Laparoendoscopic Single-site Donor Nephrectomy: A Single-center Experience

Arvind P. Ganpule, Divya R. Dhawan, Abraham Kurien, Ravindra B. Sabnis, Shashi Kant Mishra, Veeramani Muthu, and Mahesh R. Desai

OBJECTIVES To present our experience with 13 patients undergoing laparoendoscopic single-site live donor nephrectomy.

METHODS The Quadport/Triport (Advanced Surgical Concepts, Ireland) was inserted through an incision in the umbilicus. Apart from standard laparoscopic instruments, we used extra-long harmonic scalpel, suction, and bent instruments, particularly for upper pole dissection. After securing the hilum, the graft was brought near the umbilical extraction site with a grasper inserted through an extra 3- or 5-mm port and easily retrieved with the help of 2 fingers. The parameters analyzed were warm ischemia time, operative time, blood loss, postoperative visual analogue score, grafts retrieval time, and artery, vein, and ureteral length.

RESULTS Mean body mass index was 22.18 ± 3.42 kg/m^2 (range 17.9-29.78). The mean operative time, blood loss, warm ischemia time, and hospital stay were 176.9 ± 42.47 minutes, 158 ± 78 mL, 6.79 ± 1.7 minutes, and 3 ± 0.45 days (range 2-5), respectively. Graft artery, vein, and ureteral length was 3.8 ± 0.4, 4 ± 0.12, and 14.5 cm (range 13-16), respectively. The urine output was prompt in all cases. Visual analogue score in the donor at 2 weeks was 0/10 in all cases. Eleven patients required extra 3- or 5-mm port. Cosmesis was excellent, with the mean incision length of 5.23 ± 0.96 cm.

CONCLUSIONS The laparoendoscopic single-site donor nephrectomy in our initial experience is efficacious and a feasible, minimally invasive option for donors in renal transplantation. Further prospective studies with conventional laparoscopic donor nephrectomy are required to establish its current status. UROLOGY 74: 1238–1241, 2009. © 2009 Elsevier Inc.

Laparoendoscopic single-site (LESS) donor nephrectomy has evoked remarkable interest since the pioneering reports for a variety of reconstructive and ablative procedures with this technique were published.[1-4] The laparoendoscopic single-site surgery consortium for assessment and research (LESSCAR) met in July 2008 and coined the term LESS (laparoendoscopic single-site surgery) acceptable for all single-incision procedures to avoid confusion with multiple terminologies.[2] We present our initial experience of LESS donor nephrectomy and describe the modifications, which we have used at our center to ease the feasibility of the procedure.

MATERIAL AND METHODS

Thirteen live related donors underwent LESS donor nephrectomy between August 2008 and January 2009 at our center after prior approval from an institutional review board. The procedure was performed by a team of experts experienced in conventional laparoscopic donor nephrectomy (LDN). Table 1 shows the demographic data.

The positioning of the patient was similar to conventional LDN. A 2-mm Veress needle was inserted to establish pneumoperitoneum in 1 patient; in remaining cases, pneumoperitoneum was created with the open Hassan technique in which the R-port (Triport, Quadport, Advanced surgical concepts, Dublin, Ireland) was deployed after deepening the umbilical incision up to the peritoneum.

We used the R-port for all these surgeries. The characteristics and technique of insertion was similar to that described by Gill et al[1] Quadport differs from the Triport with respect to wider

Table 1. Demographic data

	Mean ± SD (range)
Age (y)	46.61 ± 7.6 (35-58)
BMI (kg/m^2)	22.18 ± 3.42 (17.9-29.78)
Male:female	5:8
Side	
Left	12
Right	1
Renal artery	
Single	12
Double	1

BMI = body mass index; SD = standard deviation.

From the Department of Urology, Muljibhai Patel Urological Institute, Nadiad, Gujarat, India

Reprint requests: M.R. Desai, M.S., F.R.C.S., Department of Urology, Dr V.V. Desai Rd, Nadiad, 387001, Gujarat, India. E-mail: mrdesai@mpuh.org

Submitted: October 12, 2008, accepted (with revisions): March 2, 2009

0090-4295/09/$34.00
doi:10.1016/j.urology.2009.03.048

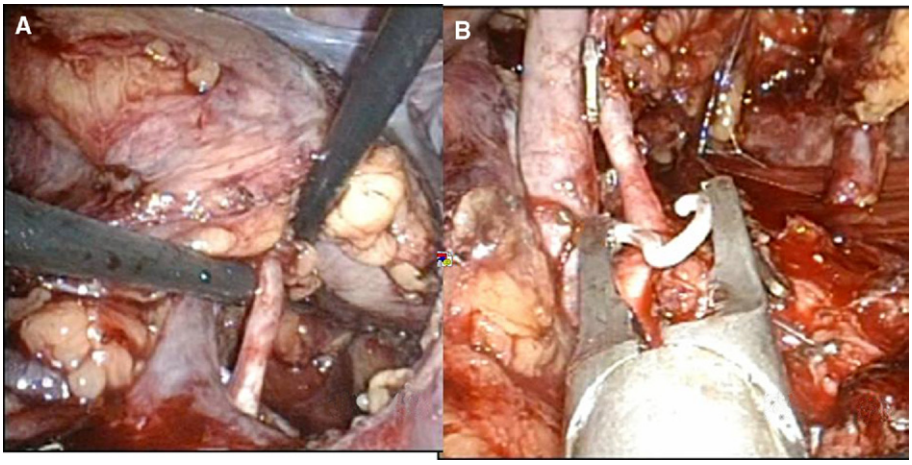

Figure 1. **(A)** Hilar dissection in right-sided donor nephrectomy. **(B)** Securing the hilum in left-sided donor nephrectomy.

inner plastic ring (3 vs 1.5 inches, respectively), thus allowing ease of using two 12-mm instruments if required and possibly facilitating easier graft retrieval (Fig. 1). The basic steps in conventional LDN were followed. The white line was incised and the colon reflected, and the ureterogonadal packet was lifted en bloc and the dissection done proximally toward the hilum. The adrenal vein was then secured and the upper pole dissected. The renal artery and the renal vein were skeletonized after the lumbar veins, if any, were clipped. Dissection was facilitated with the standard laparoscopic instruments at all the steps, except at the upper pole, where extra-long instruments were required. We used extra-long harmonic scalpel (Johnson and Johnson, Piscataway, NJ). Bent instruments such as those described by Gill et al[1] were also used, although not as frequently to avoid instrument clash when progress with the conventional laparoscopic instruments were hindered. In 11 of the cases, an extra 3- or 5-mm port was used for retraction. Before graft retrieval, as a policy all donors received a bolus of mannitol (100 mg) and a diuretic (furosemide 40 mg). The gonadal vein was secured and clipped and the ureter doubly clipped. The renal artery followed by the renal vein was doubly clipped with hem-o-lock clips (Teleflex Medical, Research Triangle Park, NC). The posterior dissection was then completed. Once the graft was ready for retrieval, it was held with a pair of forceps. The R-port was then removed and the incision extended for 1-1.5 cm on either side of the umbilical wound. The surgeon introduced his 2 fingers into the incision in which the graft was fed by the assistant holding it near the incision site by grasping the forceps through the 3- or 5-mm port. The graft was retrieved by a gentle traction of the 2 fingers. After retrieving the graft, the extended incision in the rectus sheath was partially closed with sutures. The R-port was reinserted; check laparoscopy was performed to confirm homeostasis before closure of the umbilical incision.

RESULTS

The operative details are as shown in Tables 1 and 2. Retrieval site was the umbilicus in all the cases; average incision length was 5.23 ± 0.96 cm (range 4-7 cm). The procedure could be completed with an R-port in all 13 cases. There was prompt urine output in all 13 cases. Two renal units had upper pole abrasion, which did not require any intervention. The mean hemoglobin drop was 1.8 g %. Average donor visual analogue score was 2 on discharge. Recipient nadir creatinine was 1.14 ± 0.23 on day 3 (range 0.9-1.5).

Table 2. Parameters analyzed

Parameters	Mean ± SD (Range)	Range
Estimated blood loss (mL)	158.18 ± 77.79	50-300
Warm ischemia time (min)	6.79 ± 1.69	4-10
Renal artery length (cm)	3.78 ± 0.44	3-4.3
Renal vein length (cm)	4.04 ± 0.12	3.8-4.2
Ureteral length (cm)	14.54 ± 0.82	13-16
Incision length (cm)	5.23 ± 0.96	4-7
VAS at discharge	2.89 ± 0.48	2-4
VAS at 14 d	0 ± 0.48	0-1
Serum creatinine of recipient at 3rd day (mg %)	1.17 ± 0.23	0.9-1.5
OR time (minutes)	176.9 ± 42.47	90-240

VAS = Visual analogue score; OR time = operating room time; SD = standard deviation.

COMMENT

We have been performing LDN since 2002. In our opinion, the LESS procedure requires adequate expertise in conventional LDN. There are certain technical issues that need to be addressed before the procedure can become the reference standard.

First, unlike conventional LDN, the surgeon has an unfamiliar viewing angle from the umbilicus, which he needs to become accustomed to. To overcome this problem, as we did, laparoscopic surgeons may initially start performing standard donor nephrectomy through a camera port inserted via the umbilicus before switching to LESS donor nephrectomy.

Second, the single access site amounts to a rather steeper learning curve. Proper case selection and previous planning are essential. In our opinion, prerequisites for LESS donor nephrectomy would include body mass index <25, initial cases of single-vessel grafts, adequate exper-

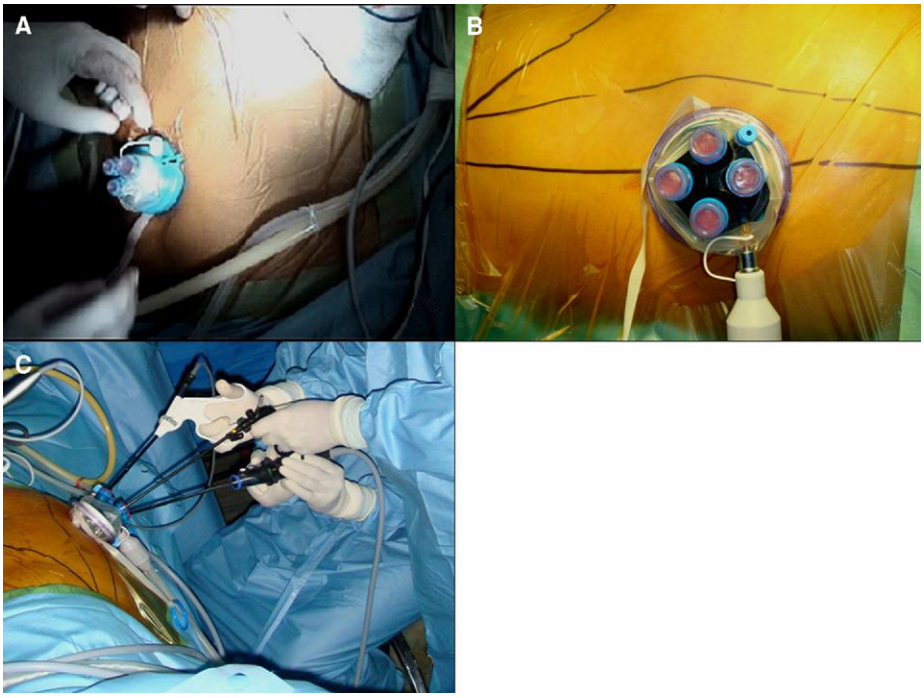

Figure 2. (A) Tri-port in position (R-Port). **(B)** Quad-port in position (R-Port). **(C)** The camera driver sits and the surgeon stands for better ergonomics.

tise in multiport surgery, and an oriented surgical team for assistance. During the last few cases, we observed that if xiphoid to umbilicus length is >16 cm, the LESS procedure becomes technically difficult, especially dissection of the upper pole. This fact needs to be confirmed with larger studies.

Third, the procedure occasionally requires longer instruments, specialized articulated instruments with curved shaft, which may facilitate dissection. The optics used are the digital laparoscope with the "chip at the tip" technology and an integrated camera head (EndoEYE, Olympus, Orangeburg, NY) to reduce cluttering of instruments during surgery. It is crucial to understand that these instruments require a surgical team with adequate experience and expertise to operate and maintain.

Finally, in our initial series of 13 cases, we made a few technical modifications. From an ergonomic point of view we think that the procedure becomes easier if the camera driver sits and the surgeon stands. The camera driver also needs to be oriented because the telescope tends to move with the movement of working instrument; hence, close coordination is required between the operating surgeon and the camera driver. The upper pole dissection is difficult, and thus we started using extra-long instruments for the dissection. The vein and the artery in all the cases were secured (Fig. 2) with hem-o-lock clips (Teleflex Medical), unlike the previous reports in which an endo GIA stapler was used for the vein.[1] We retrieved the graft in all cases manually with 2 fingers without a retrieval bag, with the aim to reduce the warm ischemia time and retrieval time.

CONCLUSIONS

Our initial experience suggests that LESS donor nephrectomy appears to be a technically feasible option for donors in renal transplantation. The currently perceived advantages of LESS donor nephrectomy are enhanced cosmesis and reduced pain. Proper selection of donors in the initial learning curve is the key to successful completion of the procedure in the initial few cases. We found the procedure to be easier in patients with body mass index <25, shorter xiphoid to umbilicus length, no vascular anomalies, adequate expertise in conventional LDN, and an oriented surgical team for assistance. Further randomized study is ongoing at our center to establish the current status of LESS donor nephrectomy vs conventional LDN.

References

1. Gill IS, Canes D, Aron M, et al. Single port Transumbilical (E-NOTES) donor nephrectomy. *J Urol.* 2008;180:637-641.
2. Tracy CR, Raman JD, Caddeddu JA, et al. Laparoendoscopic single site surgery in urology; where have we been and where are we heading? *Nat Clin Pract Urol.* 2008;5:561-568.
3. Rane A, Rao P, Rao P. Single port access nephrectomy and other laparoscopic urologic procedures using a novel laparoscopic port (R-port). *Urology.* 2008;72:260-263.
4. Ponsky LE, Cherullo EE, Sawyer M, et al. Single access site laparoscopic radical nephrectomy; initial experience. *J Endourol.* 2008;22:663-666.

EDITORIAL COMMENT

This study demonstrates the technical feasibility and initial outcomes after laparoendoscopic single-site, or "single-port," donor nephrectomy. The authors present their experience with