Laparoendoscopic Single Site Live Donor Nephrectomy: Initial Experience

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Purpose: We present our initial experience in 40 patients undergoing laparoendoscopic single site donor nephrectomy.

Materials and Methods: We prospectively collected data on 40 consecutive patients. A single access GelPOINT™ device was inserted into the abdomen through a 4 to 5 cm periumbilical incision. We used a bariatric camera with a right angle attachment for the light cord to maximize triangulation. Parameters analyzed included warm ischemia time, operative time, estimated blood loss, visual analog pain score, time to recipient creatinine less than 3 mg/dl, and recipient creatinine at discharge home, and 3 and 6 months.

Results: A total of 38 left and 2 right donor nephrectomies were performed. Complete laparoendoscopic single site donor nephrectomy was successful in 38 cases. One left and 1 right case were converted to a hand assisted approach. Average ± SD body mass index was 26.1 ± 5.2 kg/m^2. Mean operative time to allograft extraction was 93.5 ± 27.5 minutes and mean total operative time was 166.7 ± 33.8 minutes. Average estimated blood loss was 106.7 ± 93.5 cc. Mean warm ischemia time was 3.96 ± 0.72 minutes. Mean hospital stay was 1.77 ± 0.43 days and median time to recipient creatinine less than 3.0 mg/dl was 54.2 ± 110.3 hours. Mean recipient creatinine at discharge home, and at 3 and 6 months was 1.48 ± 0.67, 1.29 ± 0.38 and 1.19 ± 0.34 mg/dl, respectively. Complications included hyponatremia in 1 patient, wound infection in 1, and a grade III laceration in an allograft that was sustained during extraction.

Conclusions: Our initial experience with laparoendoscopic single site donor nephrectomy is encouraging. This approach to kidney donation without an extra-umbilical incision could become particularly relevant to minimize morbidity in young, healthy organ donors.

Key Words: kidney, kidney transplantation, nephrectomy, laparoscopy, instrumentation

Abbreviations and Acronyms

BMI = body mass index

LDN = laparoscopic donor nephrectomy

LESS = laparoendoscopic single site surgery

LESS-DN = LESS donor nephrectomy

Submitted for publication March 23, 2010.

Study received institutional review board approval.

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† Financial interest and/or other relationship with Applied Medical.

LAPAROSCOPIC live donor nephrectomy has become the standard of care at most major academic centers. Traditionally performed via 3 to 5 small incisions, the advantages of decreased morbidity, improved cosmesis and shorter recovery time are well documented. Also, long-term studies confirming complication rates and graft outcomes equivalent to those of open donor nephrectomy have helped increase the potential pool of living kidney donors.[1–4]

Laparoendoscopic single site surgery represents the next step in the evolution of standard laparoscopic surgery. It is done through a single small skin incision, which is often

0022-5347/10/1845-2049/0
THE JOURNAL OF UROLOGY®

Vol. 184, 2049-2053, November 2010
Printed in U.S.A.
DOI:10.1016/j.juro.2010.06.138

partially concealed at the umbilicus. In addition to obvious cosmetic advantages, patients may experience less postoperative pain and fewer port site related complications.[5] This may be particularly relevant when applied to further decreasing disincentives for young, healthy individuals to undergo kidney donation.[1]

Single site urological surgery has been reported for several urological indications, including donor nephrectomy, pyeloplasty, and radical and partial nephrectomy.[1,6–9] For the most part they have been performed using dedicated multichannel port devices with fixed operative channels. Since LESS defies the most basic laparoscopic principle of triangulation, articulating instruments have been used to aid in dissection and overcome the limitations of the smaller operative space.[10] Most reported cases also describe the use of extra-umbilical ports for surgeon assistance.[8,11]

Due to the limitations of LESS in providing the surgeon with an ergonomic platform for dissection and suturing, LESS-DN is a technically complex procedure. Only a few small series of LESS-DN have been reported to date.[1,8] We present our initial experience with LESS-DN at a high volume kidney transplant center.

MATERIALS AND METHODS

Between August and November 2009 LESS-DN was performed in 40 consecutive patients, including 18 men and 22 women, with a mean age of 43.7 years (range 21 to 64). All potential donors were evaluated by our multidisciplinary transplant team and met the usual renal donation criteria. All patients underwent computerized tomography with vascular reconstruction to image the renal hilum before surgery. Renal scintigraphy was not routinely done to evaluate renal function unless there was a greater than 1 cm size difference between the right and left kidneys. Preoperatively mean serum creatinine was 0.8 mg/dl (range 0.4 to 1.2). The renal artery was single in 32 patients.

Two right and 38 left donor nephrectomies were done. The left kidney was chosen preferentially if the renal vasculature and renal function were comparable. Right organs were chosen if there were multiple vessels on the left side or a greater than 10% difference in function, as measured by scintigraphy. All procedures were performed through a periumbilical GelPOINT device. Left LESS-DN was done with 3 trocars through the device. In the 2 right LESS-DNs a fourth port was placed through the device for liver retraction. No extra-umbilical ports were used.

We collected data prospectively using hospital and office visit charts. Operative time to allograft extraction was considered the time from operative field skin preparation to organ extraction and total operative time was considered the time from operative skin preparation to skin closure. Warm ischemia time was considered the interval from renal artery occlusion to back table perfusion with ice-cold Custodial® HTK solution. Pain scores were measured using a visual analog pain scoring system. Data are reported as the mean ± SD and range.

Patients are placed in a modified flank position. A 5 cm vertical periumbilical incision is made with the abdominal skin on stretch. After creating a vertical midline anterior rectus fasciotomy the abdomen is entered. The GelPOINT with 3 trocars already in place is inserted into the abdomen and pneumoperitoneum is established. Two 5 mm and 1, 15 mm trocar are used. A bariatric 10 mm rigid laparoscope is used through the 15 mm port with a right angle attachment for the light cord to maximize space for triangulation (fig. 1). Standard nonarticulating laparoscopic instruments are used in most of the procedure.

The LESS-DN surgical technique essentially duplicates standard LDN. For left LESS-DN the descending colon, pancreas and spleen are mobilized generously en bloc without the need for continuous retraction. The ureter and gonadal vein are identified and lifted off the psoas muscle together, maintaining periureteral attachments, and dissected toward the hilum. If present, the lumbar vein is divided between titanium clips. As in LDN, the renal vein is skeletonized, the adrenal vein is divided between titanium clips and the adrenal gland is released from the upper pole. The renal artery is dissected down to its aortic origin and the interaortocaval region is skeletonized. Lastly, the posterior attachments are dissected free from the kidney. A 12 mm trocar replaces 1, 5 mm trocar in anticipation of using the Endo GIA® vascular stapler.

When the recipient team is ready, the ureter and gonadal vein are divided together at the pelvic brim. The renal artery and then the vein are divided using the vascular stapling device. An Endo Catch™ bag is introduced. The allograft is gently entrapped and extracted by removing the gel cap. The graft is perfused with ice-cold Custodial HTK solution. If needed, the fascial incision is extended 1 to 2 cm to facilitate graft removal with care taken to leave the overlying skin intact without further extension of the incision. Fascia and skin are closed in standard fashion after ensuring adequate hemostasis. No articulat-

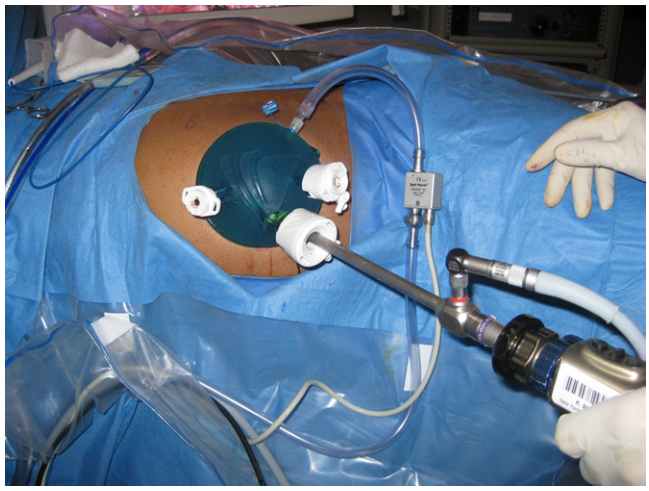

Figure 1. GelPOINT is inserted in 5 cm periumbilical incision. Two 5 mm and 1, 15 mm trocars are inserted in abdomen. Bariatric 10 mm rigid laparoscope is used through 15 mm trocar with right angle attachment for light cord to maximize triangulation.