

# Comparison of three different endoscopic techniques in management of bladder calculi

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## ABSTRACT

**Introduction:** We present our experience of comparison of endoscopic treatment of vesical calculus in bladder stone.

**Materials and Methods:** This study included 67 patients of bladder stone treated in this hospital from between June 2006 to December 2009 who were randomly assigned in three groups—group 1 (transurethral removal using a nephroscope), group 2 (transurethral removal using a cystoscope), and group 3 (percutaneous removal using a nephroscope).

**Results:** Statistical significant difference was observed in operating time—group 1 (32.1+ 8.5 mins), group 2 (69.2 +16.3), and group 3 (46 + 7.3). Statistically significant difference was also observed in the postoperative stay of the patient, which was highest for the group 3 patients. Complete clearance was achieved in all the patients. Group 1 had maximum number of urethral entries as compared to other two groups in consideration.

**Conclusions:** Transurethral stone removal using a nephroscope is safe and efficacious method of stone removal without increasing the morbidity of the patients.

**Key words:** Cystolithotripsy, percutaneous cystolitholapaxy, transurethral cystolitholapaxy, vesical calculus

## INTRODUCTION

Vesical calculus means “urolith in bladder” and accounts for nearly 5% of urinary system calculus.<sup>[1]</sup> Calculus disease affects all parts of urinary system—kidneys, ureter, urinary bladder, and urethra. Usually calculus diseases are symptomatic in occurrence but in few cases they can be asymptomatic.

Vesical calculi are commonly classified as primary or secondary. Primary vesical calculus are stones which passes from kidney via ureter and lodges in the urinary bladder while, secondary vesical stones are due to the bladder outlet obstruction, bladder diverticulum, trauma, catheterization, neurogenic bladder, foreign body, etc.

Surgical treatment of vesical calculi has evolved over years from “blind” insertion of crushing forceps into the bladder to open surgical removal or extracorporeal fragmentation. Open surgery has been the best-recommended modality for large stones.<sup>[2]</sup> In small or moderate calculi, endosurgical procedures as optical mechanical cystolithotripsy have an added advantage as it can be combined with corrective procedure for bladder outlet obstruction.<sup>[3]</sup> Zhaowu *et al.* have recommended that electrohydraulic shockwave lithotripsy (EHSWL) preferably to be avoided in large, hard vesical calculi and if the stone is in the diverticulum or stuck to the mucosa.<sup>[4]</sup> Kemal *et al.* in their randomized study concluded that the transurethrally nephroscopic removal of bladder stone is fast and effective method compared to endoscopic treatment via cystoscope.<sup>[5]</sup>

In this study, we present our experience of different techniques of removal of bladder stone endoscopically (transurethrally, using nephroscope or cystoscope, and percutaneous).

## MATERIALS AND METHODS

The study included 67 patients of bladder stone treated in this hospital from between June 2006 to December 2009. After receiving informed consent from the patients, they were randomly assigned in three groups (using randomization tables)—group 1 (transurethral removal

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using a nephroscope), group 2 (transurethral removal using a cystoscope), and group 3 (percutaneous removal using a nephroscope). Preoperative evaluation included history and physical examination, hemogram, renal function tests, urine culture and sensitivity, X-ray KUB, and ultrasound abdomen.

All patients received prophylactic antibiotics 24 hours prior to surgery. Cystourethroscopy was performed initially after administering spinal anesthesia to the patient. Cystoscopy (Karl Storz 19F) was performed to determine the size, number, and presence of associated pathology. Pneumatic lithoclast was used to fragment the stones in all the three groups.

In group 1 (n=22), 24 Fr rigid nephroscope (Richard Wolf) was introduced after adequate lubrication into the urethra. After entering the bladder and visualizing the stone, the intracorporeal lithotripter is passed and stone fragmented into smaller pieces. After adequate fragmentation is achieved, the nephroscope is withdrawn and cystoscope was reinserted and fragments are retrieved using an ellick evacuator. Check cystoscopy is done to ascertain clearance of stone. In case any residual stone is present, nephroscope is reinserted and fragment is completely fragmented and retrieved as mentioned above. At the end of procedure, 16F foleys was placed which was removed on first postoperative day (if there was no hematuria) and patient was discharged the same day.

In group 2 (n=20), 22 F cystoscope (Karl Storz) was placed transurethraly and stone was visualized. The stone was fragmented into smaller pieces and subsequently retrieved using an ellick evacuator. We avoided removal of any stone fragments by holding it using a forceps through the urethra. The foleys catheter was placed at the end of the procedure. The catheter was removed on first postoperative day (if there was no hematuria).

In group 3 (n=23), cystoscopy was performed using 19 F Karl Storz cystoscope. Suprapubic puncture was made using the puncture needle. Guide wire was passed and the tract dilated to place 28 F Amplatz sheath suprapubically.

The entire process was performed under direct vision. 24 F nephroscope (Richard Wolf) was inserted through the sheath and stone fragmented and then retrieved. A suprapubic catheter was placed through the amplatz sheath. Suprapubic catheter was removed on first postoperative day while per urethral catheter was removed on second postoperative day.

Eighteen patients (group 1 n=5, group 2 n=7, group 3 n=6) in all the groups required additional procedures—optical internal urethrotomy, transurethral resection of prostate, meatotomy, and bladder neck incision. The operative time for these additional procedures was not included in the operative time used for statistical analysis. Antibiotics were administered for 7 days postoperatively and postoperative X-ray KUB was done on first postoperative day to ascertain clearance of stone.

Two patients required open cystolithotomy and were excluded from the study.

Statistical analysis was performed using Mann–Whitney U test and differences were accepted to statistically significant at  $P \leq 0.05$ . The groups were compared for age, stone size, operation time, clearance, and duration of postoperative stay.

## RESULTS

Sixty-seven patients of bladder stone treated between June 2006 and December 2009 were included in the study. Since there were only two cases requiring open cystolithotomy and this procedure is seldom done these days, they were excluded as the number of the patient was low and to prevent skewing of the data.

The male to female ratio was 3:1. No statistical significance was found in all the groups regarding the age, stone size, and number of patients [Table 1]. Statistical significant difference was observed in operating time: group 1 ( $32.1 \pm 8.5$  mins), group 2 ( $69.2 \pm 16.3$ ), and group 3 ( $46 \pm 7.3$ ). Statistically significant difference was also observed in the postoperative stay of the patient which was highest for the

**Table 1: Comparison of all the three groups for various variables**

	Group 1	Group 2	Group 3	P value
No of patients	22	20	23	0.768
Age (years+ SD)	45.6 + 11.2	48.4+12.3	47.6+10.8	0.675
Stone size (cm+ SD)	2.9 cm +1.1	3.1+1.3	3.1+1.2	0.541
Operation time (mins)	32.1+ 8.5 mins	69.2+ 16.3	46+ 7.3	0.005
Additional procedure	5	7	6	0.872
TURP	1	3	2	
OIU	4	1	3	
BNI	0	3	1	
Mean urethral entries	3.2+ 0.6	1.07+ 0.15	1.04+0.04	0.005
Postoperative stay	1.4 + 0.6	1.3+ 0.4	2.1+ 0.15	0.005

group 3 patients. Complete clearance achieved in all the patients. Group 1 had maximum number of urethral entries as compared to other two groups in consideration.

The operative time for the additional procedures was not included in the analysis. The patients with bladder neck contracture and stricture urethra were advised calibrations according to standard follow-up protocols.

Two patients required open surgery (intracorporeal lithotripter malfunctioning) and another patient had large adrenal mass for which suprapubic incision was given to retrieve the specimen. Through this incision, the bladder stone was removed.

## DISCUSSION

Vesical calculus usually occurs due to some secondary factors leading to obstruction of the bladder outlet. In few instances, the stone travels from kidney via ureter and gets lodged in the urinary bladder. The stones in the latter situation are known as primary bladder stones. Variety of treatment modalities have been mentioned in literature regarding removal of bladder stone—open surgical, lithotripsy, percutaneous, and transurethral.<sup>[1-6]</sup> All endoscopic procedures aim to achieve complete stone-free state in shortest possible time, with short hospital stay and minimal complications associated with it.

This present study aimed to analyze the various endoscopic methods of stone removal. Since the hospital does not have a laser or ultrasonic lithotripter, so it could not be compared with pneumatic lithotripter in this study. Pneumatic lithotripter is widely used in most of the urological centers and it is also a cost-effective method of fragmenting the bladder stone. Safer and effective endourological methods have almost totally replaced open and cystolitholapaxy.<sup>[7]</sup>

Ener *et al.* in their study concluded that large bladder stones treated by transurethral placed nephroscope are a fast and effective treatment modality compared to endoscopic treatment via cystoscope. They used combined pneumatic/ultrasonic lithotripsy device, with its aspiration for the stone fragmentation and retrieval.<sup>[5]</sup> In this study, in group 1, 24F nephroscope (without sheath) was used to fragment the stone. The advantage of nephroscope is better vision and the probe is stronger and sturdier. To avoid overdistension of the urinary bladder during the procedure, we kept the inflow of the saline slow and many times the flow of the fluid was completely stopped. If the bladder got distended during the procedure, then the rubber cap over the port inlet of the nephroscope was removed to empty the bladder. The use of cystoscope gives two advantages—evacuation of fragments and to ascertain completion of stone evacuation. In case any stone could not be retrieved due to its size, nephroscope was reinserted and the same was fragmented. In initial part of the

series, re-entry into urethra was more as compared to later part. As the experience grew, the number of entries in the urethra decreased, as the stone was fragmented to smaller pieces at first instance before nephroscope was withdrawn. We also found this modality to be faster and more effective in fragmenting bladder stones as compared to other two methods in terms of operative time and postoperative stay.

Percutaneous removal of bladder stone is not a new procedure. Placement of amplatz sheath supra pubically helps in better visualization and fragmentation of the stone; also it prevents prolonged instrumentation of the urethra. The only disadvantage with this procedure is placement of suprapubic catheter, which increases the morbidity as well as increases the postoperative stay of the patient. Ahmadina *et al.* in their study found this modality to be more beneficial in treating large bladder stones in children.<sup>[8]</sup> Percutaneous approach is better than transurethral approach especially in male child because of small caliber of male child urethra by decreasing the chances of iatrogenic urethral stricture.<sup>[9]</sup> Percutaneous approach is also preferred to treat bladder stones in artificially created bladder.<sup>[10-12]</sup>

Over the last few years, there has been increasing trend in urologist to remove bladder stone using nephroscope and to achieve this various methods have been described in literature. Maheshwari *et al.* in their study used Amplatz sheath in female patients for the removal of bladder stone. This sheath was inserted transurethraly after adequate dilatation of the urethra. The stone was visualized fragmented and retrieved.<sup>[13]</sup> Okeke *et al.* used amplatz sheath in male patients transurethraly after urethral dilatation and concluded that smaller stone fragments easily get removed by the irrigating fluid while the larger fragments could be retrieved using grasping forceps.<sup>[14]</sup>

Nephroscope has distinct advantage over the cystoscope as it has a wider lumen, which facilitates easy removal of the stone fragments. Also cystoscopic fragmentation requires longer operating time and there is a decrease in vision quality, which parallels the degree of stone fragmentation. We also observed in our study that the operative time in group 2 was maximum as compared to the remaining two groups and this difference achieved statistical significance.

## CONCLUSION

Transurethral stone removal using a nephroscope is safe and efficacious method of stone removal without increasing the morbidity of the patients.

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