Living Laparoscopic Donor Nephrectomy

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INTRODUCTION
Given the nearly 60,000 patients waiting for renal transplantation, living donor nephrectomy has become a significant source of kidney donation supplementing the shortage of available cadaveric kidneys in the United States. The first laparoscopic living donor nephrectomy (LLDN) was performed by Ratner 10 yr ago with the aim of reducing the morbidity associated with the open procedure. Since that time, more than 200 institutions worldwide have gained expertise in performing LLDN. In 2004, it was estimated that more than 10,000 kidneys had been retrieved with laparoscopic assistance.

PATIENT SELECTION AND PREPARATION
Typically, a living donor is either an immediate blood-related family member or a spouse of the recipient who has end-stage renal failure. Recently, altruistic third-party donation has gained considerable attention. All candidates are screened preoperatively for any transmissible diseases, infection, or malignancy. Basic blood group compatibility and cross-match lymphocytic testing is performed. A thin slice (3-mm) computed tomography (CT) scan optimally assesses vascular anatomy and the integrity of both kidneys. Three-dimensional (3D) volume rendering provides details of vascular anatomy commensurate with conventional angiography. We perform an angiogram only if the 3D CT scan demonstrates vascular anomaly or multiplicity. The left kidney is preferred given its longer vein. However, in cases of complex multiple vasculature of the left kidney, the right kidney is retrieved. Similar to open surgery, the dictum of leaving the best kidney with the donor is strictly adhered to during laparoscopic donor nephrectomy.

Patients are presented a detailed discussion about the procedure, including major risks and the potential for open conversion. All patients undergo gentle bowel preparation with clear liquid diet the day prior to surgery and two bottles of magnesium citrate.

OPERATIVE TECHNIQUE
Transperitoneal Left Donor Nephrectomy
Although multiple techniques have been described, including hand assistance, we prefer the standard transperitoneal approach for the left kidney and the retroperitoneal approach for the right kidney. Although the right renal vein is shorter than the left, in our experience both afford adequate renal vein length for transplant anastomosis.

The patient is positioned and secured to the table using adhesive tape in a modified 45–60° lateral position (Fig. 10.1). We do not raise the kidney bar. The proposed Pfannenstiel site two finger-breadths cephalad to the pubic bone is marked. Veress pneumoperitoneal access is obtained at the midway point between the anterior superior iliac spine and the umbilicus. The Veress site serves as the insertion site for the primary port. Additional ports are placed under direct vision using a 30° lens, as illustrated. During the procedure, the patient is kept well hydrated. To counteract effects of pneumoperitoneum-induced oliguria, the patient is well hydrated and mannitol/Lasix is administered.

The descending colon is reflected medially along the white line of Toldt using cold endoshears in the right hand and a small bowel atraumatic grasper in the left hand. The avascular plane between Gerota’s fascia and the large bowel is developed.

The ureter and gonadal vessel are retracted anteriorly and laterally off the psoas muscle. The gonadal vein is dissected to its insertion point into the renal vein. The cephalad and inferior edges of the renal vein are dissected with J-hook electrocautery. The gonadal vein is ligated with hemolock clips and divided. A long stump of the gonadal vein attached to the renal vein facilitates its anterior retraction allowing safe dissection of the more posteriorly located lumbar vessels. Lumbar veins are dissected and
divided with clips. Only the most proximal 2 cm of the renal artery near the aorta is dissected so as to minimize unnecessary manipulation of the renal artery, which may lead to vasospasm. Diluted papaverine is administered locally over the artery to prevent vasospasm.

The adrenal vein is identified and transected between hemlock clips at its insertion point onto the renal vein. Care must be taken not to incorporate adrenal tissue into the hemlock clip to minimize troublesome adrenal gland bleeding. Gerota’s fascia is entered superiorly and the upper pole parenchyma is exposed. The attachments of the adrenal gland are dissected off the medial aspect of the upper pole kidney, taking care not to injure any arterial branches. The adrenal gland is thus preserved.

The ureter and gonadal vein are divided distally near the common iliac vessels. The proximal cut end of the ureter is not clipped to allow documentation of intraoperative urine production. The kidney is completely mobilized laterally. The previously marked modified Pfannenstiel incision site is developed in a muscle-splitting fashion down to the peritoneum. A 12-mm dilating trocar is placed in the midline of the Pfannenstiel incision for future application of the Endo-GIA vascular stapler.

Additional Lasix and mannitol are administered 5 min prior to clamping of the hilar vessels (Fig. 10.2). An assistant provides lateral traction on the kidney using a small bowel atraumatic grasper. The renal artery is ligated with two hemlock clips proximally close to the aorta and divided. The distal side of the renal artery is not clipped. The renal vein is divided with the Endo-GIA vascular stapler at an area anterior to the aorta, medial to the adrenal vein stump. The vascular stapler is fired carefully along the vein, being aware of the potential risk of inadvertent superior mesenteric artery injury. Any remaining attachment of the renal vein not divided by the Endo-GIA stapler is ligated with hemlock clips and divided.

The kidney is rapidly retrieved with the surgeon’s right hand through the previously created muscle-splitting Pfannenstiel incision and transferred for bench preparation. The extraction incision is closed with a running 0-Vycril suture. After approx 5 min without pneumoperitoneum, laparoscopic inspection is performed to ensure hemostasis. Laparoscopic exit is completed.

**Retroperitoneal Right Donor Nephrectomy**

Although transperitoneal laparoscopic dissection of the right kidney and renal vein length preservation using a Satinsky clamp has been described, our preference has been to perform the right donor nephrectomy by the retroperitoneal laparoscopic approach given safety concerns with the former approach. Advantages with the retroperitoneal access include early dissection of the renal vasculature as well as a more flush placement of the Endo-GIA vascular stapler alongside the inferior vena cava (IVC).

The patient is positioned in full flank 90° position (Fig 10.3). The table is flexed, but the kidney bar is not raised. All pressure points are carefully padded, and the patient is secured to the operating table.

A 1.5-cm skin incision is made at the tip of the 12th rib (Figs. 10.4 and 10.5). The lumbodorsal fascia is incised with electrocautery, and the surgeon’s index finger is inserted posterior to the kidney to develop a small working space. A retroperitoneal balloon dissector is placed in the retroperitoneum posterior to the kidney and inflated to 800 cc. A blunt-tip 10-mm balloon port is placed to prevent leakage of pneumoperitoneum. A 12-mm port is placed under direct laparoscopic visualization three fingerbreadths cephalad to the anterior superior iliac spine. A 5-mm port is placed lateral to the paraspinal muscle at the junction of the 12th rib.