Mini-Laparoscopic Live Donor Nephrectomy: Initial Series

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Purpose: To present the safety and surgical outcomes of the initial series of mini-laparoscopic live donor nephrectomy and graft outcomes in related recipients.

Materials and Methods: From January 2012 through July 2012, fifty patients underwent mini-laparoscopic live donor nephrectomy. Two 3.5 mm trocars were inserted above and lateral to the umbilicus for grasping and scissoring. One 5 mm trocar with a camera was inserted in the umbilicus and an 11 mm trocar was inserted through fascia from a 6-8 cm Pfannenstiel incision for bipolar coagulation, kidney extraction, and vascular clip applier.

Results: Mean age of donors was 28 ± 4.2 (range, 21-39) years. Mean operative time from trocar insertion was 145.8 (range, 85-210) minutes. No major perioperative or postoperative complications occurred. The average decrease in hemoglobin level was 1.14 (range, 0.32-1.8) mg/dL and no one required blood transfusion. Mean warm ischemia time was 4.41 (range, 2.35-9) minutes. Mean hospital stay was 2.2 (range, 2-5) days. Mean follow-up time of the recipients was 215 (range, 130-270) days. The mean serum creatinine level of the recipients at discharge time and the last follow-up visit was 1.38 mg/dL and 1.22 mg/dL, respectively.

Conclusions: While the primary purpose of this technique is to make donor nephrectomy less invasive and more cosmetic, it is also comfortable for the laparoscopist surgeons because it is nearly similar to standard laparoscopy. A randomized controlled trial with a large sample size, long-term follow-up, and comparison with standard laparoscopy are necessary to present more definitive data about this technique.

Keywords: laparoscopy; methods; surgical procedures; minimally invasive; kidney transplantation; nephrectomy; living donors.

INTRODUCTION

Laparoscopy has brought changes to various advanced urologic surgeries, and donor nephrectomy is no exception. The first laparoscopic donor nephrectomy(LDN) was performed by Ratner and colleagues.[1] Afterward, some reports revealed that laparoscopy is concomitant with less bleeding, shorter convalescence, and better cosmesis compared with open donor nephrectomy (ODN). A review of the literature shows that LDN is now accepted as a standard procedure for donor nephrectomy.[2] A randomized clinical trial with a sufficient number of cases revealed the safety of LDN, which had similar graft outcomes as ODN.[3] A later follow-up study of the aforementioned cases confirmed the short-term findings.[4] Recently, efforts were made to improve the technical aspects, cosmesis, and surgical outcomes of laparoscopy. Pure natural orifice transluminal endoscopic surgery (NOTES) and laparoendoscopic single-site surgery (LESS) using umbilical or Pfannenstiel incision are new modifications employed in donor nephrectomy.[5-7] Although the cosmetic outcomes are better compared to standard laparoscopy; these procedures seem to be less ergonomic and more costly.

Previously, mini-laparoscopy was performed in general surgery with good results.[8] This study reveals our experience with mini-laparoscopic donor nephrectomy, comprising fifty cases, and evaluates the safety of this approach and graft outcomes. Likewise, it seems that this technique is easier to master for surgeons already skilled at standard laparoscopy.

MATERIALS AND METHODS

We previously report a successful technique, mini-laparoscopic donor nephrectomy that had an excellent graft outcome in the recipient and excellent cosmetic outcome in the donor.[9] Afterward, from January 2012 through July 2012, fifty mini-laparoscopic left donor nephrectomies were performed with the same technique. Multiple vessels and right donor nephrectomies were excluded. Weight of the donor was not considered an excluding factor.

Donors underwent general anesthesia in modified left flank position, and nasogastric tube was fixed. A 5 mm trocar was used as a camera port and placed transumbilically using open access technique. Two 3.5 mm trocars were placed above and lateral to the umbilicus and were used for grasping and scissoring, respectively. An 11 mm trocar was fixed through fascia from a 6-8 cm Pfannenstiel incision, to be used for kidney extraction. Vascular clipping, suctioning, and bipolar coagulating can all be performed through this trocar. A vascular stapler was not used, because large series have recently shown that vascular clips are safe and very cost-effective.[10] The colon was mobilized medially and splenorenal and renocolic ligaments were dissected. The left ureter together with the gonadal vein was dissected free and upward while preserving peri-ureteral tissues. The renal vein was dissected distal to the gonadal vein and bipolar coagulation and division of lumbar and adrenal veins were performed. The adrenal gland was separated from the kidney using bipolar coagulation of small adrenal arteries under the adrenal gland. The rest of the kidney was dissected free from surrounding tissues. The renal artery and vein and the ureter were clipped through the suprapubic trocar using a Hem-o-Lok clip applier and titanium clip applier, as we previously described in a report of 1834 nephrectomy cases.[10] The renal artery and vein and the ureter were divided and the kidney was hand extracted through the prepared suprapubic opening.[9] Only the 5 mm camera port was closed, using monocryl sutures. The two 3.5 mm miniports were left unsutured according to Novitsky and colleagues experience.[8] Figures 1 and 2 demonstrate the appearance of the skin at the site of miniport insertion at operation time and 2 months later.

RESULTS

Forty three cases were men and the others were women, and their mean age was 28 ± 4.2 (range, 21-39) years. Mean body mass index (BMI) was 22.6 (range, 18.1-29.8) kg/m². Mean operative time from trocar insertion to skin closure was 145.8 (range, 85-210) min. According to Clavien grading system, grade I and II happened in three and two donors, respectively and no major perioperative or postoperative complications occurred. The average decrease in hemoglobin level was 1.14 (range, 0.32-1.8) mg/dL and no one required blood transfusion. Mean warm ischemia time was 4.41 (range, 2.35-9) minutes. Average opium requirement from recovery room to discharge was 33 mg mepridine (intramuscular injection). Mean hospital stay was 2.2 (range, 2-5) days. Harvested kid-

neys started diuresis immediately after transplantation in all cases except one case who had delayed graft function (DGF) and diuresis started after one week and discharged with normal serum creatinine. No arterial or venous thrombosis was happened in the recipients. There were two cases of ureteral leak that were managed successfully by repeat ureteral reimplantation. Mean follow-up time of the recipients was 215 (range, 130-270) days. The mean serum creatinine level of the recipients at discharge time (average discharge time of the recipients was 17 days) and the last follow-up visit was 1.38 mg/dL and 1.22 mg/dl, respectively.

Figure 1. Configuration of trocars for mini-laparoscopic donor nephrectomy.

Figure 2. Skin appearance two months after operation.

DISCUSSION

Definitive management of end-stage renal disease (ESRD) is kidney transplantation.[11] Graft outcome is usually better when it comes from a living donor, and the waiting list for kidneys from cadavers is too long.[12] The introduction of laparoscopic donor nephrectomy, with acceptable cosmetic outcomes, shorter hospital stay, and lower pain score, has encouraged kidney donation.[2] Simforoosh and colleagues reported a randomized clinical trial comparing short-term and long-term graft outcomes between two groups of 100 donors (laparoscopic and open), and concluded that graft outcomes are similar for these groups.[3,4] A long-term follow-up study by Dols and colleagues comparing LDN with mini-incision open live donor nephrectomy confirmed these results.[13]

Improvement of surgical outcomes, cosmetic appearance, and perioperative morbidity led to the introduction of new modifications to laparoscopic surgery. Gill and colleagues performed donor nephrectomy using LESS technique with an umbilical R-port and extracted the specimen from this incision.[5] Kurien and colleagues compared some variables between two groups (25 cases in each arm) of donors who had undergone standard laparoscopy (SL) and LESS surgery for kidney donation and reported notable findings. Dissection of the upper pole, division of the renal artery and vein, and specimen extraction were more difficult in the LESS group. Warm ischemia time (7.5 min in LESS) was significantly longer than in the standard group ($P < .0001$), but this difference did not negatively affect graft outcome or quality of life. Body image was similar between the two groups.[14] In another report, Andonian and colleagues performed LESS donor nephrectomy with three trocars fixed in a Pfannenstiel incision 5 cm long.[7] Afterward, they compared surgical outcomes between six SL donor nephrectomies and six Pfannenstiel LESS donor nephrectomies. Warm ischemia time, hospital stay, morbidity, and pain score were similar in the aforementioned groups. They concluded that LESS has only a cosmetic advantage over SL, and the major limitation of this approach is that it requires a flexible telescope and more

expensive instruments.[15]

Mini-laparoscopy is a modification of SL. Some reports in this field focus on general surgery, and especially cholecystectomy. Cheah and colleagues reported that using three 2 mm ports instead of three 5 mm ports will be lead to decreased analgesic consumption and postoperative pain.[16] Novitsky and colleagues compared 33 SL cholecystectomies with 34 mini-laparoscopies. Eight (twenty-four percent) patients in the mini-laparoscopy arm were converted to standard technique. Mean operative time was similar between the two groups, cosmetic result was significantly better with mini-laparoscopy, and visual analog scale on the first postoperative day was significantly lower in the mini-laparoscopy group than in the SL group. This last item was not different on the third or seventh postoperative days.[8]

We previously reported that mini-laparoscopic donor nephrectomy using unique trocar insertion has outcomes similar to SL.[9] We used only two 3 mm trocars instead of three or four trocars, thereby improving the cosmetic outcome. The renal pedicle was divided using vascular clips, not Endo-GIA stapler; using these clips considerably reduced the total cost of surgery.[10] We present the first case series of mini-laparoscopic donor nephrectomy, with initial outcomes and short-term follow-up of the donors and their recipients, in this study.

Robotic single-site surgery is a notable alternative for donor nephrectomy and has improved cosmetic outcomes; but the high cost is a drawback. The LESS technique has some limitations, including the lack of triangulation and rolls over of the instruments, a less ergonomic experience for the surgeon, additional training requirement for laparoscopic surgeons, and expensive equipment, such as flexible videoscope and instruments. Mini-laparoscopy is performed with one 5 mm camera port and two 3.5 mm ports that are not closed and leave nearly invisible scars after a few weeks.[8] An 11 mm trocar is placed through the Pfannenstiel incision. This approach is ergonomic and similar to standard SL and requires no additional expensive instruments. Cosmetic outcomes seem better than in SL and especially better than in transumbilical LESS, since a smaller incision is made in the umbilicus (5 mm). Warm ischemia time, hospital stay, analgesic requirement, perioperative morbidity, and short-term graft outcome were acceptable and comparable to previous report of SL outcomes.[3]

In a retrospective study, Tisdale et al revealed that extraction of the specimen through a Pfannenstiel incision is concomitant with lower incisional hernia and morbidity and shorter hospital stay, compared with LESS surgery, which requires which requires large umbilical incision.[17]

Precise assessment of mini-laparoscopic donor nephrectomy requires a randomized clinical trial with a sufficient number of cases and long-term follow-up comparing this modification with SL. We accept that subjective assessment of cosmetic appearance of scars is a drawback of our study and we will use a validated questionnaire for objective evaluation of cosmesis in future randomized clinical trial.

CONCLUSION

Mini-laparoscopic donor nephrectomy as one of the less invasive approach for donor nephrectomy was performed using 3.5 mm trocars in usually visible parts of the abdomen. It is comfortable for the laparoscopist surgeons because it is nearly similar to standard laparoscopy. Perioperative outcomes and short-term follow-up in donors and recipients revealed acceptable findings. A randomized controlled trial with a large sample and long-term follow-up seems to be necessary.

CONFLICT OF INTEREST

None declared.

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