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Laparoscopic retroperitoneal ureterolithotomy for large, impacted calculi in upper and mid ureter

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Abstract---Background: Urolithiasis is a common recurrent condition in which the stones are formed within the urinary tract and lead to symptoms when they cause obstruction in the renalpelviccalyceal system, ureters, bladder and the urethra. Most cases of urolithiasis can be managed with non-invasive strategies, however, urolithiasis associated with infections, obstructions, and renal failure may require interventional measures such as ureteroscopy (URS), Percutaneous nephrolithotomy (PCNL) and shock wave lithotripsy (SWL). Although open surgeries are almost obsolete in urological centers, laparoscopic ureterolithotomy (LU) is required in the special group of patients and also as a salvage procedure for failed URS &/or SWL. It is also widely used as a primary procedure for large stones at centers that do not have access to URS and SWL. The aim of the present study was to prospectively evaluate the efficacy, safety, and complication rates of retroperitoneal laparoscopic ureterolithotomy in the treatment of large, impacted proximal, and mid ureteric calculi. Methodology: Thirty patients who underwent laparoscopic retroperitoneal ureterolithotomy between February 2010 to May 2012 were enrolled in the study. Proximal and mid ureteric stones were removed retroperitoneally. Results: The mean age of the patients was 36 years (range, 18–69 years). Mean stone size was 16 mm (range, 11–

24 mm). Mean operative time was 59 min with minimal bleeding (35 ml) and drain was removed on day3 with return of normal activity at 11 days. The success rate was 100%, no conversion to an open procedure was seen. There were no major complications. Conclusion: We recommend retroperitoneal laparoscopic ureterolithotomy for specific indication like impacted > 1cm proximal calculi in the primary setting as an effective alternative with highest stone free rate with a caution that the surgeon should be well versed with the procedure and the anatomy of the retroperitoneal space.

Keywords---Retroperitoneal, ureterolithotomy, Percutaneous nephrolithotomy, ureterorenoscopy, hydronephrosis.

Introduction

Ureteric calculi are the most common callfor patients presenting with flank pain. The main aim is to protect the ipsilateral renal unit and achieve a stone free status in such patients. Most patients are managed conservatively but some who fail the initial management or develop hydronephrosis usually require a surgical option in the form of ureterorenoscopy (URS), shock wave lithotripsy (SWL) or Percutaneous nephrolithotomy (PCNL)[1-5].In cases of large ureteric calculus (> 1cm), impacted calculus, and in patients who have proximal ureteric calculi with hydronephrosis, open ureterolithotomy is performed. Although open ureterolithotomy has the advantage of achieving a complete stone free state, it is associated with many limitations including poor cosmesis, greater morbidity, and loss of days of work [6]. SWL is not recommended in patients with large stones and associated hydronephrosis. With an associated stone free rate of 60 - 90 %, URS and PCNL are also in the contest of the best treatment modality for ureteric calculi.

To overcome these difficulties, use of minimal invasive surgery intheform of lap ureterolithotomy has been an alternative method for the management of such cases. Lap ureterolithotomy has been proposed to have similar results as compared to open surgery with the advantages of better cosmesis, decrease in analgesic requirement, fast recovery, and decreased hospital stay [7].Additionally, the retroperitoneal approach has some inherent advantages like minimal peritonitis, no colonic mobilisation, faster recovery, and if any urinary leak occurs it is contained within the retroperitoneum [7]. In the premise of the associated advantages of lap retroperitoneal ureterolithotomy,the presentstudy was aimed to evaluate the outcomes of lap retroperitoneal ureterolithotomy in upper and mid ureteric calculi.

Material and Methods

Patient recruitment

A total of 30 patients with larger than 1 cm dense and impacted upper and mid ureteric stones, with failed URSL or SWL procedurewere included in the study. The study was conducted at the Kidney hospital Sonwar,Srinagar, Indiafrom Feb

2010 to May 2012. Patients with history of previous retroperitoneal surgery on the same side and patients with lower ureteric calculus were excluded from the study.

Baseline screening and investigations

All the patients were screened in the outpatient department with ultrasonography and on admission they underwent base line investigations for complete blood count, serum biochemistry, and coagulation profile. CT urogram was advised for anatomical details and stone size and location, and function of the kidney. Stone size was based on the long axis of stone on preop CT urogram. Pre anesthetic check-up was done in all cases, all cases were done under general anesthesia and preop antibiotics were given at the time of intubation. Well informed written consent was taken from all patients to participate in the study.

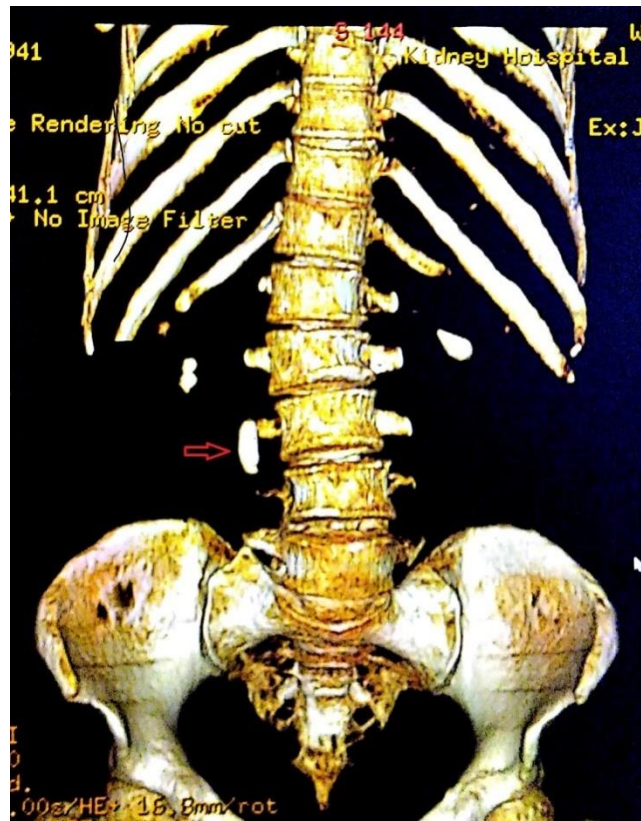


Figure 1: Ct urogram depicting Right proximal ureteric calculus (arrow)

Procedure

Patients were placed in supine position for intravenous line, induction, endotracheal tube, and urinary catheter placement. Patient position was then changed to lateral decubitus depending on the side to be operated with hyperextension. A 15mm incision was made 1 cm below the tip of the 12th rib in the anterior axillary line and an opening was made in the lumbodorsal fascia with the use of long artery forceps. The retroperitoneal space was dissected using

blunt finger dissection and peritoneum was separated anteriorly using finger sweeping motion. The working space was expanded using a balloon dissector (PDB) which was filled upto 400-600 ml of air and kept for 5 min to achieve hemostasis.

The balloon was then deflated, withdrawn, and under finger guidance two ports were created one 10 mm and other 5mm. The ports were placed depending on the side to be operated, the 10mm port is usually placed as the working port. One port was created at the renal angle marked by the 12th rib and the lateral border of sacrospinalis muscle confluence and the other at around 2 cm above the anterior superior iliac spine. A Hassan trocar was placed at the primary port which was used as the camera port. Additional 5 mm port was placed as required.



Figure 2: Retroperitoneal access depicting the trocar positions.

The first step was the identification of the psoas muscle after which the ureter was identified just above and medial to the psoas tendon. The ureter was then traced unto the pelvis. Stone was usually localized by a bulge in the ureter on which an incision was given using an Endo knife which was extended by the endoscissors. The stone was dislodged and retrieved using cup forceps. A specially designed stent with both ends closed and a small guide wire in between was placed across. The guide wire was removed after the stent was placed. The ureterotomy was closed using 4 0 polyglactin sutures. A drain was kept, and the post sites were closed back. The ureter was held with a bowel grasper proximal to the stone which nullified stone migration.

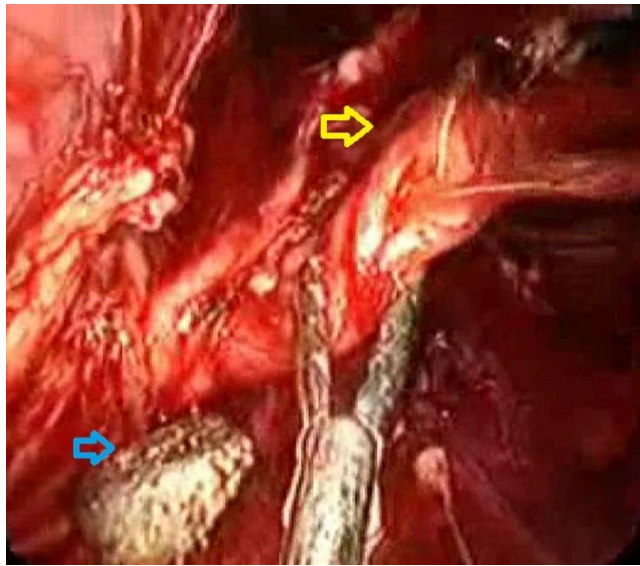


Figure 3: Ureterotomy with gush of urine (yellow arrow) and stone (blue arrow)

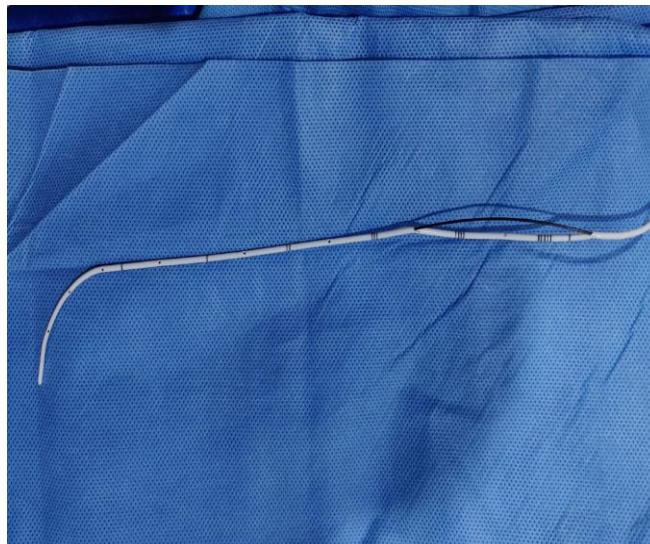


Figure 4: Modified DJ stent.

Postoperative care

Inj. diclofenac *was given immediately post operation for pain relief which was shifted to oral diclofenac 50 mg after 6 hrs. Oral feeds were started after 6 hrs. and patients were made to ambulate freely. Urinary catheter was removed on day 1 post op, the (in dwelling) id drain was removed when the drain was less than 50 ml and if it did not increase further. Patients were advised for follow up visits at 1 week, 1 month, 3 months, and at 1 year.

Statistical analysis

All data were entered to Microsoft excel sheet and was subjected to statistical analysis. Descriptive statistics were performed. Continuous variables were expressed as mean $\pm$ SD and categorical variables were expressed as frequency (%).

Results

The perioperative characteristics of patients are listed in Table 1. The mean age of patients was 36.4 ± 14.2 . Out of the 30 patients 23 (76.67%) were males and 7 (23.33%) were females. The mean BMI was 23.4 kg/m^2 . Based on laterality 19 (63.33%) patients had right side stone and 11 (36.67%) had left side stone. The mean stone size was 16.0 ± 3.3 (11.2-24) mm. Twenty-two patients (73.33%) had upper ureteric calculi and 8 (26.67%) had mid ureteric calculi (Fig.). The frequency of Grade I/II/III hydronephrosis was 4 (13.33%)/19 (63.33%)/7 (23.33%). The mean procedure time was 58.9 ± 16.9 min, and the mean blood loss were 34.8 ± 12.3 ml. Additional ports were placed in three patients. Clearance rates at discharge and follow up were 100%. The mean time of removal of drain was 3.1 ± 2.5 days. The mean time taken to return to normal activity was 11.5 ± 2.1 days. Complications seen were subcutaneous emphysema in 2 (6.67%) patients, opening of peritoneum in 2 (6.67%) patients, port side bleeding in 1 (3.33%) patient, urinary leak in 1 (3.33%) patient. No case of ureteral stricture was seen on a follow up of 1 yr.

Table 1: Patient characteristics and perioperative variables

Characteristic		value
Mean age		36.5 (18-69)
Sex	Male	23 (76.67%)
	Female	7 (23.33%)
Laterality	Right	19 (63.33%)
	Left	11 (36.67%)
Site	Upper	22 (73.33%)
	Mid	8 (26.67%)
Stone size (mm)		16.0 ± 3.3 (11.2-24)
Hydronephrosis	Gr I	4
	Gr II	19
	Gr III	7
Procedure time (mins)		58.9 ± 16.9
Blood loss (ml)		34.8 ± 12.3
Port placement	3 ports	27 (90%)
	4 ports	3 (10%)
Removal of drain		3.1 ± 2.5
Hospital stays (days)		3.6 ± 0.6
Return to normal life (days)		11.5 ± 2.1
Complication		
Subcutaneous emphysema		2 (6.67%)
Opening of peritoneum		2 (6.67%)
Port Side bleeding		1 (3.33%)

Urinary leak	1 (3.33%)
Ureteral stricture	0

Discussion

For ureteral stone management URS followed by SWL are the main modalities. However, in conditions where the stone size is > 1 cm, proximal ureteric calculi, large, impacted calculi and failed URSL, and SWL procedures, we recommend laparoscopic ureterolithotomy by the retroperitoneal route. In the present study we performed retroperitoneal laparoscopic ureterolithotomy in patients with larger than 1 cm dense and impacted upper and mid ureteric stones, with failed URSL or SWL procedure.

The most important advantage reported in this technique is the achievement of a 100% stone free rate [8-11]. In the present study we also achieved a 100% stone free rate in our patients. Stone migration with URS can be problematic in proximal stones and the procedure is abandoned or changed to PCNL or retrograde intrarenal surgery (RIRS) and requires an additional sitting. However, no stone migration was seen in the present study using laparoscopic ureterolithotomy technique. This might be attributed to the technique of cranial to caudal sweeping while dissecting and the use of a bowel grasper proximal to the stone in the present study to prevent any stone from migrating.

Ureteral stricture formation is a common issue when URS is used with laser in impacted stone and mucosal oedema. This is also seen when the ureterotomy is closed with tight sutures. To overcome the issue, we used loose 4/0 Polyglactin sutures for ureterotomy closure in a continuous fashion. We did not observe any case of ureteral stricture in our study on follow up of 1 yr.

Stents were placed in all our patients. We have a specially designed stent [11] (both ends closed with a short guidewire in the middle) which aids in stent placement without difficulty and less operative time. The mean operative time was around 59 min in the present study; however, it is based on the skill advancement of the surgeon. This routine stenting technique adopted by us led us to achieve low incidence of urinary leakage, early removal of drain, and fast resumption of normal activity in our series of patients [12,13].

We routinely use the retroperitoneal route as it is associated with early recovery, no peritoneal soiling and no mobilization of colon leading to less postoperative ileus, but retroperitoneal route has a limitation of small working space and has a longer learning curve as compared to the transperitoneal technique [14,15]. In the present study we observed peritoneal breach in two patients which was managed by placing a Veress needle in the peritoneal cavity, also, this can be managed by enlarging the breach to have a common pressure in the cavity. Overall, no significant complications were seen in our series and all cases were dealt in a safe and effective manner.

Conclusion

The mainstay for ureteral calculi is URS with laser lithotripsy but for specific indication like impacted > 1cm proximal calculi, retroperitoneal lapareterolithotomy can be an effective alternative with highest stone free rate. We recommend retroperitoneal lap ureterolithotomy for such cases in the primary setting with a caution that the surgeon should be well versed with the procedure and the retroperitoneal space.

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