IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 16, Issue 8 Ver. I (Aug. 2017), PP 74-76
www.iosrjournals.org

Role of Tamsulosin in The Medical Expulsive Therapy of Urinary Calculi in Children

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Abstract
Objectives: *To evaluate the efficacy of tamsulosin in ureteric stone expulsion in children based on the proven efficacy of tamsulosin in medical expulsive therapy for adult distal ureteric calculi.*
Patients and methods: *67 children presenting with distal ureteric stone of size <1 cm on unenhanced computed tomography from August 2013 to July 2016 were included in the study. The patients were randomised into two groups,with group 1 (33 patients) receiving tamsulosin 0.4 mg and a NSAID analgesic, and group 2 (34) receiving NSAID only. They were followed up for 4 weeks.For patients with uncontrolled pain, recurrent urinary tract infection, hypersensitivity to tamsulosin and failure of stone passage after 4 weeks of conservative treatment endourological treatment was done.*
Results: *63 children completed the study.There were no statistically significant difference between the groups in terms of patient age, body weight and stone size,the mean (SD) of which was 6.52 (1.8) mm in group 1 vs. 6.47 (1.79) mm in group 2 (P = 0.9). The mean (SD) time to stone expulsion in group 1 was 7.7 (1.9) days, vs. 18 (1.73) days in group 2 (P < 0.001). The analgesic requirement (mean number of ketorolac injections) in group 1 was significantly less than in group 2, at 0.55 (0.8) vs.1.8 (1.6) (P < 0.001). The stone-free rate was 87% in group 1 and 63% in group 2 (P = 0.025).*
Conclusions: *Tamsulosin can be safely and effectively used as a medical expulsive therapy for children with ureteric calculi,as it facilitates spontaneous expulsion of the calculus.*

I. Introduction

There is an overall increase in the incidence of urolithiasis in children, mostly due to changes in dietary habits, climate changes, and the widespread use of ultrasonography (US) for examination of nonspecific conditions. Generally the incidence of paediatric urolithiasis is 2–3%.With the development of smaller and more durable endoscopic equipment, the management of ureteric stones in children has developed from open stone surgery to minimally invasive procedures [3]. One approach to the treatment of ureteric calculi is observation, with pharmacotherapy used to relieve any pain. This might be a good choice, as it avoids the risk of anaesthesia and the cost of interventional techniques [4]. Several studies reported that medical expulsive therapy (MET) is effective in promoting the passage of distal ureteric stones in adults.But studies in pediatric population are sparse. The aim of the present study was to evaluate the efficacy of tamsulosin in promoting the spontaneous expulsion of distal ureteric stones in children.

II. Materials And Methods

Inclusion criteria:

From August 2013 to July 2016, 67 children presenting to Surgical outpatient department with distal ureteric stone of size less than 1 cm as assessed by unenhanced CT, were included in the study.

Exclusion criteria:

Children with bilateral ureteric stones, multiple stones, marked hydronephrosis, UTI, urinary tract anomalies, voiding dysfunction, and any previous open or endoscopic ureteric surgery were excluded from the study. All patients were fully evaluated by a detailed history, physical examination, laboratory examinations (urine analysis, blood urea and serum creatinine levels), and radiological tests (a plain abdominal film, urinary tract US, and unenhanced CT of the abdomen and pelvis). The patients were randomised into two groups; group 1 included 33 patients who received tamsulosin 0.4 mg and ibuprofen, and group 2 included 34 patients who received ibuprofen only. Tamsulosin was administered using an arbitrary dose of 0.4 mg for patients aged >5 years and 0.2 mg for younger children. The drug was given at bedtime. We discussed with families the off-label use of tamsulosin and the possible side-effects, e.g., headache, dizziness, rhinitis, back pain, somnolence and

sinusitis. The ibuprofen dose was 4–10 mg/kg orally every 6–8 h as needed. In the case of intractable pain, ketorolac 0.5–1 mg/kg was given intramuscularly. The blood pressure (BP) with the child seated was measured before the administration of therapy and at each subsequent visit, to record any change in haemodynamics.

The guardians of enrolled children were advised to give their children the study medication, and to filter the child's urine to detect passed stones.Also, they used a diary to record the amount of required analgesics, the number pain attacks, the time of stone expulsion, and any side-effects of study medication. The patients were assessed clinically every week with a measurement of BP, urine analysis, a plain film if the stone was radio-opaque, and with US if the stone was radiolucent. A radiolucent lower ureteric stone can be assessed by US directly by looking at an acoustic shadow with a negative background, and indirectly by looking at hydronephrosis proximal to the stone. The results were analysed statistically using an independent Student's t-test for parametric data and the Mann–Whitney U-test for nonparametric data, after using the Kolmogorov–Smirnov test of normality. In all analyses $P < 0.05$ was considered to indicate statistical significance.

III. Results

Of the 67 children, four were lost during the follow-up and so 63 patients were included in the evaluation.There were no statistically significant differences in age, body weight and stone size between the groups.In group 1 there was a statistically significant advantage in the mean time to stone expulsion ($P < 0.001$; Table 1). The mean number of daily pain episodes in group 1 was significantly less than in group ($P = 0.03$; Table 1), and the analgesic requirement (mean number of ketorolac injections during the study) in group 1 was significantly less than in group 2 ($P < 0.001$). The values of BP were within normal levels in all children during the study period, with no significant differences between the groups ($P = 0.8$; Table 1).

Table 1 : Results of the study

Mean (SD), *n* or *n* (%) variable	Group (*n*)		
	1 (31)	2 (32)	*P*
Age (years)	7.7 (3.02)	7.25 (2.70)	0.5
Male	17 (55)	19 (59)	
Female	14 (45)	13 (41)	
Weight (kg)	22.1 (5.8)	23.0 (5.6)	0.5
Stone size (mm)	6.52 (1.8)	6.47 (1.79)	0.9
<5	9	7	
>5	22	25	
Right	14	18	
Left	17	14	
BP (mmHg)			
Systolic	93.6 (10.0)	94.1 (10.0)	0.8
Diastolic	61.1 (6.2)	62.7 (5.8)	0.8
Time to stone	7.7 (1.9)	18 (1.73)	<0.001
Expulsion (days)			
Daily pain	1.6 (1.6)	2.5 (1.9)	0.03
Episodes (*n*)			
Analgesic requirement*	0.55 (0.8)	1.8 (1.6)	<0.001
Stone-free rate (%)	87	63	0.025

IV. Discussion

The recent miniaturisation of ureteroscopes and growing endourological expertise has resulted in greater success in the management of ureteric stones in children by ureteroscopy. However, ureteroscopy is associated with the risk of anaesthesia and the probability of ureteric trauma and stricture. There are several factors affecting the chance of spontaneous passage of distal ureteric calculi, such as the size, site and number of stones, and ureteric spasm and oedema. Stone size has been reported to be the main predictive factor for the spontaneous passage of ureteric stones, with a linear relationship .Pietrow et al [3] concluded that the passage rate of ureteric stones is consistent in adults and children, with stones of >5 mm unlikely to pass spontaneously. Alpha-Blockers have been used as MET for ureteric stones, suggested by many physiological studies. The ureteric smooth muscles are supplied with a-adrenergic receptors,especially in the distal third of the ureter.Alpha-Adrenergic blockers inhibit basal smooth muscle tone and hyper-peristaltic uncoordinated frequency, with no effect on tonic propulsive contractions [4]. Since 2002, several studies have reported the beneficial effect of alpha-blockers in increasing the likelihood of the spontaneous passage of ureteric stones, as alpha-blockers lower the ureteric muscle tone and intramural pressure. Donohoe et al. [5] used alpha-blockers in children with primary bladder neck obstruction, reporting that alpha-blockers were effective and well tolerated, especially tamsulosin, with no major adverse effects (palpitation, or postural hypotension). Also, they reported

mild to moderate degrees of headache, somnolence, nasal congestion or dizziness in 75% of children treated with alpha-blockers.

45 children with a distal ureteric stone were enrolled in a study by Erturhan et al. [6] and randomised into two groups, the first treated with ibuprofen and the second with ibuprofen and doxazosin. The stone-free rate was significantly higher in the second group, with statistically significantly fewer colic attacks and quicker stone passage. In a multi-institutional retrospective study, Tasian et al. [7] concluded that the rate of spontaneous expulsion of ureteric stones was higher in children who received tamsulosin than in those managed by analgesics only. They also noted that there were no side-effects related to tamsulosin use. Lojanapiwat et al. [8] reported that tamsulosin at a low dose (0.2 mg daily) and standard dose (0.4 mg daily) for distal ureter calculi was effective as MET, with no significant difference between the doses. In the present study the dose of tamsulosin in children aged <5 years was 0.2 mg daily, whilst in older children it was 0.4 mg daily. Tamsulosin significantly increased the spontaneous stone expulsion rate within a short time (87% vs. 63%, P = 0.025), and significantly decreased the number of colic episodes and the need for analgesics.

V. Conclusion

Based on the present study, tamsulosin seems to be a safe therapy that facilitates the spontaneous passage of stones in children.In conclusion, tamsulosin as MET for a ureteric stone in children is safe and effective, as it facilitates spontaneous expulsion of the stone.

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