Is Tamsulosin Effective after Shock Wave Lithotripsy for Pediatric Renal Stones? A Randomized, Controlled Study

Ahmed Shahat, Ahmad Elderwy, Ahmed S. Safwat,* Islam F. Abdelkawi, Ahmed Reda, Yasser Abdelsalam, Mohamed Sayed and Hisham Hammouda

From the Pediatric Urology Section, Urology Department, Assiut Urology and Nephrology Hospital, Assiut University, Assiut, Egypt

Abbreviations and Acronyms

NCCT = noncontrast computerized tomography

SWL = shock wave lithotripsy

Accepted for publication November 12, 2015.

No direct or indirect commercial incentive associated with publishing this article.

The corresponding author certifies that, when applicable, a statement(s) has been included in the manuscript documenting institutional review board, ethics committee or ethical review board study approval; principles of Helsinki Declaration were followed in lieu of formal ethics committee approval; institutional animal care and use committee approval; all human subjects provided written informed consent with guarantees of confidentiality; IRB approved protocol number; animal approved project number.

* Correspondence: Pediatric Urology Section, Urology Department, Assiut Urology and Nephrology Hospital, Assiut University, Assiut 71516, Egypt (telephone: (+20) 106-414-7477; FAX: (+20) 88-233-3327; e-mail: assafwat@gmail.com).

Purpose: We assessed the effect of tamsulosin as an adjunctive therapy after shock wave lithotripsy for pediatric single renal pelvic stones.

Materials and Methods: A total of 120 children with a unilateral single renal pelvic stone were included in a prospective randomized, controlled study. All children were randomized to 2 equal groups. Group 1 received tamsulosin (0.01 mg/kg once daily) as adjunctive therapy after shock wave lithotripsy in addition to paracetamol while group 2 received paracetamol only. Stone clearance was defined as no renal stone fragments or fragments less than 3 mm and no pelvicalyceal system dilatation.

Results: Our study included 69 boys and 51 girls with a median age of 3.5 years and a median stone size of 1.2 cm. There was no statistically significant difference between groups 1 and 2 in stone or patient criteria. Of the children 99 (82.5%) achieved stone clearance after the first session, including 50 in group 1 and 49 in group 2. All children in each group were cleared of stones after the second session. The overall complication rate was 14.2%. There was no statistically significant difference between single session stone clearance rates ($p = 0.81$) and complications rates ($p = 0.432$) in either group. On multivariate analysis using logistic regression smaller stone size ($p = 0.016$) and radiopaque stones ($p = 0.019$) were the only predictors of stone clearance at a single shock wave lithotripsy session. Tamsulosin therapy did not affect stone clearance ($p = 0.649$).

Conclusions: Tamsulosin does not seem to improve renal stone clearance. Smaller and radiopaque renal stones have more chance of clearance after shock wave lithotripsy for pediatric single renal pelvic stones.

Key Words: kidney, ureter, nephrolithiasis, lithotripsy, tamsulosin

THE incidence of urolithiasis in childhood and awareness of this problem have been increasing in recent decades.[1,2] Since its introduction in the early 1980s,[3] SWL has been a popular and well tolerated method for treatment of renal stones. Its efficacy in clearing of renal stones in children has been reported with a stone-free rate of 70% to 96%.[4–7]

Tamsulosin has been recognized to be effective as a medical expulsive therapy for urolithiasis, given that α-adrenergic receptors mediate ureteral peristalsis.[8–10] Its efficacy in increasing spontaneous passage of ureteral stones in children has been reported.[11,12]

There are many reports of using tamsulosin as adjunctive therapy

0022-5347/16/1954-1284/0
THE JOURNAL OF UROLOGY®

http://dx.doi.org/10.1016/j.juro.2015.11.021
Vol. 195, 1284-1288, April 2016
Printed in U.S.A.

after SWL for renal stones in adults.[13,14] It has been shown to shorten stone expulsion time and improve pain management.[15] However, its effect on overall stone expulsion and the clearance rate is controversial.[16] Furthermore, the ureters of children have the ability to pass larger stones than adult ureters,[17,18] which may affect the benefit of tamsulosin.

In this study we aimed to assess the effect of tamsulosin as adjunctive therapy after SWL in children.

PATIENTS AND METHODS

A prospective randomized, controlled study was performed between October 2012 and August 2014 after receiving approval from our institutional ethics committee. Our study included patients younger than 14 years with a single unilateral renal pelvic stone. Renal ultrasound, plain x-ray of the kidneys, ureters and bladder, and NCCT were used to diagnose and assess the stones. Stone size was defined as the longest dimension on NCCT. Patients with a bleeding tendency, a branched stone, a solitary kidney, an anomalous kidney (ectopic, fused or malrotated), previous ipsilateral renal or ureteral surgery, an ipsilateral ureteral stent, moderate/marked hydronephrosis with cortical thinning or renal insufficiency (estimated glomerular filtration rate less than 60 ml/minute/1.73 m^2 using the bedside Schwartz formula) were excluded from analysis.

A total of 412 children were assessed for eligibility. The study included 120 patients who were randomized to 2 equal groups of 60 each using the closed envelope randomization method. Sample size was calculated using Epi Info™, version 3.5. To detect a 15% difference between the 2 groups with 90% power and a threshold of significance of 0.05 the sample size had to be 106 patients (53 per group).

Patients in both groups underwent an outpatient SWL procedure under general anesthesia using the Dornier-S® lithotripter with a power of 14 to 16 kV at a rate of 70 to 80 shocks per minute. Each session consisted of 1,500 to 2,200 shocks. All patients received a single dose of first-generation cephalosporin (50 mg/kg) intravenously before induction.

All patients received a 15 mg/kg dose of paracetamol orally every 8 hours for 5 days and were instructed to maintain a high oral fluid intake. Children in group 1 (study group) received tamsulosin at a dose of 0.01 mg/kg once daily for 3 weeks. The dose of tamsulosin was obtained by breaking the capsule and sprinkling the granules of the drug into a drink. Side effects of off label use of tamsulosin were discussed with parents.

Regular followup and evaluation of the outcome were done by urinalysis and renal ultrasound 3 and 6 weeks after the SWL session. Stone clearance was defined as no renal stone fragment greater than 3 mm and no pelvicalyceal system dilatation. In case of residual renal stone fragment(s) greater than 3 mm after 6 weeks the patient underwent a second session of SWL. In case of persistent/new pelvicalyceal system dilatation at the 3 to 6-week followup visit NCCT was performed to detect any ureteral stone fragment. If found, it was managed conservatively by the same adjunctive therapy for another 4 weeks before deciding to perform ureteroscopic stone disintegration and extraction.

Statistical analysis was done using Intercooled STATA®, version 9.2. The 2 groups were compared regarding patient and stone criteria, and procedure details. Continuous variables were compared using the Mann-Whitney U test with values shown as the median and IQR. Categorical variables were compared using the Pearson chi-square or Fisher exact test. Multivariate logistic regression analysis was used to identify variables independently associated with single SWL session stone clearance with $p < 0.05$ considered statistically significant.

RESULTS

Our study included 69 boys and 51 girls with a mean ± SD age of 4.04 ± 2.5 years (range 1 to 13). Stones were in the right kidney in 72 children and in the left kidney in 48. Mean stone length was 1.19 ± 0.28 cm (range 0.6 to 2.2). On x-ray 82 stones were radiopaque and 38 were radiolucent. Of the radiopaque stones 64 were faint in comparison to the last rib. On NCCT mean stone density was 575.5 ± 206 HU (range 190 to 1,200). During SWL stones were localized using ultrasound in 107 patients and x-ray in 13. There was no statistically significant difference between groups 1 and 2 in patient or stone criteria, or procedure details (table 1).

Table 1. *SWL in children with single renal pelvic stone who received adjuvant tamsulosin vs controls*

	Tamsulosin	Control	p Value
No. pts	60	60	
Median yrs age at presentation (range)	3.5 (2.5—5)	4 (2—5)	0.788
% Male	60	55	0.580
% Rt side	58.3	61.7	0.709
% Radiolucent stone	26.7	36.7	0.472
Median HU stone density (range)	554 (454—735)	565 (396—705)	0.603
Median mm stone length (range)	12 (9.5—14)	12 (10—14)	0.215
% Mild hydronephrosis	53.3	48.3	0.584
% SWL ultrasonic localization	95	83.3	0.075
% Single SWL session success	83.3	81.7	0.810
Median total No. shocks/pt to complete clearance (range)	2,000 (1,900—2,140)	2,000 (1,985—2,200)	0.472