

# Laparoscopic Simple Nephrectomy After Previous Ipsilateral Open Versus Percutaneous Renal Surgery

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## ABSTRACT

**Background and Objectives:** Fibrosis after previous open or percutaneous renal surgery may interfere with ipsilateral laparoscopic nephrectomy. We prospectively compared the outcome of laparoscopic nephrectomy in patients with previous open renal surgery or percutaneous nephrolithotomy.

**Patients and Methods:** During the study period, 38 patients with previous ipsilateral open renal surgery (n = 22) or percutaneous nephrolithotomy (n = 16) who underwent transperitoneal laparoscopic nephrectomy were evaluated. All patients had symptomatic nonfunctioning small or hydronephrotic kidneys.

**Results:** Mean age was 57.6 y (range, 15 to 77). Both groups were age and sex matched. Two procedures (both in patients with previous open renal surgery) were converted to open surgery because of difficult pedicle dissection. Mean operative time was nonsignificantly longer in group 1 (111 versus 97 min;  $P = .22$ ). Intraoperative complications consisted of symptomatic capnothorax and diaphragmatic rupture in 1 case per group, managed successfully by inserting a chest tube or laparoscopic repair. Intraoperative blood loss and mean postoperative hematocrit drop were similar in the 2 groups. No significant differences were found between groups in postoperative variables, including time to oral intake, hospital stay, and time to ambulation.

**Conclusion:** Transperitoneal laparoscopic nephrectomy in patients with a history of ipsilateral open or percutaneous renal surgery is feasible in a timely manner. Given adequate laparoscopic experience, similar perioperative outcomes can be achieved in both groups. When laparoscopic nephrectomy is used, the precautions that need to be considered are similar for patients with previous percutaneous nephrolithotomy and those with previous open flank surgery.

**Key Words:** Laparoscopy, Nephrectomy, Previous surgery, Kidney, Complications.

## INTRODUCTION

Laparoscopic nephrectomy (LN) is currently accepted as a standard minimally invasive procedure at many institutes. At centers with a high turnover, a considerable number of candidates for nephrectomy have a previous history of surgery. Traditionally, previous abdominal surgery has been considered a relative contraindication for laparoscopy, because of the high likelihood of access-related complications, vital organ injury, and difficulties with tissue dissection.<sup>1,2</sup> The procedure may be even more challenging when LN is needed at the site of previous ipsilateral kidney surgery, because dense postoperative scarring may make hilar dissection and kidney mobilization more cumbersome. In a recent prospective trial, we showed that transperitoneal LN was feasible for benign renal pathologies in the setting of previous ipsilateral open or percutaneous renal surgery.<sup>3</sup> Although difficulties with tissue dissection and hilar control may result in a longer operative time, no increased risk was observed for intraoperative or postoperative complications.

In the present study, we prospectively compared the outcome of LN in patients with a previous history of open renal surgery (ORS) or percutaneous nephrolithotomy (PCNL).

## PATIENTS AND METHODS

Between March 2008 and December 2011, all patients with previous open or percutaneous flank surgery who

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required LN were enrolled in the study. Written informed consent was obtained from all patients. The benefits and risks of laparoscopic surgery and the possible need for open conversion, especially in the setting of previous surgery, were explained to each patient before surgery.

All patients had a symptomatic small or hydronephrotic poorly functioning kidney caused by chronic pyelonephritis or chronic obstructive uropathy resulting from missed ureteropelvic junction obstruction or obstructive stone disease. Functioning of the target kidney was evaluated by preoperative intravenous (IV) urogram and technetium-99m dimercaptosuccinic acid scintigraphy.

After the preoperative administration of a single IV dose of ceftriaxone and light bowel preparation, all patients underwent LN by the same surgeon (ARA).

### Surgical Technique

The patient was placed in a flank position and supported by adequate padding. A 4-port transperitoneal laparoscopy was made with a 10-mm camera port at the umbilicus, two 5-mm working ports at the subcostal area and midway between the umbilicus and anterior superior iliac spine, and another 10-mm trocar lateral to the rectus muscle at the level of the umbilicus. When needed, another 5-mm port was placed on the midline at the level of the xiphoid process for liver retraction. The camera port was made with an open-access technique. After medial mobilization of the colon (and duodenum on the right side), the ureter, gonadal vein, and renal pedicle were exposed. After complete dissection of the renal vein and artery, they were double-clipped separately with 10-mm Hem-o-Lok clips (Weck Closure Systems, Research Triangle Park, NC). If the renal artery was encased in dense scars, it was double-clipped en block with surrounding scars. If severe hydronephrosis was present, exposure of the renal pedicle was facilitated by draining the collecting system percutaneously with a Chiba needle. After the renal pedicle was divided, the kidney was mobilized outside Gerota's fascia; if dense surrounding fibrosis was observed, Gerota's fascia was incised and the kidney was mobilized in this fascia. Then, the specimen was extracted through a tiny incision over the site of the previous flank incision or by extending the site of the 10-mm trocar. The site of specimen retrieval as well as the trocar sites were then closed.

### Study Outcome

Patients were classified into 2 groups. Patients in group 1 had previous ORS (open retroperitoneal flank approach) and those in group 2 had previous PCNL. Demographic data as well as perioperative variables and major postoperative complications (higher than grade 1 according to Clavien's classification<sup>4</sup>) were recorded.

The outcome of LN was compared between the 2 groups by analyzing perioperative variables with Mann-Whitney's and Student *t* tests. SPSS version 15 was used for data analysis (SPSS, Inc., Chicago, IL).

### RESULTS

During the study period, 38 patients (18 [47.4%] men) with a previous history of ipsilateral renal surgery underwent LN. Mean age of the patients was 57.6 y (range, 15 to 77). Of these, 22 (57.9%) patients had a previous history of ORS and the other 16 (42.1%) had a previous history of ipsilateral PCNL. Both groups were age and sex matched.

In all patients, dense and loose fibrous tissue was found around the hilum and the kidney. In all but 2 patients, the hilar scars were released and the renal pedicle could be controlled safely. The other 2 patients had a history of open nephrolithotomy, and the procedure was converted to open nephrectomy to facilitate dissection of the renal pedicle. Mean operative time was longer in group 1, but the difference was not statistically significant (111 versus 97 min;  $P = .22$ ). Major intraoperative complications occurred in 2 (5.3%) patients (1 in each group). One patient with previous ORS developed capnothorax that compromised her hemodynamics. This patient was managed by insertion of a chest tube for 48 h. In another patient in group 2, the diaphragm ruptured during dissection of the left kidney. The diaphragm was repaired laparoscopically, and no chest tube was required postoperatively.

Intraoperative blood loss and mean postoperative hematocrit drop were statistically similar in the two groups. However, the need for blood transfusion was higher in group 1 (40.9% versus 12.4%). No statistically significant differences were observed between groups with respect to postoperative variables, including time to oral intake, hospital stay, and time to ambulation. Demographic data and perioperative parameters are shown in **Table 1**. No major postoperative complications occurred in any patient.

**Table 1.**  
Patient Characteristics, Intraoperative and Postoperative Data

	Group 2 (LN <sup>a</sup> with prior PCNL <sup>c</sup> ) (n=16)	Group 1 (LN <sup>a</sup> with prior ORS <sup>b</sup> ) (n=22)	Total (n=38)	P Value
Blood Transfusion (%)	2 (12.4%)	9 (40.9%)	11 (28.9%)	–
Intraoperative complication (%)	1 (6.2%)	1 (4.5%)	2 (5.3%)	–
Open conversion <sup>d</sup> (%)	0 (0%)	2 <sup>d</sup> (9.1%)	2 <sup>d</sup> (5.3%)	–
Mean Hospital Stay (days) (range)	3.1 (2–5)	3.27 (2–7)	3.1 (2–7)	0.94
Mean Time to Oral Intake (days) (range)	1 (1–1)	1.2 (1–5)	1.1 (1–5)	0.83
Mean Operative Time <sup>e</sup> (range)	97 (60–150)	111 (60–180)	108 (60–180)	0.22
Mean Preop/Postop Cr <sup>f</sup>	0.84/1.0	1.15/1.3	1.03/1.17	0.25/0.33
Mean ΔPostop-Preop Hct <sup>g</sup> (±SD)	–5.81 ±7.21	–8.35 ±6.19	–7.28 ±6.67	0.25
Indications for LN Nf small kidney <sup>h</sup> /Nf HN kidney <sup>i</sup>	9 (36%)/7 (53.8%)	16 (64.0%)/6 (46.2%)	25 (65.8%)/13 (34.2%)	0.40
Right/Left	7/9	15/7	22/16	0.6
Male/Female	8/8	10/12	18/20	0.82
Mean age (range) (years)	44.8 (20–77)	43.8 (15–70)	57.6 (15–77)	0.87

<sup>a</sup>LN=Laparoscopic nephrectomy.

<sup>b</sup>ORS=Open renal surgery.

<sup>c</sup>PCNL=Percutaneous nephrolithotomy.

<sup>d</sup>Due to difficulties in pedicle dissection.

<sup>e</sup>Calculated in minutes from insertion of the first trocar to closure of the skin.

<sup>f</sup>Cr: Creatinine (md/dL).

<sup>g</sup>Hct: Hematocrit.

<sup>h</sup>Nonfunctioning (Nf) small size kidneys presented with intractable flank pain/recurrent urinary tract infection (UTI) or uncontrolled renovascular hypertension.

<sup>i</sup>Nonfunctioning (Nf) hydronephrotic (HN) kidneys due to chronic obstructive stone disease, missed ureteropelvic junction obstruction (UPJO), secondary UPJO following previous operation or failed previous pyeloplasty and presenting with flank pain/flank mass or recurrent UTI.

## DISCUSSION

Laparoscopy in the setting of previous abdominal surgery needs special precautions; however, as a result of extensive research in the field of general surgery, previous abdominal surgery is no longer considered a contraindication for laparoscopic cholecystectomy.<sup>5</sup> Previous abdominal surgery may be associated with intraabdominal adhesions in up to 90% of patients. The urology literature contains little evidence regarding the effect of previous surgery on the outcome of LN. Likewise, little is known regarding the role of percutaneous kidney surgery on adhesion formation and the influence of previous PCNL on the performance and outcomes of LN.

Because the use of LN has become increasingly popular at academic centers, the number of candidates for laparoscopic urologic procedures who have a previous history

of surgery has increased. Parsons et al.<sup>6</sup> noted that during a 6-y period, 48% of their 700 patients who underwent a laparoscopic procedure had a history of abdominal surgery, and 15% of them had had surgery for the same target kidney. These investigators showed that this history was associated with a longer operative time and hospital stay after LN, but not with a higher rate of open conversion or complications.<sup>6</sup> Similar outcomes were later reported in a prospective cohort trial.<sup>3</sup>

The retroperitoneoscopic approach for nephrectomy or adrenalectomy was suggested by Viterbo et al.<sup>7</sup> for patients with previous open abdominal surgery or irradiation to avoid intraperitoneal adhesions and limit the risk of visceral injury. Seifman et al.<sup>8</sup> also showed that a retroperitoneoscopic approach for renal surgery was safer in the setting of previous open abdominal surgery. Nonethe-

less, this approach might be difficult in patients with previous ipsilateral ORS or PCNL. In these situations, a transperitoneal approach may be more appropriate, because the scar tissue usually lies behind the renal pedicle. Pautler et al.<sup>9</sup> retrospectively compared the outcome of laparoscopic renal and adrenal procedures in patients with and without previous abdominal surgery. Despite the presence of adhesions caused by previous open surgery, LN could be accomplished without an increased risk of complications. These investigators recommended measures to prevent access-related complications, such as using an open technique to insert the first trocar and selecting the site of the first trocar as far as possible from the site of the previous incision.

PCNL, as a minimally invasive approach, might be associated with less adhesion formation than ORS is, which usually requires complete mobilization of the kidney and its hilum. However, during and after PCNL, leakage of the irrigation fluid and urine into the retroperitoneum as well as perinephric hematoma can result in future scarring. To our knowledge, few studies have compared the outcome of LN in patients with previous PCNL versus previous ORS. Recently, Turna et al.<sup>10</sup> documented the feasibility of laparoscopic partial nephrectomy in patients with previous ipsilateral renal surgery. They stratified their sample (n = 25) into those with previous percutaneous surgery (n = 13) and ORS (n = 12) and found that in both groups, the operation can be challenging and should be limited to centers with appropriate experience with laparoscopic procedures. They observed no significant differences between the 2 groups regarding operative time, surgical complications, and postoperative morbidity. In our experience, and somewhat unexpectedly, we found that in patients with previous PCNL, the difficulties associated with LN were similar to those in patients with previous ORS. However, with due care, LN was feasible in a timely manner in both groups.

The present study highlights that during LN in patients with previous ipsilateral renal surgery (whether open or percutaneous), perinephric and/or perihilar adhesions can be expected. Transperitoneal laparoscopy in these patients provides excellent exposure and visualization of the renal pedicle, because the fibrotic bands are usually located posterior to the renal pedicle. Because of the obliteration of tissue planes in these settings, meticulous dissection is crucial to avoid penetration into the renal parenchyma. Meticulous technique is also important during hilar dissection. In our experience, we were usually able to dissect the renal vein circumferentially, but in some cases, in both groups, skeletonizing the renal artery

was difficult and risky, so the renal artery was double-clipped with its surrounding tissue. We believe that if the hilum is encased with fibrous tissue (as in 2 patients in this series), the surgeon should not hesitate to convert the procedure to open nephrectomy to ensure safe pedicle control.

Some limitations of this study deserve mention. The relatively small sample size may mask potential differences between our 2 subgroups. Moreover, we included only patients with benign renal pathologies in this cohort. Obviously, laparoscopic surgery for cancer in the setting of previous ipsilateral open or percutaneous renal surgery would be more challenging, because precise dissection of the scar tissue would be needed to avoid penetrating Gerota's fascia or the renal capsule.<sup>10</sup> However, a comparative study in a group of patients with laparoscopic radical nephrectomy would be worthwhile to define the extent of obliteration of the tissue planes caused by previous ORS or PCNL more precisely.

## CONCLUSIONS

Despite its technical challenges, transperitoneal LN in patients with a previous history of ipsilateral PCNL or ORS is a feasible, rewarding minimally invasive procedure. Given adequate laparoscopic experience, the perioperative outcome is similar for patients who previously underwent ORS or PCNL. When LN is used, the precautions that need to be considered are similar for patients with previous PCNL and those with previous open flank surgery.

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