
Endoscopic Treatment of Vesicoureteral Reflux Associated With Ureterocele

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Purpose: We determined the value of endoscopic treatment for vesicoureteral reflux associated with ureterocele.

Materials and Methods: From 1984 to 2005, 109 children with a median age of 6 months underwent endoscopic ureterocele puncture. Ureterocele presented as a part of a duplex system in 97 of patients (89%) and as part of a single system in 12 (11%). Vesicoureteral reflux was seen to the lower ipsilateral moiety in 53 patients and in 32 contralateral kidneys (85 refluxing renal units). Puncture was performed with a 3Fr Bugbee electrode. High grade vesicoureteral reflux or breakthrough infection while on antibiotic prophylaxis served as the indication for the surgical correction of vesicoureteral reflux. Median followup after endoscopic correction was 10 years (range 1 to 21).

Results: Spontaneous vesicoureteral reflux resolution following successful ureterocele puncture was seen in 36 of the 85 refluxing renal units (42%) and in 5 (6%) reflux was downgraded. The latter patients were withdrawn from antibiotic prophylaxis and they did well. A total of 33 refluxing renal units with vesicoureteral reflux into the lower moiety of the ureterocele kidney and 11 contralateral refluxing renal units underwent endoscopic correction. Reflux was corrected in 31 of the 44 refluxing renal units (70%) after a single injection and it resolved after a second injection in another 9 (21%). In 4 refluxing renal units (9%) endoscopic correction failed and open reimplantation was done. Of the 109 patients (13%) 14 had vesicoureteral reflux to the ureterocele moiety following endoscopic puncture. Of those patients endoscopic correction resolved reflux in 3, reflux resolved spontaneously in 5 and upper pole partial nephrectomy was performed in 4 due to a nonfunctioning moiety. The remaining 2 patients did well without antibiotic prophylaxis.

Conclusions: Our data show that endoscopic treatment of vesicoureteral reflux associated with ureterocele is a simple, long-term effective and safe procedure, avoiding the need for open surgery in the majority of patients following endoscopic puncture of ureterocele.

Key Words: ureter, ureterocele, vesico-ureteral reflux, endoscopy, hyaluronic acid

Recently surgical treatment for ureterocele has evolved from complicated major surgery to minimally invasive endoscopic treatment, namely endoscopic puncture.¹⁻³ However, some groups still advocate a routine aggressive surgical approach to ureterocele, including partial nephrectomy and open ureteral reimplantation.^{1,4} They justify this management based on a high percent of the patients who still have VUR to the lower moiety following puncture or frequently de novo reflux to the ureterocele moiety associated with breakthrough infection and a low incidence of spontaneous resolution. We previously reported our experience with endoscopic ureterocele puncture, describing a success rate of greater than 90% in terms of complete ureterocele decompression in 2 series.^{2,3} Moreover, a significant number of patients demonstrated a high ratio of spontaneous VUR resolution following successful puncture. In those who still have high grade VUR or breakthrough infection while on antibiotic prophylaxis, endoscopic correction of VUR was performed.

Although endoscopic treatment (STING) has a high success rate for primary VUR, to our knowledge its role for VUR

associated with ureterocele has not yet been explored. Therefore, we performed a retrospective study to evaluate the effectiveness of endoscopic treatment for VUR associated with ureterocele.

MATERIALS AND METHODS

We retrospectively reviewed the medical records of all patients who underwent primary endoscopic puncture of ureterocele at our 2 institutions from 1984 to 2005. A total of 109 consecutive children with a median age of 6 months (range 1 month to 14 years) underwent endoscopic ureterocele puncture. Ureterocele presented as part of a duplex system in 97 patients (89%) and as part of a single system in 12 (11%). Prenatal ultrasound detected hydronephrosis leading to the postnatal diagnosis of ureterocele in 41 patients (38%), whereas in the remaining 68 (62%) the diagnosis was made on investigation for UTI.

Our regimen of preoperative evaluation and postoperative followup was identical at the 2 institutions and it was previously published.^{2,3} Briefly, it included renal and bladder ultrasound, VCUG, and repeat renal scans with diethylenetriaminepentaacetic acid in the past, mercaptoacetyltriglycine-3 in the last decade and ^{99m}technetium dimercapto succinic acid. Kidney uptake of 45% to 55% of

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total renal activity was considered normal. VUR was seen in the lower moiety of the ipsilateral kidney in 53 cases and in 32 contralateral kidneys (85 RRUs). According to the International Classification System of the International Reflux Study Committee⁵ VUR was grades I to IV in 11, 46, 18 and 10 RRUs, respectively.

Puncture was performed using a 3Fr Bugbee electrode. All patients underwent renal and bladder scans 2 weeks following puncture. All patients received antibiotic prophylaxis until VCUG showed spontaneous VUR resolution or definitive treatment cured VUR. High grade VUR or breakthrough UTI while on antibiotic prophylaxis served as indications for surgical correction of VUR.

Endoscopic correction was initially performed using polytetrafluoroethylene as a tissue augmenting substance. After Food and Drug Administration approval in 2001 dextranomer/hyaluronic acid copolymer (Deflux®) was used. In patients with a duplex system and VUR into a lower moiety injection was performed by introducing the needle submucosally under the ureteral orifice of the upper moiety at the 6 o'clock position (see figure).^{6,7} In cases in which the gap between the 2 orifices was large, injection was done at the 6 o'clock position in the submucosal part of the refluxing ureter. In patients with grade I to III VUR we used the usual STING technique, while in those with grade IV VUR or a widely open orifice injection was performed inside the orifice, as we previously described.⁸ In patients with de novo reflux into the ureterocele moiety, requiring endoscopic correction, injection was performed by introducing the needle under the ureteral orifice when identified, and under the collapsed ureterocele when anatomical landmarks were not clearly recognized to achieve the volcanic appearance of the distal ureter.

VCUG was performed 3 to 6 months after endoscopic correction. Antibiotic prophylaxis was administered when VCUG showed no reflux. In those patients annual ultra-

<i>VUR outcome after endoscopic ureterocele puncture in 85 RRUs</i>	
Outcome	No RRUs (%)
Spontaneous resolution	36 (42)
Downgrading	5 (6)
Endoscopic correction after injection 1	31 (70)
Endoscopic correction after injection 2	9 (21)
Failed endoscopic treatment + open reimplantation	4 (9)

sound was performed as long-term followup. Median followup after puncture was 10 years (range 1 to 21).

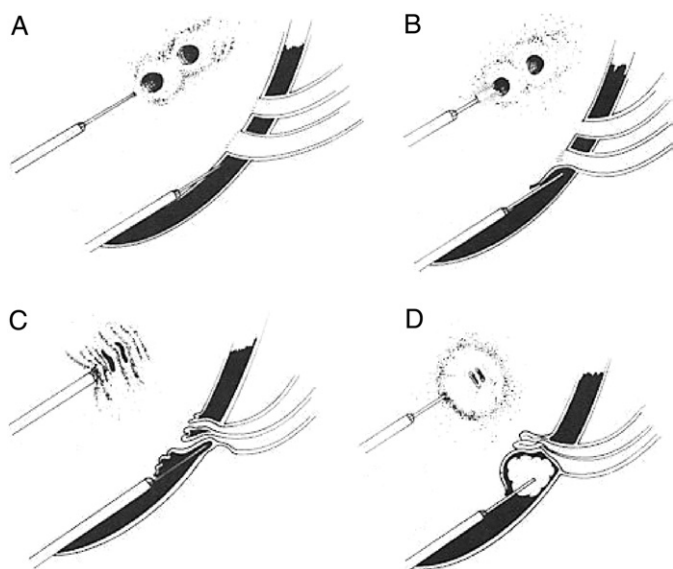
RESULTS

Spontaneous VUR resolution following successful ureterocele puncture was seen in 36 of the 85 RRUs (42%) and in 5 (6%) VUR was downgraded. The latter patients were withdrawn from antibiotic prophylaxis and they did well (see table). A total of 33 RRUs with VUR into the lower moiety of the ureterocele kidney and 11 contralateral RRUs underwent endoscopic correction. Of those 44 RRUs 18 (41%) underwent STING using polytetrafluoroethylene as a tissue augmenting substance. The remaining 26 RRUs (59%) received STING with Deflux. Reflux was corrected in 31 of the 44 RRUs (70%) after a single injection and it resolved after a second injection in 9 (21%). In 4 RRUs (9%) endoscopic correction failed. Those patients underwent open reimplantation.

Of the 109 patients 14 (13%) had VUR to the upper ureterocele moiety following endoscopic puncture. Eight children had an ectopic ureterocele and 6 had an intravesical ureterocele associated with a duplex system before puncture. There was no difference in reflux grade between children with an ectopic vs an intravesical ureterocele. In 3 patients endoscopic correction resolved VUR, while reflux resolved spontaneously in 5 cases and upper pole partial nephrectomy was performed in 4 due to a nonfunctioning moiety at the beginning of our learning curve. The remaining 2 patients with a poorly functioning kidney did well without antibiotic prophylaxis. Five patients (4.5%) had lower UTI following successful endoscopic correction of VUR during long-term followup. In none of these children did repeat VCUG show recurrent VUR. No difference was observed in the outcome of surgery between children who underwent endoscopic correction using polytetrafluoroethylene vs Deflux as the tissue augmenting substance.

DISCUSSION

The concept of endoscopic VUR correction provides a minimally invasive treatment option for UTI or renal parenchymal damage associated with reflux.⁹ Since the introduction of STING 2 decades ago and Deflux approval by the Food and Drug Administration as a suitable implant for subureteral injection, endoscopic correction of VUR has become first line treatment in the majority of children with primary and secondary VUR.^{10,11} The wide use of minimally invasive approaches has changed the management not only of VUR, but also of different congenital anomalies. We and others have reported high success with endoscopic puncture of ureterocele.¹⁻³ Endoscopic treatment of obstructive ureterocele has become an initial



Endoscopic correction technique in duplex system with upper ureterocele and VUR of lower moiety. Technique is identical to that for duplex system.^{6,7} A, needle is inserted under ureterocele moiety orifice. B, needle is introduced at 6 o'clock position. C, whole needle length is introduced under 2 ureters. D, implant position after injection.

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