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Comparison of Outcomes of Open versus Laparoscopic Living Donor Nephrectomy in Nepal

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ABSTRACT

Introduction

Laparoscopic donor nephrectomy is the gold standard for kidney retrieval in live donors. Until recently, donor nephrectomies were performed only by open technique in Nepal. There is no information on the experience and outcomes of laparoscopic donor nephrectomy in Nepal. The study was done to compare the outcomes among donors undergoing open and laparoscopic nephrectomies, and to compare the graft related outcomes between the two groups receiving these kidneys.

Methods

In this retrospective study, 44 kidney donors from March 2019 to October 2019 were analyzed. Donors were divided into 2 groups: open donor nephrectomy (ODN) and laparoscopic donor nephrectomy (LDN). Parameters for analysis included demographic data, warm ischemia time, surgery time and length of hospital stay. Data on early graft function and complications in recipients till 30th post-operative day were compared.

Results

There were 22 donors each in the ODN and LDN groups. Baseline characteristics of the donors were comparable between two groups. Mean surgery duration (183.55±43.31 minutes vs 117.73±18.75 minutes) and first warm ischemia time (11.22±4.34 minutes vs 2.3±0.8 minutes) was significantly high in LDN. Hemoglobin drop, post-operative complications in donors, creatinine of donors at discharge, mean hospital stay, graft function at one month and complications in recipients were comparable among ODN and LDN. Pain score in 1st post-operative day was comparable between two groups, however, pain was significantly less in second post-operative day in LDN.

Conclusion

Laparoscopic donor nephrectomy is feasible in Nepal and associated with acceptable morbidity and graft function when compared to ODN.

Keywords: *Laparoscopic donor nephrectomy, open donor nephrectomy, renal transplantation*

INTRODUCTION

Laparoscopic live donor nephrectomy (LLDN) is the gold standard for kidney retrieval in live donors.[1] The first successful live related renal transplantation was done by Joseph E Murray in 1954.[2] First laparoscopic live donor nephrectomy (LLDN) was performed by Ratner et al in 1995.[3] Cadaveric transplant has not been regularized in Nepal and most donor nephrectomies are done by the open technique. Global Observatory on Donation and Transplantation (GODT) reported 84,347 kidney transplants (41.8% from living donors) in 2015.[4] The benefits of laparoscopic donor nephrectomy are short hospital stay, less post-operative pain and early return to daily activities.[5] However it has long learning curve and surgeon requires long exposure to laparoscopic skills. Objective of study was to compare various intraoperative and post-operative parameters of laparoscopic and open donor nephrectomy donors, and to compare the early graft outcome in patients receiving these kidneys.

METHODS

This was a retrospective review of patients who underwent donor nephrectomy and kidney transplants from March 2019 to November 2019. Ethical clearance from Institutional Review Committee was obtained. Kidney Donors were divided into two groups - laparoscopic donor nephrectomy (LDN) and open donor nephrectomy (ODN). Evaluation of donors were carried out by transplant team using Amsterdam guidelines. Anatomic evaluation was done using CECT abdomen with CT urogram. Glomerular filtration rate (GFR) was assessed using 99m-technetium diethylene-triamine-penta-acetic acid (Tc-99m DTPA) scan. Decision to perform LDN was at the surgeon's discretion.

The laparoscopic donor nephrectomies were performed at the Department of Urology and Kidney Transplant Surgery in Tribhuvan University Teaching Hospital and Grande International Hospital, Kathmandu. Left kidney was preferred because of longer renal vein. If significantly different function was found in DTPA scan, then the donor was left with the higher-functioning kidney. All right donor nephrectomies were done by the open technique. ODN were done by loin incision by retroperitoneal approach. LDN were performed in lateral decubitus by transperitoneal approach. First warm ischemia was the time taken from renal artery clipping to placement of graft kidney in cold ringer lactate solution. Operation time was taken from skin incision to wound bandage. Twenty Fr abdominal tube drain was kept in all cases and removed when drain was less than 50 ml in 24 hours.

Renal transplantation was done with modified Gibson's incision. Post-operative hemoglobin was measured in first post-operative day. Donors were mobilized on first post-operative day and discharged when pain free.

Donor records were studied retrospectively. Follow up records in both donor and recipient were studied for one months. Analysis were done based on demographic data, warm ischemia time, surgery time and length of hospital stay. Comparison of early graft function and complications in recipient were done from perioperative period up to 30 days. All data were entered in MS excel, and converted into IBM SPSS Statistics for statistical analysis. Data were summarized using frequency distribution tables and graphical methods of presentation of data. Bivariate analysis was done using t-test, Mann Whitney test (as appropriate) for continuous data, while chi-square test was used for comparison of categorical data. Statistical significance was tested at 95% confidence interval and p-value less than 0.05 was considered significant.

RESULTS

There were 22 donors each in the ODN and LDN groups. Consecutive cases of ODN and LDN during the study period were taken. . The mean age of donors was 44.1 ± 11.6 years, ranging from 26 to 66 years. There were 30 female and 14 male donors. Baseline characteristics of the donors were comparable between two groups. (Table 1)

There were total 41 left sided donor nephrectomies and 3 right side donor nephrectomies. There were no right sided LDN. Mean surgery duration was significantly high in LDN. Mean first warm ischemia was 11.22 ± 4.34 minutes in LDN and 2.3 ± 0.8 minutes in ODN, the difference being statistically significant. Intraoperative details are shown in

Table 1. Baseline characteristics of the donors

Characteristics	LDN	ODN	Total	p-value
Sex				
Female	14 (63.64%)	16 (72.73%)	30 (68.18%)	0.52
Male	8 (36.36%)	6 (27.27%)	14 (31.82%)	
Age (Mean ± SD) in years	44.95 ± 12.76	43.23 ± 10.6	44.09 ± 11.63	0.63
Pre-operative Hemoglobin (g/dl)	13.9 ± 1.9	13.58 ± 1.8	13.74 ± 1.84	0.57
Pre-operative Serum creatinine (µmol/L)	70.1 ± 19.61	78.5 ± 16.03	74.3 ± 18.2	0.13

Table 2. Operative and post-operative details of the donors

Characteristics	LDN	ODN	Total	p-value
Surgery side				
Left	22 (100%)	19 (86.36%)	41 (93.18%)	0.23
Right	0 (0%)	3 (13.64%)	3 (6.82%)	
Surgery duration (minutes)	183.55 ± 43.31	117.73 ± 18.75	150.64 ± 46.86	<0.001
First Warm Ischemia time (minutes)	11.22 ± 4.34	2.3 ± 0.8	6.76 ± 5.46	<0.001
Hemoglobin drop	0.87 ± 0.91	0.99 ± 1.97	0.93 ± 1.52	0.79
Pain score on 1st POD	5.14 ± 0.94	5.45 ± 1.01	5.3 ± 0.98	0.29
Pain score on 2nd POD	3.45 ± 1.01	4.05 ± 0.79	3.75 ± 0.94	0.04
Complications				
No	21 (95.45%)	19 (86.36%)	40 (90.91%)	0.61
Yes	1 (4.55%)	3 (13.64%)	4 (9.09%)	
Creatinine at discharge	95.57 ± 27.58	99.18 ± 13.12	97.38 ± 21.42	0.58
Hospital stay duration (days)	5.41 ± 1.01	5.32 ± 0.95	5.36 ± 0.97	0.76

Table 2. There was no conversion from LDN to ODN.

Hemoglobin drop, post-operative complications in donors, creatinine of donors at discharge, mean hospital stay were comparable between two groups. Pain score in 1st post-operative day was comparable between two groups, however, pain was significantly less in second post-operative day in LDN (Table 2). Graft function at one month and complications in recipient were comparable among ODN and LDN (Table 3). Complications in recipients and donors are summarized in Table 4.

DISCUSSION

Female donor preponderance (68%) was seen in our study, which is similar to percentage of female for donor nephrectomy (63%) in 2016 in US.[6]

First WIT is relatively longer in all LDN. After transecting the vessels, kidney needs to be mobilized from other remaining tissues before it can be retrieved.[7] Mean warm ischemia time in our study was 11.22 ± 4.34 minutes for LDN and 2.3 ± 0.8 minutes for ODN. Out of 22 cases of LDN, two had double arteries which had definitively skewed the warm ischemia time. In the single center experience from Thailand, warm ischemia time was 3.1±1.1 minutes in LDN and 1.7±0.8 minutes in ODN.[8] Delayed graft function (DGF) is defined as the need for dialysis during the first posttransplant week.[9] There is theoretical risk of delayed graft function as the warm ischemia increases. However, early graft function in our study was similar to ODN.

As we are in learning phase, surgery time in our LDN (183.55 ± 43.31 minutes) is longer than ODN (117.73 ± 18.75 minutes). In a study from United Kingdom, the mean time spent in the operating theatre was approximately 60 minutes longer for LDN compared with ODN (215 v 155 min).[10]

None of the cases were converted from LDN to ODN. Predictors for difficult laparoscopic donor nephrectomy are obesity[11], right sided kidney[12] and multiple renal vessels.[13] All of the LDN were in left side. Long renal vein on left side and unavailability of vascular staplers has made to choose left kidney for LDN. Lumbar vein dissection is an important step in LDN and without its dissection, it is not possible to reach the renal artery. Lumbar vein injury, renal artery and renal vein injury are the important causes of conversion to ODN which is not seen in our study.[14]

Early series of LDN had high complication rates regarding graft loss, ureteral injury or intraabdominal injury.[11,15] There were no such complications in our early experience. The chief surgeon had done more than 100 cases of simple laparoscopic nephrectomy before starting LDN and followed the standardized laparoscopic techniques. Less complications in our study might also be due to a smaller number of highly selective cases of LDN.

Pain was similar between LDN and ODN in 1st post-operative day, however pain was significantly less in 2nd post-operative day in LDN group. There is minimal damage during surgery and small incision

Table 3. Post-operative details of recipients

Characteristics	LDN	ODN	Total	p-value
Creatinine in 1 month	113.8±54	118±30	115±42	0.75
Complications				
No	19 (86.36%)	17 (77.27%)	36 (81.82%)	0.69
Yes	3 (13.64%)	5 (22.73%)	8 (18.18%)	

Table 4. Complications during nephrectomy

Complications	Number
Recipients	
Delayed graft function	1
Urinoma	1
Fever	1
Hemoglobin drop	1
Ureteric stricture	1
Lymphorrhea	1
Right EIA dissection	1
Diarrhoea	1
Donors	
Pneumonia	1
Superficial SSI	1
Persistent shoulder pain	1
Hemoglobin drop (from 12.5 to 8.2 g/dl)	1

in LDN. Patient might have complained more pain in ODN than in LDN on second POD due to active mobilization after first post-operative day. VAS on 2nd POD similar between the two groups (1.0 in LDN and 1.1 in ODN) in the study done by Anderson et al.[16]

Hospital stay was similar in both LDN (5.4 days) and ODN (5.3 days). Although most donors of LDN were mobilized early and had less pain, they insist to stay more in hospital and to be discharged with recipients. In a study from Norway, mean hospital stay in ODN was 6.7 days and LDN was 6.2 days and was not statistically different.[16] Similar results were found in study from Thailand.[8]

Comparison with one-month serum creatine of recipient between two groups was comparable. With less pain, rapid recovery from surgery and similar graft function outcome laparoscopic donor nephrectomy has been popular.

There are few limitations of the study. It is a retrospective study with small sample size. Decision to perform LDN was at the surgeon's discretion, which lead to selection bias. The exact doses of analgesics prescribed to the donor has not been documented. Difference in dose of analgesics alters the pain score. Studies have shown that risk of DGF increases not only with first WIT but also with second WIT.[17] We have not compared the second warm ischemia in this study. Only one month of graft outcome has been taken in the study. Larger cases on prospective basis with longer follow up are required to validate the results.

CONCLUSION

LDN is feasible in Nepal and associated with acceptable morbidity and graft function with less pain when compared to ODN.

CONFLICT OF INTEREST

None declared.

REFERENCES

1. Friedersdorff F, Kothmann L, Manus P et al, Long-Term Donor Outcomes after Pure Laparoscopic versus Open Living Donor Nephrectomy: Focus on Pregnancy Rates, Hypertension and Quality of Life. Urologia Internationalis. 2016;97(4):450-6.
2. Hatzinger M, Stastny M, Grutzmacher P et al. The history of kidney transplantation. Der Urologe Ausg A. 2016;55(10):1353-9.
3. Gupta N, Raina P, Kumar A. Laparoscopic donor nephrectomy. J Minim Access Surg. 2005;1(4):155-64.
4. Mahillo B, Carmona M, Alvarez M et al. Worldwide distribution of solid organ transplantation and access of population to those practices. Transplantation. 2018;102:S71-S2.
5. Montgomery RA, Kavoussi LR, Su L et al. Improved recipient results after 5 years of performing laparoscopic donor nephrectomy. Transplantation proceedings. 2001;33(1-2):1108-10.
6. Gill J, Joffres Y, Rose C et al. The Change in Living Kidney Donation in Women and Men in the United States (2005–2015): A Population-Based Analysis. Journal of the American Society of Nephrology. 2018:ASN.2017111160.
7. Nanidis TG, Antcliffe D, Kokkinos C et al. Laparoscopic versus open live donor nephrectomy in renal transplantation: a meta-analysis. Annals of surgery. 2008;247(1):58-70.
8. Taweemonkongsap T, Nualyong C, Amornvesukit T et al. Laparoscopic live-donor nephrectomy: a comparison with the open technique and how to reach quality standards: a single-center experience in Thailand. Transplantation proceedings. 2011;43(10):3593-8.
9. Chaumont M, Racapé J, Broeders N et al. Delayed Graft Function in Kidney Transplants: Time Evolution, Role of Acute Rejection, Risk Factors, and Impact on Patient and Graft Outcome. J Transplant. 2015;2015:163757-.
10. Waller JR, Hiley AL, Mullin EJ et al. Living kidney donation: a comparison of laparoscopic and conventional open operations. Postgraduate Medical Journal. 2002;78(917):153-7.
11. Jacobs SC, Cho E, Dunkin BJ et al. Laparoscopic nephrectomy in the markedly obese living renal donor. Urology. 2000;56(6):926-9.
12. Mandal AK, Cohen C, Montgomery RA et al. Should the indications for laparascopic live donor nephrectomy of the right kidney be the same as for the open procedure? Anomalous left renal vasculature is not a contraindiction to laparoscopic left donor nephrectomy. Transplantation. 2001;71(5):660-4.
13. Lennerling A, Blohme I, Ostraat O et al. Laparoscopic or open surgery for living

donor nephrectomy. Nephrology, dialysis, transplantation : official publication of the European Dialysis and Transplant Association - European Renal Association. 2001;16(2):383-6.

14. Mohsin R, Shehzad A, Bajracharya U et al. Laparoscopic Donor Nephrectomy: Early Experience at a Single Center in Pakistan. Experimental and clinical transplantation : official journal of the Middle East Society for Organ Transplantation. 2018;16(2):138-42.
15. Kocak B, Koffron AJ, Baker TB et al. Proposed classification of complications after live donor nephrectomy. Urology. 2006;67(5):927-31.
16. Andersen MH, Mathisen L, Øyen O et al. Postoperative Pain and Convalescence in Living Kidney Donors—Laparoscopic Versus Open Donor Nephrectomy: A Randomized Study. American Journal of Transplantation. 2006;6(6):1438-43.
17. Kukla U, Cholewa H, Chronowska J et al. Effect of the Second Warm Ischemia Time and Its Components on Early and Long-term Kidney Graft Function. Transplantation proceedings. 2016;48(5):1365-9.