



Comparison of treatment modalities for urinary tract dilatation in children: Open versus endoscopic surgery

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ABSTRACT

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Our aim is to evaluate the efficiency and outcomes of endoscopic surgery (ES) and open surgery (OS) in children with urinary tract dilatation (UTD). Between February 2009 and June 2014, 77 patients (41 male, 36 female) with UTD underwent either an OS or ES. The age, gender, final diagnosis, type of surgery, postoperative problems (hematuria, fever, urinary tract infection and length of hospital stay (LOS) are retrospectively evaluated. The ES for UTD causes less pain, less hematuria, decreased LOS after surgery. ES is superior in terms of postoperative pain management, morbidity and LOS in selected conditions.

Keywords:

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1. Introduction

Endoscopic procedures have gained popularity in pediatric population as in adults in the treatment of urinary tract dilatations (UTD). Main causes of UTD in children are urinary stones, vesicoureteral reflux (VUR), ureterocele, trauma, congenital stenosis including ureterovesical stenosis and posterior urethral valves. Endoscopic techniques have been performing more frequently in the recent years for diagnostic and treatment purposes of these conditions.

In the current study, our aim is to compare

endoscopic and open surgery (OS) in terms of postoperative complications, length of stay (LOS), reliability and efficacy in children with UTD.

2. Patients and methods

This study included 77 children with UTD between 2009 February and 2014 June. Patients' age, sex, diagnosis, type of surgery, postoperative analgesia requirement, postoperative hematuria, urinary tract infection (UTI), length of stay were evaluated. Results of both open and endoscopic surgeries were compared.

SPSS® 15.0 package software was used for descriptive analysis and analysis of variance.

Table 1. Number and etiology of patients with urinary obstruction

	VUR	Stones	UVO	Ureterocele	PUV	Trauma
n	45	16	8	3	3	2

VUR: Vesicoureteral reflux; **UVO:** Ureterovesical obstruction; **PUV:** Posterior urethral valve

3. Results

Of the 77 patients, 41 were male and 36 were female. Mean age of the patients was 81.03 months (4 to 204 months). The underlying cause of the obstruction was VUR in 45 patients; urinary stones in 16 patients, ureterovesical obstruction (UVO) in eight patients, ureterocele in three patients, posterior urethral valve (PUV) in three patients and urinary tract trauma in two patients (Table 1). Fifty nine patients underwent endoscopic procedures while 18 underwent open procedures. Thirty six patients with VUR underwent endoscopic STING procedure as initial treatment. Eight of them required a subsequent OS due to failure. Nine patients with VUR underwent primary OS due to co-existing conditions such as neuropathic bladder and paraureteral diverticulum.

Ten of the urinary tract stones were located at the distal ureter, six at the renal pelvis and or calyceal system. The mean stone diameter was 12 mm (8 to 24 mm). Twelve of the patients with urinary stones underwent endoscopic surgery (ES) and ten were regarded stone-free after the intervention (basket retrieval has used in eight and fragmentation alone in two). Four patients with urinary stones underwent OS. One patient had 5 and 10-mm stones at the lower pole of the kidney; three patients had 10, 15 and 20-mm stones at the renal pelvis. Two patients were converted from ES to OS.

Of the 45 patients with VUR, 36 had endoscopy and nine had OS as initial treatment. In three of the patients with UVO, we placed JJ catheter via cystoscopy and the remaining were treated by OS.

The patients with ureterocele, posterior urethral valve and urinary tract trauma have been managed through ES as initial treatment modality. One patient with trauma underwent OS after the initial intervention.

In the two patients with posttraumatic urethral stenosis, we performed balloon dilatation with the aid of rigid cystoscope and a guide-wire. No morbidity was encountered after the procedure except a transient hematuria in one patient.

The mean LOS was 1.2 days (1-5 days) in the endoscopy group while it was 6.5 days (1-12 days) in the OS group ($p < 0.05$).

Two patients in the endoscopy group had postoperative fever ($>38^{\circ}\text{C}$) and one of them had culture

proven UTI. Four in the OS group had postoperative fever and two of them had culture proven UTI. There was no significant difference in terms of postoperative UTI and fever ($p > 0.05$). Eight patients who underwent endoscopy required pain medication in the first postoperative day (13.5%) while 17 patients in the OS group required pain medication for about three days postoperatively (94.4%). The difference is significant between the groups ($p < 0.05$).

Fifteen patients who underwent OS had postoperative hematuria (83.3%) and mean duration of hematuria was four days. Meanwhile, eight patients undergone endoscopic procedures had transient hematuria postoperatively (13.5%) and hematuria lasted for three days in one of these patients. The number of postoperative hematuria was significantly lower in the endoscopy group ($p < 0.05$).

4. Discussion

There are many studies comparing endoscopic versus open techniques in limited aspects but few papers focus on the results on many different indications and they lack to examine the efficacy and safety sufficiently.

Although there are many studies investigating whether minimally invasive procedures are superior to conventional techniques, reliable conclusions could not be drawn because none of them are randomised, does not have enough follow up and the definitions for success, relapse and complications are variable.

Endoscopic management is regarded as the first line therapy for VUR in the last two decades since it has low complication rates with comparable success rates (excluding higher degrees of VUR) and shorter surgery duration. Employing different injection materials remains controversial in dilating reflux due to conflicting recurrence and complication rates. The risk of postoperative ureteric obstruction is less than 0.5% (O'Donnell and Puri, 1984; Puri and O'Donnell 1984; Başaklar, 2000; Lendvay et al., 2006; Moreno Román et al., 2008; Ziesel et al., 2012). Meanwhile some authors have doubts about these results in terms of cost-effectiveness, long term success and inadequate data about clinical results (Saperston et al., 2008).

There are many studies on the efficacy and safety of endoscopic lithotripsy (both with rigid and flexible endoscopes) in the treatment of urinary tract stones of children. Ureteral strictures or perioperative ureteric injuries are among the rare complications (Caione, 1990; Grasso et al., 1995; Minevich et al., 1997; Fabrizio et al., 1998; Minevich, 2001).

Gedik et al. (2008) evaluated the efficacy of ureterorenoscopy in 44 patients. Forty two patients with ureteric stones underwent pneumatic lithotripsy and all were stone-free after the procedure while two patients underwent OS since their stones were located at the upper urinary tract.

Erturhan et al. (2007) also reported successful results on rigid cystoscopy with forceps extraction and pneumatic lithotripsy. They observed mucosal injury and bleeding in a minor group of patients.

Two pediatric case series reported one ureteric perforation and one intramural stenosis in a megaureter, moderate fever in five patients, urinary retention in one and ureteric perforation in one other patient during endoscopic urinary stone surgery (Delakas et al., 2001; Raza et al., 2005). El-Assmy et al. (2006) needed ureteral orifice dilation in ten patients among their 32 patients during ureterorenoscopy. No postoperative stricture was observed at the site of the stone location and they had one postoperative hematuria with one postoperative renal colic as perioperative morbidity. In our patients with urinary stones, all distal ureteric stones were managed endoscopically and no complication is encountered while proximal stones (renal pelvis, calyces) usually underwent OS.

Urinary stone disease is a highly relapsing disease and significant number of patients will require multiple surgical interventions for urinary stones, endoscopic procedures must be preferred if suitable to avoid from the sequelae and morbidity of multiple operation without

forgetting the rare but devastating complications related with these so called "simple" procedures (Komjakov and Guliev, 2015).

Although some authors reported longer definitive resolution durations (7 months vs. 122 months) and higher complication rates (10% vs. 82%) with more surgical procedures in endoscopic management of urethral injuries (Tausch et al., 2014; Tausch et al., 2015), we believe that initial endoscopic management is a safe and effective way as it can be converted to OS at any time and it may facilitate the subsequent open procedure.

In our study, in line with the literature, the need for postoperative pain management, the duration of the postoperative hematuria and the length of stay, frequency of postoperative fever and urinary tract infections were found less in endoscopic procedures compared to open procedures. Complication rates were also lower in endoscopic procedures.

In conclusion, endoscopic procedures can be safely performed by experienced surgeons in any age group and has many advantages in terms of reproducibility, length of hospital stay, analgesia requirement, related morbidity and cost-effectiveness.

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