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Original research article

Live donor nephrectomy for renal transplantation: a comparison of lap and open procedures at IGIMS,Patna

Dr. Rakesh Kumar[1], Dr. Ahsan Ahmad[2], Dr. Nikhil Ranjan [3]

[1]MCh-Resident, Department of Urology, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India

[2]Additional Professor, Department of Urology, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India

[3]Assistant Professor, Department of Urology, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India

Corresponding Author: Dr. Rakesh Kumar

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ABSTRACT

Aim: The aim of the present study was to compare laparoscopic and open living donor nephrectomy, based on the results from a single center.

Methods: The present study was conducted at department of Urology, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India and there were 300 LDN performed including 200 LLDNs and 100 open living donor nephrectomies (OLDNs).

Results: In the present study, 200 patients underwent in Laparoscopic nephrectomy and 100 underwent in Open nephrectomy. The preoperative glomerular filtration rate was similar (LLDN = 127.3 ± 34 mL/min vs OLDN = 124.6 ± 25 mL/min) between the donors for the two groups. The reasons for which the right kidney was chosen included number of arteries or veins, presence of cysts, size, presence of stones and a tortuous ureter, with the guiding principle being to always have the better kidney remain with the donor. There was no statistically significant difference between the LLDN and the OLDN groups regarding operating time, donor preoperative renal function, donor and recipient postoperative kidney function, delayed graft function or the incidence of major complications. There was a trend towards decreased operating room time as the years progressed and the experience accumulated. The number of conversions was a total of 12/200 (6%).

Conclusion: LDN is a safe technique with accepted intraoperative and postoperative morbidity. It offers short hospital stay, better cosmesis and early convalescence. In experienced hands, it can effectively deal with various vascular and ureteral anomalies without compromising early graft function.

Keywords: kidney transplantation; living donor; laparoscopy; warm ischemia time

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INTRODUCTION

Kidney transplantation is the most effective strategy for improving the survival and quality of life in patients with end-stage renal disease.[1] Living donor nephrectomy is a method that allows reducing the time on a waiting list for kidney transplant and in non-advanced cases to avoid the introduction of dialysis.[2] It is a special procedure as it is performed on healthy patients, unlike the traditional approach. Therefore, the safety and effectiveness of the surgery are crucial. Minimizing the complication rate, reducing the length of stay in hospital, faster recovery, and the return to normal professional activity are key to increase the number of donors for transplantation.[3] Since 1995, when Ratner and his team performed the first laparoscopic living donor nephrectomy (LLDN), this minimally invasive approach has become the standard method of organ retrieval for living donor kidney transplantation. In most centers, it has replaced conventional open donor nephrectomy (ODN).[4] LLDN compared to ODN is characterized by a lower complication rate, faster convalescence, lower intraoperative blood loss, and a better cosmetic effect.[5,6]

Refinements in surgical technique, improvements in postoperative care, individualized immunosuppressive treatment protocols, and increased rate of live kidney donations enhanced kidney transplant outcomes.[7] Besides, live donor kidney transplantation (LDKT) offers numerous significant advantages, including shorter waiting time for transplantation, higher quality renal grafts, elective surgical setting, and an opportunity for a preemptive transplant.[8,9] Worldwide, the LDKT rate increased significantly after the implementation of minimal invasive donor nephrectomy techniques.[8]

More importantly, and even though a concern about underreporting remains, there have been reviews of the literature which have reported at least eight perioperative deaths with LLDN.[10] The seriousness of this can only be fully understood if we consider that living donation represents a unique type of surgical procedure, where a healthy person undergoes an operation with significant risk, without any biological benefit for themselves; that is, the donor will not feel any better or be any healthier after the surgery. For this reason, we have to understand that the safety of the living donor is paramount. That is the main reason why, despite the existing studies, it is very important to welcome further studies evaluating the results of living donation, as well as to encourage centers to assess their own results and share the lessons learnt.

The aim of the present study was to compare laparoscopic and open living donor nephrectomy, based on the results from a single center.

MATERIAL AND METHODS

The present study was conducted at department of Urology, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India for one year and there were 300 LDN performed including 200 LLDNs and 100 open living donor nephrectomies (OLDNs).

The decision between the open or the laparoscopic procedure was a combination of patient’s and surgeon’s preference. Although originally the left kidney was the preferred one for the LLDNs,

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because of the longer vein, with increasing experience, kidney side, number of renal arteries or previous surgeries were not obstacles to LLDN.

The main criterion regarding the procurement was choosing the "less healthy" kidney, so that the "better" one would remain with the living donor. All donors and recipients underwent extensive preoperative evaluation and testing by a multidisciplinary team before the decision was made to proceed with the donation. Patients underwent three-dimensional computed tomography and computed tomographic angiography, in order to evaluate renal size and anatomy, as well as the presence of any abnormalities. Donor and recipient medical records were reviewed, after approval from the Institutional Review Board. Information that was collected and analyzed included epidemiological data, and the LLDN and OLDN groups were compared regarding pre-, intra- and post-operative parameters, including pre and post-operative donor and recipient renal function, operative time, the effect of the learning curve, delayed graft function, length of stay and complications. Delayed graft function was defined as the need for hemodialysis within a week after the transplantation. Additionally, the reasons for conversion from laparoscopic to open LDN were recorded. There were no statistically significant differences between the LLDN and the OLDN groups regarding age or gender.

Surgical technique

There were five different attending surgeons performing the donor nephrectomy, with the surgical team also including a transplant fellow. The surgical technique for the OLDN was a standard retroperitoneal flank approach, without a rib resection. For the LLDN, the initial preferred technique was that of a hand-assisted transperitoneal laparoscopic procedure, given the increased security that it provides to the surgeon. Patients were in a flexed, lateral decubitus position and initial access consisted of the placement of a hand port either around the area of the umbilicus or through a low transverse incision, which could later be used to retrieve the kidney. Frequently, a 7-9 cm Pfannenstiel incision was chosen, given the improved cosmetic result. The intraabdominal pressure was set to 10-12 mmHg, to avoid any effect on renal perfusion. Urine output was maintained at a brisk rate using aggressive intravenous hydration, supplemented with diuretics, and 5000 U of unfractionated heparin (when there was no contraindication) was given just prior to the renal artery occlusion. Originally, the artery was secured using locking polymer clips, but because of instances where the clips were not secure on the artery leading to bleeding, the decision was made that both the renal artery and vein would subsequently be secured with linear staplers. In the case of the right kidney being retrieved, the right renal vein was exposed at its insertion into the inferior vena cava and caval countertraction was applied just prior to firing the endovascular stapler, so that adequate length could be obtained. The postoperative protocol included analgesia with intravenous ketorolac on-demand (limited number of doses for only one day), removal of the Foley catheter on postoperative day 1 and advancing to a regular diet on day 2.

Statistical analysis

Data are expressed as mean ± standard deviation. Statistical analysis used Student t test to asses group differences for continuous variable and statistical significance was defined as $P < 0.05$.

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RESULTS

Table 1: Laparoscopic vs open living donor nephrectomy

Laparoscopic nephrectomy	200
Left	170
Right	30
Open nephrectomy	100
Left	60
Right	40

In the present study, 200 patients underwent in Laparoscopic nephrectomy and 100 underwent in Open nephrectomy.

Table 2: Comparison of laparoscopic vs open living donor nephrectomy

	Laparoscopic LDN	**Open LDN**
Donor preoperative GFR (mL/min ± SD)	127.3 ± 34	124.6 ± 25
Donor preop Cr (mean ± SD)	0.97 ± 0.3	0.86 ± 0.4
Operative time (min ± SD)	228 ± 52	246 ± 64
Donor postop Cr 1 mo (mean ± SD)	1.44 ± 0.6	1.38 ± 0.8
Delayed graft function (%)	6%	7%
Recipient postop Cr 1 mo (mean ± SD)	1.45 ± 1.5	1.38 ± 1.2
Major complications (%)	7%	8%

The preopeartive glomerular filtration rate was similar (LLDN = 127.3 ± 34 mL/min vs OLDN = 124.6 ± 25 mL/min) between the donors for the two groups. The reasons for which the right kidney was chosen included number of arteries or veins, presence of cysts, size, presence of stones and a tortuous ureter, with the guiding principle being to always have the better kidney remain with the donor. There was no statistically significant difference between the LLDN and the OLDN groups regarding operating time, donor preoperative renal function, donor and recipient postoperative kidney function, delayed graft function or the incidence of major complications.

Table 3: Reasons for conversion from laparoscopic to open living donor nephrectomy

Reasons for conversion	Number of patients
Bleeding	6
Adhesions	3
Anatomy	3

There was a trend towards decreased operating room time as the years progressed and the experience accumulated. The number of conversions was a total of 12/200 (6%).

DISCUSSION

Compared to dialysis, kidney transplantation is the best treatment option for patients with end-stage renal dis- ease (ESRD), with significantly better survival rates.[12] Advancement in surgical techniques, improvements in postoperative care, specialized immunosuppressive treatment protocols, and increased rate of live kidney donations have certainly improved kidney transplant outcomes.[13] Additionally, live kidney donation offers numerous significant advantages, including

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shorter waiting time for transplantation, higher quality renal grafts, elective surgical setting, and an opportunity for a preemptive transplant.[14,15] In 1995, Ratner performed the first laparoscopic donor nephrectomy (LDN), which later became the most accepted standard surgical technique for donor surgery in renal transplantation.[16]

In the present study, 200 patients underwent in Laparoscopic nephrectomy and 100 underwent in Open nephrectomy. The preopeartive glomerular filtration rate was similar (LLDN = 127.3 ± 34 mL/min vs OLDN = 124.6 ± 25 mL/min) between the donors for the two groups (Table 2). The reasons for which the right kidney was chosen included number of arteries or veins, presence of cysts, size, presence of stones and a tortuous ureter, with the guiding principle being to always have the better kidney remain with the donor. There was no statistically significant difference between the LLDN and the OLDN groups regarding operating time, donor preoperative renal function, donor and recipient postoperative kidney function, delayed graft function or the incidence of major complications. Some studies have questioned the safety of Hem-o- lock clips in sealing renal artery and vein.[17,18] We confirmed their safety in our series as we did not get any complications regarding this issue. Left side was the most commonly retrieved side which is mindfully attributed to more favorable anatomy. A shorter right renal vein was managed by upwards traction of the freely mobilized kid- ney during Hem-o-lock application and placing the distal Hem-o-lock in flush with inferior vena cava. Additionally, LDN showed a great success in dealing with different vascular and ureteral variations without compromising graft function. The overall outcome was in concordance with the LDN literature.[19-22] Despite the steep learning curve, our mean operative time was 72.8 min. It should be stated that LDN was performed by surgeons with excellent laparoscopic skills for other kidney procedures but not LDN. Moreover, they possess frequent exposure to ODN. These combinations of skills may have had impact on mastering this newly adopted technique in a relatively short period.

The question of using the left or the right kidney is part of a bigger issue having to do with choosing the right living donor. The basic elements of that are identifying a person who will be able to donate a kidney that is functioning well, while at the same time preserving the well-being of the donor throughout the whole process.[23,24] This has become even more critical as, given the success of living donation, there is increased pressure to include more high risk donors, such as those with obesity, older or younger donors, hypertensive donors, and those with preexisting conditions, such as kidney stones, that might affect the renal function post-donation.[25,26] There was a trend towards decreased operating room time as the years progressed and the experience accumulated. The number of conversions was a total of 12/200 (6%).

CONCLUSION

LDN is a safe technique with accepted intraoperative and postoperative morbidity. It offers short hospital stay, better cosmesis and early convalescence. In experienced hands, it can effectively deal with various vascular and ureteral anomalies without compromising early graft function.

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