

Case Report

Laparoendoscopic Single-Site Nephrectomy for Patients with Dialysis-Dependent End Stage Renal Disease

Sompol Permpongkosol MD, PhD*,
Kullanan Nontakaew MD*

* Division of Urology, Department of Surgery, Faculty of Medicine, Ramathibodi Hospital,
Mahidol University, Bangkok, Thailand

Objective: Assess the feasibility, safety, and outcome of laparoendoscopic single-site (LESS) nephrectomy in high-risk patients with end-stage renal disease (ESRD), who have undergone continuous ambulatory peritoneal dialysis (CAPD) and hemodialysis (HD) treatment.

Material and Method: Between October 2009 and January 2010, a 62-year-old female and a 36-year-old male that had undergone CAPD and HD, respectively, consecutively underwent LESS nephrectomies. The medical records of the two patients were retrospectively reviewed. The indications for nephrectomy were that the non-functioning kidney was associated with a ureteric stone and distal ureteric stricture, respectively. Parameters examined were patient demographics, medical co-morbidities, operative outcomes, and complications.

Results: All procedures were completed successfully via transumbilical LESS laparoscopy. The operative times were 160 and 200 minutes, blood loss 200 and 50 mL, and postoperative hospital stay 6 and 14 days, respectively. No intraoperative complications were reported. The first patient who used CAPD before LESS nephrectomy for whom CAPD was successfully reinstated within two weeks postoperatively. No other catheter-related complications occurred. The second patient required a reoperation to evaluate the active bleeding on the fifth post-operative day, but could not find any blood vessel injuries. The bleeding was stopped from the platelet replacement. Pathological evaluation revealed chronic glomerulonephritis in each case.

Conclusion: Less nephrectomy is a feasible technique with the advantages of less pain, shortened convalescence, improved cosmesis, and absence of wound complications.

Keywords: Laparoendoscopic single site surgery, Nephrectomy end stage renal disease, Continuous ambulatory peritoneal dialysis

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Patients with the end stage renal disease (ESRD) are considered as high-risk operative candidates as they often present with multiple co-morbidities such as electrolyte imbalances, platelet dysfunction, anemia, diabetes mellitus (DM), hypertension, congestive heart failure, ischemic heart disease, and peripheral vascular disease⁽¹⁻³⁾. The prevalence of patients with ESRD who need dialysis and/or transplantation has more than doubled in Thailand during the past two decades⁽³⁾. The prevalent number of dialysis in Thailand is 282 per million population, and utilization of peritoneal dialysis (PD) is 4.6% of the utilization of hemodialysis (HD)⁽⁴⁾.

Recently, Bird et al⁽¹⁾ demonstrated that a large cohort series of laparoscopic nephrectomy (LESS nephrectomy) for the treatment of renal tumors in ESRD patients requiring dialysis is feasible and safe with acceptable intraoperative and postoperative complication rates. Patients with ESRD may require longer hospital stay after LESS nephrectomy. However, no patient underwent peritoneal dialysis or had a peritoneal dialysis catheter in place. In the opposite, many studies indicated that laparoscopic cholecystectomy might be a relatively safe and feasible procedure in CAPD patients, offering an effective tool to rescue the dialysis catheter⁽⁵⁻¹¹⁾. Abdominal surgery can have a major impact on peritoneal dialysis patients and may interrupt peritoneal dialysis. Since 2009, laparoendoscopic single-site (LESS) nephrectomy, a type of embryonic natural orifice transluminal endoscopic surgery (NOTES), which is one of the recent innovations in the era of laparoscopy, has been

Correspondence to:

Permpongkosol S, Division of Urology, Department of Surgery,
Faculty of Medicine, Ramathibodi Hospital, Mahidol University,
Rama 6 Rd, Bangkok 10400, Thailand.
Phone & Fax: 0-2201-1315
E-mail: sompolpermpong@gmail.com

the treatment of choice in treating kidney disease. LESS nephrectomy has been shown to be a suitable treatment modality for an expanding spectrum of high-risk patients, including patients with complex co-morbidities and larger renal tumors. However, one such group includes those patients presenting with ESRD has not been evaluated in the literature. The aim of the present study was to assess transumbilical LESS nephrectomy in patients with ESRD treated with CAPD and HD.

Case Report

The surgical procedures were performed after obtaining an informed consent from the patients and the Internal Review Board acknowledged for the present study. Between October 2009 and January 2010 (4 months), the authors identified two patients with diagnosed ESRD that underwent CAPD or HD and then underwent LESS nephrectomy by a single surgeon for a non-functioning kidney. For each patient, the following data were recorded from medical charts, patient characteristics [medical history, demographic features, body mass index (BMI), physical status according to the American Society of Anesthesiologists (ASA) scoring system, indications for nephrectomy, concomitant illness, length of time that the CAPD catheter remained in place], peri-operative data (operative time, and estimated blood loss), and postoperative information (complications, length of stay, visual analog scale [VAS], and total morphine requirements) and time to resumption of CAPD.

Case 1 (Fig. 1)

Patient No. 1 was a 62-year-old woman, who had been using CAPD for four months because of ESRD secondary to diabetic and hypertensive nephropathy. Since she suffered from left pyonephrosis and non-function kidney with a proximal to middle ureteric stone, she had undergone percutaneous nephrostomy (PCN). Before PCN, the diagnosis was confirmed by ultrasound of the KUB system, which demonstrated the left ureteric stone, causing severe hydronephrosis (Fig. 1). The KUB X-ray shows the left proximal ureteric stone sized 1.15 centimeters. The DTPA-Renal scan confirmed non-functioning of the left kidney. After no infection, she underwent LESS nephrectomy. Peritoneal dialysis was stopped, and the dialysis solution was emptied 1 day before surgery. An intravenous prophylactic antibiotic (ceftriazone, 2 g) was given to the patient. Her body mass index

(BMI), ASA, hematocrit, urea, and creatinine were 24.1 Kg/m², III, 39.3%, 48 mg/dL and 5.1 mg/dL, respectively.

Operative technique

After anesthesia induction, the patient was placed in the flank position with the affected side elevated by 70°. The authors entered the abdominal cavity under direct vision. The R-port (Advanced Surgical Concepts, Dublin, Ireland) was inserted and a pneumoperitoneum was performed by CO₂ insufflation to 15 mm Hg. A 5 mm laparoscope with an integrated camera head (EndoEye, Olympus, Japan) laparoscope was inserted through the R-port. A Harmonic of Ultrasonic technology was used to dissect the tissue and to stop bleeding during the operations. Before the operation started, the CAPD catheter was positioned away from the operative field and the authors moved the camera to check placement of the CAPD catheter and to see whether any intra-abdominal adhesions were present and the adhesion was not found. Nephrectomy with LESS was performed duplicating standard laparoscopic steps with the help of bent and straight laparoscopic instruments.

Results

The procedure was successfully completed without conversion to conventional laparoscopic or open surgery. Operative time was 160 minutes. Moreover, the specimen could be easily and rapidly extracted through the opened R-port without the use of an additional entrapment bag. Estimated blood loss was 200 mL and pain scale was 0-1 while no morphine requirement. On the same day of the operative procedure, a double-lumen HD catheter was introduced for post-operative HD.

The patient underwent hemodialysis treatment via a subclavian catheter after the operation and he was discharged home on the sixth post-operative day with a functioning CAPD catheter, with no further problems. After two weeks, the patient switched from HD to CAPD without complications. Pathological analysis revealed chronic pyelonephritis. Post-operative hematocrit, blood urea nitrogen, and creatinine were 39.3%, 22 mg/dL, 2.3 mg/dL respectively. The scars receded into the umbilicus and were hardly visible.

Case 2 (Fig. 2)

Patient No. 2 was a 36-year-old man with dialysis-dependent ESRD. He had a surgically created

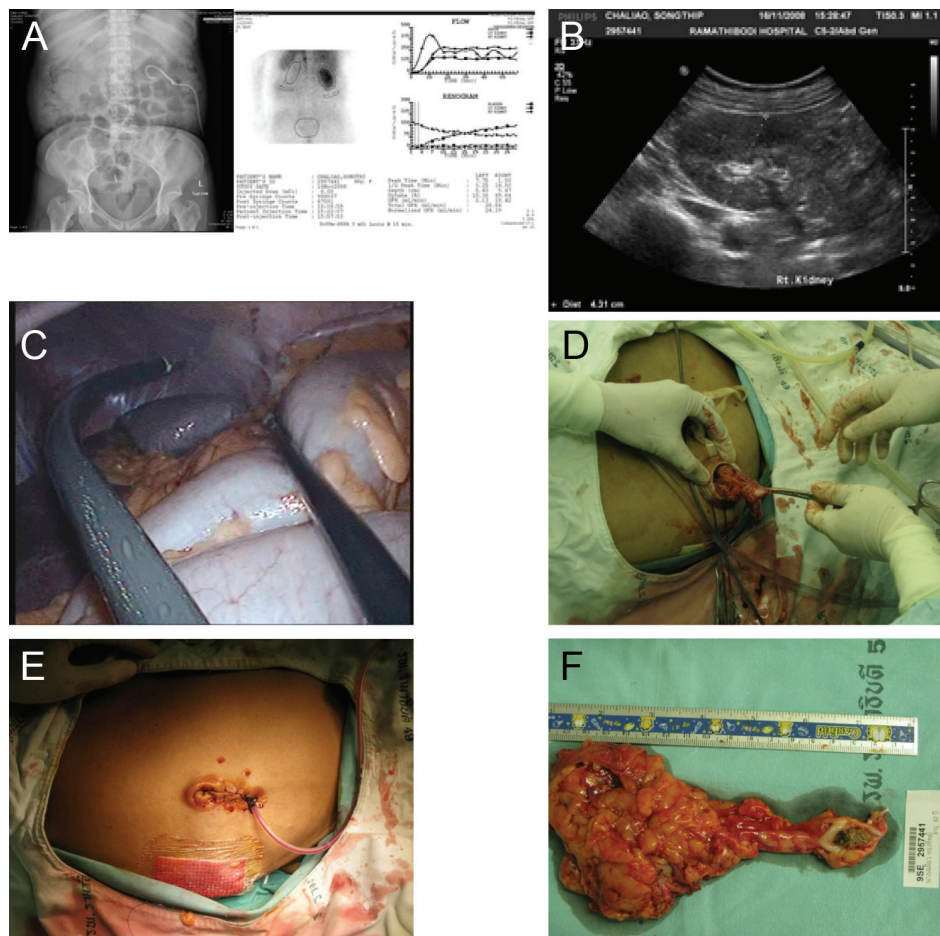


Fig. 1 Patient No.1 (A) KUB and renal scan and (B) Ultrasound of the KUB system confirmed non function and no hydronephrosis after percutaneous nephrostomy (C) An inner view from the operation; The dissection of the left kidney with bent laparoscopic instruments. (D) We extracted the specimen through the R-port without the use of an additional entrapment bag (E) Postoperative view of the wound (F) The removed specimen with a ureteric stone

arterio-venous fistula and was in a waiting list for renal transplantation. His ESRD was secondary to chronic glomerulonephritis and the co-morbidities were hypertension and heart disease. He needed HD 2 times per week. He was referred to the urologic clinic, due to a left upper and lower abdominal mass sized 10 x 7 centimeters. Computed Tomography scan demonstrated that the left kidney was markedly atrophied with a large tortuous, thin wall non-enhancing tubular cystic structure extended along the course of the left ureter. The right kidney had the chronic right parenchymatous disease. The parameters of BMI, ASA, hematocrit, blood urea nitrogen, and creatinine were 25 Kg/m², III, 32%, 54 mg/dL and 18.3 mg/dL, respectively. Hemodialysis was performed one day before surgery.

Operative technique

After a urethral Foley catheter was placed, the patient was positioned in the left flank position, padded and secured appropriately to the operating table for LESS nephrectomy. A 2.5-cm curvilinear infraumbilical incision was made, and the tissues were bluntly dissected into abdomen. The SILS Port system (Covidien, Norwalk, CT) was placed in its introducer and inserted into the abdomen. The gas tubing was connected to the insufflation port and pneumoperitoneum achieved. Articulating instruments (Roticulator Articulating Instruments, Covidien, Norwalk, CT) and a streamlined profile camera system (EndoEye, Olympus Medical Systems Corp, Tokyo, Japan) were used. Due to a very large diseased tumor, needle aspiration was performed through

the port to decrease the size of tumor. The LESS nephrectomy procedure was performed duplicating standard laparoscopic steps with the help of the articulate and straight laparoscopic instruments. The distal ureter was left with an open end.

Results

Operative time was 200 minutes and the blood loss was minimal. There was no intraoperative complication. After complete mobilization, the kidney was secured in an entrapment sac, and removed

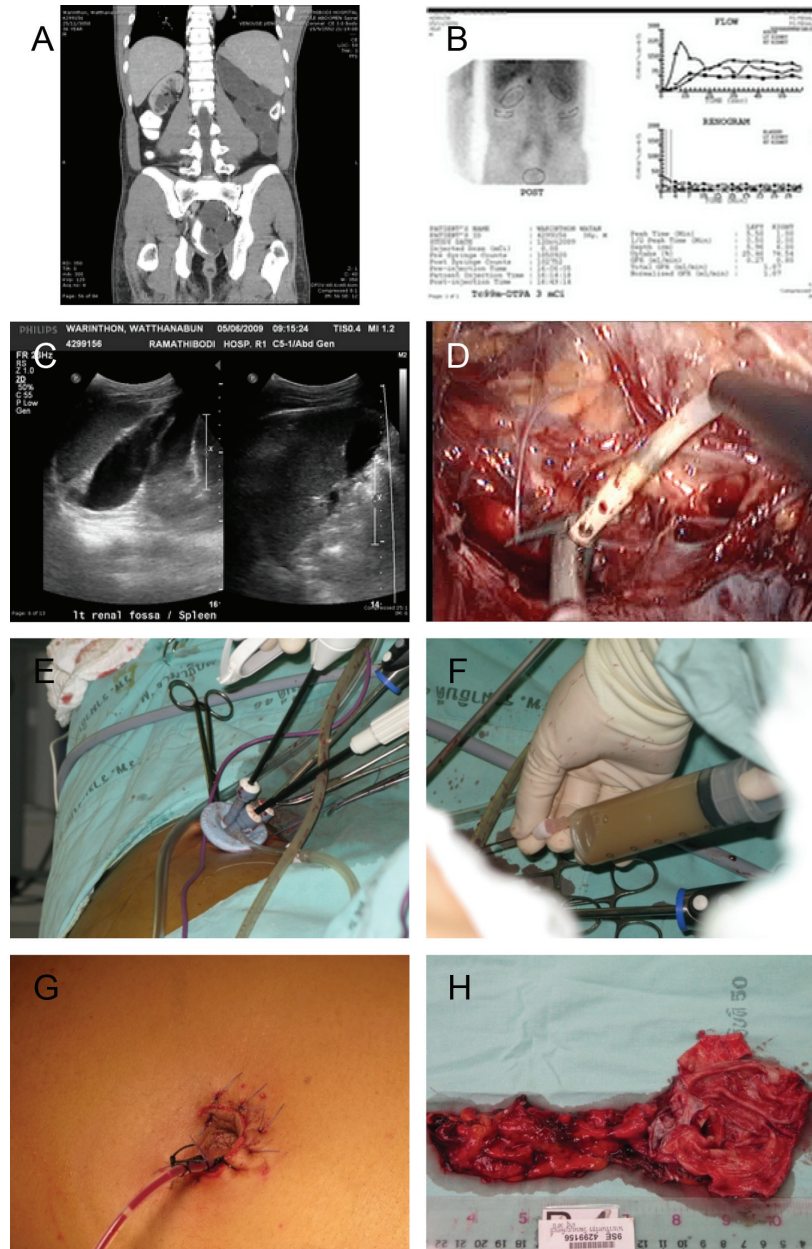


Fig. 2 Patient No.2 (A) Computerized abdominal tomography (B) Renal scan and (C) ultrasound confirming left non functioning kidney with severe hydronephrosis and hydroureter (D) An inner view from the operation; the of the left kidney with articulating laparoscopic instruments. Exposition of the hilar vessels (E) an outer picture from the operation site with LESS and laparoscopic standard instruments (F) aspirate the kidney to decrease the kidney size (G) Postoperative view of the belly button wound (H) The removed specimen after aspiration

through the single infra-umbilical incision and a Jackson-Pratt drain is left in situ through a separate fascial puncture but the same skin incision. The estimated blood loss was 50 mL and the pain scale was 0-1 while no morphine requirements.

Although initial postoperative hemodialysis in the immediate 48 hours after surgery was performed without the use of heparin, the patient required reoperation to evaluate the active bleeding on the fifth post-operative day. The authors could not find any arterial or venous bleeding. The bleeding was stopped from platelet replacement. The patient was discharged at the thirteen postoperative day. Post-operative hematocrit, blood urea nitrogen, and creatinine were 32.3%, 52 mg/dL, 15.5 mg/dL respectively. The post-operative cosmetic result was excellent as the incision scar was hidden inside the belly button. A pathological analysis revealed severe hydronephrosis and hydroureter.

Discussion

The smaller abdominal incisions decrease the incidence of peritoneal fluid leakage, wound infection, and dehiscence. The laparoscopic approach is associated with a lower incidence of adhesion formation and peritoneal swelling from fluid third-spacing⁽⁶⁾. Presently, there are many institutions reporting the immediate post-operative reinstatement of CAPD in patients undergoing laparoscopic cholecystectomy⁽⁵⁻¹¹⁾. Although retroperitoneal nephrectomy is a safe treatment modality in particular for patients with a history of previous abdominal surgery and adhesions⁽¹²⁾ as well as allowing CAPD to continue without interruption postoperatively, several circumstances require a transperitoneal approach. Rais-Bahrami⁽¹³⁾ indicated that bilateral or large tumors and a body habitus limiting access to the retroperitoneum favored a transperitoneal approach. In 2006, Kavoussi and team⁽¹³⁾ demonstrated that CAPD in three patients of their series could be reinstated within two weeks of laparoscopic transperitoneal radical nephrectomy without complications. Likewise, in 2009, Bird et al⁽¹⁾ reported that the largest series of LESS nephrectomy for the treatment of renal tumors in dialysis-dependent patients with ESRD was feasible and safe, yielding comparable results to LESS nephrectomy performed on non-dialysis-dependent patients. Nevertheless, no patient underwent peritoneal dialysis or had a peritoneal dialysis catheter in place.

Meanwhile, LESS nephrectomy has developed rapidly since 2007⁽¹⁴⁾ and the reports have been

followed by the widespread acceptance and use of the LESS technique for urological procedures. The present report confirmed that LESS nephrectomy for benign nonfunctioning kidney in patients undergoing CAPD and HD has a great potential as a new variant of laparoscopic procedures with less scars. All operations were successfully completed within a reasonable time without the need for extraumbilical incisions. Patients with ESRD may have higher surgical and anesthetic risk due to the aforementioned number of co-morbidities associated with this condition⁽¹⁵⁾. In the present study, it was demonstrated that these patients had a higher number of underlying associated diseases, a greater frequency of a high ASA score, blood urea nitrogen, and creatinine. The possibility of bleeding from coagulopathy can occur after LESS in ESRD. In the authors' view, the initial experience demonstrated excellent surgical results, but a postoperative follow-up was needed. Furthermore, the benefits of these procedures are necessary to confirm in a larger number of patients.

In patients with ESRD, especially those treated with CAPD, peritonitis can be a devastating complication that can result in a change of the type of dialysis treatment or death. To decrease the chance of postoperative peritonitis, administering a single dose of intravenous antibiotics before surgery is recommended⁽¹⁶⁾. All patients in the present study were electively operated on and no deaths occurred. There was no dialysate fluid leakage or trocar site hernia in any of the patients during a follow-up.

The authors have found many advantages of R-port. This system has low profile, incorporates 12 mm channel, can disconnect valve without removing ring and can be used as easily in obese patients. The limitations of this system are gel leakage, smudges to the camera tip, and cannot be reinserted if the entire valve is removed. The advantages of SILS port were pliable foam with enhanced mobility, incorporates a 12 mm port, can be reinserted when removed and minimal gas leak. The limitations of SILS port are a fixed length and somewhat larger incision for insertion. Moreover, the present study confirmed that LESS nephrectomy is not a contraindication in the patients with ESRD undergoing treatment with CAPD or HD.

Conclusion

The authors reported their clinical experience with LESS nephrectomy in high-risk patients with ESRD undergoing CAPD or HD treatment. Less nephrectomy is a feasible technique with the advantages of less

pain, shortened convalescence, improved cosmesis, and absence of wound complications.

Potential conflicts of interest

None.

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การผ่าตัดนำไตออกผ่านรูเดียวทางสะดือในผู้ป่วยไตวายเรื้อรังที่ได้ล้างไตผ่านหน้าท้องหรือฟอกเลือดล้างไต

สมพล เพิ่มพงศ์โกศล, กุลนันทน์ นนทแก้ว

วัตถุประสงค์: เพื่อศึกษาความเป็นไปได้ ความปลอดภัย และผลการผ่าตัดแบบเจาะรูเดียวผ่านสะดือ สำหรับผู้ป่วยที่มีความเสี่ยงสูงจากไตวายเรื้อรังระยะสุดท้าย ซึ่งได้รับการล้างไตผ่านหน้าท้องหรือฟอกเลือดล้างไต

วัสดุและวิธีการ: ระหว่างเดือนตุลาคม พ.ศ. 2552 ถึง มกราคม พ.ศ. 2553 ผู้ป่วยหญิงอายุ 62 ปี ได้รับการล้างไตผ่านหน้าท้อง และผู้ป่วยชายอายุ 36 ปี ได้รับฟอกเลือดล้างไตตามลำดับ ผู้ป่วยทั้งสองได้รับการผ่าตัดรูเดียวผ่านทางสะดือ ขอบ่งชี้การผ่าตัดไตออกคือ ไตไม่ทำงานจากมีนิ่วหลอดไต และหลอดไตตีบตามลำดับ ได้ศึกษาโรคประจำตัว ผลการผ่าตัด และผลข้างเคียง

ผลการศึกษา: การผ่าตัดไตออกทั้งหมดผ่านสะดือประสบความสำเร็จได้ดี ใช้เวลาการผ่าตัด 160 และ 200 นาที สูญเสียเลือด 200 และ 50 มิลลิลิตร และนอนโรงพยาบาล 6 และ 14 วัน ตามลำดับ ไม่มีผลแทรกซ้อนระหว่างผ่าตัด ผู้ป่วยรายแรกซึ่งล้างไตผ่านหน้าท้องก่อนผ่าตัดนำไตออกผ่านรูเดียวทางสะดือได้กลับมาล้างไตผ่านช่องท้องได้อีกภายในสองสัปดาห์หลังการผ่าตัด ไม่พบผลข้างเคียงจากการใส่สายล้างไตเกิดขึ้น ผู้ป่วยรายที่สองต้องเข้าห้องผ่าตัดใหม่ เพื่อความมีเลือดออกอีกหรือไม่หลังการผ่าตัดไปแล้ว 5 วัน แต่ไม่พบว่าเลือดออกชัดเจน เลือดหยุดออกจากการให้เกล็ดเลือด ผลพยาธิวิทยาพบว่าไตอักเสบเรื้อรังทั้งสองราย

สรุป: การผ่าตัดนำไตออกผ่านรูเดียวทางสะดือสำหรับไตไม่ทำงานสามารถทำได้ในผู้ป่วยไตวาย ทั้งผู้ป่วยที่ได้รับการล้างไตผ่านหน้าท้อง หรือ ผู้ป่วยที่ได้รับการฟอกเลือดล้างไต
