



Retro-peritoneal Laparoscopic Ureterolithotomy for Proximal Ureteral Stones: An Experience from a Tertiary Care Institute from Kashmir Valley

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Abstract

Background: *Currently, shock wave lithotripsy (SWL), ureteroscopy (URS) and HO:YAG laser are the first line of treatments for patients with ureterolithiasis requiring surgical management. At centers which don't have access to expensive equipment needed in URS and SWL, Laparoscopic ureterolithotomy may be used as a primary procedure. The aim of this study is to share our experience of retroperitoneal laparoscopic ureterolithotomy for proximal ureteric calculi and evaluate the safety and efficacy of this procedure.*

Material and Methods: *This prospective study was conducted from March 2011 to August 2017 at our centre. A total of 94 patients with proximal ureteric stone who accepted laparoscopic ureterolithotomy were enrolled in the study. The evaluation and assessment of all these patients was done on the OPD basis with reference to their indication and suitability for laparoscopic ureterolithotomy modality of treatment.*

Results: *The mean age was 37 years. There were 61(64.89%) males. The stones were located in the right side in 58(61.70%) patients. 66(70.21%) patients have upper ureteral stone and 28(29.78%) patients have middle ureteral stones. The average stone size was 14.5 mm. Various complications that occurred during the procedure were difficulty in ureter localization, bleeding, injury to peritoneum, stone migration, and urinary leakage. The mean operative time was 65 minute and the mean blood loss was 70.50 ml. Mean hospital stay was 2.1 days and the stone clearance was 92(97.87%).*

Conclusion: *Even though SWL and URS are considered to be the first-line treatment for ureteral stones, retroperitoneal laparoscopic ureterolithotomy is a very effective minimally invasive modality of treating ureteral calculi. Unlike URS this procedure can give 100% stone clearance in one session. Although its role as a salvage procedure for failed ESWL, and ureteroscopy is undisputed, in selected patients with large chronically impacted ureteric stones, it may be considered the first line of treatment.*

Keywords: *Uteric calculus, Retro-peritoneal laparoscopy, ureterolithotomy.*

Introduction

The life time incidence of urolithiasis is up to 15 % in males and 8 % in females with a yearly incidence of around 131 per 100,000. The life time recurrence rate in patients with known urolithiasis approaches 50 %. Even today most of these patients are still handled by surgeons^[1]. Currently, shock wave lithotripsy (SWL), ureteroscopy (URS), and HO: YAG laser are the first line of treatments for patients with ureterolithiasis requiring surgical management^[2]. However, their use for large upper and middle ureteral stones remains controversial^[3]. Particularly with impacted stones, the success rate of SWL and URS diminishes, and when the stone size exceeds 1 cm, SWL efficacy decreases to from 84 to 42%^[4]. However 7 % of patients with ureteral stones may require repeated sessions of SWL, 1% –10% of such patients may need open surgery^[5]. At centers which do not have access to expensive equipment needed in URS and SWL, laparoscopic ureterolithotomy may be used as a primary procedure. The patients who are otherwise candidates for open surgery constitute the target population that may benefit from laparoscopic surgery in reducing morbidity and hastening recovery. Laparoscopic ureterolithotomy is gaining popularity for the management of upper ureteric stones especially if the stone is big or may require many endoscopic procedures and SWL sessions. Although laparoscopic ureterolithotomy (LU) is not the first choice in most cases for its invasiveness, LU has the highest stone-free rate (SFR) compared to SWL and URS, and LU also has its unique advantages on patients with large impacted stone, severe hydronephrosis, or anatomic anomalies^[6].

Material and Methods

The study titled “Retro-peritoneal Laparoscopic Surgery in the management of proximal ureteric stones: An experience from a tertiary care institute from Kashmir Valley” Was under taken in the Post Graduate Department of General and Minimal Access Surgery, Govt. Medical College

Srinagar. The study was completed from March 2011 to August 2017. A total of 94 patients were enrolled in the study. It was prospective observational study. An informed consent was obtained from the patients. Patients presenting with symptomatic proximal ureteric stones were included in the study lot. The diagnosis was established by ultra-sound, KUB, IVU and CT Urography in some patients [Figure 1].Patients with bilateral stones, having previous retro-peritoneal surgery and those unfit for general anesthesia were excluded from the study.The indications for LU were a stone >15 mm in diameter in upper or midureter or a history of failed SWL or URS. All lower ureteric stones were managed by URS. All procedures were performed by an experienced laparoscopic surgeon. All patients were followed up for at least 3 months. The study sample of patients was evaluated by detailed history, thorough general physical examination, and focused systemic examination and by metabolic profile. Informed consent was taken from all patients after explaining various available modalities of treatment with their potential benefits and possible risks. The patients were kept fasting over night and morning KUB was advised in all patients before surgery. All patients received a prophylactic dose of injection of ceftriaxone 1 gm 1 hour before surgery.

Operative techniques

General anesthesia with Endo-tracheal intubation is used in all Patients. After catheterization the patients are placed in right or left Standard full flank (lateral decubitus) position depending on the side involved. The patients were usually managed by the standard technique of 3 ports. The first port was made distal and anterior to the 12th rib in mid axillary line by designing 1.5cm incision the artery clip was used to open up the retro-peritoneal space by splitting and lumbo-dorsal fascia. We used balloon dissection in some patients and in others we used finger dissection to develop the space. The other 2 ports 5mm and 5/10 mm were made either finger guided or video

guided. The Hassan's cannula was fixed in the camera port and secured with 2 -0 Vicryl sutures to avoid gas leak. Two 5 mm ports were created anterior and lateral to this 10 mm optical port. However the 5 mm port made 5cm above and anterior to the anterior ileac spine was changed to 10 mm port in most of patients, as gauze insertion and a big stone removal becomes feasible through 10 mm port. Fourth 5 mm port (accessory port) for retraction if needed is positioned usually between telescopic port and the port near anterior superior iliac spine. We precisely identified the Psoas muscle and located the ureter running all along its medial boarder. Ureter is identified by its peristaltic activity and anatomical position. The stone was detected easily in majority of patients creating a dumb-bell appearance with the proximal ureter distended and the distal ureter collapsed. The longitudinal ureterotomy was made either by using harmonic ace, mono-polar hook or by Endo knife and stone was sandwiched out between 2 working instruments. The flushing was done by either the ureteric catheter or by feeding tube proximally and distally. The DJ stent was mounted on a guide wire and a pusher and the assembly was loaded in to the lumen of suction tip. The stent was introduced by the left hand of the surgeon and guided by the right hand. Using 4-0 vicryl the ureterotomy was closed in all patients by interrupted intra-corporal suturing. The stones were removed through the 10 mm working port using stone scoop forceps. . A drain was put in all patients. The ports were closed and dressing applied. On the 1st postoperative period a plain X-Ray KUB was performed to check the status of stent and any residual stone bit left over. The catheter was always removed first followed by drain. The patients were discharged usually between 3 to 7 days postoperatively. The patients were advised to come for follow up and removal of DJ stent was done usually after 6 weeks (Figure. 2 to 6).

Statistical Analysis: The present study was used in descriptive and observation analysis technique for the purpose of study.

Results

The prospective analytic observational study of, "Retro-peritoneal laparoscopic ureterolithotomy for proximal ureteral stones: An Experience from a tertiary care institute from Kashmir valley." was carried out in the post graduate department of General and minimal access surgery Government medical College Srinagar from March 2011 to August 2017. A total number of 94 patients were evaluated with reference to aims and objectives mentioned, by analyzing the collected data from them. The age of patients ranged from 17–70 years with mean age 37 years. Our study reflected that males were mostly affected to the tune of 61(64.89%), Females 33(35.10%). In majority of patients stone were located in the right side 58(61.70%) and in left side 36(38.29%). Majority of patients 66(70.21%) have upper ureteric stone and 28(29.78%) have mid ureteric stone. The size of the stones varied from 12 to 25 mm among the patients; the mean stone size was 14.5 mm Table 1.

The complications that we faced were difficulty in ureter localization 4(4.25%) which were managed by conversion to open surgery, bleeding 4(4.25%), injury to peritoneum 3 (3.19%), conversion to open 6(6.38%), stone migration 2(2.12%), urinary leakage 3(3.19%), port infection 4(4.25%), sepsis 2 (2.12%) and stent migration 1(1.06%), ureteral stricture 2(2.12) Table 2.

In our study group the mean operative time was 65 minutes (range 45-90 minutes), and mean blood loss 70.30 ml (range 30-120 ml), resumption of oral intake was done early as in other laparoscopic surgeries and was average 1.1 days (range 1-2 Days), removal of Foleys catheter was done first followed by removal of drain. Foleys catheter was removed on an average of 1.1 days (range 1-6 days) and drain 1.2(range 2-7days). The mean hospital stay was 2.1 days (range 2-7days) .To check any residual stone and stone clearance, X Ray KUB was done on 1st post operative days. The complete clearance was done in 92(97.87 %) patients Table 3.

Table 1 Demographic Data

Variables	Results
Patient (N)	94
Mean age (years),Range	37(17-70)
Sex	
Male	61(64.89%)
Female	33(35.10%)
Stone location	
Right	58(61.70%)
Left	36(38.29%)
Stone site	
Upper	66(70.21%)
Middle	28(29.78%)
Lower	00(00.00%)
Stone size(Average),mm	14.5(12-25)

Table 2 Peri and Postoperative Complications

Complications	N=94
Difficulty in ureter localization	4(4.25%)
Bleeding	4(4.25%)
Injury to peritoneum	3(3.19%)
Transfusion	0(0%)
Major Vessel Injury	0(%)
Conversion to open	6(6.38%)
Stone migration	2(2.12%)
Urinary leakage	3(3.19%)
Port Infection	4(4.25%)
Sepsis	2(2.12%)
Stent migration	1(1.06%)
Ureteral Stricture	2(2.12%)

Table 3 Postoperative Variables

Variables	Results
Mean Operative Time, Min	65(45-90)
Mean Blood Loss, ml	70.50 (30-120)
Resumption to Orals intake, Days	1.1(1-2)
Removal of Foleys Catheter, Days	1.1(1-6)
Removal of Drain, Days	1.4(1-7)
Hospital Stay, Days	2.1(2-7)
Stone Clearance	92(97.87%)

Intra-operative figures



Figure 1 CT Urography of patient showing calculus in right upper ureter



Figure 2 calculus in ureter identified

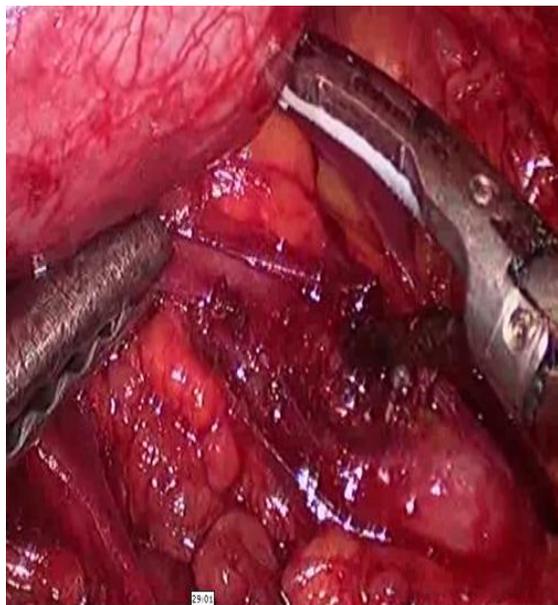


Figure 3 ureterotomy



Figure 4 Retrieved uretric calculus

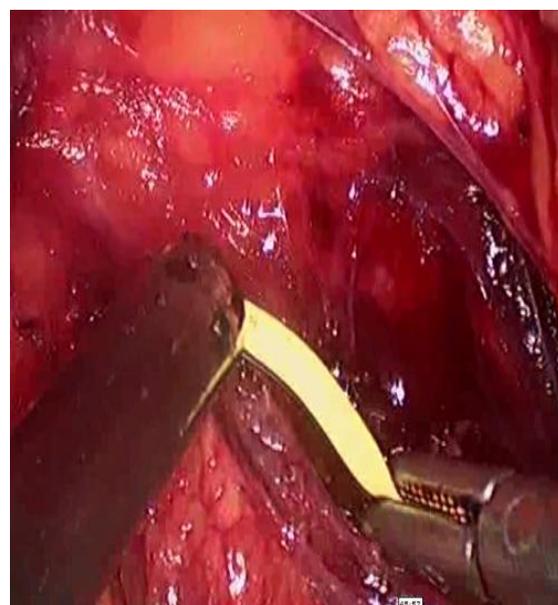


Figure 5 DJ stenting

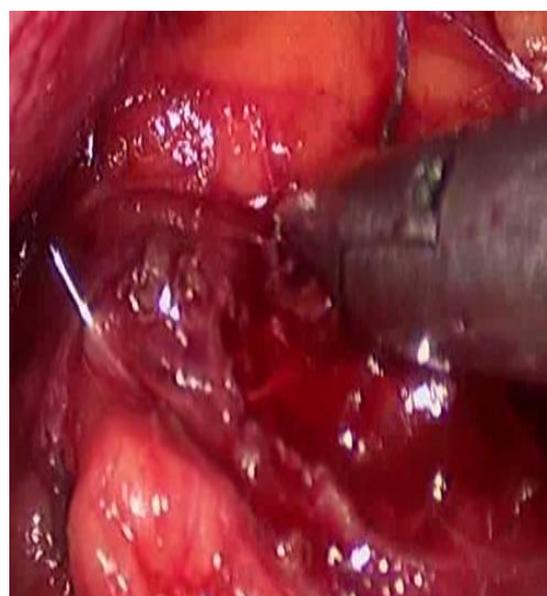


Figure 6 Closure of ureterotomy

Discussion

The treatment of ureteral calculi has evolved in recent decades and the ultimate objects are clearance and minimal invasion. Current options including SWL and URS have the particular rates of clearance; complications, and limitations, respectively. ESWL is suitable for managing ureteric stones of less than 1 cm in size. With the increase in stone size the chances of stone clearance decreases and the need for multiple sessions increases which together tells upon the patient compliances and adds cost to the treatment [4].

The first retroperitoneal ureterolithotomy was performed in 1979 by Wickham^[7]. In several studies LU showed a >95% success rate in the treatment of large ureter stones^[8,9] According to the European Association of Urology guidelines on urolithiasis, large impacted ureteral stones, failure of minimally invasive procedures, different operative requirements for a concurrent indication, and technological deficiency are considered to be indications for performing LU^[10]. laparoscopic ureterolithotomy occupies the central and dominant place as it is the minimally invasive procedure of choice in a selected group of patients

were the stone cannot be accessed ureteroscopically or were stones cannot be fragmented.

We took up a study with 94 patients presenting with upper and mid ureteric stones and performed laparoscopic retro-peritoneal ureterolithotomy on all of them. There was the significant learning curve in our performance and took us more than first 15 cases to grasp the technique. The analysis of our series showed that mean age was 37 years (range 17-70 years) and males were predominantly 61(64.89%) involved in the renal calculi disease 61(64.89%)^[11]. We also evaluated the data and found that the presentation of stone and the location was predominantly on the right side to the tune of 58 (61.70%) and 36 (38.29%) on the left side^[12]. In our study group upper ureteric stone was present in 66(70.21%) and lower ureteric stone in 28(29.78%). The average stone size 14.4 mm (range 12-25mm) [Table 1]

No surgery is devoid of complications so did we have in our series. In the first few cases we had difficulty in ureter localization 4(4.25%). As we progressed during our learning curve with the grasp of technique this problem was solved subsequently. Dissection for ureteric localization should be done very much carefully as during this step one may injure gonadal vessels or even IVC and aorta if dissection is carried too medially. During dissection one should avoid sweeping in caudal to cranial direction as it can cause proximal stone migration. We have proximal stone migration in 2(2.12%) in to the dilated pelvic calyceal system and this patient was converted to open managed thereof. This happened in the beginning of the study during our learning curve. Subsequently we learned that in upper ureteric stones one should always hold the proximal dilated ureter above the stone with a soft non traumatic grasper before making ureterotomy. The study conducted by Selcuk Sahin et al reported higher stone migration rate (11%) as compared to our study. Inadvertent peritoneal injury is one of the technical mishaps which can make the procedure difficult by significantly reducing the

working space. In our series 3(3.19%) patients developed this complication. The best way to manage this complication is by introducing Veress needle in the peritoneal cavity. In some cases one may need to enlarge the peritoneal tear to equalize the Pressures^[13]. The bleeding was present in 4(4.25%) and we didn't encounter any major vessel injury thereby no transfusions were required in any patient. The conversion rate in our study was 6(6.38%) Compared to several series that reported conversion rates of <10%^[14, 15, 16, 17]. The reasons for our conversion to open were mostly due to tear in the peritoneum resulting in the collapse of space, ureter localization and occasionally for bleeding.

We routinely stented all patients and also sutured ureterotomy with vicryl 4-0 in all patients. This helped us to reduce the prolonged urinary leakage in the post operative period which otherwise increases the morbidity and the hospital stay, though it will increase operative time. 3 (3.19%) patients in our study developed prolonged urinary leak. This was probably in patients where it was difficult to close the pelvis and ureter water tight^[18]. Urinary loss of 2-20% is reported in the literature^[15,18,19,20,21]. All these were managed conservatively. It is important to mention that the patients who had prolonged urinary leakage were discharged from the hospital with an advice to report back after the drain output would substantially would decreased. The port site infection was present in 4(4.25%) These patients were managed by culture sensitivity specific antibiotics and daily dressing. Sepsis is part of any surgical procedure and we encountered it in 2(2.12%) cases, possibly due to urinary tract infection or prolonged surgery in these cases which might also be due to port infection. The technique of stenting was practiced meticulously in all patients however in 1(1.06%) patient we found the stent had curled in the lower ureter. Luckily it didn't pose any post operative problem but it needed Ureteroscope for removal in the third post operative week by the urologist. In follow up period Ureteric stricture was present

2(2.12%) which were managed by balloon dilatation [Table 2].

The mean operative time in our study is 65 min (45-90). The operative time steadily decreases with increasing experience. Goel et al^[13] reported a mean operative time of 108.8 minutes (range 40-275 minutes). Hemal et al^[22] reported a mean operative time of 67 minute (range 40 -97 minutes). Flasko et al^[20] reported the shortest mean operative time of 45 minutes (range 15-100 minutes). It is important to mention that one has to be skilled in the technique of port making, establishing a space, localizing the pelvis and ureter, stent insertion and intra corporeal suturing. The blood loss is a part of all surgical procedures but luckily in our series we had a negligible blood loss amounting to mean 70.50 (30-120). While as study conduct by Gaur et al has a mean blood loss of 25 ml (range 5-100ml). Goel et al^[13] had a mean blood loss of 58.5 ml (range 25-75ml). In our study we start orals in majority of patients in 1st post operative day; the mean start of orals was 1.1 day (range 1-2 day). It was our standard to remove the Foleys catheter on 1st postoperative day and if there is no increase in urinary drainage after 12 hours, we remove the retroperitoneal drain. The mean duration of removal of Foleys catheter was 1.1(range 1-6days) and drain 1.4 (range 1-7 days). The mean hospital stay in our study is 2.1(2-7)) days. Goel et al^[13] reported hospital stay ranging from 2-14 days, with an average hospital stay of 3.3 days. Hemal et al^[22] has a mean hospital stay of 2.4 days range 2-3 days. The short hospital stay which we could offer to these patients we believe is due to using stent in all cases and closing the ureterotomy. Early start of oral feeds on the day of surgery and early removal of Foleys catheter and drain

All patients had to undergo an X-Ray KUB in the first post operative period to access the status of the stent and any residual stone left over. We are satisfied with the stone clearance 92(97.87%)^[5,13] This was possibly because we took care while delivering the stone either from the pelvis and either from the ureter and didn't allow it to break.

It is also because we selected solitary stone patients whether pelvic or ureteric. It is also because proper flushing was performed and also possibly an inherent benefit of laparoscopy that provides a visual guide to remove the stone in Toto.

Conclusion

We conclude from our study that Endoscopic management takes a lead in the management of urinary calculi disease. Even though SWL and URS are considered to be the first-line treatment options for ureteral stones, retroperitoneal LU can be established as an effective, safe, minimally invasive and reliable method, particularly in cases with large impacted stones and failure of the first-line treatments. It is also a cost effective technique especially in patients who need repeated endoscopic procedures to handle the stone load especially in developing countries like ours. Laparoscopy also avoids exposure to repeated radiation and removes the stone in Toto in a single sitting with the best stone clearance. Additionally for the urologists this procedure provides the opportunity to develop enough skill for operating laparoscopically in the retro-peritoneum and train himself for more complicated procedures like laparoscopic pyeloplasty, laparoscopic nephrectomy etc.

Conflict of interest: The authors declare they have no conflict of interest

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