Endoscopic Correction of Vesicoureteric Reflux: 10 years of experience in a tertiary care center

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Key words: Vesicoureteric reflux, Saudi Arabia, Endoscopic treatment.

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Abstract:

Introduction:

Endoscopic treatment (ET) of vesicoureteric reflux (VUR) is becoming the new gold standard for surgical correction, once its needed. Her we review our experience over 10 years in a tertiary care center, and describe our technique in the procedure.

Materials and methods:

We retrospectively reviewed all the files of our patients with primary VUR and had ET, between 1998, and 2008, and had at least one year of follow-up. We looked at laterality, success rate, need for a second procedure, and complications rate.

Results:

We observed 321 patients with ET for VUR during this period, of them 115 male (35.8%) and 206 female (64.2%) patients with a total of 480 ureters.

Correction of VUR was defined as either the resolution of reflux or a downgrading to G1 upon follow-up VCUG and no ipsilateral renal or ureteric dilatation upon renal ultrasound. At 2-3 months of follow-up, VUR was corrected in 393 of 480 refluxing ureters (81.8%) after a single endoscopic injection. With a second, repeated injection in the failed cases, VUR was corrected in a total of 418 refluxing ureters (87.1%).

Only 3 patients had post operative complications (< 1%)

Conclusion:

From our experience, ET for VUR using newly available bulking agents is a reliable, safe alternative to open ureteral reimplantation for the treatment of VUR in children. This study suggests that the majority of patients will be cured after undergoing this out-patient, endoscopic procedure.

We believe that the widely reported safety of bulking agents, and the short learning curve will make ET the initial standard treatment for VUR once surgical correction is warranted.

Introduction:

Primary vesicoureteral reflux (VUR) is the most common urological anomaly in children; it has been reported in up to 50% of those who present with urinary tract infection (UTI). [1, 2] Additionally, there is high association between VUR, UTI, and renal damage. Accordingly, reflux nephropathy is the cause of end stage renal failure in about 25% of children and 15% of adults. In Saudi Arabia, it was attributed to 26.3% of end stage renal failure cases in children.[3]

Conservative medical management, in which patients are continued on prophylactic antibiotics to prevent the recurrence of infection, constitutes the standard initial management of VUR. However, the international reflux study and the American Urological Association[1,2] put forth absolute and relative indications for surgical interventions, and breakthrough UTI is the leading cause for antireflux procedures.

Endoscopic management (ET) of VUR in children has now become an accepted alternative to open ureteral reimplantation for the treatment of pediatric VUR [2]. This treatment was pioneered by O'Donnell and P Puri when they presented their first report in 1984.[4]

Since 1998, this mode of management has become our initial standard of management for patients with VUR in need of surgical correction. Here, we review our experience with ET for VUR in 321 patients with at least one year of follow-up treated over the last 10 years.

Materials and methods:

We retrospectively reviewed the charts of all patients with primary VUR who underwent ET to correct their VUR between 1998 and 2008. We looked at the indication for ET, status of the bladder function, grade and laterality of VUR, post operative complications, and success rate. Success was defined as either complete resolution or downgrading of VUR to grade 1.

Initially, all children diagnosed with VUR were questioned to obtain a history regarding frequency, urgency, incontinence, and constipation. If the child was diagnosed with non-neuropathic bladder sphincter dysfunction (NNBSD),® the child was started on a voiding day, program involving dietary changes, stool softeners, and anti-cholinergic medication at least one month before the procedure. This program was continued until the resolution of reflux and then tapered gradually, according to the symptoms.

Our routine procedure included a screening urine test to rule out acute urinary tract infection. The patient was then prepared for surgery. A single pre-operative prophylactic antibiotic according to weight was given with the induction of anesthesia.

The procedure was performed under general anesthesia with a tracheal mask, and caudal analgesia was performed for male patients. After routine cystoscopic preparation in the lithotomy position, a standard 10F angled offset cystoscope was introduced under visual control. The bladder was emptied of urine and partially filled with standard irrigation fluid.

Cannulation of the ureteric orifice was preserved only for bizarre-shaped ureteric orifices; otherwise, there was no need for routine ureteric cannulation. The ureteric orifice was checked for suitability for ET.

The injectable material was prepared according to the standard instructions. For Deflux®, the needle provided was flushed with sterile normal saline, connected to the syringe, flushed with material through the working channel, and then introduced for injection. The same procedure was performed with Macroplastique,® but the lubrication of the needle was performed with a special gel provided in the package; the injection was made with a gun made especially for this procedure.

In the initial five years, we injected just below the ureteric orifice. Later, we adopted the "HIT" technique[5], in which the needle is introduced inside the ureteric orifice with the bevel of the needle facing superiorly.

The injected volume varied from 0.5 to 1.3 ml per refluxing ureter until proper coaptation of the ureteric orifice was seen, with the ureteric orifice lying at the top of a mountain-shaped bolus (Fig1). If the desired configuration was not achieved after one injection, another was attempted with a different angle. The same procedure was performed on the other side in cases of bilaterality. The bladder was then drained and the procedure terminated.

The child was kept for 6 hours for observation, and another intravenous dosage of prophylactic antibiotics was given. The child was then send home with oral analgesia and a full dosage of antibiotics for 7 days. The family then continued the prophylactic antibiotic treatment until the child was seen after 2-3 months for a follow-up examination, which included an ultrasound and voiding cystourethrogram.

Results:

Between 1998 and 2008, we observed 321 patients with ET for VUR. This group included 115 male (35.8%) and 206 female (64.2%) patients with a total of 480 ureters. A total of 159 patients had bilateral VUR (49.5%), 68 had right-side VUR only, and 94 had left-side VUR only (Table 1).

Correction of VUR was defined as either the resolution of reflux or a downgrading to G1 upon follow-up VCUG and no ipsilateral renal or ureteric dilatation upon renal ultrasound. At 2-3 months of follow-up, VUR was corrected in 393 of 480 refluxing ureters (81.8%) after a single endoscopic injection. With a second, repeated injection in the failed cases, VUR was corrected in a total of 418 refluxing ureters (87.1%).

Among this group, correction of VUR after a single endoscopic injection occurred for 87% of patients in Grade I, 83.8% of patients in Grade II, 82.2% of patients in Grade III, 80.2% of patients in Grade IV, and 74.5% of patients in Grade V (Table 1). With repeat endoscopic injections, reflux correction occurred in 95% of patients in Grade I, 90.5% of patients in Grade II, 84% of patients in Grade III, 89% of patients in Grade IV, and 79.7% of patients in Grade V (Table 1). Unilateral reflux was corrected after a single endoscopic

procedure in 143 of 162 patients (88.2%), and bilateral reflux was corrected after a single endoscopic procedure in 125 of 159 patients (78.6%) (Table 2).

Two patients, both with a single kidney, became anuric after the injection. We had to place a ureteric stent in both patients for one month. After removal of the stents, the patients had normal urine output with no upper tract changes. One child who had undergoing prior surgical correction developed a high fever during the 24 hours after the procedure secondary to a urinary tract infection; this child required hospitalization for 48 hours. There were no episodes of postoperative toxicity or illness that might indicate adverse reaction to or migration of the implant.

Discussion:

Endoscopic injection of bulking agents for the treatment of VUR in children offers a viable alternative to open ureteral reimplantation, with good surgical results and minimal complications.[6,7] For many years, open surgery was the golden standard for the treatment of VUR that failed medical treatment due to its very high success and definite but low complication rate.[2]

The basic principle behind the endoscopic correction of VUR is that providing additional submucosal bulking to the subureteric space results in adequate coaptation of the ureteral orifice during active bladder filling and contraction. This then by prevents the retrograde flow of urine to the upper urinary tract.[6]

For an injectable biomaterial to be ideal, it must have specific qualities: 1) be non-toxic and stable without migration to vital organs, 2) cause minimal local inflammation, and 3) be well encapsulated by normal fibrous tissue and fibrocytes. The material should be easy to inject through a long needle that passes easily through most standard endoscopic instruments. It must be viscous enough to prevent leakage from the puncture site and maintain the

injected volume after the normal process of exchange and excretion of any carrier molecules.[6,7]

In the most recent years since the first report by O'Donnell and Puri,[4] ET for VUR has gained great popularity. It is becoming the method of choice for managing patients with primary VUR in need of surgical correction.[5,6,7,8] In general, ET is a shorter, minimally invasive procedure that is cost effective. It has a short learning curve, better accepted by patients and their families, and is associated with no reported post-operative complications.

Here, we report our experience using two widely-used bulking agents. Polydimethylsilone (macroplastique uroplasty, inc. Geleen, the Netherlands®) is a silicone elastomer that is soft and flexible when suspended in a bio-excretable carrier gel. It is widely used in Europe and North America.[7,8] The other bulking agent we employed was Dextranomer microspheres (Deflux, Q-Med Inc, Uppsal, Sweden), which are made of a network of cross-linked dextran polysaccharide molecules with a larger particle size (80-120 um).

These gained wide popularity as a bulking agent both in Europe and North America, where they became the first FDA-approved bulking agent for the treatment of VUR[5,6]

In our series, the 81.8% success rate after one injection and 87.1% success rate after the second injection make ET an excellent alternative to open surgical technique treatment for VUR.

The only instance in which we did not perform ET was when the ureteric orifice was too wide, where the bulking agent would not produce the desired coaptation of the ureteric orifice.

From our experience and the experience of other units worldwide, the learning curve is quite short and the procedure itself technically not demanding, with a low complication rate in our series (<1%). We believe that most urologists dealing with children will be comfortable with this procedure and should achieve a success rate similar to that reported here after a short period.

Conclusion:

From our experience, ET for VUR using newly available bulking agents is a reliable, safe alternative to open ureteral reimplantation for the treatment of VUR in children. This study suggests that the majority of patients will be cured after undergoing this out-patient, endoscopic procedure.

We believe that the widely reported safety of both agents and the short learning curve will make ET the initial standard treatment for VUR once surgical correction is warranted.

References:

1. Medical versus surgical treatment of primary vesicoureteral reflux: report of the international reflux study committee. Pediatrics 1981; 64: 392-400.
2. Elder JS, Peters CA, Arant BS Jr, Ewalt DH, Hawtrey CE, Hurwitz RS et al: Pediatric vesicoureteric reflux Guidelines Panel summary reporton the management of primary vesicoureteral reflux in children, J urol 1997; 157: 1846- 1851.
3. Al-Harthi A A .Chronic renal failure in children at Aseer Region, *Curr Pediatr Res 2009; 13): 5-7*
4. O'Donnell B and Puri P. Treatment of vesicoureteric reflux by endoscopic injection of Teflon. Br Med J 1984; 299: 7-9.
5. Cerwinka HC, Scherz HC, and Kirsch AJ. Endoscopic Treatment of Vesicoureteral Reflux with Dextranomer/Hyaluronic Acid in Children Volume 2008, Article ID 513854, 7 pages
6. Lackgren G, Wahlin N, Skoldenberg E and Stenberg A. Long term follow-up of children with dextranomer/hyalurouric acid copolymer for vesicoureteral reflux. J Urol; 2001;166:1887-1892.
7. Herz D, Hafez A, Bagli D, Caplicchio G, Mclorie G and Khoury A. Efficacy of endoscopic subureteral polydimethylsioloxane injectin for treatment of

vesicoureteral reflux in children: A North American Clinical Report. J Urol 2001; 166: 1880-1886.

8. Shulmann CC. Use of particulate silicone microimplants for the endoscopic correction of vesicoureteric reflux. Dialogues Pediatr Urol 1994; 17:11-15.

Fig1:

Endoscopic treatment of Vesicoureteric reflux;

1. hydrodistension of the ureter, 2. intraureteric injection, 3. mountain shape ureteric orifice post injection

Table 1:
Demographic data

No. of patients	321 M 115 F 206
VUR laterality	Bilateral 159 Right 68 Left 94
Refluxing ureters	480 ureters

Table 2:
Success rate of ET;
after the first injection; 87% in Grade I, 83.8% in Grade II, 82.2% in Grade III, 80.2% in Grade IV, and 74.5% in Grade V (Table 1).
With repeat endoscopic injections, reflux correction occurred in 95% in Grade I, 90.5% in Grade II, 84% in Grade III, 89% in Grade IV, and 79.7% in Grade V