

Original Research Article

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Study of the outcome on ureteroscopic lithotripsy in patients with upper ureteric calculi: a descriptive study

Anu V. Babu, Arun B. Nair*, Deepak Paul, Devi V. Shaji, Ribin Christudas

Department of General Surgery, Sree Gokulam Medical college and Research Foundation, Venjaramoodu, Kerala, India

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***Correspondence:**

Dr. Arun B. Nair,

E-mail: arunbdr@gmail.com

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ABSTRACT

Background: Ureteric calculi are one of the most common cause of abdominal pain in the emergency room. There are several options for the management of ureteric stones. Ureterorenoscopy and lithotripsy is the commonly used modality because it is less morbid and invasive, but the drawback is proximal stone migration which leads to persisting symptoms and increased costs. The aim of this study is to use an anti-retropulsion device to reduce the rate of proximal stone migration.

Methods: This description study was conducted in Sree Gokulam Medical college from December 2014 to December 2015, on 75 consecutive patients who had ureteric stones, of ages 20-60 who were willing to give consent. All patients underwent ureteroscopy and lithotripsy and in those patients from who anti-retropulsion device could not be manipulated proximal to the stone lithotripsy alone was done. Both groups were compared for procedure time, post-operative symptoms and stone free rates.

Results: The average time taken for the procedure with anti-retropulsion device was 45 minutes whereas in the other group was 72 minutes. 48 (96%) of patients using the device were symptom free and 48 (96%) patients had no symptoms after the procedure.

Conclusions: The use of a anti retropulsion device can significantly reduce proximal stone migration, so thereby reducing further procedures and costs.

Keywords: Anti-retropulsion device, Ureteroscopy, Lithotripsy, Proximal stone migration, Residual stone

INTRODUCTION

Ureteric calculi are one of the most common problem a surgeon faces with lifetime risk of 12%.¹ Surgeons should have a thorough knowledge about evaluation and management of ureteric calculi. There are a multitude of treatment options like medical expulsive therapy, shock wave lithotripsy, percutaneous nephrolithotomy, ureterorenoscopy and open or laparoscopic stone surgery.² Ureterorenoscopy (URS) and lithotripsy is the commonly used modality because it is less morbid and invasive. The drawback of ureterorenoscopy and lithotripsy is proximal stone migration which may lead to

persisting symptoms and increased costs.³ The use of an anti-retropulsion device is said to greatly reduce the incidence of proximal stone migration. This study compares the outcome of ureterorenoscopy and lithotripsy with a anti retropulsion device (NTrap®) a stone entrapment and extraction device by COOK® medical to ureterorenoscopy and lithotripsy alone.⁴ The aim of this study is to know whether the use of an anti-retropulsion device during ureteroscopic lithotripsy will reduce proximal stone migration, thereby reducing the necessity for second procedure and costs.

METHODS

In this study of one year from December 2014 to December 2015, we enrolled 75 consecutive patients with proximal ureteric stones who underwent ureteroscopic retrieval of stones in our institution. The stones were defined as proximal if the stone was located in a position between the ureteropelvic junction(L2) and inferior border of sacroiliac joint in kidney ureter bladder (KUB) and in ultrasound (USG) stones between UPJ and crossing of iliac artery.

All patients were evaluated before treatment with history taking, physical examination, laboratory investigations, imaging, ultrasonography, plain x-ray of the kidney, ureter and bladder and intravenous urography, while MRI were taken in patients with azotemia.

URS and pneumatic lithotripsy were done in all 75 patients, in those patients in which NTrap® could not be manipulated proximal to the stone lithotripsy alone was done. In 50 patients NTrap was used and in 25 it could not be deployed. Both groups were compared for procedure time, post-operative symptoms and stone free rates.

Sample size was calculated with a formula $n=(Z^2 \times P_x(1-P))/e^2$ with confidence interval at 95% (standard value of 1.96).

Inclusion criteria

All diagnosed case of upper ureteric stone in patients of age 20-60 years undergoing URS.

Exclusion criteria

Patients with concomitant renal calculi with ureteric calculi and those who refused to give an informed consent.

After collecting the data, it was entered into a Microsoft excel worksheet and analysed by SPSS statistical package. The necessary statistical tables were constructed along with charts and diagrams. The test of significance of difference in proportion and chi square test were used to test the statistical hypothesis.

RESULTS

The mean age of patients who underwent URS with NTrap® was 39.7 ± 11.8 whereas in the URS only group was 41.96 ± 8.96 years. 66 (88%) out of the 75 patients were males (Table 1). Radiopaque stones were present in 69 (92%) of the patients. Stone size of 7-9 mm was the commonest in both groups (Table 2). The average time taken for the procedure with NTrap was 45 minutes whereas in the other group was 72 minutes. Post procedure 48 (96%) of patient using NTrap were symptom free compared to 17 (68%) (Table 3). Out of 50

patients the group using NTrap only 48 (96%) patients had no residual fragments more than 4mm compared to 18 (72%) in the other group and p value was 0.002 which is significant.

Table 1: Distribution of gender.

	Frequency	Percentage	Valid Percent	Cumulative percent
Female	9	12.0	12.0	12.0
Male	66	88.0	88.0	100.0
Total	75	100.0	100.0	

Table 2: Distribution of stone size is comparable among 2 groups.

Stone diameter	Group using ntrap number (%)	Group not using ntrap number (%)
5-7 mm	3 (6%)	0 (0%)
7-9 mm	34 (68%)	14 (56%)
9-11 mm	10 (20%)	10 (40%)
>11 mm	3 (6%)	1 (4%)

Table 3: Overall stone free rates.

Stone free rate	In the group using ntrap	In the group not using ntrap
Number of patients	48	18
Percentage	96%	72%

DISCUSSION

Ureteroscopic pneumatic lithotripsy is one of the most commonly used treatment for ureteric stones. The procedure has high success rates with minimal morbidity.

American urological association and European urological association published ureteral stone guideline panel reported the stone free rate in URS were 81-92 % for proximal stones.⁴ This was comparable to our study were stone free rate was 88%. It is comparable to studies by Isen K et al, Prabhakaran M et al, Ulla S et al.⁶⁻⁸ Proximal stone migration during lithotripsy results in high failure rates Ding et al reported 40% migration for upper ureteric calculus when using both pneumatic lithotripters and holmium.⁹ In our study proximal stone migration was 22% which was confirmed by X-ray KUB or ultrasound abdomen. Several studies of ureteroscopic treatment for ureteral stones have reported that most failure for stone clearance is due to stone fragment retropulsion. Stone retropulsion can result in increased operative time and cost due to additional procedures is required to treat residual proximal migrated fragments to renal pelvis.¹⁰ The degree of migration depends mainly on the energy source used for lithotripsy; pneumatic and

electrohydraulic lithotripters are associated with a greater degree of retropulsion than lasers. Different stone-trapping strategies and devices have been developed to minimize stone retropulsion. Novel devices include the lithovac suction device, the passport balloon, the stone cone, the percSys accordion, the NTrap, and stone baskets such as the litho catch, the Parachute, and the escape.¹¹⁻¹³

Cephalad stone migration during ureteroscopic lithotripsy can be problematic as it may lead to increased operative times, increased cost, and increased numbers of additional procedures required to treat clinically significant fragments which have migrated to the upper ureter or kidney.¹⁴

The NTrap is a new ureteral occlusive device that prevents the migration of stone fragments during ureteroscopic lithotripsy. The NTrap is composed of a tightly woven mesh of nitinol wires that consists of the inner wire and the outer radio-opaque carrying catheter. The inner wire is a shape memory alloy and is 7 mm sized umbrella design, called, the basket. Its diameter is 2.8 Fr and its total length is 145 cm.

In a meta-analysis including 456 patients by Ding et al showed a significant advantage in the Ntrap cohort over controls in terms of stone-free rates (odds ratio OR=3.08, P=0.003). The incidence of stone migration was also significantly lower using the NTrap (OR=0.23, P=0.0006) but operative time was not prolonged compared to controls (P=0.62).¹⁵ In our study it is demonstrated that the stone free rate is 96% when Ntrap is used and stone free rate is 72% when Ntrap is not used (p value=0.002), incidence of proximal stone migration is also less in group using Ntrap .in our study the operative time is found less in the group using Ntrap (p value=0.001).

Phan et al reported the efficacy of the Ntrap for the treatment of ureteral stones in their initial clinical experience. That study revealed the overall stone-free rate was 98% and no patient had required additional treatment.¹⁴ In our study the stone free rate stone free rate in the group using NTrap was 96%.

The Ntrap can significantly prevent stone retropulsion during ureteroscopic lithotripsy. In this study, we found that the use of the Ntrap can increase the success rate of stone removal using pneumatic lithotripsy and less operating time

The limitations of this study are that no randomisation was done for patients using the anti-retro pulsive device. It was tried on all patients, and if it was not possible to deploy it, the procedure was continued without the device and compared to the group in which the device was deployed.

CONCLUSION

From this study we could infer that use of antiretropulsion device significantly reduced proximal stone migration compared to patients not using it. Migration of larger fragments into the kidney in the group using Ntrap required additional procedures for complete clearance of stones in 20% of patients which lead to mounting hospital bills. So, we conclude that use of antiretropulsion device like NTrap can significantly reduce need for further procedures and reduce costs.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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