Original Article

Laparoscopic transperitoneal ureterolithotomy for large ureteric stones

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Abstract

Objectives: To evaluate the efficacy and safety of laparoscopic transperitoneal ureterolithotomy for management of large proximal ureteric stones.

Materials and Methods: Medical records of patients who underwent laparoscopic transperitoneal ureterolithotomy for proximal ureteral stones ≥2 cm were reviewed retrospectively. Patients' characteristics, stone characteristics, perioperative and follow-up data were studied. Patients with stones <2 cm in size, previous transperitoneal surgical procedure, or follow-up duration <6 months were excluded from the study.

Results: Twelve patients (mean age = 52.9 ± 12 years) with large upper ureteric stones (mean stone largest diameter = 39 ± 13 mm) were included. Nine patients had single stone, 2 patients had two stones, and 1 patient had large impacted stone with 2 small stones floating above. Mean operative time was 107 ± 49.5 min with mean blood loss of 60.5 ± 19.2 cc. Mean total pain score was 38.4 ± 5.5 (100 point scale) and mean time till resuming oral intake was 3.6 ± 0.5 h. Mean duration of hospital stay was 2.6 ± 1.4 days and mean duration of stenting was 7.3 ± 2 weeks. Throughout a mean duration of follow-up of 14.8 ± 7.6 months, 100% stone clearance rate was achieved with no recurrence. One patient developed a ureteric stricture treated by laser endoureterotomy and stenting for 6 weeks and responded without re-stricture formation.

Conclusion: Laparoscopic transperitoneal ureterolithotomy is a safe and effective approach for selected patients with large proximal ureteric stones with reduced postoperative pain and short hospital stay, and should be considered as a treatment option for such stones.

Key Words: Laparoscopy, stone, ureterolithotomy

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INTRODUCTION

The treatment of urinary lithiasis has been revolutionized during the last three decades. Minimally invasive therapies in the form of endoscopic surgery in conjunction with the advent of shock wave lithotripsy have diminished the role of open stone surgery.[1]

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Laparoscopic surgery provides a higher degree of patient satisfaction than open surgery from a cosmetic perspective. It is also effective in reducing postoperative pain, operative wound complications, blood loss, and the length of hospital stay. Accordingly, it has been remarkably developed in the field of urology over the past 20 years. Laparoscopy as a minimally invasive treatment is continuously gaining place in the treatment of urinary stones, mainly replacing open surgery.[2]

Skolarikos *et al.*[3] have tried to identify the level of evidence and grade of recommendation supporting the laparoscopic approach of stone extraction. The highest level of evidence (IIa) was found for laparoscopic ureterolithotomy. It is technically feasible and having lower postoperative morbidity compared to open ureterolithotomy. It is mostly recommended (grade B) for

large impacted stones or when endoscopic ureterolithotripsy or shock wave lithotripsy have failed.

The present retrospective study aimed to evaluate the efficacy and safety of laparoscopic transperitoneal ureterolithotomy for management of large proximal ureteric stones.

MATERIALS AND METHODS

We retrospectively reviewed the medical records of patients who underwent laparoscopic transperitoneal ureterolithotomy for large (≥2 cm) proximal ureteral stones during the period between 2007 and 2010 (image 1–2). Patients with stones <2 cm in size, previous transperitoneal surgical procedure or follow-up duration <6 months were excluded from the study.

The studied characteristics included patient's age, sex, stone (size, number, and laterality) and past history of stone surgeries or extracorporeal shock wave lithotripsy (ESWL). Collected operative data included type of anesthesia applied, operative time, mean amount of intraoperative blood loss, and the frequency of conversion to open surgery. Postoperative data included postoperative pain severity judged using 100-point pain visual analogue scale (VAS) with 0 = no pain and 100 = the worst intolerable pain, duration till first request and number of requests of postoperative analgesia, time till resumption of oral intake, time till first mobilization, and duration of hospital stay. Follow-up data included duration of follow-up, stone recurrence, ureteral stricture formation, and other complications.

Collected data were presented as mean ± SD, range, numbers, and percentages were analyzed using Wilcoxon unrelated test (Z test) and Chi-square test (χ^2 test) using SPSS Software program (Version 10, 2002).

Technique

After induction of anesthesia, flexible cystoscopy is done followed by retrograde pyelogram and a trial of ureteral catheterization to facilitate ureteral identification and later stenting. The catheter could pass alongside the stone in only 2 patients, while in 10 patients the impaction of the stone hindered passage of the guide wire and the catheter was left just distal to the stone. The patient is then placed in flank position with no flexion of the operating table and including the ureteric catheter in the sterile field. The procedure is performed through 3 ports, a 10 mm camera trocar inserted 2 fingerbreadth lateral and superior to the umbilicus, and 2 additional 5 mm working ports inserted a handbreadth superior and inferior to the camera port. A fourth 5 mm trocar is occasionally used for liver retraction in right-sided cases. After reflection of the colon, the ureter is identified and stone is located and extracted through a vertical ureterotomy. A 6F DJ stent is then inserted and the ureterotomy is closed with 4/0 Vicryl sutures. Using a 5 mm scope, the stone is extracted in a sac through the 10 mm port and then a small drain is inserted via the other 5 mm port.

RESULTS

Twelve patients fulfilled the inclusion criteria (9 males and 3 females) with mean age of 52.9 ± 12 (range, 31–67) years. The mean stone largest diameter was 39 ± 13 (range, 21–62) mm. Seven patients had left-sided and 5 had right-sided ureteral stones. Nine patients had solitary stone, 2 patients had two stones, while 1 patient had large impacted stone with 2 small stones floating above. Three patients had previous successful ESWL, 2 patients had previous successful ureteroscopy, 4 patients were small-stone passers, and 3 patients had ureteric stones for the first time. Stone clearance was achieved in 100% of patients.

Operative data are shown in Table 1. All procedures were completed uneventfully without any intraoperative complications or the need for open conversion.

Patients who received general anesthesia requested postoperative analgesia significantly (P<0.05) earlier than those who had neuroaxial anesthesia with significantly (P<0.05) lower number of requests of postoperative analgesia. Mean total pain VAS score at the time of first request of postoperative analgesia was 38.4 ± 5.5; range: 30–45 and was significantly (P<0.05) lower in those who received neuroaxial anesthesia compared with those received general anesthesia [Table 2].

Table 1: Operative data

Data	Findings
Anesthesia	
General inhalational	9 (76%)
Thoracic epidural	3 (24%)
Open conversion rate	0
Operative time (min)	107 ± 49.5 (70–250)
Intraoperative blood loss (ml)	60.5 ± 19.2 (35–90)

Data are presented as mean ± SD and numbers; ranges and percentages are in parenthesis

Table 2: Postoperative pain data

	Total	General anesthesia	Neuroaxial anesthesia
Pain VAS score	38.4 ± 5.5 (30–45)	40.9 ± 3.8 (35–45)	31.7 ± 2.9* (30–35)
Time till 1st request of analgesia (min)	84.4 ± 53.5 (30–180)	56 ± 19.4 (30–90)	160 ± 34.6* (120–180)
Number of requests of postoperative analgesia			
Once	4 (33.3%)	1 (8.3%)	3 (25%)
Twice	7 (58.4%)	7 (58.4%)	0
Trice	1 (8.3%)	1 (8.3%)	0
Mean	1.73 ± 0.6	2 ± 0.5	1

Data are presented as mean ± SD and numbers; ranges and percentages are in parenthesis. *Significant difference versus general anesthesia

Patients who had neuroaxial anesthesia showed significantly ($P<0.05$) longer time till first mobilization 4 ± 1 h (3–5) compared to those who received general anesthesia 2 ± 0.4 h (1.5–3). Only one patient had paralytic ileus, while the other 11 patients resumed oral intake after a mean duration of 3.6 ± 0.5 (range: 3–4 h).

Mean duration of hospital stay was 2.6 ± 1.4; range: 1–5 days and duration of stenting was 7.3 ± 2; range: 4–10 weeks. Throughout a mean duration of follow-up of 14.8 ± 7.6; range: 7–30 months, all patients remained stone free. However, one patient developed a ureteric stricture after 6 months of follow-up. He had laser endoureterotomy and stenting for 6 weeks and responded to the applied procedure without re-stricture formation.

DISCUSSION

The current study shows that past history of ureteric stones passage, previous ureteroscopy, or ESWL are not considered as a contraindication or hampers the utility of laparoscopic ureterolithotomy. Similarly, Huri *et al.*[4] had 6 patients in his series with previous history of ESWL and did not consider this as a contraindication for laparoscopic ureterolithotomy.

All enrolled patients had laparoscopic ureterolithotomy through the transperitoneal approach, a finding that confirms the established experience of the working team with this approach rather than retroperitoneal approach, which is more familiar to the urologists throughout their experience in open surgery. The transperitoneal approach offers more working space and better identification of anatomical landmarks Henkel *et al.*[5] However, previous abdominal surgery with the possibility of intraperitoneal adhesions could be a limiting factor; such a limitation was avoided in the current study, where patients with past history of abdominal or pelvic surgeries were excluded.

Proper patient selection allowed completion of the procedure without the need for open conversion, a result indicating that favorable surgical outcome depends on combined proper patient selection and surgical experience. In line with this, the mean operative time was about 107 min within a range of 70–250 min. Only one case with 3 stones in the initial experience required prolongation of operative time up to 250 min, while the actual range was 70–115 min with a mean time around 90 min. Our operative time was superior to that reported by Huri *et al.*[4] who reported a mean operative time of 124 min; this extended operative time could be attributed to the larger number of cases operated using the retroperitoneal approach. In support of this assumption, Simforoosh *et al.*,[6] compared extraperitoneal versus intraperitoneal approach for laparoscopic proximal ureterolithotomy and reported that operative time was different significantly in favor of the intraperitoneal approach. Moreover, the procedure was associated with minimal intraoperative bleeding with a mean blood loss of 60 mL and this goes in hand with El-Feel *et al.*[7] and Kongchareonsombat *et al.*,[8] who reported that estimated blood loss during intraperitoneal laparoscopic ureterolithotomy was 62 and 51 cc, respectively.

All patients had low pain VAS scores despite being lower in patients received neuroaxial anesthesia with significantly lower frequency of requests of postoperative analgesia compared to those received general anesthesia. Irrespective of the type of anesthesia, mean pain score was low and this could be attributed to minimal dissection and minimization of wound-related pain. The lower pain scores and the decreased consumption of postoperative narcotics allowed early ambulation and resumption of oral intake and spared the narcotic-related side effects, especially nausea and vomiting. These data go in hand with the conclusion provided by Almeida *et al.*,[9] who documented that comparison of laparoscopic and open ureterolithotomy proved that laparoscopy offered significant advantages over traditional open ureterolithotomy, resulting in improved analgesia and shorter hospital stays, but with similar complication rates.

All patients were discharged stone-free without stone recurrence throughout follow-up period and were free of complications apart from one patient who developed later a ureteric stricture and responded to endoureterotomy without re-stricture formation. These data indicate the efficacy and safety of laparoscopic transperitoneal approach. In support of that, Basiri *et al.*,[10] compared three surgical options for the management of urinary stones in the upper ureter, namely, retrograde ureteroscopic lithotripsy using a semirigid ureteroscope, transperitoneal laparoscopic ureterolithotomy, and percutaneous nephrolithotripsy and reported stone-free rates at discharge and 3 weeks later of 56%, 88%, and 64% and 76%, 90%, and 86%, for the three procedures, respectively. El-Moula *et al.*[11] indicated that laparoscopic ureterolithotomy was successful in 94.6% of cases and Matias *et al.*,[12] reported the global rate of stone free was 91%. Khaladkar *et al.*,[13] reported stone clearance rate of 39.1% with ESWL, 79.2% with ureteroscopic pneumatic lithotripsy and 100% with the laparoscopic method, with a statistically significant difference in favor of laparoscopic methods.

Our reported mean duration of hospital stay of 2.6 ± 1.4 days was superior to that previously reported by El-Feel *et al.*[7] and Abolyoser[14] who reported a mean hospital stay of 4.1 and 3.8 days, respectively, despite the absence of intraoperative or postoperative complication, but was in line with Matias *et al.*,[12] who reported a mean hospital stay duration of 3.3 days.

It can be concluded that transperitoneal laparoscopic ureterolithotomy is safe and effective approach for selected

patients with large proximal ureteric stones and can be considered as a treatment option for its advantages concerning consumption of postoperative analgesia and other medications with short-hospital stay. However, considering the limitations of the retrospective and noncomparative design of our study, larger scale prospective randomized controlled trials are mandatory to confirm the therapeutic yield for this option.

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