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Extraction of kidney via suprapubic or inguinal incision in total laparoscopic donor nephrectomy

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ABSTRACT

Introduction: The objective of this study was to investigate the results of the first 48 patients who underwent total laparoscopic transperitoneal donor nephrectomy at a single institution and to present the impact of the kidney extraction site on ischemia time.

Materials and Methods: The study included patients who underwent kidney donor surgery between February 2017 and December 2018. Evaluation of the kidney transplantation candidates was performed by the kidney transplantation council. A total of 4 trocars were used for a right-side nephrectomy, and 3 trocars were used for a left-side nephrectomy. The kidneys were extracted through a suprapubic incision in the first 18 cases and through the inguinal region in the last 30 cases. A comparison was made of the demographic characteristics and the intraoperative and postoperative results of the 2 groups.

Results: Of the study patients, 30 were female and 18 were male, with a mean age of 48.0±9.6 years (range: 30–71 years). All of the patients underwent a total laparoscopic transperitoneal donor nephrectomy. Four patients underwent a right-side nephrectomy and 44 underwent a left-side nephrectomy. There was no case of conversion to open surgery. The mean operative time was 251.4±72.4 minutes (range:127–420 minutes). In the first 18 cases, the organ was extracted through a suprapubic incision and the ischemia time was 318±140 seconds (range: 150–720 seconds). In the last 30 cases, the organ was extracted through an inguinal incision and the mean ischemia time was 151.5±55.1 seconds (range: 80–265 seconds). The mean length of hospital stay was 5.4±1.1 days (range: 3-10 days).

Conclusion: The application of minimally invasive surgery in healthy individuals undergoing donor nephrectomy leads to better physical, psychological, and social outcomes. Surgical experience and the choice of extraction site can shorten the warm ischemia time significantly. Extraction through the inguinal region is recommended, as it provides for a faster removal and shortens the warm ischemia time. Laparoscopic donor nephrectomy can be used safely in centers with experience performing advanced laparoscopy.

Keywords: Donor nephrectomy; laparoscopic donor nephrectomy; minimal invasive nephrectomy.

Introduction

thousands of deaths every year. Hemodialysis or peritoneal dialysis is often used for symptomatic treatment in chronic renal failure, however, the main treatment is renal transplantation. Living-donor organ transplantation is more prominent in countries such as ours where organ

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donation is limited due to socio-cultural factors.

Advances in surgical techniques and technology have lead the minimal invasive surgery to stand out among other surgical techniques. Donor nephrectomy was previously performed using open surgical technique. However, in 1995, the first laparoscopic donor nephrectomy was performed by Ratner et al.[1]

In this study, we aimed to investigate the results of the first 48 patients who underwent total laparoscopic transperitoneal donor nephrectomy in our clinic, and the impact of the extraction site on ischemia time.

Materials and Methods

In this study, we included the first 48 cases who underwent laparoscopic donor nephrectomy between February 2017 and December 2018. The kidney transplantation council evaluated all the kidney transplantation candidates. Donor candidates with a BMI of 36 kg/m^2 and above, over the age of 70 or below the age of 30 were excluded. In addition, some exclusions were made due to medical problems. Ethics committee approval was obtained for non-kin patients. Multi-slice computed tomography was performed on donor candidates to evaluate the vascular anatomy, renal pelvis and ureters. The surgical team evaluated the anatomical variations preoperatively and provided intraoperative guidance. 4 trocars were placed for the right-side nephrectomy. 3 trocars were placed for the left-side nephrectomy. The kidneys were extracted through suprapubic incision in the first 18 cases, and through the inguinal region in the last 30 cases. We compared the demographic characteristics, intraoperative and postoperative results between the two groups.

Surgical Technique

Following insertion of the intubation and urinary catheter, the patient was positioned in a 90-degree lateral decubitus position. After proper care and covering the patient, the Veress needle was used to create the pneumoperitoneum of 12 mmHg. Firstly, a 10-mm camera port was placed 3–4 cm above the umbilicus. After abdominal exploration in left-side nephrectomy, a 5-mm and a 12-mm ports were placed beneath the rib in the left upper quadrant and left lower quadrant under direct laparoscopic view The camera port was placed in the same way for the right-side nephrectomy. Then, 5-mm ports were placed in the right subcostal area and the right/left lower quadrant. In addition, the 4th port was placed in the right epigastric region for liver retraction. Figure 1a and 1b demonstrate the placement of ports. The devices such as monopolar cautery, Harmonic (Ethicon, Cincinnati OH) or Ligasure (Covidien, Minneapolis, MN) can be used for dissection. The colon was mobilized along the line of Toldt. The distortion of anatomical planes during the stage where the mesocolon is medialized and freed from the Toldt's fascia complicates dissection. Therefore, it is an important stage to medialize the mesocolon within the correct surgical plane without injuring the mesocolon. The lower pole of the spleen was mobilized for the left kidney. The spleen was freed as main splenic and capsule vascular structures along with the splenic hilum to the tail of pancreas were securely medialized.

After the colon was mobilized sufficiently, the ureter was exposed medially in the area where the iliac artery crossed the ureter, and converted in the anterior including the psoas muscle and the surrounding fatty tissues. The ureter and adjacent gonadal vein were clipped. During dissection of ureters, the fatty tissue was carefully refrained, and the gonadal vein was clipped and divided along with the ureter. The gonadal vein was dissected distally where the ureter was to be transected. The reason for this was to try to prevent the complications of ureteral ischemia that might occur in the ureter.

Gonadal vein was traced up to the renal vein and mobilized using sharp and blunt dissection. The renal vein edges were freed with sharp and blunt dissection. The Ligasure device was used for transecting the surrenal vein. The adrenal gland was separated from the kidney by lateral dissection. Then, Gerota's fascia was opened, and

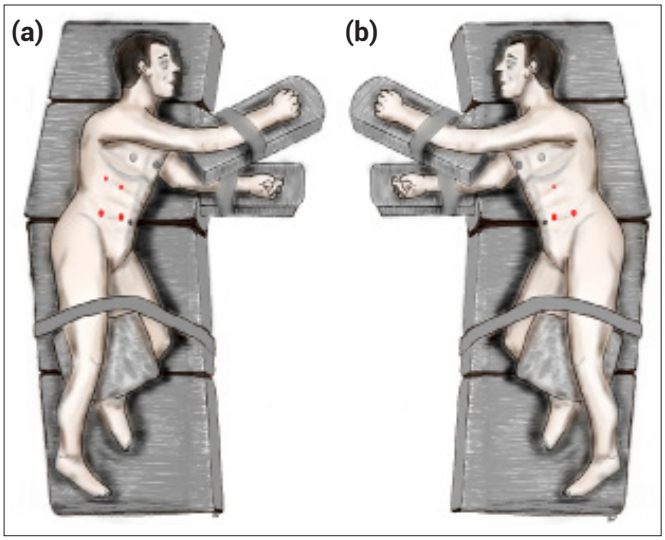

Figure 1. (a) Right nephrectomy position. **(b)** Left nephrectomy position.

the kidney was freed from the lateral ligaments and upper poles. Then, the vein and adjacent arterial dissection was performed up to the aorta with inferior dissection over the psoas muscle. It is possible to encounter more than one posterior lumbar veins during the dissection of the renal vein. Energy device or clips are used for the closure of lumbar veins to completely free the renal veins. Hilar vascular dissection should be performed carefully after the achievement of full hemostasis due to the risk for safety of vascular structures and postoperative hemorrhage.

After the procedure, the operation was suspended to reset the intra-abdominal pressure during the period of delivery by the recipient team. This results in an expansion of blood volume in the kidney by decreasing intra-abdominal pressure. At the same time, fluid replacement and diuretic drugs were administered intravenously to increase diuresis. The laparoscopic apparatus was inserted by making an approximately 5–6 cm incision including the 12mm port incision, which allowed the extraction of the kidney from the lumbar region. Firstly, the gonadal vein and ureter were transected distally with a hemolacic clip.

The renal artery was then transected using white vascular stapler at the outlet of the aorta. After the artery, the renal vein was traced and transected beneath the gonadal vein. We used vascular stapler for the arterial and venous closure because we thought that it would be safer, although there were different techniques for transection of vascular structures. The 4–5 mm shortening of the arteries was a handicap, however, arterial reconstruction can be performed safely if sufficient dissection is performed up to the aorta. There were not any issues regarding the vein length, and it was observed that contour tracing through the gonadal vein before the vein transection could lead to an even longer vein length.

The kidney which was completely freed was extracted through the lumbar region and the back table procedure started.

Results

Of the patients, 30 were female and 18 were male with a mean age of 48.0±9.6 (30–71). The mean body mass index of donors was 27.7±4.2 (18.8–35.8), and all patients underwent total laparoscopic transperitoneal donor nephrectomy. Four patients underwent right-side nephrectomy, and 44 underwent left-side nephrectomy. There was not any conversion to open surgery. 4 trocars were placed for the right-side nephrectomy. 3 trocars were placed for the left-side nephrectomy. The mean operative time was 251±72 (127–420) minutes. In the first 18 cases, the organ was removed through the suprapubic incision. In the next 30 cases, the specimen was removed through lateral inguinal incision. The mean length of hospital stay was 5.4±1.1 (5) days. The mean follow-up period was 12±6 (4–25) months. In the first 18 cases, the organ was removed through a suprapubic incision and the ischemia time was 318±140 (150–720) seconds. In the last 30 cases, the organ

Table 1. Demographic and clinic data

	Suprapubic incision	Inguinal incision
Age	48 (30–71)	48 (32–64)
Female	9	21
Male	9	9
Body mass index (kg/m^2)	26.5 (18.8–35.4)	28.6 (22–35.8)
Right	2	2
Left	16	28
Operation time (minute)	248 (185–420)	253 (127–390)
Hot ischemia time (second)	318 (150–720)	151 (80–265)
Hospitalization time (day)	5.5 (4–10)	5.4 (3–7)
Hemorrhage	1	0
Lymphatic drainage	1	0
Renal artery injury	0	1
Wound infection	0	1
İncisional hernia	0	1

was extracted through the inguinal incision and the mean ischemia time was 151±55 (80–265) seconds (p=0.0001). Patients were given narcotic analgesic only in the early postoperative period (Table 1). In the early postoperative period, one patient developed wound infection, one patient had intrabadominal hemorrhage and another had lymphatic drainage. None of the patients required reoperation. The patient with early post-operative wound infection developed incisional hernia in the late period. A mesh was used to repair the incisional hernia. No further complications arose. There was not any donor mortality in the early and late period.

Discussion

It is very important to carry out a minimally invasive procedure on individuals wishing to be living donors for kidney transplantation. Open donor nephrectomy used to be the prominent surgical technique, however, in 1995, the first laparoscopic donor nephrectomy was performedby Ratner and colleagues. In the first group, a 9-cm incision was made under the umbilicus and the organ was extracted with a warm ischemia time of less than 5 minutes.[1] Laparoscopic donor nephrectomy has become popular with the advances in surgical techniques and technology, and shortened the warm ischemia time.

During laparoscopic donor nephrectomy, the organ must be extracted as soon as possible without prolonging the warm ischemia time.

In our series, the suprapubic incision was performed in the first 18 cases, and the mean ischemia time was 318±140 (150–720) seconds. Suprapubic incision was abandoned for the removal of the organ due to the prolonged ischemia time and the lateral incision was performed in the inguinal region. The mean ischemia time was 151±55 (80–265) seconds in 30 patients (p=0.0001). The review of the literature reveals that the shortest warm ischemia time is observed in the open donor nephrectomy.[2,3] However, in laparoscopic donor nephrectomy, the learning curve completion and expansion of experience in the standard surgical technique shorten the ischemic time. Open donor nephrectomy has been performed in our clinic for many years. However, we have started to perform laparoscopic donor nephrectomy in the last two years. The data we present here belong to our first experiences including the learning curve.

The literature shows that the rate of conversion to open surgery is between 1–2%. None of our cases had conversion to open surgery.[4,5]

Laparoscopic donor nephrectomy shortened the length of hospital stay. Although the patients were medically ready for discharge on the second day, the length of hospitalization was longer in our patients The median length of hospital stay was 5 days. This was due to the fact that the donors were discharged along with the recipients as the patients from other cities or countries tended to wait for the recipients.

Laparoscopic donor nephrectomy presents better outcomes in wound healing, length of hospital stay, and cosmetic results compared to open surgery. This results in a positive impact on living organ donors.

In conclusion, minimally invasive surgical procedures in healthy individuals undergoing donor nephrectomy provides better physical, psychological and social outcomes. Laparoscopic donor nephrectomy can be performed safely in centers with experience of advanced laparoscopy. In laparoscopic donor nephrectomy, rapid removal of the organ through the easiest incision shortens the warm ischemia time of the graft.

Disclosures

Ethichs Committee Approval: The study was approved by the Local Ethics Committee.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

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