Evaluation of time taken for laparoscopic donor nephrectomy (LDN) and to achieve lowest creatinine levels after surgery among renal transplant recipients with multiple renal arteries

INTRODUCTION

Live donor renal transplantation is considered the ideal treatment for patients with end-stage renal failure. Compared with long-term dialysis, kidney transplantation offers an improved quality of life, reduced death rate, and much lower cost.1,2

While the introduction of laparoscopic live donor nephrectomy has significantly increased the number of grafts with multiple RAs (compared with historical open controls), this change in practice is safe for both donors and recipients from a patient outcome–based perspective.3

Laparoscopic donor nephrectomy is a relatively new technique that has the potential of decreased postoperative pain, less incisional morbidity, and shorter recovery time.3

However, the pure laparoscopic technique for living donor nephrectomy is a technically difficult procedure, and the longer operating times and warm ischemic times compared with the open technique are also perceived as disadvantages of LDN. In contrast, the hand-assisted procedure has more advantages with the early incision that is necessary for intact organ removal. In addition to these advantages, HALDN has operating times and warm ischemic times comparable with those of ODN and is associated with less postoperative pain, faster recovery times, and better cosmesis.5

There is paucity of literature regarding time taken for Laparoscopic donor nephrectomy and time to achieve lowest creatinine levels after surgery among renal transplant recipients with multiple renal arteries.

Abstract: Background: This was a prospective observational study to evaluate the time taken for laparoscopic donor nephrectomy and to achieve lowest creatinine levels after surgery among Renal transplant recipients with multiple renal arteries. Material & Methods: In the present study 25 patients’ recipients of multiple renal artery graft kidney who underwent renal transplant after 30 the June 2016 till October 2017 with post-transplant serum creatinine ≤ 1.5mg/dl were included and evaluated for time taken for laparoscopic donor nephrectomy and to achieve lowest creatinine levels. Results: In the present study, in 16 cases (64%) time taken for LDN ranged from 180-239 minutes, 3 (12%) cases were completed in less than 120 minutes and 5 (20%) cases were completed in time range of 120-179 minutes. Average time time for LDN is 177.96 ± 87.578 minutes. Time taken for recipient surgery in 20 cases (80%) varied from 180-239 minutes. In 4 cases (16%) surgery was completed in range of 240-300 minutes. Average time taken for recipient surgery was 203.64± 61.504 minutes. Mean cold ischemia time (CIT) in this study was 107.44 ± 43.416 minutes In this study the time taken to reach the lowest creatinine value varied from 3 days to 14 days with mean of 7.52 ± 7.7 days. In majority of cases i.e 12(48%) the lowest creatinine level was reached in less than 5 days . in 7 cases (28%) the time taken was 6-10 days and in 6 cases(24%) it was between 11-15days. Conclusion: In conclusion, among majority of patients undergoing Laparoscopic Donor Nephrectomy, time taken for LDN & recipient surgery was between3-4 hours while in majority of cases the lowest creatinine level was reached within a week.

Keywords: Time, laparoscopic donor nephrectomy, lowest creatinine levels, renal transplant recipients.
AIM OF THE STUDY

To evaluate the time taken for laparoscopic donor nephrectomy and to achieve lowest creatinine levels after surgery among renal transplant recipients with multiple renal arteries.

MATERIALS AND METHODS

Type of Study: Prospective observational study

Study period: 1st July 2016 onwards till October 2017

Follow up: 90 days

Sample size: we included all 25 patients’ recipients of multiple renal artery graft kidney who underwent renal transplant after 30 the June 2016 were included in this study. The patients in whom serum creatinine levels were ≤1.5 after follow up for 90 days were selected for CT Angiography of graft kidney

Inclusion Criteria

Patients with live donor renal transplant with multiple renal arteries

a. Having completed at least 3 months of post-transplant follow up.
b. And with at least five recorded values of serum creatinine ≤1.5 during the 90 day period.

Exclusion Criteria

1. Patients of live donor renal allograft transplant with single renal artery.
2. Patient of with creatinine level >1.5 on less than 5 occasions even if they have grafts with more than one artery.

METHODOLOGY

All patients with donor having multiple renal arteries were identified (after CT Angiography of donor) and enrolled into the study. Written informed consent and case Record form were entered for all enrolled patients. This selected group of patient was also followed intra operatively. Lap donor nephrectomy was performed for all patients in Department of Renal Transplant Surgery, PGIMER. Bench reconstruction of multiple renal artery graft kidney was done mainly into 3 types

1. Double barreling.
2. Y Graft.
3. End to side anastomosis.

After bench reconstruction the graft kidney was transplanted into right iliac fossa of the recipient. During transplant of renal graft into recipient cold ischemia time, presence of atheromas in recipient vessels & difference in diameter of recipient & donor vessels were noted.

Renal artery of graft was anastomosed to internal iliac artery or external iliac artery of recipient as end – end anastomosis or end – side anastomosis depending upon the feasibility of surgery. In post-operative period patient was followed up by daily creatinine levels and time taken to reach lowest creatinine levels (before discharge) was recorded.

KTR were followed post operatively for 90 days on outpatient basis and those patients with creatinine levels<=1.5 during the entire period of follow up were identified.

OBSERVATIONS & RESULTS

In Department of Renal Transplant Surgery from 1st July 2016 till October 2017 forty one multiple Renal Artery Transplants were done .These cases were followed in the outpatient department for a period of 90 days. Out of these 25 cases which fulfilled the inclusion criteria were enrolled in this study. Of the 25 patients, left side kidney was consistently chosen for Lap Donor Nephrectomy in all cases.

Incidence of aberrant renal artery in left kidneys was one case (4%) whereas rest 24 cases (96%) were of accessory renal artery. In all cases the accessory and main renal artery were of unequal size. Left Lap Donor Nephrectomy was done in all 25 cases (100%). Left side was chosen for laparoscopic donor nephrectomy in all cases irrespective of presence of triple or double renal arteries on left side. This is because of presence of longer vein on left side as well as frequent presence of pre hilar branching on right side.(Figure-1)

Bench reconstruction of donor multiple renal arteries were done in all 25 cases. Double barreling was done in 12cases (48%) whereas Y Graft technique was used for arterial reconstruction in 5 cases (20%). End to side anastomosis of smaller renal artery to main renal artery was done in 8 cases (32%).(Figure-1)

After bench reconstruction the reconstructed renal artery was anastomosed to either external iliac artery or internal iliac artery of the recipient. In 19 cases (76%) the reconstructed renal artery was anastomosed to internal iliac artery of recipient as end-to-end anastomosis. In 6 cases (24%) the reconstructed renal artery was anastomosed to external iliac artery of recipient as end to side anastomosis due to either atheroma or calcification in internal iliac artery or size discrepancy between reconstructed artery and internal iliac artery.(Figure-1).
Minimum and maximum time taken for laparoscopic donor nephrectomy was 110 & 240 minutes respectively. However in 16 cases (64%) time taken for LDN ranged from 180-239 minutes. 3 (12%) cases were completed in less than 120 minutes and 5(20%) cases were completed in time range of 120-179 minutes. Average time time for LDN is 177.96 ± 87.578 minutes. (Table-1)

Minimum and maximum time taken for recipient surgery was 165 minutes (1 case) and 280 (1 case) respectively. Time taken for recipient surgery in 20 cases (80%) varied from 180-239 minutes. In 4 cases (16%) surgery was completed in range of 240-300 minutes. Average time taken for recipient surgery was 203.64± 61.504 minutes.(Table-1)

Table-1: Time taken for LDN & time taken for recipient surgery

<table>
<thead>
<tr>
<th>Time taken for LDN in minutes</th>
<th>Number of cases (n=25)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-119</td>
<td>3</td>
<td>12%</td>
</tr>
<tr>
<td>120-179</td>
<td>5</td>
<td>20%</td>
</tr>
<tr>
<td>180-239</td>
<td>16</td>
<td>64%</td>
</tr>
<tr>
<td>240-299</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td>Mean Operative time ( lap donor Nephrectomy )</td>
<td>177.96 ±43.859</td>
<td></td>
</tr>
<tr>
<td>Time taken for recipient surgery in minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120-179</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td>180-239</td>
<td>20</td>
<td>80%</td>
</tr>
<tr>
<td>240-299</td>
<td>4</td>
<td>16%</td>
</tr>
<tr>
<td>Mean Operative time (recipient Surgery)</td>
<td>203.64±30.752</td>
<td></td>
</tr>
</tbody>
</table>

Cold ischemia time for most cases varied from 81 min to 172 min. 9 cases (36%) had CIT from 81-100 min , 9 cases(36%) had CIT from 101-120 min . 5 cases (20%) had CIT between 121-140 minutes. Single case (4%) had CIT varying from 141-160 minutes, another single case (4%) had CIT ranging from 161-180 minutes .Average CIT taken for single case is 107.44 ± 43.416 minutes.(Table-2)

Table-2: Cold Ischemia Time
In majority of cases i.e 12(48%) the lowest creatinine level was reached in less than 5 days . in 7 cases (28%) the time taken was 6-10 days and in 6 cases(24%) it was between 11-15days.Average time taken in days to achieve lowest creatinine levels after transplant was 7.52± 7.706 days. This is in concordance to time to lowest serum creatinine for most patients with single renal arteries. (Table-3)

**DISCUSSION**

In the present study left sided Lap Donor Nephrectomy was done in all cases. The reasons for choosing the left side were due lower glomerular filtration rate (n=1), stone in right kidney (n=1), short right renal vein (n=5) and surgeons preference (n=5) in 12 (48%) cases despite the presence of single renal artery on right side.

At the beginning of Lap Donor Nephrectomy era, kidneys with multiple renal arteries were considered a contraindication for LDN. Due to this reason in case of multiple renal arteries in left kidney of donor, right sided kidneys were chosen for LDN despite of surgical preference for left kidney due to longer renal vein. Gurkan et al., reported similar incidence of urological and vascular complications in open vs laparoscopic donor nephrectomy group as well as left sided vs right sided LDN.

In the present study bench reconstruction was done in all cases. Double barreling was done in 12 cases (48%), Y graft was done in 5 cases (20%) and end to side anastomosis was done in 8 cases (32%). All the three techniques of reconstruction were equally effective without any evidence of TRAS in study group.

Patel NH et al., in their study of 831 transplants (584 cadaveric,247 live donor)found that 72 patients were symptomatic for hypertension and renal dysfunction. Amongst these 72 patients TRAS was seen in 14 patients out of 45with end to side anastomosis and 12 patients out of 27 with End to End anastomosis.

In this study in 19 cases (76%) end to end anastomosis was done and in 6 cases (24%) of patients end to side anastomosis was done. In addition arterial reconstruction may also be classified as end to end anastomosis (Y graft reconstruction) or end to side anastomosis (double barreling and end to side reconstructions).

Patel et al., in their study of 831 transplants found that in cadaveric grafts, TRAS was associated with higher mean CIT group (29 ± 6.9hr) than control group (mean CIT 25 ± 8.1 hr). TRAS is more common in deceased donor transplantation because of longer CIT whereas intimal injury leading to intimal hyperplasia is more likely to occur in live donor allograft perfusion because the perfusion cannulae are directly placed in renal artery lumen. However in one of studies done by Xenos et al., no association was established between intimal hyperplasia of graft kidney and CIT.

In this study only living donors were included and CIT varied from 80-180 minutes with mean of 107.44 ±43.416 minutes. In this study the time taken for Lap Donor Nephrectomy varied from 110-240 minutes with mean of 177.96 ± 87.7 minutes. The time taken for recipient surgery ranged from 165-280 minutes with mean of 203.64 ± 61.5 minutes. In this study the time taken to reach the lowest creatinine value varied from 3 days to 14 days with mean of 7.52 ± 7.7 days.

**CONCLUSION**

In the present study 25 patients with post-transplant serum creatinine ≤ 1.5mg/dl were included and evaluated for time taken for laparoscopic donor nephrectomy and to achieve lowest creatinine levels after surgery among renal transplant recipients with multiple renal arteries. Among majority of patients undergoing laparoscopic donor nephrectomy, time taken for LDN & recipient surgery was between 3-4 hours while in majority of cases the lowest creatinine level was reached within a week.

<table>
<thead>
<tr>
<th>Cold ischemia time (minutes)</th>
<th>Number of cases(n=25)</th>
<th>Percent</th>
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</thead>
<tbody>
<tr>
<td>81-100</td>
<td>9</td>
<td>36%</td>
</tr>
<tr>
<td>101-120</td>
<td>9</td>
<td>36%</td>
</tr>
<tr>
<td>121-140</td>
<td>5</td>
<td>20%</td>
</tr>
<tr>
<td>141-160</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td>161-180</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td><strong>Cold Ischemia Time in minutes</strong></td>
<td><strong>107.44±21.708</strong></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Time taken to achieve lowest creatinine levels after surgery(days)</th>
<th>Number of cases(n=25)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5</td>
<td>12</td>
<td>48%</td>
</tr>
<tr>
<td>6-10</td>
<td>7</td>
<td>28%</td>
</tr>
<tr>
<td>11-15</td>
<td>6</td>
<td>24%</td>
</tr>
<tr>
<td><strong>Time for lowest creatinine levels post operatively in days</strong></td>
<td><strong>7.52±3.853</strong></td>
<td></td>
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REFERENCES


