Laparoscopic Ureterolithotomy with Concomitant Pyelolithotomy Using Flexible Cystoscope

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Purpose: To report and discuss the treatment of ipsilateral upper ureteral and renal stones by laparoscopic ureterolithotomy with concomitant pyelolithotomy using flexible cystoscope.

Materials and Methods: A total of 19 patients (14 men and 5 women) underwent laparoscopic retroperitoneal ureterolithotomy with concomitant pyelolithotomy using flexible cystoscope through the ureterotomy site. The mean age of the patients was 37.9 (22-61) years. Stones were on the right side in 12, on the left side in 7, and multiple in 6 patients. All ureteral stones were located in the upper ureter. Most renal stones were in the pelvis or in the calices.

Results: All procedures were completed laparoscopically without conversion to open surgery. Mean operation duration was 86.5 (range: 80-93) minutes, thus operation duration was prolonged by a mean of 24.4 minutes in patients with concomitant stone extraction. Fifteen cases were treated using flexible cystoscope and a nitinol basket; in the remaining four cases holmium laser lithotripsy was performed. Complete stone clearance was confirmed by postoperative imaging in all patients.

Conclusions: Laparoscopic ureterolithotomy with concomitant pyelolithotomy is a feasible and effective technique for patients with large ureteral stone and low renal stone burden.

Keywords: flexible ureteroscopy, laparoscopic ureterolithotomy; pyelolithotomy

INTRODUCTION

During the last 3 decades with improvement and miniaturization of instruments, the treatment of urinary stone disease has dramatically changed. Minimally invasive surgical techniques like extracorporeal shock wave lithotripsy (SWL), ureteroscopy (URS), and percutaneous nephrolithotomy (PNL) have played an important role in the treatment of urinary stones.[1,2] For patients who were failed on these treatments, open surgery is needed.[1] However several drawbacks are associated with this approach. Since the introduction of the laparoscopy in urologic surgery, most urologic surgeries, including ureterolithotomy, can now be performed laparoscopically. Compared to the open ureterolithotomy, the laparoscopic approach enables lower postoperative morbidity, less blood loss, less postoperative pain, reduced hospitalization, a short convalescence period, and better cosmetic results.[3,4] Patients with ipsilateral renal and ureteral stones, pose a challenge for treatment. They often require multiple interventions or open surgery in order to have their stones retrieved. Recently, laparoscopic pyeloplasty or ureterolithotomy with concomitant flexible ureteroscopic renal stone extraction through a laparoscopic port has been reported.[5-8] The aim of our study is to evaluate the effectiveness of laparoscopic retroperitoneal ureterolithotomy with concomitant pyelolithotomy using flexible cystoscope for the treatment of ipsilateral ureteral and renal calculi.

MATERIALS AND METHODS

Study Population

We retrospectively reviewed the charts of 161 patients (163 renal units) who had undergone laparoscopic ureterolithotomy in our institution from April 2006 to August 2014. Of these patients, 19 had concomitant ipsilateral renal stones at the time of diagnosis which included 14 men and 5 women with a mean age of 37.9 (range: 22-61) years. Stones were on the right side in 12, on the left side in 7, and multiple in 6 patients. All ureteral stones were located in the upper ureter. Most renal stones were in the pelvis or in the calices (**Table 1, Figure 1**).

Procedures

Patients underwent laparoscopic retroperitoneal ureterolithotomy with concomitant pyelolithotomy using flexible cystoscope through the ureterotomy site.

Evaluations

All patients underwent radiologic imaging including ultrasonography, intravenous urography (IVU), and computed tomography (CT). Stone size was defined as the greatest diameter of the stone. In cases of multiple kidney stones, the greatest diameter of the largest stone was used. Preoperatively, we performed physical examination, renal function test, urine analysis and culture, complete blood count and coagulation profile tests. In patients with active urinary tract infection, appropriate treatments were performed. A stone free status at 2 weeks or having clinically insignificant residual stones (<4 mm) were considered as treatment success.

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Table 1. Patient demographics and stone characteristics

Variables	Values
Number of patients	19
Male:female	14:5
Age, years; mean (range)	37.9 (22-61)
Right:left	12:7
Ureteral stone size, mm; mean (range)	21.2 (16-32)
Multiple renal stones; number (range)	6 (2-4)
Renal stone size, mm; (range)	3-14

Operation Technique

Under general anesthesia a retroperitoneal approach was employed in all patients. We have previously described our laparoscopic retroperitoneal ureterolithotomy technique in detail with its modifications[9]. After ureteral stone removal, a 16 Fr Storz flexible cystoscope (Karl Storz Endoscopy-America, Inc., Culver City, CA) was introduced through an available working port under direct laparoscopic guidance into the collecting system (**Figure 2**). Usually a port that is well aligned with the pelvis or ureter should be chosen for passing the instrument. Pyeloscopy is performed under direct vision. Continuous irrigation via the cystoscope allowed for superb visualization. Renal stones were removed with a nitinol basket. If the stone was large, holmium laser lithotripsy was performed. The laparoscopic suction device was placed below the renal pelvis to aspirate irrigation fluid from the operative field. An indwelling double-j ureteral stent was placed at the end of the procedure based on surgeon preference. The ureterotomy was closed with interrupted 4-0 absorbable sutures. The stone was removed in a homemade bag and was extracted through the first port. A closed suction drain was placed through one of the trocar sites. The fascia and skin were closed in the standard fashion. Ureteral stents were removed 4 to 6 weeks after surgery. This was followed by IVU examination 3 months after the operation. Analgesics were not routinely administered. Diclofenac sodium (75 mg intramuscularly) and paracetamol (500 mg oral) were given to achieve analgesia whenever needed. Analgesic usage and visual analog pain scores (VAS) were measured on the day of operation and on the first postoperative day. VAS score was clearly explained to each patient before the examination. The VAS score, in which 0 represents minimum (no) pain and 10 represents maximum (the worst possible) pain, was used to evaluate pain as perceived by each patient.

Table 2. Operative and postoperative data

Variables	Values
Mean operative time, minutes; mean (range)	86.5 (80-93)
Additional time for pyelolithotomym, minutes	24.4
Intraoperative DJ insertion, (n)	9
Analgesia requirement, days; mean ± SD	4.3 ± 0.82
Average VAS score on the day of operation; mean ± SD	5.93 ± 1.1
Average VAS score 1st postoperative day; mean ± SD	3.94 ± 0.88
Mean hospital stay, day; mean ± SD	2.97 ± 0.86
Mean return to normal activity, day; mean ± SD	8.91 ± 2.21
Auxilary procedures, N	0
Stone-free rate (%)	100

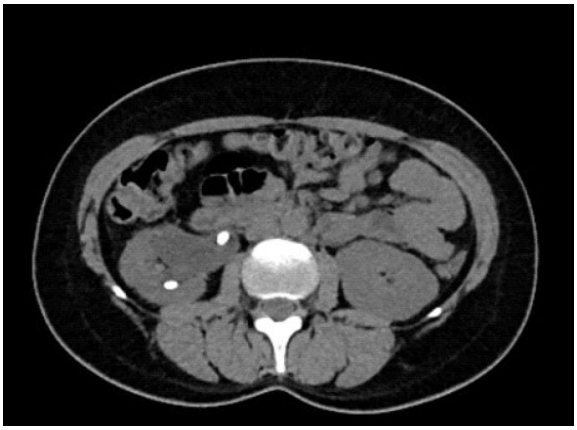

Figure 1. Preoperative CT imaging

RESULTS

All the procedures were completed laparoscopically with no conversion to open surgery. The mean size of ureteral stones was 21.2 (range: 16-32) mm. Renal calculi size ranged from 3 to 14 mm and a mean of 1.5 stones per patient was removed (range, 1 to 4 stones). Mean operative time was 86.5 (range: 80-93) minutes, thus the operation duration was prolonged by a mean of 24.4 minutes in patients with concomitant stone extraction. Fifteen cases were treated using a flexible cystoscope and a nitinol basket; in the remaining four cases holmium laser lithotripsy was performed. Double-J stent was inserted in 9 patients. The detailed perioperative data of patients are listed in **Table 2**. Complete stone clearance confirmed by postoperative imaging was achieved in all patients. No intraoperative complications were noted. No patient received blood transfusion. One patient who was not stented during the operation, was treated conservatively for high drain output which lasted for 6 day postoperatively . One patient developed fever and required antipyretic treatment. In one patient subcutaneous emphysema developed and ileus was seen in another patient which required conservative treatment. Stones analysis was available in 14 patients which revealed calcium oxalate, calcium phosphate, struvite and uric acid composition in 9, 2, 2 and 1 patients respectively.

DISCUSSION

Current standard treatment of urinary stones includes extracorporeal SWL, URS and percutaneous antegrade removal as important role players[1]. The frequently known limitations are high stone density, large and impacted stones[10]. The presence of concomitant ipsilateral ureteral and renal stone disease presents a challenging situation for the urologist. Multiple stones are found in 20% to 25% of patients with urolithiasis. In cases with multiple stones, 29% to 36% of patients have ureteral stones with renal stones simultaneously[11-14]. On the basis of a 40% to 50% stone-free rate (SFR) for

Figure 2. Flexible cystoscope introduced through an available working port

SWL in patients with multiple stones, questions are being raised about the effectiveness of SWL for these patients[15]. Improvements in flexible ureteroscopes, instruments, and laser technology have made retrograde stone removal more attractive. In case of large and multiple stones, complete stone clearance rate decreases and auxillary procedures may be required[14,16] .Due to these factors some patients require open surgery. Open ureterolithotomy has several drawbacks. Compared to open ureterolithotomy, the laparoscopic approach enables lower postoperative morbidity, less blood loss, less postoperative pain, reduced hospitalization, a short convalescence period, and better cosmetic results[3,4]. The success rate of laparoscopic ureterolithotomy for large ureteric stones is more than 95% as described by various researchers[17,18]. Currently, laparoscopic ureterolithotomy is performed either transperitoneally or retroperitoneally[19]. The retroperitoneal approach is advantageous in that the ureter can be accessed more directly and intraperitoneal contamination or infection due to urine leakage is less likely. Another advantage of this approach is the absence of peritoneal irritation[20,21] .In laparoscopic ureterolithotomy, dealing with concomitant kidney stones is a very difficult situation. Laparoscopic pyeloplasty with concomitant pyelolithotomy has been previously reported, and has been typically performed using a flexible nephroscope introduced through a laparoscopic port[5-7]. Ball et al. have reported complete stone clearance in 6 out of 7 patients undergoing simultaneous laparoscopic pyeloplasty and pyelolithotomy using a flexible endoscope and stone basket through the laparoscopic port without the use of intraoperative fluoroscopy[5]. Atug et al. reported the use of robotic graspers in one patient and flexible nephroscopy in seven patients for pyelolithotomy during robot-assisted laparoscopic pyeloplasty. Their stone-free rate was 100%, but operative time was 61.7 minutes longer for patients undergoing pyelolithotomy[6]. You and collegues, have recently described the methods for treating ipsilateral renal and ureteral calculi by combining retroperitoneal laparoscopic ureterolithotomy[8]. They performed laparoscopic ureterolithotomy with renal stone extraction using a stone basket under flexible ureteroscopy in 11 patients. Mean ureteral stone size was 19.9 mm. In addition 25 renal stones (mean size 7.48 mm, range 2-12) were removed. Mean operation duration was 78.5 minutes. Previously we have demonstrated this concomitant surgical technique. The removal of stones through the ureterotomy site was succesfully completed in three patients[9]. Laparoscopic retroperitoneal ureterolithotomy is the method of choice in large and impacted ureteral stones due to the low percentage of auxillary procedures in comparison to SWL or URS. If there is a concomitant renal stone present, then we prefer flexible cystoscopy and laser lithotripsy during laparoscopy in renal stones lower than 15 mm diameter irrespective of its multiplicity. In patients having a concomitant renal stones larger than 15 mm diameter, percutaneous stone extraction during retroperitoneal laparoscopy could be an option. Sun and collegues presented their study of treating ipsilateral renal and ureteral calculi by combining retroperitoneal laparoscopic surgery with tubeless mini-percutaneous nephrolithotomy. The mean number of stones in their study was 3.3 (range 2–7), and the mean stone size was 2.5 cm (range 0.9–3.8 cm) in 11 patients[22]. Our opinion is that concomitant percutaneous nephrolithotomy for patients having small renal stone is an invasive method and flexible cytoscopy is morenadvantegeous.

CONCLUSIONS

Laparoscopic ureterolithotomy with concomitant pyelolithotomy using flexible cystoscope was a safe and effective procedure and required relatively little extra operative time. We obtained complete stone clearance in all patients, without the need for additional procedure and morbidity. This combined technique requires expertise in laparoscopy and endourology. In addition, the diameter of the concomitant renal stone determines the best treatment option .

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