

**Bilateral Laparoscopic Stone Surgery for Renal Stones- A Case Series**

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**Purpose:** To present our experience with synchronous or metachronous laparoscopic pyelolithotomy and ureterolithotomy for patients with bilateral urolithiasis.

**Materials and Methods:** The data of all patients who underwent laparoscopic pyelolithotomy ( $\pm$  ureterolithotomy) for bilateral renal and/or ureteral stones from November 2009 to July 2014 were included. Laparoscopic operations were performed through a transperitoneal approach.

**Results:** 10 patients underwent laparoscopic operations for renal stones (19 kidney stones) and ureteral stones (1 ureteral stone). 4 patients underwent synchronous operations and 6 patients underwent metachronous operations. The mean  $\pm$  SD of operation duration were  $212 \pm 51$  minutes for synchronous operations and  $166 \pm 41$  minutes for metachronous operations. Residual stone was observed 5 patients. No patient developed urinary leakage.

**Conclusion:** Laparoscopic pyelolithotomy and/or ureterolithotomy for bilateral stones is a feasible option in centers with experience in laparoscopy.

**Keywords:** Laparoscopy; pyelolithotomy; ureterolithotomy; ureterolithiasis; nephrolithiasis; synchronous; metachronous

**INTRODUCTION**

Laparoscopic pyelolithotomy (LPL) was introduced more than 2 decades ago by Gaur et al.<sup>(1)</sup> In the following years after its introduction several series of comparative and non-comparative studies were published assessing the outcome of LPL and/or comparing it with percutaneous nephrolithotomy (PCNL).<sup>(2-10)</sup> Currently, LPL is accepted as an alternative second choice modality for treatment of renal stones especially single pelvis stones in centers with enough laparoscopy experience.

Simultaneous treatment of bilateral renal stones through PCNL has been reported by a few researchers.<sup>(11-13)</sup> We could find only limited cases in reports of laparoscopic treatment of bilateral renal and/or ureteral stones.<sup>(3,14)</sup>

**MATERIALS AND METHODS**

This study is an observational descriptive and retrospective study (Case series). Laparoscopic management of renal stones has been accomplished in our center (Labbafinejad Hospital) since May 2002. Laparoscopic pyelolithotomy had been performed on a total of 188 patients from May 2002 to Dec 2013 which included 10 cases of bilateral operations in same or different sessions. We collected data ONLY on all bilateral laparoscopic procedures for renal stones with or without ureteral stones. Preoperative evaluation included taking the clinical history, physical examination, urine analy-

sis and culture, serum creatinine and hemoglobin, intravenous pyelography or computerized tomography (CT) scan, and renal ultrasonography.

The choice of surgery by laparoscopy, percutaneous or transureteral approach was made by the discretion of the operating surgeon. Percutaneous and transureteral procedures are routinely performed in our center with high volumes each year (more than 2000 operations by PCNL or transurethral lithotripsy each year) therefore, the above laparoscopic procedures include a small percent of the endourologic procedures for stones in our center. The choice of other methods including percutaneous approach and transureteral approach was explained for the patient and his/her informed consent was obtained. Laparoscopic pyelolithotomy and ureterolithotomy were performed through transperitoneal route as described before<sup>(9)</sup> and are summarized below. After general anesthesia, the patient was positioned in the modified lateral decubitus with minimal flexion. A 10-mm camera port was inserted in the umbilicus by open access. Three 5-mm working ports were inserted under direct vision in the midline, 10 cm above the umbilicus, in the midclavicular line parallel to the umbilicus, and 5 cm below the umbilicus lateral to the rectus muscle. The white line of Toldt was incised, and the colon was medially reflected. The pelvis and ureter were identified, the renal pedicle was exposed, and then the renal pelvis was freed from surrounding peripelvic fat. The pyelotomy incision was made by electrocautery on

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**Table 1.** Patients' and operations' characteristics for synchronous operations

Variable	Data
Patients	N = 4
Operation duration (minutes), mean $\pm$ SD	212 $\pm$ 51
Creatinine before operation (mg/dL), mean $\pm$ SD	2.6 $\pm$ 1.1
Creatinine 1st postop day (mg/dL), mean $\pm$ SD	2.2 $\pm$ 1.2
Hemoglobin before operation (mg/dL), mean $\pm$ SD	12.1 $\pm$ 3.1
Hemoglobin 1st postop day (mg/dL), mean $\pm$ SD	11.4 $\pm$ 1.5
Hospitalization days, mean $\pm$ SD	7.7 $\pm$ 2.2
History of failed SWL, N	1
Operations	N = 8
Stone location, N	
Pelvis, multiple, ureter	3,4,1
Stone size (mm), mean(range)	25.2(10-56)
Residual stone, N(%)	1(12.5)

the renal pelvis and extended from the superior to inferior calyx with scissors, cautiously to prevent excessive pelvis tearing.

The tip of the pelvic stone was freed from the ureteropelvic junction, and then the stone was extracted with curve grasper and/or Babcock grasper. Additional stones were removed, and the pyelocalyceal system was washed out with normal saline. A ureteral stent was inserted, and the edge of the incision line on the renal pelvis was re-approximated using 4-0 Vicryl (Ethicon, Inc., Johnson & Johnson, Somerville, NJ) sutures. The stones were extracted from the abdominal cavity using surgical glove. In one case of ureteral stone, after medializing colon, ureter was identified and dissected free of surrounding tissues with care not to push the ureteral stone backward. Proximal ureter above the stone was held with locking Babcock and the ureter was incised in the proximal part of the stone. The stone was freed from ureteral mucosa and removed by graspers and extracted from abdominal cavity using surgical glove.

The drain was fixed in the peritoneal cavity near the operative field and was subsequently removed 3–5 days after the operation. The Foley catheter was retained for 5–7 days. The ureteral stent was removed 1 month after the surgery. The assessment of residual stones was performed by using plain abdominal radiography 1 day after the operation. All patients were followed up by non-contrast CT scan and/or IVP in the next 2-4 weeks after the operation.

Operative and postoperative data was extracted from patients' records.

## RESULTS

Laparoscopic pyelolithotomy has been performed on a total of 188 patients from May 2002 to Dec 2013 which included 10 cases of bilateral operations in same or different sessions. Bilateral procedures had been performed from November 2009 to July 2014. They included synchronous bilateral procedures in 4 patients and metachronous bilateral procedures in 6 patients. The mean  $\pm$  SD of patients' age was 45.5  $\pm$  17.2 years. All patients were male. One patient had previous history of SWL (Table 1). Another patient had history of both SWL and PCNL who underwent metachronous operations.

Operations' characteristics have been summarized in Tables 1 and 2 separately for synchronous and metachronous operations.

**Table 2.** Patients' and operations' characteristics for metachronous operations (N = 12)

Variable	Data
Stone location, N	
Pelvis, multiple, staghorn	6,3,3
Stone size (mm), mean $\pm$ SD	29.1 $\pm$ 6.7
Operation duration (minutes), mean $\pm$ SD	166 $\pm$ 41
Creatinine before operation (mg/dL), mean(range)	4.2(1-16)
Creatinine 1st postop day (mg/dL), mean(range)	3.5(1.2-10)
Hemoglobin before operation (mg/dL), mean $\pm$ SD	11.4 $\pm$ 1.5
Hemoglobin 1st postop day (mg/dL), mean $\pm$ SD	10.6 $\pm$ 1.7
Ureteral stent insertion, N(%)	12(100)
Hospitalization days, mean(range)	6.7(3-20)

## Synchronous operations

In patients with synchronous bilateral stone operations, one patient developed postoperative fever on the 4th postoperative day that resolved on the 5th day by intravenous antibiotics. No patient developed postoperative urinary leak. No patient received packed cells(PC) either during the operation or during postoperative hospitalization. Intraoperative ureteral stent was inserted for all patients. In one patient with bilateral pelvic stones, ureteral stent was not inserted on the right side with a single pelvic stone but was inserted on the left side with several pelvic stones. In one 11-year-old adolescent male, right pelvis stone and left upper ureteral stone were simultaneously operated.

## Metachronous operations

In patients with metachronous bilateral stones (6 patients, 12 operations), postoperative fever was observed in 3 patients. Fever in all these operations lasted for 24-48 hours and resolved by intravenous antibiotics. Packed cells were infused in 4 patients during 6 operations: In 3 operations, the patients received 1 unit PC; in one operation, the patient received 3 units of PC; and in two operations, the patients were given 4 units of PC. Residual stones were observed in 4 patients. In two patients, PCNL was performed to clear residual stones. These two patients originally had staghorn stones before their LPL operations. The latency time between metachronous operations ranged from 7 days to 3 years.

## DISCUSSION

Laparoscopic pyelolithotomy has long been used for treatment of renal stones. Currently, LPL is indicated in the treatment of renal stones as an alternative procedure to PCNL in cases of large, hard, or impacted stones, failed sessions of PCNL or endourology, associated anatomical abnormalities, and before embarking to open surgery.<sup>(5,9,15)</sup> However, there are reports on the performance of laparoscopic pyelolithotomy as the initial procedure for renal stones<sup>(15,16)</sup> and recent randomized clinical trials and meta-analyses highlighting the safety of laparoscopy for renal stones have been published.<sup>(6,7,17)</sup> Additionally the combination of laparoscopy with endourologic lithotripsy through the laparoscopic ports has been reported with success rates similar to open surgery.<sup>(18)</sup>

Bilateral PCNL operations have been reported by some researchers.<sup>(11-13)</sup> As in PCNL renal parenchyma is invaded and is associated with bleeding from injured pa-

renchymal tissue; there is concern regarding contralateral simultaneous operation which increases risk of bleeding. In laparoscopic operations, renal parenchyma is not invaded and risk of bleeding is less in comparison with PCNL as reported previously by several comparative trials<sup>(5-7,10)</sup> and one recent meta-analysis.<sup>(19)</sup> Therefore, bilateral simultaneous laparoscopic operations can be feasible if the first side operation can be accomplished in a reasonable duration with no complications. The patient will then be turned on the contralateral side, contralateral colon will be mobilized and operation will continue on the contralateral side. In patients with multiple renal stones in whom the sole use of laparoscopy for stone removal may result in impaired stone clearance rates several suggestions including the use of endoscopic lithotripsy through laparoscopic ports have been suggested.<sup>(18)</sup>

A unique scenario will be simultaneous operation of renal and ureteral stones on the same or contralateral side(s) which is not always possible in PCNL especially if upper ureter is not dilated or the ureteral stone is not in the vicinity of the uretero-pelvic junction.

Despite reports of bilateral synchronous PCNL operations, there are few reports on bilateral synchronous or metachromous laparoscopic pyelolithotomy operations. Nambirajan et al. reported bilateral matrix stones in a horseshoe kidney which was operated by laparoscopic pyelolithotomy in separate sessions.<sup>(14)</sup> Gaur et al. also reported bilateral retroperitoneal laparoscopic pyelolithotomy in one patient.<sup>(3)</sup> We could not find details of laparoscopic bilateral stone operations in the other series reported.

In the current series, we performed LPL on 2 patients with high preoperative serum creatinine. After the first operation, serum creatinine decreased substantially and the second side was then operated.

In brief; it seems that bilateral laparoscopic operations on patients with bilateral renal and/or ureteral stones seems feasible and can be performed in centers with extensive laparoscopic experience.

## CONCLUSIONS

Bilateral laparoscopic operations for renal and/or ureteral stones seem feasible for centers with laparoscopic expertise.

## CONFLICT OF INTEREST

The authors report no conflict of interest.

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