

Received: 2020.05.29

Accepted: 2020.08.07

Available online: 2020.08.24

Published: 2020.09.29

# Surgical Drains After Laparoscopic Donor Nephrectomy: Needed or Not?

Authors' Contribution:  
Study Design A  
Data Collection B  
Statistical Analysis C  
Data Interpretation D  
Manuscript Preparation E  
Literature Search F  
Funds Collection G

BC 1 **Haydar Celasin**  
A 2 **Akın Fırat Kocaay**  
DEF 3 **Sanem Guler Cimen**  
ABCF 4 **Suleyman Utku Çelik**  
D 2 **Nurian Ohri**  
EF 5 **Şule Şengül**  
ABC 5 **Kenan Keven**  
ABCD 1 **Acar Tüzüner**

1 Department of General Surgery, Faculty of Medicine, Lokman Hekim University, Ankara, Turkey  
2 Department of General Surgery, Faculty of Medicine, Ankara University, Ankara, Turkey  
3 Department of General Surgery, Health Sciences University, Ankara, Turkey  
4 Department of General Surgery, Gulhane Training and Research Hospital, Ankara, Turkey  
5 Department of Nephrology, Faculty of Medicine, Ankara University, Ankara, Turkey

**Corresponding Author:** Sanem Guler Cimen, e-mail: S.Cimen@dal.ca

**Source of support:** Departmental sources

**Background:** Routine placement of prophylactic drains after laparoscopic donor nephrectomy has been suggested and has become common practice in some centers. However, there is a lack of evidence proving the surgical benefits of routine drain placement in laparoscopic donor nephrectomy. Here, we assessed the effect of surgical drain placement on recovery, length of hospital stay, and complication rates of live kidney donors.

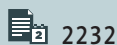
**Material/Methods:** This retrospective study included all live donor nephrectomies performed at a single institution from January 2010 to January 2017. Surgeries were performed by 2 surgeons; one routinely placed a closed suction drain after LDN whereas the other did not. Patients operated on by these 2 surgeons were enrolled in either the drain or no drain group. Demographic data, preoperative and postoperative creatinine levels, estimated blood loss (EBL), surgical time, surgical complications, and length of hospital stay were compared.

**Results:** The study included 272 patients. Three were converted to open donor nephrectomy and were excluded (1.1%). Among the 269 patients, 156 (57.9%) had surgical drains and 113 (42.1%) did not. Mean surgical time, estimated blood loss, and duration of hospital stay did not significantly differ between groups. Postoperative complications were encountered in 17 of the patients, but the overall complication rate did not differ between patients with vs. those without surgical drains.

**Conclusions:** There was no significant difference between the drain and no drain groups in terms of length of hospital stay, complication rates, or postoperative creatinine levels. Thus, placement of a surgical drain in the setting of an LDN is not justified based on our single-center experience.

**MeSH Keywords:** Directed Tissue Donation • Drainage • Kidney Transplantation • Laparoscopy • Living Donors

**Full-text PDF:** <https://www.annalsoftransplantation.com/abstract/index/idArt/926422>



2232



2



1



18



## Background

The current organ shortage is a major challenge in organ transplantation [1]. To overcome this challenge, living organ donation is increasingly accepted and living donor kidney transplantation has become the first and best choice of treatment for patients with end-stage renal disease (ESRD) [1]. Additionally, advancements in immunology, improvements in surgical techniques, and increasing experience with transplantations have significantly decreased the graft loss rate. With these accomplishments, 1-year patient and graft survival have reached 95% [2].

However, clinical studies on organ donors remain scarce. The donor surgery is a unique intervention performed on a healthy volunteer; therefore, its outcomes should be studied separately. When possible, minimally invasive procedures should be preferred to reduce postoperative pain and hospital stay and to improve quality of life of living donors [3]. A laparoscopic donor nephrectomy (LDN) with small extraction site is the criterion standard that provides the most comfort to living donors.

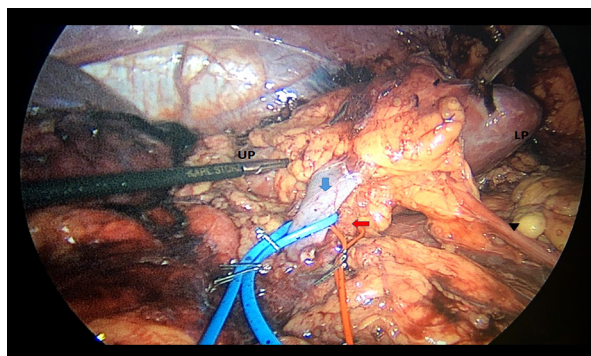
However, safety and comfort does not go hand in hand at all times. Particularly in LDN, every effort should be made to assure a balance between safety and comfort. While living kidney donation appears to be relatively low risk and comfortable for the donor, there are anecdotal and published reports of serious complications and even death attributed to LDN [4]. These complications were mainly due to postoperative hemorrhage, chyle leak, or iatrogenic injury to the bowel.

To detect these complications earlier, routine placement of prophylactic drains after LDN has been suggested and has become common practice in some centers. This practice was based on experience with other abdominal surgeries, such as laparoscopic cholecystectomy, splenectomy or colectomy [5,6]. In these surgeries, the drains have helped surgeons to identify postoperative hemorrhage, as well as to drain or monitor residual intraperitoneal fluids like bile, fecal material, and pancreatic juice. However, there is a lack of evidence proving the surgical benefits of routine drain placement in LDN. Additionally, routine use of surgical drains may compromise post-surgical comfort.

In this retrospective clinical study, we investigated the influence of surgical drain placement on the recovery, hospital stay, and complication rates of live donors who underwent LDN.

## Material and Methods

This study was conducted in accordance with the Declaration of Helsinki and Good Clinical Practices and was approved by Ankara University Research Ethics Council. All patients consented to be included in the study cohort. All live donor nephrectomy



**Figure 1.** Extent of surgical dissection at the renal hilum (left donor kidney) during laparoscopic donor nephrectomy. UP – upper pole; LP – lower pole; Blue arrow – renal vein; Red arrow – renal artery; Arrowhead – ureter.

procedures performed at a single institution between January 2010 and January 2017 were included. Surgeries were performed by 2 surgeons who were trained in different transplant centers; one routinely placed a closed suction drain tube after LDN and the other did not. Patients operated on by these surgeons were enrolled in either the drain group or the no drain group.

During donor evaluation, kidney vascular anatomy was detailed with high-resolution spiral computed tomography, providing three-dimensional reconstruction. Left kidney with a single renal artery and vein was preferred when possible. This was done to obtain an extra length of the renal vein. Both surgeons performed the renal hilar dissection in a similar extension by staying close to the renal artery, with no dissection around the aorta above the renal vein (Figure 1).

Demographic data, preoperative and postoperative creatinine levels, estimated blood loss (EBL), surgical time, surgical complications, and length of hospital stay were retrieved for both groups from the medical charts.

Foley catheters were routinely placed to all donors and removed on the day after surgery. The drains were removed when output was less than 30 cc per day with serous discharge.

## Surgical technique

The position of the donor was lateral decubitus in all cases. All patients received 1 g of Cefazolin for prophylaxis. The first trocar was inserted peri-umbilically, and the abdomen was insufflated with CO<sub>2</sub>. A video-endoscope was introduced, and 3 to 4 additional trocars were inserted, as described in the literature [7]. The right or left hemi-colon was dissected from the lateral abdominal wall and mobilized medially. Gerota's fascia was opened, and the kidney was dissected from the surrounding connective tissue. The renal vessels and ureter were dissected. Subsequently, an 8-cm Pfannenstiel incision was

made while maintaining pneumoperitoneum. The ureter was clipped distally and divided, followed by stapling and division of the renal artery and vein.

Subsequently, the kidney was extracted by hand and cooled immediately. Pneumoperitoneum was re-established, and hemostasis was checked in the operative field. A closed-loop suction drain was placed at the surgical site through one of the 5-mm trocars in the drain group. No drains were placed in the other group. The Pfannenstiel incision was closed by continuously suturing the fascia with no. 1 loop polydioxanone stitch, and skin incisions were closed using skin staplers.

### Postoperative follow-up

Foley catheters, which were routinely placed in all donors intraoperatively, were removed on the day after surgery. All the drains placed during surgery were closed-suction drains. They were removed when output was less than 30 cc per day with serous discharge.

During the postoperative follow-up, intra-abdominal infections were diagnosed via a computed tomography scan, and hemorrhage was diagnosed via changes in patient hemodynamics of and hemoglobin drop in complete blood counts. We directly monitored hemorrhagic drainage through the drain in the drain group, and retroperitoneal ecchymosis and abdominal distention with discomfort assisted the diagnosis in the no drain group. Urinary tract infections were suspected based on symptoms and were diagnosed by urine analysis and culture.

Symptomatic urinary tract infections were treated with oral antibiotics. Surgical wound infections were treated with daily wound dressings and oral antibiotics when necessary. Hemorrhage was treated, if clinically symptomatic, with packed red blood cell (PRBC) replacement and close monitoring, and intra-abdominal infections or abscesses were drained via ultrasonic guidance and intravenous antibiotics.

### Statistical analysis

Descriptive statistics were used to present the data. As a measure of central tendency, mean values were calculated. Standard deviation was displayed as the measure of variability. Statistical analysis was performed with SPSS 20.p software using the chi-square test and *t* test. *p* values of less than 0.5 were considered statistically significant.

## Results

The study included 272 adult patients who underwent live donor nephrectomy. The medical records revealed that 269 of

these patients underwent a standard LND and 3 (1.1%) were converted to open donor nephrectomy due to intraoperative bleeding. These 3 patients who were converted to open were excluded from the study. The remaining 269 patients underwent standard laparoscopic donor nephrectomy. The mean donor age was  $47.6 \pm 11.1$  years and 112 of the donors were female (43.1%). There was no difference between the 2 groups in terms of preoperative creatinine levels, which were all within normal range.

Among the 269 patients, 156 (57.9%) had surgical drains and 113 (42.1%) did not. Left LDN was performed in 242 (89.9%) donors and 28 donors underwent right LDN (10.1%). The mean surgical time was  $68.4 \pm 24.5$  min and did not significantly differ between the 2 groups. Similarly, intraoperative EBL was  $150 \pm 30$  mL and was not significantly different between groups.

Postoperative creatinine levels and mean duration of hospital stay were not significantly different between the groups. In the drain group, the mean drain duration was  $3.35 \pm 0.81$  days. Age, sex, side of nephrectomy, creatinine values, surgical time, EBL, duration of hospital stay, and postoperative complications are demonstrated in Table 1. Postoperative complications were encountered in 17 (6.3%) patients. The most common complication was intra-abdominal hemorrhage, which was detected in 6 donors. One of these cases had tachycardia and required PRBC transfusion classified as a Clavien-Dindo class II complication (Table 2). This patient belonged to the drain placement group and presented with hemorrhagic discharge from the drain, abdominal distention, tachycardia, and mild hypotension. Clinically symptomatic urinary tract infections requiring antibiotic treatments were seen in 3 patients, 2 in the no drain group and 1 in the drain group. None of the urinary tract infections recurred after treatment. Wound infections were encountered in 4 patients; 3 of them were in the no drain group. There was no significant difference between the 2 groups in terms of wound infections. A total of 4 patients developed intra-abdominal abscesses diagnosed by ultrasound or computed tomography scans. One was located in the pelvis behind the uterus, and the others were at the surgical dissection site. The patient with the pelvic abscess was in the no drain group. All abscesses were drained under local anesthesia by interventional radiology, followed by antibiotic treatment according to the bacterial culture results. No recurrent abscesses were encountered. The overall complication rate did not differ by presence or absence of surgical drains. No patients were taken back to the operating room for any of the listed complications.

## Discussion

Kidney transplantation is the criterion standard of treatment for patients with ESRD. Living donation has clear advantages over

**Table 1.** Demographic data, serum creatinine levels, surgical time, duration of hospital stay, and postoperative complication rates of the drain and no drain groups.

	Group1 (n=156) (Drain)	Group2 (n=113) (No drain)	P value
Age	47.57±10.72	47.67±11.88	0.94
Gender (F/M)	58/98	54/59	0.71
Nephrectomy side (left/right)	140/16	101/12	0.91
Preoperative serum creatinine levels	0.96±0.12	0.93±0.23	0.82
Postoperative serum creatinine levels (mg/dl)			
– 1 <sup>st</sup> day	1.17±0.27	1.20±0.50	0.53
– 7 <sup>th</sup> day	1.11±0.25	1.10±0.26	0.68
– 30 <sup>th</sup> day	1.14±0.24	1.10±0.22	0.71
– 1 year	1.06±0.22	1.09±0.22	0.42
Surgical time (minutes)	68±8.6	64±9.0	0.65
Estimated blood loss (milliliters)	140±32	150±15	
Duration of the drain (days)	3.35±0.81	(–)	
Duration of hospital stay (days)	6.1±2.23	5.7±2.41	0.18
Postoperative complications			
– Intra-abdominal hemorrhage	4	2	NS
– Intra-abdominal abscess	3	1	
– Urinary tract infection	2	1	
– Surgical wound infection	3	1	

**Table 2.** Classification of postoperative complications after laparoscopic donor nephrectomy according to Clavien-Dindo system.

	Group 1 (n=156) (drain)	Group2 (n=113) (no drain)
Clavien-Dindo Class I	7	2
Clavien-Dindo Class II	2	2
Clavien-Dindo Class IIIA	3	1

deceased donor kidney transplantation, and with the continuing organ shortage, it also can reduce the number of patients able to receive a cadaveric organ for transplantation. According to the data provided by the Turkish Ministry of Health, over the last year, 2347 live donor kidney transplantations (78%) were performed [8]. Similarly, the increase of living donation is significant worldwide: last year, 31 924 (46%) kidney transplants were performed from live donors [1]. The major problem with living kidney donation is that a healthy person has to undergo a major surgical procedure to provide the organ for transplantation; therefore, a nephrectomy technique that is associated with the lowest risk for the donor with minimal complication rate and invasiveness should be preferred.

The overall complication rate for standard LDN has been reported to be between 3% and 22% [4,9,10]. These complications include pulmonary emboli, surgical wound infections, intra-abdominal hemorrhage, chyle leak, abscesses, and urinary tract infections. Some of these complications are directly related to the technique and extent of surgical dissection at the renal hilum.

Renal hilar dissection is clearly the most crucial part LDN. Especially on the left side, mapping out the venous anatomy intraoperatively is important due to the relatively high incidence of variations and aberrant lumbar veins. Dissection in this area should be meticulously performed using delicate instruments. Lymphatics are dense around the renal vessels, and

division of the perirenal and periaortic lymphatics should be performed with energy devices to reduce the risk of chylous leakage. The renal artery should also be carefully dissected and exposed as proximally as possible. Early branching of the arteries may require more extensive dissection; however, over-dissection and transection should be avoided. The extension of hilar dissection preferred in our center is shown in Figure 1. Using this dissection, we have not encountered any lymphatic leakage-related complications in our series.

In the present study, the postoperative complication rate was 6.4% and did not differ according to placement of surgical drains. However, 6 cases had postoperative hemorrhage and 1 of these patients required PRBC transfusions.

Although these hemorrhages were diagnosed with the help of an existing drain in the drain group, it was not overlooked in the no drain group and was diagnosed promptly with changes in vital signs and hemoglobin levels. Accordingly, no significant difference was found between the 2 groups in terms of complication rates.

Prophylactic placement of drains postoperatively has been widely practiced since the mid-1800s, with an attitude of 'When in doubt, drain'. Since then, several clinical studies evaluated the pros and cons of the use of surgical drains [11–14]. Some studies found a direct correlation between the use of surgical drains and intra-abdominal infections, including surgical wound infections, abdominal pain, and diminished pulmonary functions leading to a prolonged hospital stay [13,14–16]. Furthermore, Lubawski et al. found that the use of drains was associated with postoperative ileus and delayed return of bowel functions after surgery [17]. Additionally, Laine et al. suggested that the use of drains might trigger infections by disseminating bacterial flora in a retrograde fashion, cause ascites

formation due to peritoneal irritation and inducing abdominal pain [18]. Consequently, they emphasized the futility of drain usage and recommended drain use only in pancreatic surgeries and emergent cases.

At the present time, little information exists in the literature about the use of drains after laparoscopic surgeries. In the era of laparoscopic surgery, more studies should be performed to eliminate dogmatic surgical practices originating from open surgeries of the past. In our study, drains were not found to be associated with safer outcomes. However, routine placement of surgical drains after LDN might increase the cost of this surgery. Unfortunately, no cost analysis was performed to compare the 2 groups in this study. Future studies should focus on randomized placement of surgical drains after LDN and compare the groups in terms of cost-benefit ratio as well as surgical outcomes and satisfaction rates of the donors.

## Conclusions

To the best of our knowledge, this study is the first to analyze the role of surgical drains and their impact on outcomes after LDN. Our findings revealed there was no significant difference between the drain and no drain groups in terms of hospital stay, complication rates, or postoperative creatinine levels. Because donor nephrectomy is a surgery for a patient who does not have any disease and is volunteering to donate a kidney, drain placement can be justified when an intraoperative necessity arises to ensure the safety of the donor. In our experience, in case of postoperative bleeding, the diagnosis can be made based on clinical presentation, changes in vital signs, and radiological imaging, if needed. Thus, non-placement of a surgical drain in the setting of an LDN case is justified based on our single-center experience.

## References:

1. Organ Procurement and Transplantation Network (OPTN), Scientific Registry of Transplant Recipients (SRTR): OPTN/SRTR 2012 Annual Data Report, Rockville, MD, Department of Health and Human Services, Health Resources and Services Administration, Healthcare Systems Bureau, Division of Transplantation, 2014
2. Cimen S, Guler S, Tennankore K et al: Surgical drains do not decrease complication rates but are associated with a reduced need for imaging after kidney transplant surgery. *Ann Transplant*, 2016; 21: 216–21
3. Shockcor NM, Sultan S, Alvarez-Casas J et al: Minimally invasive donor nephrectomy: Current state of the art. *Langenbecks Arch Surg*, 2018; 403(6): 681–91
4. Lentine KL, Lam NN, Axelrod D et al: Perioperative complications after living kidney donation: A national study. *Am J Transplant*, 2016; 16(6): 1848–57
5. Petrowsky H, Demartines N, Rousson V, Clavien PA: Evidence-based value of prophylactic drainage in gastrointestinal surgery: A systematic review and meta-analyses. *Ann Surg*, 2004; 240(6): 1074–85
6. Zhang W, He S, Cheng Y et al: Prophylactic abdominal drainage for pancreatic surgery. *Cochrane Database Syst Rev*, 2018; 6: CD010583
7. Ratner LE, Ciseck LJ, Moore RG et al: Laparoscopic live donor nephrectomy. *Transplantation*, 1995; 60(9): 1047–49
8. Republic of Turkey, Ministry of Health Transplantation Statistics. Retrieved from <https://organ.saglik.gov.tr/ContentView.aspx?q=1>
9. Halgrimson WR, Campsen J, Mandell MS et al: Donor complications following laparoscopic compared to hand-assisted living donor nephrectomy: An analysis of the literature. *J Transplant*, 2010; 2010: 825689
10. Lentine KL, Patel A: Risks and outcomes of living donation. *Adv Chronic Kidney Dis*, 2012; 19(4): 220–28
11. Fong Y, Brennan MF, Brown K et al: Drainage is unnecessary after elective liver resection. *Am J Surg*, 1996; 171(1): 158–62
12. Gurusamy KS, Samraj K: Routine abdominal drainage for uncomplicated open cholecystectomy. *Cochrane Database Syst Rev*, 2007; (2): CD006003
13. Merad F, Yahchouchi E, Hay JM et al: Prophylactic abdominal drainage after elective colonic resection and suprapromontory anastomosis: A multicenter study controlled by randomization. *French Associations for Surgical Research. Arch Surg*, 1998; 133: 309–14
14. Alvarez Uslar R, Molina H et al: Total gastrectomy with or without abdominal drains. A prospective randomized trial. *Rev Esp Enferm Dig*, 2005; 97: 562–69

15. Monson JR, Guillou PJ, Keane FB et al: Cholecystectomy is safer without drainage: The results of a prospective, randomized clinical trial. *Surgery*, 1991; 109: 740–46
16. Benedetti-Panici P, Maneschi F, Cutillo G et al: A randomized study comparing retroperitoneal drainage with no drainage after lymphadenectomy in gynecologic malignancies. *Gynecol Oncol*, 1997; 65: 478–82
17. Lubawski J, Saclarides T: Postoperative ileus: Strategies for reduction. *Ther Clin Risk Manag*, 2008; 4(5): 913–17
18. Laine M, Mentula P, Koskenvuo L et al: When should a drain be left in the abdominal cavity upon surgery? *Duodecim*, 2017; 133(11): 1063–68