Laparoscopic Donor Nephrectomy: Recipient Surgeon’s Perspective

Head, Section of Renal Transplantation, Glickman Urological Institute, Cleveland Clinic Foundation, Cleveland, OH, USA
David A. Goldfarb

The most important problem facing solid organ transplantation today is the shortage of organs. According to the United Network for Organ Sharing registries close to 60,000 patients are waiting kidney transplant. Last year approximately 16,000 patients received a kidney transplant. This is a tremendous disparity. The projected prevalence of end-stage renal disease continues to rise exponentially compounding the problem. Solutions to the organ shortage have included extending donor criteria for deceased donor kidneys, xenotransplantation, tissue engineering and most importantly an increase in living donation.

Laparoscopic donor nephrectomy was first introduced in 1995 and over the past ten years has evolved from a developmental technique to a widely accepted standard. Critical to abrogating the donor shortage there has been an expansion in the living donor program at many centers across the world. This is due to many factors. There are improved results associated with living donation. It results in diminished wait times. The development of minimally invasive surgical techniques, particularly laparoscopic donation, has removed disincentives to donation. The growth in the kidney transplant program at Cleveland Clinic Foundation over the past five years parallels the growth in our laparoscopic donor nephrectomy program. Laparoscopic donor nephrectomy offers the advantages of less bleeding and pain. There is a shorter hospitalization and more rapid return to normal activity. There is also an improvement in cosmetic appearance. It seemed reasonable that this would be more attractive and leads to more donors. In a publication by the group at the University of Maryland in 2000 they demonstrated very nicely the impact of laparoscopy on increased donation rates.

While the increase in donation is welcome to abrogate the organ shortage problem laparoscopic donor nephrectomy is not without its risks. In essence there is transfer of risk from the donor to the recipient surgical team. There has been concern over the past ten years over the anatomic and physiologic integrity of organs procured with laparoscopy. The vessels are shorter, but more important the pneumoperitoneum adversely impacts renal physiology. Additionally the warm ischemia time during laparoscopic procurement has also raised concern. While these issues to elevate level of concern over these kidneys there are ways to manage these and achieve excellent outcomes.

In assessing whether the savings in donor morbidity are a tradeoff for more transplant problems I would like to point out some of the early literature regarding laparoscopic donor nephrectomy. There were several concerns. There were papers suggesting slower improvement in graft function, higher rates of vascular complications and higher rates of ureteral complication. With experience many of these issues have been resolved. With increasing donor surgeon experience vascular complications have been minimized. With proper dissection of the ureter to include periureteral vascular supply the rate of complications is certainly manageable. One issue that has remained is slow evolution of early renal function. In a recent review of the UNOS database Troppmann and colleagues demonstrated no difference in rates of delayed graft function between laparoscopic and open donors. There was a greater percentage of patients with a discharge serum creatinine >20 mg% and >14 mg% in the laparoscopic group. This suggests slow return of early renal function. We were interested in this topic and took a critical look at early renal recovery using multiple definitions for early graft dysfunction in our first 100 laparoscopic donor nephrectomies. We segregated renal function outcomes by delayed graft function (need for dialysis in the first week), serum creatinine greater than or equal to 2.5 mg/dL at postoperative day 5, and renal centigraphy cri-
teria at day 5 (T1/2 > 12.2 minutes, Tmax > 6.6 minutes). Our data showed no difference between the laparoscopic donor nephrectomy group and the open nephrectomy group. Furthermore, creatinines at 1.36 and 12 months showed no difference. There was no difference in creatinine clearance between the laparoscopic and open group at one year. One-year patient and graft survivals were similar. These very good results are attributed to meticulous detail to technique. Notably the laparoscopic donor nephrectomy group had considerably more intraoperative fluid associated with an increase in urine output during the donor operation. Other features of the donor technique that were also important were a limited arterial dissection to the proximal 1.0 cm from the aorta, wide resection of the ureter to include the ureteral blood supply and minimization of warm ischemia time (average = 4.3 minutes). Lastly, careful recipient reconstruction was also considered essential.

Other contested areas with regard to laparoscopic donor nephrectomy include procurement of the right kidney. In the early reports many of the kidneys that were lost were right-sided kidneys. This is owing to the shorter length of the right renal vein and also to the poorer tissue quality of the right renal vein. Solutions to this issue at the Cleveland Clinic has been a retroperitoneal laparoscopic right donor nephrectomy. Caveats of this technique include transection of the renal vein in a plane parallel to the IVC to maximize renal vein length. Recipient modifications that facilitate transplantation of the right kidney include extensive mobilization and lateralization of the external iliac vein. This brings the external iliac vein to the shorter right renal vein for a tension free anastomosis. Additionally, we have occasionally employed the use of third-party venous extender grafts to facilitate transplantation. Recent results reported by Ng et al suggest very good results can be achieved with this technique compared to the transperitoneal left-sided technique. Other options for management of the right side have included a hand-assist technique.

There are several features of the recipient surgery that can help contribute to a successful outcome when using the laparoscopic kidneys. First, one needs to remember that this is a team approach. Open communication and integrated decision making between the donor and recipient teams are critical to operative success in these cases. We found that predicting the anatomy has been important to achieving good outcomes. To this extent we have employed 3D-CT imaging for the donors. In addition, we feel it is important to know our recipient anatomy. Given the increasing age of our end-stage renal disease population vascular disease may predispose to technical challenges at transplantation. To this end we liberally utilize either magnetic resonance angiography or CT angiography to identify inflow vessels to plan an appropriate operation. As previously discussed extensive mobilization of the external iliac vein with lateral transposition of this vein is critical in certain cases to achieving success. Another evolution that has taken place is preference for the left kidney. This has developed despite multiple renal arteries and venous anomalies that are commonly seen on the left side. Data from our institution have indicated excellent results using kidneys with venous anomalies and multiple renal arteries.

Overall, laparoscopic donor nephrectomy has made a significant impact in renal transplantation. Due to its minimally invasive nature it removes disincentives for donation. The growth of laparoscopic donor nephrectomy has paralleled the increase in volume of renal transplantation at most major centers. It requires a committed team. For the left side and straightforward anatomy laparoscopic donation is equivalent to open donation. For the right side and aberrant anatomy, success depends upon the skill and confidence of the surgical teams. In the U.S., laparoscopic donor nephrectomy has established itself as a standard of transplant practice. 

References


