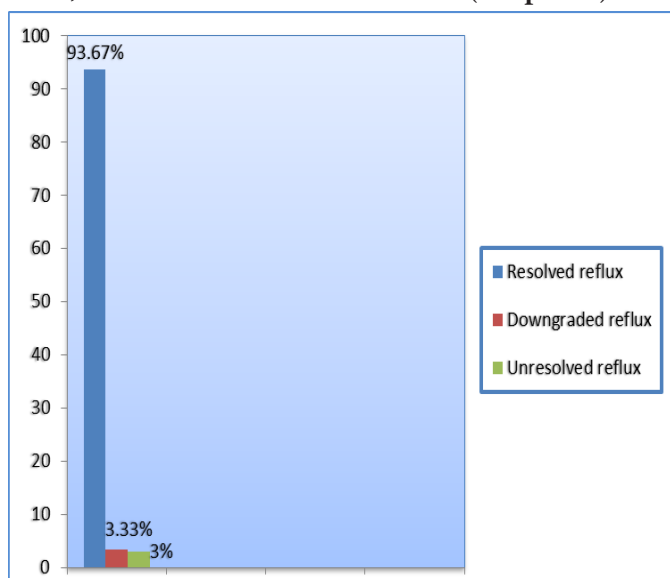
Table 2. Results of the endoscopic and open surgical management per ureteral units.

Treatment results	Number of ureters			
	Endoscopic correction of the VUR		Surgical treatment of the VUR	
	N	%	N	%
Resolved reflux	402	93.49	463	96.46
Downgraded reflux	10	2.33	13	2.71
Unresolved reflux	18	4.65	4	0.83
Total	430	100	480	100

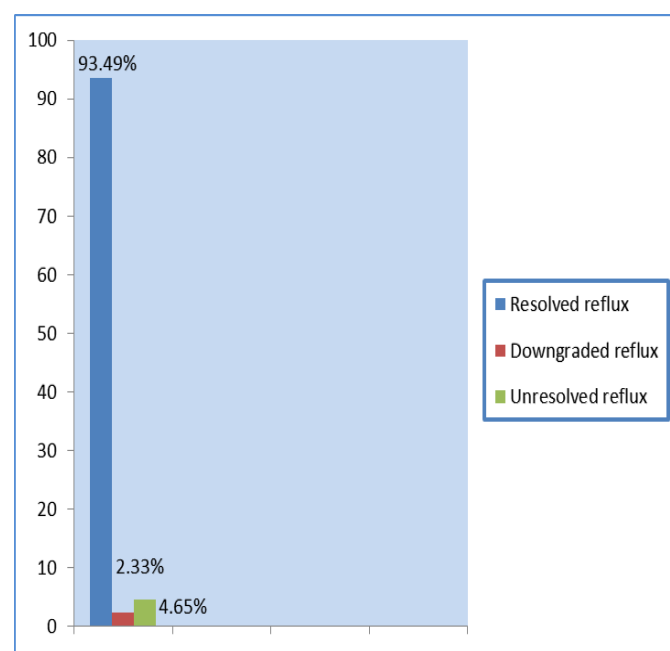
Endoscopic correction of the VUR (study group)

Among the 300 subjects who underwent the endoscopic treatment, 281 (93.67%) patients were completely cured; in 10 patients (3.33%), the reflux was downgraded, decreased for one or two grades, and in only 9 (3%) patients, the treatment was not successful (**Graphic 1**).

In 430 ureteral units, full resolution was achieved in 402 (93.49%) units; in 10 (2.33%) ureteral units the reflux was downgraded and in 18 (4.65%) the reflux didn't resolve (**Graphic 2**).

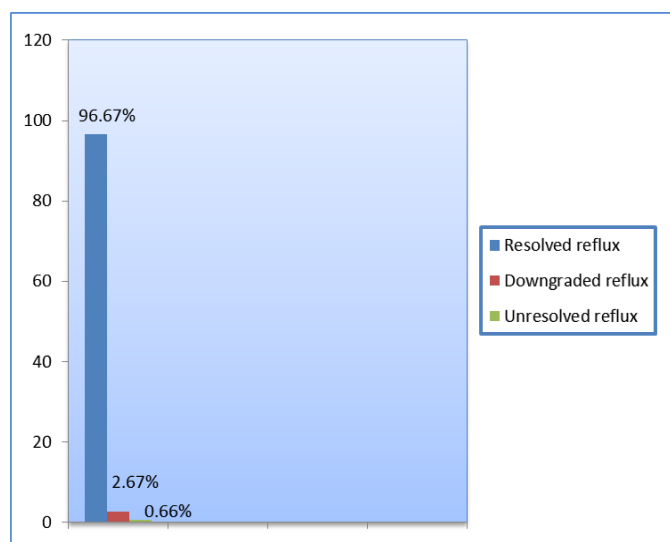


Graphic 1. Results of endoscopic treatment of all patients.



Graphic 2. Results of endoscopic treatment per ureteral units.

The treatment lasted from 7 to 21 minutes, giving the average of 12 ± 6 minutes per operation. The only noticed complication was the obstruction of the ureterovesical junction in 4 (1.33%) cases, seen as the dilation of the prevesical ureter using the ultrasound imaging method. However, three to seven days after the intervention, any obstruction resolved spontaneously on the follow-up ultrasound. Mean length of the hospital stay for this group of patients was 1.2 days (ranged from 1 to 2 days). Antibiotic prophylaxis was continued until the confirmation of the disappearance of reflux by VCUG performed three to six months after the treatment.



Graphic 3. Results of surgical correction of the VUR in all patients.

The surgical procedure lasted for 55 to 120 ± 37 minutes, leading to an average of 87 minutes. Post-operative complications were: urinary infections in 20 (6.67%) patients, acute pyelonephritis in 5 (1.67%) patients and spontaneous fall-out of the catheter from the ureter in 3 (1%) during the first one or two days following the operation. Average hospital stay for this group of patients was 8.3 days (ranged from 5 to 11 days). Patients were followed up to six months when the last evaluation was made by the VCUG.

Discussion

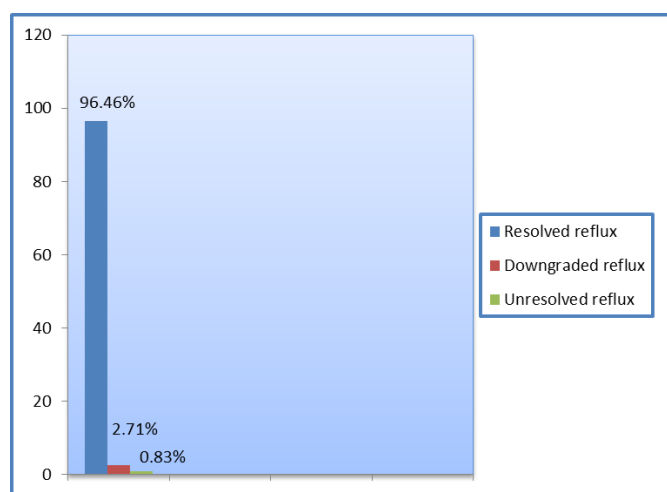
Analysing the results of our study, we didn't find any statistically significant difference between the patients endoscopically and surgically treated for the VUR. However, the average length of stay after the endoscopic treatment and the procedure time were shorter, the severity and number of complications were fewer. The ability to repeat this procedure after initial failure either with implantation or surgery is also an advantage.

Reviewing the results of different studies similar to ours, many authors came up with results that can be compared with our study. Indeed, a large European multicenter survey reported on 6216 ureters and 4166 children with 10 years' follow-up and demonstrated a cure rate of 86% after one to four injections (16). Puri and Granata in

Surgical intervention (control group)

Of the total of 300 patients suffering from the VUR IV/V grade treated surgically, in 290 (96.67%) the reflux completely disappeared; in 8 (2.67%) patients, the reflux was downgraded from the IV/V to the grades I, II or III and only in 2 (0.66%) patients the operation failed completely (**Graphic 3**).

Out of 480 ureteral units, in 463 (96.46%) units the reflux completely disappeared; in 13 (2.71%) cases the operation reduced the grade of reflux, while in 4 (0.83%) ureteral units the operation was unsuccessful (**Graphic 4**).



Graphic 4. Results of surgical treatment of the VUR per ureteral units.

a multicenter survey with a total of 53 pediatric urologists and/or pediatric surgeons at 41 centers worldwide, found that the rate of success was 87% in 8.332 patients (17). In the study of Elmore and colleagues in 90% of the patients and 89% of the ureters the reflux was resolved (18). The longest follow-up is available from Dublin in 2002 with Chertin and Puri; 247 patients treated with Teflon paste with 11 to 17 years of follow-up demonstrated a sustained success rate of 95% with a 5% recurrence rate (19). Kirsch and colleagues (2004) popularized their own approach (submucosal implantation within the intramural ureter) and reported improved results with all grades of reflux compared with the classic technique (92% vs. 79% of ureters) (20). In the study of Kirsch and colleagues from the Children's Hospitals of Atlanta, the cure rate per grade was 90% for grade I, 82% for grade II, 73% for grade III and 65% for grade IV reflux (21).

Regardless of the substance injected, the endoscopic approach to reflux management is improving, giving better results by time and has gained favor over the past several years over the other treatment options in both Europe (22-24) and the United States (25-27).

Moreover, studies of parental preference in reflux management are revealing that endoscopic treatment may sometimes be preferred over either antibiotic prophylaxis or open surgery depending on the perceived duration for reflux resolution (28, 29).

Conclusion

Endoscopic treatment of the VUR is a simple, safe and effective outpatient procedure. It has become an established alternative to long-term antibiotic prophylaxis and open surgery for the management of vesicoureteral reflux in children. However, proper selection of the patients is necessary for satisfactory outcome.

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