



THERAPEUTIC URETEROSCOPY USING PNEUMATIC LITHOTRIPSY WITH NIDHI (SWADESHI) LITHOCLAST: EXPERIENCE IN 100 PATIENTS

General Surgery

Dr. Pragya Mishra Postgraduate, Department of Surgery, Muzaffarnagar Medical College, Muzaffarnagar.

Dr. Rahul Goel* Professor, Department of Surgery, Muzaffarnagar Medical College, Muzaffarnagar.
*Corresponding Author

ABSTRACT

Objective: To study the efficacy of the Therapeutic Ureteroscopy using pneumatic lithotripsy with Nidhi Lithoclast(Indian made) in a cohort of 100 patients.

Materials And Methods: The patients were diagnosed of ureteric stone on ultrasonography, intravenous urography or computed tomography. Ureteroscopic Lithotripsy was done by Semi Rigid Storz Ureterorenoscope and Nidhi pneumatic Lithoclast.

Results: Patient aged between 20 to 75 years with 47 males and 53 females. MOST common presenting complain was the pain. Hydronephrosis was seen in 57%. Most patients had stone on right side. Most of the stones were 5 to 10mm in size. Majority of stones treated were from lower ureter. Of these stones, 92% were successfully fragmented. D-J stent was used in 40% patient operation time was less than an hour in most of the cases. There were minimal severe or long term effects [stricture, 45%] mean hospital stay was 1.54 days. Only 2% patients had proximal stone/fragment migration. Overall success rate of treatment was 91%.

Conclusion: Ureteroscopic Nidhi Lithoclast is an effective, cheap and reliable method of ureteric stone management. Besides, lack of any disposable components, extremely long instrument life, and easy maintenance of Nidhi Lithoclast, generally the lithoclast used for stone fragmentation is SWISS brand which is expensive and difficult to afford by average Indian, hence we study the effect of Indian lithoclast in fragmentation of stone.

KEYWORDS

MATERIALS AND METHOD:

We studied 100 patients with ureteric calculi admitted to our hospital between June 2010 and October 2017, all the patients record including history, physical examination, investigation, and treatment were reviewed and recorded. Among investigations abdominal USG, IVU, CT abdomen and radio-isotope scan, whichever was necessary done pre-operatively. To know exact stone status and abdominal radiograph was obtained in the morning on the day of surgery. Abdominal plane radiograph done on the 1st post-operative day and after one week to know the stone clearance.

Procedure was done under spinal anesthesia. All patients were given iv antibiotic for prophylaxis 2 hour before surgery and continued for next 12 hour followed by oral antibiotic for 3-5 days depending on urine culture and sensitivity in patient with UTI.

The procedure was done after taking informed consent. After inserting the rigid storz ureteroscope in to the ureteric orifice, stone localization by C-arm image intensifier was done when needed. Stone fragmentation was done using Nidhi lithoclast. D-J stent was put in the ureter after stone fragmentation in selected cases including severe mucosal edema, mucosal tear, ureteral perforation and a few failure patients where stones could not be removed. D-J stent was removed after 3 weeks. Stone localization was recorded as, upper if stone was in ureter below ureteropelvic junction but above the level of iliac vessel, mid between iliac vessel and pelvic brim, and distal if the stone was seen in the part of ureter below the level of pelvic brim. Stone texture was recorded as hard and soft as an intra-operative finding. Stone fragmentation was considered successful if the stone could be fragmented to small passable fragments.

Hematuria was considered mild if macroscopic and lasted <8hrs post-operatively, moderate to severe if the patient got anemic/altered hemodynamics to warrant blood transfusion UTI was considered only when it was documented by culture sensitivity report.

Patients were followed for a minimum of 6 weeks to 2 years. On follow-up Abdominal radiograph, abdominal USG was obtained if necessary.

Cost of the treatment was considered as only the money (in rupees) spent by the patient, excluding the cost of equipment charges, hospital personnel charges and any other free service/medicine charges paid by the hospital.

Analysis of the recorded data was performed by using chi-square, Mann-Whitney, and Kruskal-Wallis tests in SPSS version 10.

RESULTS:

Patient aged between 20 to 75 years: 47 were male and 53 were female with ratio of 0.886:1. Most of the patient 98 present with pain which present alone in 80 and associated with other symptom in 18 patients. Dysuria was present in 07 patients, hematuria in 6 patients, fever in 05, increased frequency of micturition was present in 01 patient alone or associated with pain. One patient had no symptom. Hydronephrosis was present in 57 patients and absent in 48 patients. Totally 62 patients had stone on the right side while 33 patients stone was on left side, 5 patient had bilateral ureteric stones. Of the patients, 89 had single stone, 11 patient had two or more than two stones. Out of 112 stones, 74 were 5-10mm, 27 were 11-15mm and 11 were >15mm in size. Of these stones, 11(9.82%) were located in upper ureter, 20(17.86%) in mid-ureter & 81(72.32%) in lower ureter. Among those patient who had >1 stone, 5 had both their stones in lower ureter, one had both their stones in mid-ureter, 1 had in upper-ureter, 2 had 1 in mid and 1 in lower ureter, 2 had 1 in upper and 1 in lower ureter each, and 1 had 3 stones all in lower ureter.

Stone fragmentation was successful in 90 patients with a total of 102 stones, unsuccessful in 10 patients with a total of 90 stones due to inadequate fragmentation, proximal migration or inaccessibility of stones.

Table 1. Fragmentation Status Of Stone On Lithotripsy With Nidhi Lithoclast (N=112)

Fragmentation status	No of stones	Percentage
Successful	102	91.5%
Unsuccessful	10	8.5%
In adequate fragmentation	05	4.9%
Stone not reached	03	2.2%
Proximal stone migration	01	1.3%

Table 2. Complication (N=100)

Complication	No of patients	Percent
Hematuria.		
Mild	57	28.5%
Moderate	7	3.5%
Urinary tract infection	14	7.0%
Mild pain/colic	12	6.0%
Moderate severe pain	3	1.5%
False passage	2	1.0%
Perforation	1	0.5%
stricture	1	0.5%

Table 3. Management Of Failure Cases (N=100)

Procedure	No of patients	Percent
Successful primary ureteroscopy (URS)	95	90%
Failed primary (URS)	10	10%
Repeat URS	2	2%
D-J stenting	3	2.5%
Open surgery	5	5%

URS- Ureterorenoscopy , D-J - double j stent

DJ stent was used in only 40 patients. The decision of using DJ stent was purely intra-operative. Dilatation of ureteric orifice/intramural ureter was necessary in 5 patients to accommodate the ureteroscope and was not required in 95 patients. Operation time was less than 45 mins in 49 cases, 45 to 60 minutes in 42 cases and more than 60 minutes in 9 case. A total of 48 complications was seen including pain hemorrhage and infection (Table2). There was 1 intra-operative bleeding requiring blood transfusion. Mild colics relieved by non steroidal analgesics ,moderate to severe pain required opioids. Only 1 case of ureteric stricture was seen which was relieved by ureteroscopic dilatation. Totally 82 patients had hospital stay of <2days, 10 cases stayed between 2-5 days, and 8 cases stayed >4days. Mean hospital stay was 1.6days. In our study, total treatment cost was <1500rs in 55 patients. Between Rs 1500-3000 in 39 patients and >Rs3000 in 6 patients. Important factor influence the cost were use of D-J stent, post-operative hospital stay ,complications and other means by which stone was managed. Ureteroscopic Lithotripsy using Nidhi Lithoclast was successful in 91 cases and failure was seen in 9 cases.

DISCUSSION:

Ureteral stone presents a challenging problem to a urologist ,many factor need to be considered including stone size ,localization, patient overall health status, available technology and expertise^[11]. Beside being done under direct vision Ureteroscopic Nidhi Lithoclast can be done in presence of coagulation disorder^[11]. For ureteroscopic lithotripsy there is variety of lithotripters available including USG lithotripters, Electrohydraulic lithotripters, and Pneumatic lithotripters^[12,13]. Compressed air is used for their working. Pneumatic type of lithotripter as used in our series uses Lithoclast is Pneumatic Lithotripter that has been developed by Electromedical system. Nidhi Lithoclast delivers energy of ballistic origin. Main component of Nidhi Lithoclast are electronic control module(generator), air supply to and generator, quick connector, pneumatic foot control, hand piece and probes of size 0.8mm, 1mm, 1.6mm and 2mm. [2] There is loss of energy from transition to thinner probe and with bending of probe approximately 20-25 degree bend reduces output by 30%. However loss of energy can be compensated by raising pneumatic operating pressure. We used 0.8mm and 1mm for most of ureteric stone. Inserted probe length is between 10-20mm longer than endoscope at the tip to allow visualization of probe. Probe is applied slightly sideways to the stone and slightly pressed to the wall of ureter to minimize proximal stone migration. Single pulse or multiple pulse mode is used in machine with lower pneumatic pressure initially. For multiple pulse mode we stopped the fragmentation and control position and disintegration of stone regularly after 1-2secs (12-24 pulses)^[15,17]. Fragmented stone removed by forceps or basket. Smaller fragments allowed to pass spontaneously. Nidhi lithoclast has many advantages which include simplicity, reliability, and ease of use beside low cost and lack of any disposable components. Hospital air supply can be used to activate the probe. It can break even extremely hard calculi rapidly. There is no heat generated during activation of device and there is no risk of electrocution. The disadvantage of this device is that it can be only used with rigid or semi-rigid ureteroscope.^[17-20] Rate of successful fragmentation is 85-95%.^[11,15-19] After ureteroscopic lithotripsy we do stenting to avoid post-operative complications like ureteral obstruction. In our study, D-J stent used in 40 patients. Studies have shown uncomplicated stentless ureteroscopy to be safe.^[21,22] Liberal use of stent in our study could lead to reduce incidence of ureteral stricture. Disadvantage of retropulsion with Pneumatic lithotripsy can be reduced with use of suction device ,lidocaine jelly or occluding basket.^[23,24] only 2 patient in our study had proximal migration of stone/fragment .In 5 patient whose stone failed lithoclast fragmentation ,stone was removed by open stone surgery.

Perforation seen in 1 patient which was managed conservatively by placement of D-J stent. 1 patient develop ureteric stricture which responded to ureteric dilatation. There was no ureteric avulsion and were no death in our study. The total success of procedure was

91%. Failure was due to unable to reach the stone, poor visualization of stone due to severe tissue edema and severe ureteric dilatation not allowing trapping of stone against ureteric wall to facilitate fragmentation.

As conclusion ureteroscopic lithotripsy has gained worldwide acceptance and is an established technique. Lithotripsy using (SWADESHI) Nidhi Lithoclast is cheapest and quite efficient technique in managing ureteric stone, and instead of using expensive pneumatic swiss lithoclast Indian machines are good and have stood by the test of time.

DISCLAIMER-

This study does not promote the company of any lithoclast, study aims to show that Indian machines are as good as imported (swiss lithoclast) machines giving equal results at low cost.

Conflict Of Interest: None

REFERENCES:

- 1) Gettman MT, Segura JW. Management of ureteric stones issues and controversies. Br J Urol 2005; 95: 85-93.
- 2) Thornbury JR, Parker TW. Ureteral calculi Semin Rontgenol 1982; 17:133-9.
- 3) El- Faqih SR, Husain I, Ekman PE, Sharma ND, Chakrabarty A, Talic R. Primary choice of intervention for distal ureteric stone: Ureteroscopy or ESWL? Br J Urol 1988; 62:13-8.
- 4) Gunlusoy B, Degirmenci T, Arslan M, Kozacioglu Z, Nergiz N, Minareci S, et al. Ureteroscopic pneumatic lithotripsy: is the location of stone important in decision making? Analysis of 1296 patients. J Endourol 2008; 22:291-4.
- 5) Assimos DG, Boyce WH, Harrison LH, McCullough DL, Kroovand RL, Sweat KR. The role of open stone surgery since extra corporeal shock wave lithotripsy. J Urol 1989; 142:263-7 PMid:2746742
- 6) Hemal AK, Goel A, Goel R. Minimally invasive retro peritoneoscopic ureterolithotomy. J Urol 2003; 169:480-2.
- 7) Biri H, Kupeli B, Isen K, Sinik Z, Karaoglan U, Bozkirli I. treatment of lower ureteral stones: extra corporeal shock wave lithotripsy or intracorporeal lithotripsy? J Endourol 1999; 13:77-81.
- 8) Aghamir SK, Mohseni MG, Ardestani A. treatment of ureteral calculi with ballistic lithotripsy. J Endourol 2003; 17:887-90
- 9) Erhard M, Salwen J, Bagley DH. ureteroscopic removal of mid and proximal ureteral calculi. J Urol 1996; 155:38-42
- 10) El-Kappany H, Gaballah MA, Ghoneim MA. Rigid ureteroscopy for the treatment of ureteric calculi: experience in 120 cases. Br J Urol 1986; 58:499-503.
- 11) Hoffbauer J, Hobarth K, Marberger N. electrohydraulic versus pneumatic disintegration in the treatment of ureteral stone: a randomized, prospective trial. J Urol 1995; 153:623-5.
- 12) Bapat SS, Pai KV, Purnapatre SS, Yadav PB, Padye AS. Comparison of Holmium Laser pneumatic lithotripsy in managing upper ureteral stones. J Endourol 2007; 21:1425-7.
- 13) Denstedt JD, Eberwein PE, Singh RR. The Swiss Lithoclast: a new device for intracorporeal lithotripsy. J Urol 1992; 148:1088-90.
- 14) Denstedt JD, Razvi HA, Rowe E, Grignon DJ, Eberwein PM. Investigation of tissue effects of a new device for intracorporeal lithotripsy- The SWISS Lithoclast. J Urol 1995; 153:535-7.
- 15) Ceylan K, Sunbul O, Sahin A, Gunes M. ureteroscopic treatment of ureteral lithiasis with pneumatic lithotripsy :analysis of 287 procedures in a public hospital. Urol Res 2005; 33:422-5.
- 16) Terai A, Takeuchi H, Terachi T, Kawakita M, Okada Y, Yoshida H, et al. Intracorporeal lithotripsy with the Swiss Lithoclast. Int J Urol 1996; 3:184-6.
- 17) Terai A, Takeuchi H, Terachi T, Kawakita M, Okada Y, Yoshida H, et al. Management of ureteral stone with pneumatic lithotripsy: report of 500 patients. J Endourol 2003; 17:721-4.
- 18) Sozen S, Kupeli B, Tunc L, Senocak C, Alkibay T, Karaoglan U, et al. Management of ureteral stones with pneumatic lithotripsy: report of 500 patients. J Endourol 2003; 17:721-4.
- 19) Yinghao S, Linhui W, Songxi Q, Guoqiang L, Chuanliang X, Xu G, et al. Treatment of urinary calculi with ureteroscopy and Swiss Lithoclast pneumatic lithotripter: report of 150 cases. J Endourol 2000; 14:281-3.
- 20) Akhtar MS, Akhtar FK. Utility of the lithoclast in the treatment of upper, middle and lower ureteric calculi. Surgeon 2003; 1:144-8.
- 21) Hosking DH, McCole SE, Smith WE. Is stenting following ureteroscopy for removal of distal ureteral calculi necessary? J Urol 1999; 161:48-50.