

Percutaneous Ureteral Elevation in Laparoendoscopic Single-Site Radical Nephrectomy

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ABSTRACT

Background and Objectives: To describe our technique of suture-assisted ureteral retraction during Laparoendoscopic Single-Site (LESS) radical nephrectomy.

Materials and Methods: A healthy, 39-year-old woman with an incidental 5-cm enhancing left renal mass elected to undergo radical nephrectomy. A 2-cm skin incision was made in the left upper quadrant of the abdomen, and a Covidien SILS port was introduced using standard Hasson techniques. Straight and angled laparoscopic instruments were used to mobilize the kidney outside of Gerota's fascia. To place the renal vessels on stretch and facilitate hilar dissection, the ureter and lower pole attachments were encircled with a 0-Vicryl suture inserted percutaneously via a disposable fascial closure device. The kidney was bagged and removed intact.

Results: The procedure was performed without complication with a total operative time of 265 minutes. EBL was minimal at 25mL. The patient was discharged home on postoperative day 1, and final pathology revealed stage pT1b chromophobe renal cell carcinoma with negative surgical margins.

Conclusion: LESS radical nephrectomy is feasible in select patients. Suture-assisted retraction of the ureter and lower pole attachments using a fascial closure device facilitates safe dissection and control of the renal hilum.

Key Words: Laparoendoscopic single-site surgery, Laparoscopy, Nephrectomy.

INTRODUCTION

Laparoendoscopic Single Site (LESS) surgery continues to be investigated in the management of a variety of surgical disorders. Some reports suggest LESS surgery may be associated with improved cosmetic results compared with standard multi-port laparoscopic surgery.¹

Surgery continues to be the most common treatment in the management of renal cell carcinoma, and standard multi-port laparoscopic radical nephrectomy is widely performed for large renal tumors. To date, most LESS nephrectomies have been performed for benign disease.²⁻⁴ We present our technique of LESS radical nephrectomy with technical modifications to replicate standard multi-port laparoscopic methods.

MATERIALS AND METHODS

A healthy, 39-year-old woman was found to have a solid 5×3-cm left midpole enhancing renal mass on evaluation for chest wall pain. CT scanning demonstrated an accessory upper pole renal artery. The patient's preoperative creatinine was 0.7mg/dL, and the metastatic workup was negative. She elected to undergo a left laparoscopic radical nephrectomy.

The patient was placed in the full flank position with modest table flexion. A 2-cm skin incision was made in the left upper quadrant in the midclavicular line about 5cm below the costal margin. A SILS port (Covidien, Mansfield, MA) was introduced via standard Hasson techniques (**Figure 1**). This device allowed introduction of 3 low-profile 5-mm cannulas through which a straight laparoscope, angle-locking laparoscopic instruments (CambridgeEndo, Framingham, MA), and standard laparoscopic instruments were inserted as appropriate.

The colon was mobilized, and the spleen was released laterally. The gonadal vein was clipped and divided, and the ureter was elevated to expose the psoas muscle. Next, a Carter-Thomason fascial closure device was inserted percutaneously in the left lower quadrant, and a 0-Vicryl suture was encircled around the ureter and lower pole attachments to retract them cephalad (**Figure 2**). This facilitated safe hilar dissection by placing the renal vessels

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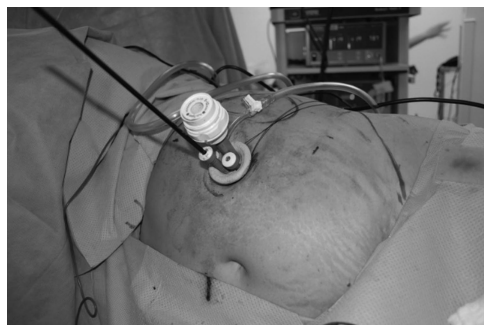


Figure 1. Covidien SILS Port is placed in the left upper quadrant and allows introduction of 3 cannulas from 5mm to 12mm in diameter.



Figure 2. Retraction of ureter and lower pole attachments via percutaneously introduced Vicryl suture exposes psoas muscle and facilitates safe hilar dissection.

on stretch and allowing use of both working instruments for this critical portion of the procedure. Next, one of the 5-mm cannulas was replaced with a 12-mm cannula. This allowed a lumbar branch of the renal vein to be ligated with 10-mm Hem-o-lock clips. The entire hilum (2 renal arteries and 1 renal vein) was controlled using a linear stapler. The adrenal gland was left in place. To retrieve the kidney, the initial incision was extended, and a 15-mm Endo-Path XL bladeless trocar was inserted adjacent to the SILS port. The specimen was placed inside an Endocatch bag and removed intact through the single site. After hemostasis was confirmed, the access port was removed, and the 4-cm incision was closed.

RESULTS

LESS radical nephrectomy was performed without complication with a total operative time of 265 minutes. EBL was minimal at 25mL. The patient was discharged in <24 hours and only required oral analgesia. Final pathology revealed stage pT1b chromophobe renal cell carcinoma

with negative surgical margins. On postoperative day 4, the patient returned to work and her baseline activities.

DISCUSSION

Laparoscopic surgery is widely performed in urology, general surgery, transplant surgery, and surgical oncology because of its ability to reduce morbidity and decrease recovery times.⁵ In recent years, LESS surgery has been investigated as a further refinement to laparoscopic surgery. Experience with LESS cholecystectomy, the most commonly performed LESS procedure, suggests that this technique can be used routinely with equivalent outcomes to standard multi-port laparoscopic cholecystectomy.⁶ However, to date, there is not enough literature to show any significant advantage of LESS in terms of hospital stay, analgesia requirements, or overall recovery. We have therefore begun to offer select patients with renal masses a LESS approach to help further define the advantages and disadvantages of this approach versus standard multi-port transperitoneal or retroperitoneal laparoscopy.

In the current study, we report our technique of LESS radical nephrectomy for a patient with renal cell carcinoma. To our knowledge, <30 LESS radical nephrectomies have been published to date.^{1-5,7-13} The current study is the first LESS nephrectomy to use the Covidien SILS port. This port allowed the introduction of low-profile cannulas that were at staggered heights, minimizing external clashing of instruments. Additionally, we chose to place this port directly overlying the kidney rather than in a periumbilical location, which facilitated performance of the procedure. However, this port location may be less cosmetic than a periumbilical site. Oncological principles were strictly adhered to; the kidney was mobilized outside of Gerota's fascia, and the specimen was removed intact. Intact retrieval is important for accurate staging and evaluation of margins. Because the incision was to be lengthened at the end of the surgery, in this case, placement of additional trocars adjacent to the SILS port earlier in the surgery could have provided additional instrumentation for retraction. However, our goal has been to develop a LESS nephrectomy technique that is also useful for benign disease, where specimen morcellation is acceptable, and the skin incision is not normally lengthened.

One challenge to this operation was gaining access to the renal hilum for safe dissection of the structures without losing a working instrument. To overcome this, a Carter-Thomason device was inserted percutaneously to facilitate extracorporeally controlled suture retrac-

tion of the ureter and lower pole attachments. Similar methods of percutaneous retraction have been described using the Keith needle in retracting bowel and the liver.^{14,15} Hodgett et al⁶ routinely use Keith needles to retract the gallbladder during LESS cholecystectomy. We believe the technique of percutaneous ureteral elevation presented in the current study provides the surgeon with a “critical view” of the renal vessels, as is common during standard multi-port laparoscopic nephrectomy, and should not be compromised. A similar “critical view of safety” concept is widely advocated in general surgery to avoid bile duct injuries during laparoscopic cholecystectomy.⁵

A future solution to achieving appropriate retraction during LESS surgery might be the Magnetic Anchoring and Guidance System (MAGS). MAGS, still in development, allows for complete insertion of a camera into the abdominal cavity that is secured through the abdominal wall by using a magnetic handle. This handle also allows for manipulation of the system from the outside without the need for an additional incision or port. Cadeddu et al have reported laboratory and human experiences with this technique, which has the potential to improve the safety and ease of LESS surgery.^{7,14}

CONCLUSION

LESS radical nephrectomy is feasible in select patients. Suture-assisted retraction of the ureter and lower pole attachments using a fascial closure device facilitates safe dissection and control of the renal hilum.

References:

1. Rais-Bahrami S, Atalla MA, Andonian S, Kavoussi LR, Richstone L. Laparoendoscopic single-site surgery of the kidney with no accessory trocars: an initial experience. *J Endourol.* 2009;23:1319–1324.
2. Raman JD, Bensalah K, Bagrodia A, Stern JM, Cadeddu JA. Laboratory and clinical development of single keyhole umbilical nephrectomy. *Urology.* 2007;70(6):1039–1042.

3. Kaouk JH, Haber GP, Goel RK, et al. Single-port surgery in urology: initial experience. *Urology.* 2008;71(1):3–6.
4. Desai MM, Aron M, Pascal-Haber GP, et al. Scarless single port transumbilical nephrectomy and pyeloplasty: first clinical report. *BJU Int.* 2008;101(1):83–88.
5. Irwin BH, Stein RJ, Desai MM. Laparoendoscopic single site surgery in urology. *Urol Clin N Am.* 2009;36:223–235.
6. Hodgett SE, Morton CA, Ross SB, Albrink M, Rosemurgy AS. Laparoendoscopic Single Site (LESS) Cholecystectomy. *J Gastrointest Surg.* 2008;13:188–193.
7. White WM, Haber FP, Goel RK, Crouzet S, Stein RJ, Kaouk JH. Single-port Urological Surgery: Single-center Experience With the First 100 Cases. *Urology.* 2009;74:801–804. Epub 2009 Jul 16.
8. Raman JD, Bagrodia A, Cadeddu JA. Single-incision, umbilical laparoscopic versus conventional laparoscopic nephrectomy: a comparison of perioperative outcomes and short-term measures of convalescence. *Eur Urol.* 2008;55(5):1198–1206.
9. Cadeddu J, FR, Desai M, et al. Novel magnetically guided intra-abdominal camera to facilitate laparoendoscopic single-site surgery: initial human experience. *Surg Endosc.* 2009.
10. Rane A, Rao P, Rao P. Single-port-access nephrectomy and other laparoscopic urologic procedures using a novel laparoscopic port. *Urology.* 2008;72(3):260–263.
11. Ponsky LE, Cherullo EE, Sawyer M, Hartke D. Single access site laparoscopic radical nephrectomy: initial clinical experience. *J Endourol.* 2008;22(4):663–666.
12. Gill IS, Canes D, Aron M, et al. Single port transumbilical (E-NOTES) donor nephrectomy. *J Urol.* 2008;180(2):637–641.
13. Desai MM, Berger A, Brandina R, et al, Laparoendoscopic single site (LESS) surgery: initial 100 patients. *Urology.* 2009; 74(4):805–812. Epub 2009 Jul 30.
14. Romanelli JR, Earle DB. Single-port laparoscopic surgery: an overview. *Surg Endosc.* 2009;23:1419–1427.
15. Cuesta MA, Berends F, Veenhof AA. The “invisible cholecystectomy”: a transumbilical laparoscopic operation without a scar. *Surg Endosc.* 2008;22:1211–1213.