Retroperitoneal Laparoscopic Ureterolithotomy for Upper Ureter Stones

We evaluated the role of retroperitoneal laparoscopic ureterolithotomy (RPLU) for upper ureter stones. Between February 1998 and July 2004, 12 patients (10 men and 2 women) underwent RPLU for upper ureter stones (mean size 18.1 mm, range 10-25). RPLU was carried out in 5 patients as a salvage treatment after failed shock wave lithotripsy (SWL) (3) and both of failed SWL and ureteroscopy (URS) (2), and in 7 patients as primary treatment for large impacted stones. Total 6 of 12 cases were converted to open surgery. The reason of open conversion was failure of locating ureter due to severe adhesion in 5 cases and vascular injury in 1 case. In 6 successful cases, mean operation time, mean estimated blood loss, and mean postoperative hospital stay were respectively 109 min (90-120 min), 50 mL (10-100 mL), 4.6 days (2-7 days). There was no serious postoperative complication except for one patient who showed delayed urinary leakage but was cured with conservative management. Our experience suggested that RPLU was not easy to perform simply because it was indicated mainly in ureter stones with severe adhesion or after failed SWL and/or URS. Nevertheless, it can be considered as a primary procedure before open ureterolithotomy.

Key Words : *Laparoscopy; Ureteral Calculi; Ureterolithotomy, Retroperitoneal; Urinary Calculi*

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INTRODUCTION

The advent of various new techniques like ureteroscopy (URS), shock wave lithotripsy (SWL), and percutaneous renal surgery has revolutionized the treatment of ureteral calculi and rendered a need for open surgical lithotomy. However, these minimally invasive techniques have not been able to completely substitute for open surgery in selected cases of large, hard, long standing, and impacted ureteral calculi.

Since the initial report by Clayman and colleague (1) in 1991, laparoscopic surgery has been used for many types of urologic surgery involving ureterolithotomy. In particular, the retroperitoneal approach has become established in laparoscopy since Gaur (2) developed a balloon dissection technique for the retroperitoneum. Many groups have described cases requiring retroperitoneal laparoscopic ureterolithotomy (RPLU) and several series have examined the transperitoneal and/or RPLU as replacements for open ureterolithotomy.

We have performed many retroperitoneal laparoscopic operations since 1997, and have treated 12 cases for large impacted upper ureteral stones using RPLU, and first reported on the safety and efficacy of the technique in a series of laparoscopic nephrectomies for nonfunctioning kidney due to renal tuberculosis (3). However, we experienced an unexpectedly high open conversion rate in our RPLU series, which was unrelated with the learning curve.

We present our unexpected experience of 12 cases treated using RPLU.

MATERIALS AND METHODS

Between February 1998 and July 2004, 12 patients (10 men and 2 women, mean age 45.2 yr [range 25-62]) underwent RPLU for upper ureter stones (10 left, 2 right) with moderate to severe hydronephrosis. Five patients had undergone previous treatment, including 3 patients treated by SWL only and 2 patients that had been treated by URS and SWL. One of two patients treated with both ESWL and URS had undergone ESWL 20 times during one year. Seven patients were treated electively for large long-standing stones without previous treatments. One of the seven patients had undergone open ureterolithotomy at the site of this ureteral stone 10 yr previously. Patients' details are summarized in Table 1

Operation technique

Patients were positioned in a full lateral position. A 2-cm muscle splitting incision was made just below the tip of 11th rib. The transversalis fascia was incised, and the possible pararenal space was developed bluntly as far as possible with a finger with the aim of pushing the peritoneum forward and creating sufficient space for the introduction of a balloon dilator. We used a No. 7 glove fixed to the end of a No. 8 Nelaton catheter as a balloon dilator. The dilator was placed into the retroperitoneal space under digital control and inflated with normal saline. After balloon deflation and removal, a 10 mm Hasson trocar was inserted and a pneumoretroperi-

Table 1. Patient demographic data and the causes of open conversion in 6 cases

Case	Sex/Age (yr)	Stone location	Stone size (mm)	Hydronephrosis	Previous treatment	Open conversion	Cause of conversion
1	F/62	left, L5	25	Moderate	SWL ×3	Yes	Fail to identify ureter (first retroperitoneal case)
2	M/37	right, L4	15	Severe	SWL ×2, URS	No	
3	M/28	left, L3	15	Severe		No	
4	M/25	left. L3	10	Severe	SWL ×3	No	
5	M/27	left, UPJ	14	Severe		No	
6	M/67	left, L3	15	Severe		Yes	Peritoneal tearing
7	M/49	left, L4	23	Severe		No	
8	M/26	left, L4	14	Severe	SWL ×3	Yes	Fail to identify ureter due to severe adhesion
9	M/44	left, L4	25	Moderate	SWL ×20 URS	Yes	Fail to identify ureter due to severe adhesion
10	F/53	right, L4	18	Severe		No	
11	M/58	left, L4	21	Severe		Yes	Vascular injury
12	M/67	left, L5	24	Severe		Yes	Fail to identify ureter due to severe adhesion

SWL, shock wave lithotripsy; URS, ureteroscopy.

Table 2. A comparison of the demographic features of laparo-scopically successful cases and open conversion cases

	Laparoscopy	Open conversion
No. of cases	6	6
Mean age (yr)	36.5	54
Sex ratio (male:female)	5:1	5:1
Mean body mass index	26.8	25.6
Mean stone size (mm)	15.5	20.7
Location (right:left)	2:4	0:6
No. of cases with previous treatment	2	3

Table 3. Postoperative results of retroperitoneal laparoscopic ureterolithotomy

	Patient No.						Aver-age
	1	2	3	4	5	6	
Operation time (min)	110	115	140	125	110	90	109
EBL (mL)	<50	<50	<50	100	<50	100	50
Hospital stay (days)	7	7	8	3	1	4	4.61
Time to oral intake (days)	1	1	1	1	1	1	1
Analgesic requirement (Ketoprofen, mg)	40	40	40	20	0	40	30
Drain removal (days)	6	7	4	2	1	3	3.8
Stent removal (days)	36	15	17	None	10	None	19.5
Complication	Urine leakage	None	None	None	None	None	

EBL, estimated blood loss.

toneum was created. Twelve and 5 mm trocars were inserted under laparoscopic vision at the midclavicular and posterior axillary lines, and three ports were located on the transverse line in preparation for open conversion.

After identifying the ureteral stone, the ureter was incised directly over the stone longitudinally, and the stone was removed using a grasping forceps. The ureterotomy was closed with 4-0 vicryl using an intracorporeal suture and a double-J ureteral stent was inserted endoscopically in the lithotomy position after laparoscopic ureterolithotomy. In two patients, ureteral stenting was not performed because the tissue around the ureterotomy seemed healthy.

RESULTS

Six of the twelve cases were converted to open surgery. The reason for open conversion was a failure to identify the ureter due to severe adhesion in 5 cases and a vascular injury in one case. In detail, the first open conversion case was our first retroperitoneal laparoscopic operation. In this case, we could not find the ureter due to anatomical disorientation and technique deficiencies. After four consecutive successful laparo-

scopic surgeries the second open conversion occurred because it was difficult to continue the laparoscopic operation due to peritoneal tearing caused by severe adhesion around the ureter. Subsequently, in the two cases in which URS and/or SWL had been performed before laparoscopy, severe adhesion around ureter forced conversion to open ureterolithotomy. The fifth open conversion was due to a vascular injury that occurred while identifying the ureter in severely adhesive fat tissue in a case with a long standing large stone (more than 6 months, 21 mm). The last open conversion case was the case that had received open ureterolithotomy 10 yr ago previously at the same site. In this case we could not identify the ureter due to severe adhesion with the retroperitoneum (Table 1).

Table 2 compares the laparoscopically successful cases and the open conversion cases with respect to patient demographics. Sex and body mass index (BMI) were similar in the two groups. The mean age and the mean stone size were higher and larger in the open conversion group than in the success-

ful laparoscopically group. The number of cases that had received previous treatment were two in the successful laparoscopically group and three in the open conversion group, respectively.

The clinical data of the six successful cases are described in Table 3. Operative time ranged from 90 to 120 (mean 109) min. Intraoperative blood loss was negligible (mean 50 mL) and no transfusion was required. Nasogastric tubes were removed immediately after operation and Foley urethral catheters were removed during the morning of the day following the procedure. Resumption of oral intake was possible at postoperative 1 day in all patients. Postoperative pain was well controlled with a mean dosage of 30 mg of Ketoprofen®. The period of hospital stay ranged from 2 to 7 days (mean 4.6 days). The average period of ureteral stenting was 19.5 days (10-36 days). One patient with ureteral stenting developed a urine leakage, which resolved after 5 weeks of ureteral stent indwelling. No significant intraoperative or postoperative complications were observed.

DISCUSSION

The surgical management of urinary stone disease has dramatically changed since the introduction and development of percutaneous renal surgery, and due to significant achievements in shockwave lithotripsy, refinements in ureteroscopy, and technical advancements in the available modalities of intracorporeal lithotripsy (4). Several authors have reported that the rates of open stone surgery since the establishment of shockwave lithotripsy and subsequent endoscopic advancements are only 0.3 to 5.4% (5, 6).

While most patients with renal and ureteral stones can be treated using less invasive techniques, open stone surgery continues to represent a reasonable alternative for a small segment of the urinary stone population (4). The indications for open stone surgery have been reported as being complex stone disease, less invasive (endourologic or SWL) treatment failures, anatomic abnormalities, obesity, comorbid disease, and patient preference (7).

The first transperitoneal laparoscopic ureterolithotomy was performed by Raboy et al. in 1992 (8). After Gaur described retroperitoneal laparoscopic surgery facilitated by a hydraulic balloon dilatation system in 1992 (2), straightforward access became available through the retroperitoneum. Thereafter, several authors have tried to replace open ureterolithotomy as a transperitoneal or retroperitoneal laparoscopic procedure for ureteral stone disease, because of the minimal invasiveness of the laparoscopic technique.

RPLU has advantages over transperitoneal access by obviating compromise of the peritoneum and mobilizing the viscera, and by preventing urine spillage into the peritoneal cavity. However, the retroperitoneal approach offers a limited working place and it is often difficult to find the ureter due to lack of anatomical landmarks. In fact, Harewood et al. (9) reported in their series that two of three retroperitoneal approach cases were converted to transperitoneal laparoscopy because of a limited working place. Hemal et al. (10) reported the lowest success rate (75%) in their RPLU series, and explained that open conversion happened early in their series and that it was related to the learning curve. In addition, Rassweiler et al. (11) reported five cases of RPLU among 200 retroperitoneal cases, but felt that the procedure needed to be evaluated further. Our results also show a high open conversion rate. Taken together these results suggest RPLU is not easily performed.

However, compared to several series that reported open conversion rates of <10% (9, 12-14), our series resulted in an unusually high open conversion rate. Thus, we feel obliged to explain why we believe that open conversion happened so frequently in the present study. First the learning curve should be considered, but the time course of open conversions during our series shows that open conversions were not related to the learning curve. Second, technical shortcomings could have been contributed, but our team reported the first series of laparoscopic nephrectomies for a nonfunctioning kidney by renal tuberculosis, which was recognized as a contraindication for laparoscopy, and proved the safety and efficacy of the technique (3). Thus, we do not believe that the six open conversion cases in the present study were due laparoscopic technique shortcomings. Third, we examined the patient demographic data of successful and open conversion cases. Open conversion group patients were older and had larger stones than those in the laparoscopically successful group, although this difference was not significant because of the small sizes of the groups involved. Thus, we cannot be sure that age and stone size are related to the difficulty of performing RPLU, and further study is needed to identify the roles of age and stone size in RPLU. Pretreatments like URS and SWL may make RPLU more difficult to perform, but little difference was observed in this respect between the two groups, which suggests that previous SWL and/or URS treatments were not the cause of open conversion.

From the above reasoning, we concluded that RPLU is inherently difficult to perform, like laparoscopic nephrectomy for xanthogranulomatous pyelonephritis, which was reported not to be feasible versus open surgery (15). This hypothesis is supported by the fact that long-standing and large ureter stones are usually accompanied by severe adhesion around a stone; we experienced severe adhesions in all twelve cases regardless of pretreatment history.

However conversion to open surgery does not necessarily indicate a complication. Unlike laparoscopic nephrectomy for xanthogranulomatous pyelonephritis, our RPLU series did not cause severe postoperative complications and were not related to protracted operation times. In addition successful laparoscopic cases recovered rapidly and required fewer analgesics. Thus, we do not agree that RPLU is inherently

too complicated to be feasible.

In conclusion, half of our cases were converted to open surgery indicating that RPLU is not easily performed, because, in the present study, it was indicated mainly for ureter stones with severe adhesion or after failed SWL and/or URS. Nevertheless, it should be considered a primary procedure before open ureterolithotomy for large impacted ureter stones and for ureteral stones after failed SWL and/or URS because RPLU has the definite advantage of reduced invasiveness.

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