Laparoscopic donor nephrectomy, complications and management: a single center experience

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ABSTRACT

Objective: To present our experience with laparoscopic donor nephrectomy (LDN), our complications and management modalities.

Material and methods: Fifty-one transperitoneal LDNs performed in our clinic between the years 2011, and 2015, were evaluated retrospectively. Demographic characteristics of the patients, operative and postoperative data and complications were evaluated.

Results: Nineteen female and 32 male patients with ages ranging from 24 to 65 years underwent left- (n=44), and right-sided (n=7) LDNs. Six patients had two, and one patient three renal arteries. Mean operation time was 115±11 (min-max: 90-150) minutes, and mean warm ischemia time 111±9 (min- max: 90-140 sec) seconds. Mean hospital stay was found to be 2.5±0.5 days. No patient needed to switch to open surgery. In one patient, lumbar vein was ruptured, and hemostatic control was achieved laparoscopically. Postoperative paralytic ileus developed in two patients. Three patients had postoperative atelectasis, and a febrile (38.1°C) episode.

Conclusion: LDN is a minimally invasive method with advantages of short hospital stay, less analgesic requirement, and better cosmetic results. However it should be performed by surgeons with advanced laparoscopic experience.

Keywords: Donor; laparoscopy; nephrectomy

Introduction

Based on the data retrieved from the kidney registration system in our country implemented in compliance with the recommendations of The Ministry of Health and the Turkish Society of Nephrology, the prevalence of end-stage renal failure (ESRF) is gradually increasing.^[1] The number of the patients with the diagnosis of ESRF was 314 patients per million population in Turkey in 2001, and within 10 years, its incidence increased 2.5 times and reached 816 patients per million population in 2012.^[2] Two most important reasons for the increase in the prevalence of ESRF are increasing average age of the community and epidemics of diabetes emerged in our country. According to data related to our country based on Turkish Society of Nephrology Renal Registry System, rates of ESRF have increased over time, due to higher rates of diabetes and hypertension as a cause of

ESRF, while the proportion of glomerulonephritis decreased.^[3]

Kidney transplantation is the best treatment option for ESRF.^[4] Throughout the whole world, inadequate number of cadaveric donors, while rapid increase in the number of renal failure patients who are waiting for organ transplantation from living donors, have enhanced the interest in kidney transplantation from living donors. Within the last 5-6 years 1500 to 2000 kidney transplants have been performed, 80% of kidney transplants have been realized by living donor nephrectomy.^[5] This fact has revived relatively safer laparoscopic nephrectomy with lower complication rates. Therefore increase in the number of transplantation from living donors has been intended.^[6] In 1991 Clayman et al.^[7] performed the first laparoscopic nephrectomy, and Ratner et al.^[8] performed the first laparoscopic donor nephrectomy (LDN) in 1995. LDN was compared with traditional open do-

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nor nephrectomy (DN), and began to be increasingly preferred with the advantages of lesser postoperative pain, shorter hospital stay, and early postoperative mobilization.^[9]

There is no clear statistical information about the method of live DN (open, laparoscopic, robotic) at the moment. In our country, there are not enough publications on experiences, and complications related to LDN. In this study we aimed to compare our LDN experience with the literature.

Material and methods

Between the years January 2011 and December 2015, 51 cases of LDN were performed. Seven right, and 44 left DNs were realized. All donors were subjected to routine blood tests, histocompatibility testing, lymphocyte cross-match tests, and computed tomographic renal angiographic examinations to evaluate renovascular structure. Preoperative data of the patients, operative times, warm ischemia times, amount of blood loss, length of hospital stay and complications were recorded.

Surgical technique

Left LDN patients were laid at 90 degree left decubitus position on the operating table. The operating table was folded at a line corresponding to the transverse axis passing through the umbilicus so as to give the patient a proper position, Surgical field was disinfected properly. A 5-6 cm long incision was started to be made at a distance of 5 cm to the anterior superior iliac spine on the transvers line, and paralel to the inguinal ligament at an oblique plane in the lower abdominal quadrant. Fascia and peritoneum were dissected. Gel port (Applied Medical, Rancho Santa Margarita, CA, USA) was placed on this area (Figure 1). Pneumoperitoneum was created using CO₂ insufflation through a gel port until intra-abdominal pressure of 15 mmHg was reached. Trocars with a caliber of 10 mm was advanced through gel port created 3 cm to the left of the umbilicus, and 3 cm inferior to the intersection point between the left outer edge of the rectus muscle, and arcus costarum. Intra-abdominal pressure was reduced to 12 mmHg. Then the colon was medialized by dissecting it away from the Toldt line. Gonadal vein was found, clipped, and dissected. Then the ureter was found lying on the psoas muscle. Ureter and surrounding tissues were retracted with suspension sutures, and a 5 mm trocar was inserted at the intersection point between transverse line passing through the umbilicus, and left anterior axillary line. We inserted a trocar with a diameter of 5 mm at the intersection point between horizontal line transversing umbilicus, and left anterior axillary line to facilitate dissection of ureter and surrounding tissues. Ureter was dissected distally up to the iliac cross over, and up to the

Figure 1. Patient position and placing gel port

renal hilus proximally. Renal vein was found by following the course of the ureter. Renal vein was found, and liberated. We placed a vessel strap around the renal vein for safety, and also to facilitate dissection. Surrenal vein was clipped and dissected. Then the renal artery was dissected up to the aorta. Kidneys were dissected away from the surrounding tissue, and mobilized. Ureter was clipped, and dissected. Then, two Hem-o-Lock® Clip (Teleflex Medical, Research Triangle Park, North Carolina, USA) clips were placed around renal artery, and vein, and they were dissected (Figure 2). Under direct vision provided by the camera the kidney was taken out with a helping hand from the gel ports placed at the beginning of the operation. A drainage catheter was placed in the renal loge under direct vision, and the operation was terminated.

In the above-mentioned right LDN, port inputs are applied to the right side and in case of need an extra port is placed an additional 5 mm-trocar the extraction of the liver. We used vascular stapler for dissecting longer segment of the renal vein in cases with right LDN.

Results

Laparoscopic donor nephrectomy was performed in 51 patients, (male, n=32, and female, n=19). Mean age of our patients was 49±24 years, while the age distribution ranged from 24 to 65 years. Six patients had double, and one patient triple arteries. All patients underwent transperitoneal DNs, and all of our cases were achieved laparoscopically. The mean operative time was 115±11 minutes (min-max: 90-150 minutes), mean warm ischemia time was 111±9 (min- max: 90-140 seconds), while mean intraoperative blood loss was 44±34 cc (0-100 cc), and mean length of hospital stay was found to be 2.5±0.5 days (Table 1).

Figure 2. Placement of two clips around renal artery and two clips around renal vein

Table 1. Preoperative data of patients who underwent laparoscopic donor nephrectomy

Number of patients	51
Male/female	32/19
Left/Right Side	44/7
Three Arteries	1
Two Arteries	6
Mean time	115±11 minutes
Mean ischemia time	111±9 seconds
Mean amount of blood loss	44±34 cc
Mean hospital stay	2.5±0.5 days

Table 2. Complications according to Clavien classification system

Classification	Number	Complication
Clavien 2	2	Paralytic ileus
Clavien1	3	Atelectasis

Intraoperative complications were observed in one patient. During dissection of the renal vein; bleeding occurred after rupture of the lumbar vein. Hemostatic control was achieved by placing a clip around lumbar vein. Postoperative paralytic ileus developed in two patients. In three patients atelectasis, and fever were observed. These patients recovered without any need for additional intervention or treatment (Table 2).

Discussion

Kidney transplant also increases life expectancy, and also quality of life in patients with ESRF.^[10] After accumulation of certain amount of experience in laparoscopic procedures, the first LDN was performed successfully in 1995.^[8] LDN is an alternative, and minimally invasive method than open DN with its potential benefits of lesser postoperative pain, low analgesic use, shorter hospital stay, lower rates of incisional morbidity, faster return to normal daily activities and better cosmetic results. It can be performed using transperitoneal, retroperitoneal and hand-assisted methods.^[9]

Although hand-assisted LDN has been preferred, because it provides tactility sense, it has some disadvantages such as requirement of a larger incision and a specific port. Besides it induces wrist strain injuries and wound problems.^[11] Retroperitoneal method has two distinct superiorities. Firstly, dissection and retraction of intraperitoneal organs are not required. This is especially important in patients with a history of previous surgery. Secondly, vessels can be reached very quickly and safely.^[12] Today, in many centers in the world and in our country, LDN is performed via transperitoneal approach. Transperitoneal approach is preferred due to the ease of orientation to ample workspace and significant anatomical landmarks.^[12] There is a issue to be considered when deciding to perform a major surgical operation. Namely, a major surgery can be performed on a healthy person. Therefore, the surgeon should gain enough skill and experience in his/her favourite technique, and select the method which he/she can master perfectly. In our clinic all LDN procedures have been performed via transperitoneal route. Indeed, we are more experienced in transperitoneal approach relative to retroperitoneal approach, and we believe that transperitoneal approach is safer than a retroperitoneal approach.

In a meta-analysis, LDN, hand-assisted LDN and open DN were compared as for operative time, complications, warm ischemia time, length of hospital stay, and graft function. As a result of this meta-analysis, all three techniques were emphasized as standard techniques for DN. However, LDN was reported to be superior over other methods as for postoperative pain, amount of blood loss and length of hospital stay. The warm ischemia time was reported to be shorter in open DN.^[13]

Meyer et al.^[14] compared their decade-long LDN experience with that of open donor nephrectomy, and detected that major complications were less frequent observed when compared with the open procedure, in addition to shorter hospital stay, less pain and better cosmetic results obtained in the LDN. However, in a randomized study, longer LDN operative times

were found relative to open LDN (LDN, 183-340 mins, and open LDN, 95-260 mins).^[15] In one study average operative time was reportedly 60 minutes shorter in open DN.^[16] The mean duration of our LDN was 115±11 (min-max: 90-150) minutes. We attribute our shorter operative time to our ample experience in laparoscopy.

Warm ischemia time is one of the most important parameters for this surgical procedure. The studies performed have demonstrated that open DN had the shortest, and LDN the longest warm ischemia times. While the the warm ischemia of hand-assisted method was shown to be between these two methods.^[17] In one study the authors concluded that with increasing experience shorter warm ischemia time could be achieved.^[18] Ruiz-Dey et al.^[19] found the mean warm ischemia time in LDN operations as 3.9±0.3 minutes. We think that warm ischemia time should be as short as possible in order to minimize ischemic damage, and increase graft survival. In our series, warm ischemia time was 111±9 secs which was found to be compatible with that reported for large series.

Gel port was placed at the beginning of our operations in all cases. Placing gel port contributes to the shortening of warm ischemia times, and allows the possibility to remove the kidney safely as soon as the kidney is fully freed from its attachments. On the other hand, the presence of a gel port gives a chance of using a helping hand to overcome an undesirable complication occurring during laparoscopic surgery. The conversion to open surgery from LDN has been reported in approximately 3% of the cases, and the most common causes for switching to open surgery include bleeding or vascular damage, difficult exploration in obese patients or adherent tissues, malfunction of vascular stapler and pneumoperitoneum.^[20] Yavascaoglu et al.^[21] performed 18 LDNs without any conversion to open surgery. They reported that LDN could be used as a safe minimally invasive safe method. We didn't switch from laparoscopic surgery to open or hand-assisted surgery in any one of our cases. All cases were completed laparoscopically.

In their study, Deng et al.^[22] reported on use of clip instead of renal vascular stapler, and they could increase the length of the vessel a few millimeters. In our series, we used only vascular stapler Articulate Endo-TA (Ethicon Endosurgery, Johnson & Johnson, Cincinnati, OH, USA) in cases with right-sided LDNs. Otherwise, we used Hem-o-Lock® Clip (Teleflex Medical, Research Triangle Park, North Carolina, USA) in all remaining cases.

Su et al.^[23] reported intraoperative complication rates in the first series of 94, and subsequent series of 96 cases as 21% and 10.4% (major complication rate, 5.2%), respectively. This

shows that the learning curve is directly proportional to the decrease in the rate of complications. In terms of blood loss, LDN is more advantageous compared with open DN. Abreu et al.^[24] reported amount of blood loss in LDN, and open DN as 266±174 cc, and 393±335 cc, respectively. In our series, amount of blood loss was 44±34 cc (0-100 cc). In our series during dissection of the renal vein, lumbar vein was ruptured and peroperative bleeding occurred. Bleeding lumbar vein was found laparoscopically. The bleeding was stopped by laparoscopically placing clip around the lumbar vein during the same session Postoperative paralytic ileus developed in two of our patients which was detected on standing abdominal radiograms did not require surgery. In our three patients, as detected on auscultation basal segment of the lungs was not ventilated. Postoperative atelectasis induced a febrile (38.1°C) episode (Table 2). We didn't change antibiotherapy, and febrile episode did not recur.

In conclusion, LDN should be performed by experienced surgeons. Using this method, postoperative analgesics will be less frequently required, besides cosmetic results and consequently shorter hospital stay will be achieved. Thus, LDN will be preferred rather than open DN. We believe that in near future LDN will completely replace open DN.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Bakırköy Dr. Sadi Konuk Training and Research Hospital.

Informed Consent: The patients were allowed using their clinical information in clinical researches with preoperative surgical consent form.

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