A Comparative Study of Laparoscopic with Conventional Open Donor Nephrectomy in Renal Transplantation

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Abstract

Background: Laparoscopic donor nephrectomy (LDN) has been gaining popularity among kidney donors. There have been concerns about the safety and efficacy of the procedure as compared to open donor nephrectomy (ODN). We compare our results on LDN with ODN.

Methods: We retrospectively analysed our data of LDN and ODN. Duration of surgery, blood loss, period of hospitalisation, per oral intake and analgesic requirements.

Result: 22 LDNs were done, the operation time ranged from 220-300 minutes, and blood loss from 100-150ml. In the first 10 laparoscopic operations four cases required conversion to open surgical dissection. Only one case was converted to open surgery in the subsequent 12 laparoscopic cases. Oral intake was started on the first postoperative day. Analgesic requirement in laparoscopy cases was less. Patients were mobilised on the first day after surgery. Patients were discharged by seventh day. There was no significant difference in the functioning of the graft after revascularisation in the recipient.

Conclusion: Laparoscopic donor nephrectomy is a safe and effective technique of donor nephrectomy.

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Key Words: Laparoscopy; Laparoscopic donor nephrectomy; Living kidney donors; Kidney transplantation

Introduction

Living donor kidney transplantation provides the best results in patients of end stage kidney disease (ESKD) [1]. It is an elective procedure, free of complications of procurement and preservation [2]. It accounts for 90 percent of transplants carried out in developing nations and 30 percent of the transplants carried out in the western world [3]. Cadaver donor renal transplantation involves a major change in the attitude of society and is still a far cry. Even in the West, cadaver donors are far less than the number of patients of ESKD. In this scenario any procedure that decreases the disincentive to living kidney donation achieves a major benefit to patients of renal failure.

Living kidney donation has traditionally been carried out by the open surgical technique. This entailed two weeks of hospitalisation, considerable postoperative pain, prolonged postoperative recovery associated with lost wages and poor cosmetic results. These factors have been a disincentive to kidney donors [4].

Of late there has been a tremendous upsurge in the utilisation of laparoscopy in urology. Laparoscopic donor

nephrectomy (LDN) was developed as a minimally invasive surgery to decrease the morbidity of kidney donation. Gill and associates[5], in a porcine model, first reported the feasibility of performing LDN in 1994. By decreasing the morbidity of living kidney donation the procedure has become more acceptable and brought about almost twenty percent increase in living kidney donation. In this paper we retrospectively analysed our experience of this procedure and compared it with conventional open donor nephrectomy.

Material and Method

Conventional open donor nephrectomy (ODN) has been performed at this centre since 1991 and records of age-matched controls were reviewed for comparison with LDN. LDN was started in Apr 2002 at this centre and so far 22 LDNs have been performed. Follow up of patients ranged from 3 to 30 months. There were 9 females and 13 male donors. The mean age of donors was 40.6 years [range from 22 to 62 years]. All donors were in good health and underwent left sided donor nephrectomy. One donor had two renal arteries; one had a single renal artery with an early branching, while the remaining 20 donors had a single renal artery. None of the donors had abdominal scars of any previous surgery. (Patient evaluation

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as for ODN was carried out in each case. This included ^{99m}Tc diethylene triamine penta-acetic acid (DTPA) renal scan and conventional renal angiography to evaluate the number and pattern of the renal vessels.)

Surgery was performed in the lateral position with four laparoscopic ports. Vigorous hydration of the patient was maintained throughout the surgery, starting with infusion of 1-2 litres of fluid prior to induction of anaesthesia. The veress needle was introduced five-finger breadth medial to the left anterior superior iliac spine. The 11 mm camera port was at the umbilicus; a second 11 mm port was placed at site of insertion of veress needle while one 5 mm port was in the epigastrium, an inch below the xiphisternum and another 5 mm port in mid clavicular line at the level of umbilicus. Beginning at the splenic flexure the descending colon was mobilised by incising the line of Toldt and the renal hilum exposed. The renal vein and its tributaries clipped. We used hemlock clips for clipping vessels. Renal artery, which lies posterior to the renal vein, was then dissected from its origin at the aorta. Dissection was carried out with the lap hook dissector. The ureter was dissected with its periureteric tissue and the gonadal vein adjacent to it. The ureter was clipped and cut at the point where it crossed the iliac vessel. The upper pole and posterior attachments of the kidney were mobilised to have the kidney completely free except for its attachment at the hilum. The renal artery was clipped with hemlock clip and then the renal vein was similarly clipped and cut. The kidney was removed by a 6 cm long incision through the 10 mm instrument port, which was made just prior to clipping and cutting the renal vessel.

Statistical comparisons done using the Student's t test with $P < 0.05$ were significant.

Results

The operation time for LDN ranged from 220-300 minutes and 110-150 minutes for ODN. The estimated blood loss ranged from 100 to 150ml. Blood loss in open surgery cases ranged from 250-350ml. The difference was statistically significant ($p < .0001$). No patient required blood transfusion in both groups. In the first 10 LDN, four cases required conversion to ODN. Only one case was converted to open surgery in the subsequent 12 LDN. Reason for conversion was inability to proceed with laparoscopic dissection in the

first 4 cases and due to the presence of multiple renal arteries in last case. Oral intake was started on the first postoperative day in LDN and on the 2nd or 3rd postoperative day after ODN. Analgesic requirement (pethidine) in LDN was to a total cumulative dose of 30-45mg, whereas in ODN it was 90-120mg. Patient mobilisation was 24 hours earlier in LDN as compared to ODN. After LDN, non service patients were discharged on the fifth day and serving personnel after a week were sent on sick leave. All patients after ODN were discharged on the 9th -10th postoperative day. There were no bowel injury, infective complications or postoperative incisional hernia in any case. One patient had superficial wound infection in the open surgery group. The warm ischemia time during LDN was 110-180 seconds and 100-120 seconds during ODN. There was no significant difference in the function of the graft after revascularisation in the recipients of both the groups. Nadir serum creatinine was arrived at, in both groups of recipients by 2-4 days.

Discussion

Live donor nephrectomy has been practised at only a few centres, the various operative parameters of LDN have been compared with ODN in earlier studies [6,7]. A comparison of the various parameters, in this study with three major series is presented in Table 1. In the study by Ratner et al, LDN resulted in less blood loss than ODN [7]. Oral intake was begun one to two days earlier in our patients and the same has been the experience of other workers [8]. Postoperative analgesic requirement was lower in both dose and duration, in our LDN patients as compared to the ODN cases. This has been corroborated in other reported series [7,8]. Time for discharge from hospital has been reported to range from 3 ± 0.9 days after LDN [7]. Due to non medical requirement, it was longer in service personnel, but in the non service donors it was 5 days after LDN and 9-10 days after ODN.

Operation times for LDN were significantly higher in our patients (220-300 minutes in LDN as compared to 110-150 minutes in ODN). El galley et al [9] reported operation times after LDN and ODN to be 306 ± 40

Table 1
Comparison of LDN in four series

Study	Patients	Blood loss (ml)	OT time (min)	Open conversion (%)	Hospital stay (days)
Ratner et al [7]					
LDN	70	266 $\pm$ 174	230 $\pm$ 29	-	3 $\pm$ 0.9
ODN	20	393 $\pm$ 335	183 $\pm$ 48	-	5.7 $\pm$ 1.7
Jacobs et al [11]					
LDN	738	128 $\pm$ 194	202 $\pm$ 52.4	1.6	2.6
El-Galley et al [9]					
LDN	28	200 $\pm$ 107	306 $\pm$ 40	0	2 $\pm$ 2
ODN	55	320 $\pm$ 199	163 $\pm$ 24		3 $\pm$ 2
AH (RR)					
LDN	22	100-150	220 - 300	21	5
ODN	50	250 - 350	110 - 150		9

Table 2**Comparison of outcome with a major Indian series**

Parameters	SGPGI Lucknow [8]	AH (RR)
Patients	71	22
Conversion %	10.1	22.7
Transfusion %	2.8	0
Re-exploration %	2.8	0
Oral intake days	1	1

minutes and 160 ± 24 minutes respectively, comparable to other studies [10]. Our operating time reduced subsequently. Jacobs, et al reported reduced, operating times with increasing experience [11].

Twenty one percent of our cases were converted to open surgery and most occurred in earlier cases. Many centres initially report high conversion rates that comes down with increased experience [10]. The conversion rate in the series from SGPGI Lucknow has been 10.1 percent [8]. Table 2 compares our results with another Indian series.

Haemorrhage, bowel injury and incisional hernia have been reported as complications of LDN [8]. We did not encounter these complications in our patients. This was probably due to the low threshold for conversion to open surgery. This seems justifiable as donor safety remains central in a renal transplantation programme.

Graft function is of paramount importance after donor nephrectomy. ODN has been proven to preserve graft function very well. Ratner and associates in their series of 110 laparoscopic and 48 open cases observed no significant difference in the serum creatinine during the four day period after surgery [7]. In our series we observed short term graft function to be similar in ODN and LDN.

We performed all LDN on the left side. Laparoscopic right donor nephrectomy is difficult due to anatomical and technical reasons [10]. The right renal vein is short and the right lobe of liver is very close and many centres have restricted LDN to left side [12].

Thus LDN is a safe and effective technique of donor

nephrectomy. The procedure results in a shorter hospitalisation, less postoperative discomfort and is as safe as ODN. The quality of the kidneys harvested laparoscopically is functionally equal to those from open surgery.

Conflicts of Interest

None identified

References

1. Ramcharan T, Kasiske B, Matas AJ. Living donor kidney transplants: The difficult decisions. *Transplantation review* 2003; 17: 3-10.
2. Kumar A, Mandhani A, Verma BS, et al. Expanding the living related donor pool in renal transplantation: use of marginal donors. *J Urol* 2000; 163: 33-8.
3. Annual report of the US scientific registry of transplants recipients. 1988-96. UNOS, Richmond, US Department of Health and Human Services.
4. Lind MY, Hazebroek EJ, Kinkel WJ, Hop WCJ, Weimar W, Ijzermans JNM. Laparoscopic versus open donor nephrectomy: ureteral complications in recipients. *J Urol* 2004; 63: 36-40.
5. Gill IS, Carbone JM, Clayman RV, et al. Laparoscopic live donor nephrectomy. *J Endourol* 1994; 8: 143-6.
6. Flowers JL, Jacobs S, Ho E, et al. Comparison of open and laparoscopic live donor nephrectomy. *Ann Surg* 1997; 226: 483-90.
7. Ratner LE, Kavoussi LR, Sroka M, et al. Laparoscopic assisted live donor nephrectomy- a comparison with open approach. *Transplantation* 1997; 63 :229-33.
8. Arvind NK, Kumar A. Laparoscopic live donor nephrectomy: An Indian perspective. *Indian Journal of Urology* 2002; 29-37.
9. El-Galley R, Hood N, Young CJ, Deierhoi M, Urban DA. Donor nephrectomy: a comparison of techniques and results of open, hand assisted and full laparoscopic nephrectomy. *J Urol* 2004; 171: 40-3.
10. Handschin AE, Weber M, Demartines N, Clavien PA. Laparoscopic donor nephrectomy. *Br J Surg* 2003; 90 : 1323-32.
11. Jacobs SC, Cho E, Foster C, et al. Laparoscopic live donor nephrectomy: the university of Maryland 6-year experience. *J Urol* 2004; 171: 47-54.
12. Alston C, Spaliviero M, Gill IS. Laparoscopic donor nephrectomy. *Urology* 2005; 65: 833-9.