

## Original Research Article

# A study of predicting factors and medical expulsion therapy for solitary lower ureteric calculi

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### ABSTRACT

**Background:** The aim of our study is to evaluate the outcome of medical expulsion therapy (MET) for lower ureteric calculi and assess the clinical, laboratory and radiological factors that predict conservative approach. We evaluated the efficacy of combined drug therapy with alpha 1 adrenergic receptor antagonist tamsulosin and corticosteroid deflazacort for MET therapy for lower ureteric calculi.

**Methods:** A prospective randomized control study was conducted in the department of surgery urology wing on out patients (OPD) basis at IIMSR Medical College Warudi District Jalna a tertiary referral center after approval from the ethical committee. The study conducted between 01 January 2020 to 31 December 2023 over period of three years. Total 76 cases included with the age 18 years old and above. The patients were examined weekly with ultrasonography and kidney ureter bladder (KUB) for 4 weeks and the stone expulsion rate and time, pain episodes during follow-up period, total diclofenac dosage and the need for any intervention was noted close monitoring and timely follow up is mandatory counselling and selection of patient is key factor.

**Results:** Stone expulsion with patients on MET was 84% which is higher as compare to another group 57%.

**Conclusions:** Medical therapy with a combination of  $\alpha$ -adrenergic blocker and corticosteroid is associated with good stone expulsion rates and should be considered in all patients with lower ureteral stones of size less than 10 mm who are not having any contraindications for medical therapy provided close monitoring and timely follow up is mandatory counselling and selection of patient is key factor.

**Keywords:** Tamsulosin, KUB, Stone, Ureteric calculi

### INTRODUCTION

Urolithiasis affects 5-15% of the population worldwide.<sup>1</sup> Although as the literature reports the disease frequency tends to increase in the western countries but a significant burden of the disease also exists in this part of the world. The stones may be present anywhere along the urinary tract; the pelvicalyceal system or in the ureter which may be proximal ureter or distal ureter, with the point of division being the narrow part of the ureter over the iliac vessels. Ureteral calculi most commonly present with symptoms of acute renal colic. If urgent intervention is not needed, the patient and clinician must decide whether to intervene or proceed with expectant management. The likelihood of spontaneous passage decreases as stone size

increases.<sup>2</sup> An extensive meta-analysis found that most ureteral calculi <5 mm in diameter will pass through the urinary tract spontaneously.<sup>3</sup> Spontaneous passage usually occurs within four weeks after the onset of symptoms.<sup>3</sup> Several factors are thought to influence the spontaneous passage of ureteral stones, such as stone size, configuration and location, smooth muscle spasm, submucosal edema, and anatomy.<sup>4,5</sup> To facilitate the spontaneous passage of these ureteral calculi, many pharmacological agents like adrenergic blockers, calcium channel blockers, prostaglandin synthesis inhibitors, glyceryl trinitrate and steroid treatment to relieve edema are being used with varying efficacy rates.<sup>6-8</sup> Currently  $\alpha$ -adrenergic receptor antagonists represent the treatment of choice for lower urinary tract symptoms, as shown in many randomized

controlled trials as well as in several studies.<sup>6,9-11</sup> They act by inhibiting the basal tone, peristaltic wave frequency and the ureteral contraction in the intramural parts of the ureter. The duration of the stone expulsion rate with a medical therapy depends not only on the effectiveness drug itself but also on the patient compliance with the medicine and their follow up particularly in a socioeconomically poor country like India. We therefore studied the effectiveness of combination pharmacological therapy in spontaneous stone expulsion in cases of distal ureteral calculi in tertiary care rural hospital in the Marathwada region of Maharashtra.

**METHODS**

A prospective randomized control study was conducted in the department of surgery urology wing on out patients (OPD) basis at IIMSR Medical College Warudi District Jalna a tertiary referral center after approval from the ethical committee, the study conducted between 01 January 2020 to 31 December 2022 over period of three years. Total 76 cases included with the age 18 years old and above. The patients were examined weekly with ultrasonography and KUB for 4 weeks and the stone expulsion rate and time, pain episodes during follow up period, total diclofenac dosage and the need for any intervention was noted close monitoring and timely follow up is mandatory counselling and selection of patient is key factor.

A total of 76 patients above age of 18 years, all having radiographic evidence of stone in the lower ureter were included in the study. Biochemical and hematological evaluation of all patients was obtained before the treatment and complete urine analyses was performed before, during and after treatment. All patients were evaluated with X-rays of the kidneys, ureters, bladder and urinary system ultrasonography before the treatment. Stone size was recorded for each patient before starting treatment. Patients having radiolucent stones, severe hydronephrosis, diabetes, ulcer disease and patients who had had distal ureter surgery were excluded from the study. The patients were then started on a combination drug therapy with an adrenergic blocker (tamsulosin 0.4 mg) daily continued for 1 month; a corticosteroid (deflazacort 6 mg) daily for 10 days and an analgesic (diclofenac oral) given on demand. All patients were advised to consume high fluid intake so as to have at-least 2 to 2.5 litres of urine output in 24 hours. The patients were examined weekly with ultrasonography and KUB for 4 weeks and the stone expulsion rate and time, pain episodes during follow up period, total diclofenac dosage and the need for any intervention was noted.

**Inclusion criteria**

Symptomatic patients, unilateral, solitary calculi, lower ureteric stone (stone at or below ischial spine on KUB), and patients with calculi less than 10 mm were included.

**Exclusion criteria**

Radiolucent calculi, associated with UTI, patients with fever, renal failure patients either acute or chronic, patients having history of previous surgery or intervention, patients with uncorrected distal obstruction, women with diagnosed pregnancy or breast-feeding mother, calculi more than 10 mm at maximum diameter at major axis, stone in the ureter draining solitary kidney either anatomically or functionally, patients with abnormal renal tract anomalies i.e., horseshoe kidney, duplex PCS, patients who are all-ready on alpha blockers for LUTS or on PDE5 inhibitors, contraindications or allergy to drugs total 76 patients of, lower ureteric calculi divided equally in to control and study group prior to study all patients underwent complete blood count (CBC), kidney function test (KFT), liver function test (LFT), complete urine exam, urine culture KUB and ultrasonography (same radiological team) were excluded. In Table 1, the patients are divided into two groups with evaluation and diagnosis and particular management prescribed for the patient with timely follow-up.

**Table 1: Distribution of two groups including patients for treatment as per regimen and follow up.**

Sr. no.	Group 1	Group 2
1	Included 38 patients	Included 38 patients
2	Included diagnosis	Counselling evaluation diagnosis
3	High fluid intake so as to urine output 2500 to 3000 ml in 24 hours	High fluid intake
4	Inj. diclofenac IM followed by tablet meftal spas twice for 10 days	Cap urimax 0.4 mg (tamsulosin) 4 weeks, tab enzocort 6 mg (deflazacort) twice 10 days, tab meftal spas twice 10 days

**RESULTS**

Male-female ratio was found to be 50/26. Age group of the study population was 20 years and above. Size of the calculi was less than 10 mm and (5 to 10 mm). Stone localization was in the right and left. Majority of patients in this study were males with male to female ratio being 2.3:1 (Table 2).

**Table 2: Distribution of patients among sex and side.**

Parameters	A control group		B study group	
	Male	Female	Male	Female
Right	8	5	8	5
Left	17	8	17	8
Total	25	13	25	13

**Table 3: Distribution of patients according to stone size.**

Size of the stone (mm)	Group A control	Group B study
5	8	4
6	8	8
7	6	10
8	8	9
9	4	5
10	4	2

**Table 4: Distribution according to size and expulsion time in number of days.**

Size of the stone (mm) and expulsion time (days)	Group A control	Group B study
<b>5</b>	(n=8)	(n=4)
<7	5	2
7-14	3	2
14-21	-	-
21-28	-	-
Stone not passed	0	0
<b>6</b>	(n=8)	(n=8)
<7	2	3
7-14	1	2
14-21	2	2
21-28	1	1
Stone not passed	2	0
<b>7</b>	(n=6)	(n=10)
<7	-	2
7-14	2	2
14-21	2	4
21-28	1	2
Stone not passed	1	0
<b>8</b>	(n=8)	(n=9)
<7	-	-
7-14	1	4
14-21	1	2
21-28	1	2
Stone not passed	5	1
<b>9</b>	(n=4)	(n=5)
<7	-	-
7-14	-	-
14-21	-	1
21-28	-	1
Stone not passed	4	3
<b>10</b>	(n=4)	(n=2)
<7	-	-
7-14	-	-
14-21	-	-
21-28	-	-
Stone not passed	4	2

In Table 3, patients were distributed according to stone size and results of pharmacotherapy were summarized which shows expulsion of 6-7 mm stones were maximum.

In Table 4, patients were distributed according to number of days in which stones were expelled during study and recorded in follow up stones expelled in 14-21 days were maximum.

Expulsion rate in group B patients were recorded for the maximum and good prognosis for the pharmacotherapy as shows the p value in Table 5.

**Table 5: Distribution according to groups and expulsion with p values.**

Parameters	Group A expulsion (%)	Group B expulsion (%)	P value
<b>Expelled</b>	22 (57.8)	32 (84.2)	0.011
<b>Not expelled</b>	16 (42.2)	6 (15.8)	0.011

Chi square statistics is 6.3973 the p value is 0.011429 the result is significant at p<0.05.

Expulsion rate was 84% in group B and 57 % in group A.

The patients were followed up with weekly clinical evaluation, KUB and USG. Successful results were defined as complete passage of calculi with documentation on KUB and USG. Failure is considered if, patient failed to pass stone in the 28 days i.e., 4 weeks. Uncontrolled pain, fever or urosepsis leading to hospitalization during study period.

**DISCUSSION**

Despite the introduction of minimally invasive therapies for lower ureteric stones like ESWL and flexible ureteroscopic retrieval, still the role of watchful waiting and pharmacotherapy for lower ureteric stones cannot be dismissed. Though being scar free, these procedures lend a lot of inconvenience to the patients, are not free of risks and are quite expensive. Even in cases of complete urinary obstruction, it takes at least 3 to 4 weeks for the signs of kidney injury to appear, therefore the spontaneous passage of the stones can be waited on for at least 4 weeks.

In 1970 Malin et al demonstrated the presence of  $\alpha$  and  $\beta$ -adrenergic receptors in human ureter, and  $\alpha$ -adrenergic receptors in animal ureter.<sup>13</sup> The stimulation effect of ureteral contraction by  $\alpha$ -adrenergic agonists is dose dependent and increases the frequency of ureteric peristalsis and the tone of muscles causing ureteral obstruction thus decreasing the ureteral flow. The specific antagonists of the  $\alpha$ -adrenergic receptors decrease the amplitude and the frequency of ureteral peristalsis, as a result the intra-ureteral pressure decreases and the urine transport increases.

Dellabella et al reported the ratio of the spontaneous passage of the stones with tamsulosin corticosteroid combination as 100% in their series of 30 patients and they have demonstrated that analgesic dosage decreases with

the pain frequency.<sup>6</sup> In another study Porpiglia et al stressed that tamsulosin reduced expulsion time 9.7.<sup>7</sup>

Tekin et al reported that in their study of 36 patients the ratio of spontaneous passage of the stones with tamsulosin alone was 77%.<sup>14</sup>

In our study, we noted a stone expulsion rate of 84.2%. The slightly lower expulsion rates in our study are probably because of the reduced adherence to the continuous medical therapy once the patient became pain free after a few days of treatment. In our study, the largest stone expelled with medical therapy was a 10 mm stone in a young female of 32 years of age. The mean stone size in our study was. There was no difference in the stone expulsion rates for right (83%) and left (72%) ureteric stones in our study (p value=0.11).

### Limitations

Limitations for the study is considered for the all-exclusion criteria mentioned above particularly stone sizes more than 10 mm and if the patient is failed to pass stone within 28 days i.e. 4 weeks, uncontrolled pain, fever or urosepsis leading to hospitalization during study period.

### CONCLUSION

Medical therapy with a combination of  $\alpha$ -adrenergic blocker and corticosteroid is associated with good stone expulsion rates and should be considered in all patients with lower ureteral stones of size less than 10 mm who are not having any contraindications for medical therapy provided close monitoring and timely follow up is mandatory counselling and selection of patient is key factor.

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