

## IS RIGHT DONOR NEPHRECTOMY SAFE? OUR EXPERIENCE IN ARMED FORCES INSTITUTE OF UROLOGY

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### ABSTRACT

**Objective:** To identify any adversities in the intraoperative and early postoperative outcome of right live-related donor nephrectomy.

**Study Design:** Cross sectional study.

**Place and Duration of Study:** Armed Forces Institute of Urology, Rawalpindi, from Jan 2013 to Jul 2015.

**Methodology:** A total of 143 successive patients underwent open live donor nephrectomies (right=41). Perioperative outcome for both sided procedures were analyzed to identify any difference as regard the intraoperative (warm ischemia time, total duration of surgery, peroperative complications) and early postoperative parameters (days of hospitalization, complications).

**Results:** No statistically significant difference was found in studied parameters like total operative time, the warm ischemia time, duration of hospital stay and the intra- and early postoperative complications amongst both the groups. The mean warm ischemia time was  $86 \pm 12$  seconds (Rt) versus  $90 \pm 12$  seconds (Lt). The mean time for surgery was  $110 \pm 18.1$  minutes (Rt) versus  $121 \pm 18.2$  minutes (Lt). There were only five minor complications and one major complication.

**Conclusion:** Right live-related donor nephrectomy is equally safe and feasible option with similar intra- and postoperative complications as for left side. Therefore, whenever required, it is safe to leave the donor with a better functioning kidney.

**Keywords:** Complications, Donor, Live-related, Nephrectomy.

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### INTRODUCTION

Open live-donor renal transplant is one of the standard therapeutic options for end-stage renal failure<sup>1</sup>. A live renal donor can potentially donate any one of his kidneys. While selecting which kidney to be harvested the left is conventionally preferred by surgeons anatomically due to its vein being longer than that of the right kidney<sup>2</sup>. Moreover liver and inferior vena cava are considered by some to pose substantial difficulty in tissue dissection during harvesting of right kidney. Considering this anatomical advantage, majority of surgeons prefer left live-related donor nephrectomy (LRDN) and have more experience in this regard. Studies reported by these centers have suggested many intraoperative advantages due to the longer renal vein, during harvesting the graft from the donor and later anastomosing it in the recipient<sup>3</sup>.

It is undeniably a standard recommendation that the kidney which is better functioning, bigger in size and with minimum anatomical defects must always be kept with the donor irrespective of the side<sup>1,4</sup>. Following this approach, a considerable experience is usually achieved for right LRDN in centers where the opera-

tive load of renal transplant is high. Many of the institutes have reported equally good success rates with no or minimum complication rates during right LRDN. These studies have demonstrated that renal graft harvest and long term results of its survival are comparable for both left and right live donor nephrectomies<sup>2,5</sup>.

Open live-related donor nephrectomy is a standard practice for renal transplantation in Armed Forces Institute of Urology, Rawalpindi, since its inception in 1978<sup>6</sup>. In the beginning, the left donor nephrectomy was the standard however as the experience of our transplant surgeons enhanced the right renal graft harvest was performed with equal proficiency. Our study aims to compare the outcome of right and left LRDN in terms of intra-operative and early postoperative events, including warm ischemia time and total duration of surgery, hospital stay, complications and early graft outcome.

### METHODOLOGY

This cross sectional study included all those patients who underwent live related donor nephrectomy (LRDN) in Armed Forces Institute of Urology (AFIU), Rawalpindi, from January 2013 to July 2015. After getting formal approval from the Ethics Review Committee, the record of 143 successive LRDN performed in AFIU was critically analyzed. In order to

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identify which kidney was to be harvested, a detailed anatomic and functional evaluation of the donor renal system was performed. For this purpose, triple phase contrast enhanced CT scans of the kidneys, ureters and bladder were carried out and any vascular and other anatomical anomalies were identified. Mercaptoacetyl-triglycine 3 (MAG3) renal scan was used to identify the differential renal function of the donor and to select the kidney to be harvested for the recipient. Intraoperative study parameters included total operative time, ischemia time, and any operative complications. Early postoperative study parameters comprised postoperative complications, duration of hospital stay and graft outcome. LRDN was performed using a supracostal (above the 11<sup>th</sup> rib) approach, kidney was mobilized all around; on the left side the renal vein was separated from its tributaries (gonadal, adrenal and lumbar) to gain its extra length while on the right side the length of renal vein was achieved by taking a cuff of inferior vena cava (IVC) and repairing the defect with 5/0 Polypropylene Suture (Prolene Ethicon). The three structures were cut in the following sequence to remove the kidney; ureter followed by renal artery and finally the renal vein. During the extraction of kidney, the time from clamping and cutting of the renal artery to the point of beginning of infusion of ice-cold fluid into the harvested renal graft, the warm ischemia time, was noted using an electronic stop watch. The wound was closed in layers and 10ml of 0.5% Bupivacaine HCl (Abocaine) was infiltrated into the wound for a better postoperative analgesia. Postoperatively the patient was closely monitored for hemodynamic stability for 24 hours. Postoperative pain was controlled with injection Ketorolac tromethamine (Toradol) 30 mg intravenous thrice daily with narcotic analgesia as on required basis. Foley catheter was removed on first postoperative day and patient was made ambulatory. Oral fluids and semisolid diet were started on first postoperative day. In case of an uneventful recovery the patient was discharged on second or third postoperative day.

Patients' record including age, gender, side of LRDN, reason for selecting the side of renal graft, operative time, warm ischemia time, number of days in the hospital postoperatively, graft outcome in terms of creatinine clearance and any complications both intra and postoperative were recorded and reviewed.

All the data were analyzed by SPSS-22. Descriptive statistics i.e. the Mean  $\pm$  SD were calculated for numerical values like age, warm ischemia and total operative time, number of days in the hospital post-

operatively, graft outcome in terms of creatinine clearance while frequencies and percentages were calculated for categorical variables like gender, side of LRDN, reason for selecting the side of renal graft and complications. Different parameters were compared by using student t-test; *p*-value <0.05 was recognized as statistically significant.

## RESULTS

A total of 143 LRDNs were performed during the study period, out of which 102 (71.3%) were on left side and 41 (28.7%) on the right side. There were 28 males and 74 females; male to female ratio being 1:2.6 for left LRDN while for the right side 8 males and 33 females with ratio of 1:4 were operated. Median age was  $39.5 \pm 5.2$  years on the left and  $37.8 \pm 5.4$  years on the right side. The kidney having multiple arteries (two or more) was the most important factor for selecting the side of graft for harvesting due to operative complexities involved in arterial dissection and graft extraction. Better functioning kidney (determined by MAG 3 scan) was the second most important determinant, as better kidney was always retained for the donor. Differential function of greater than 5% as determined by MAG3 renal scan was the draw line for harvesting the kidney with lower functional capacity. In cases where the differential function was slightly better on left (difference less than 5%) and there were two or more renal arteries on left, the right kidney was harvested. The right-sided renal vein length measurement by CT angiogram was not considered an important parameter for selection of the kidney graft. Various indications for right LRDN are listed in table-I.

A meticulous bench dissection of the renal graft was performed of the renal hilum in every case to release the renal artery and the vein from the surrounding hilar fat. According to recipient's anatomy, the external iliac vein was mobilized by tying its posterior tributaries in order to achieve anterior displacement for an easy vascular anastomosis. No intraoperative technical problems were encountered in the recipient due to the shorter vein of the right sided renal graft.

Right LRDN operation time was  $110 \pm 18.1$  minutes, while for the left LRDN it was  $121 \pm 18.2$  minutes. Warm ischemia time during right LRDN was slightly shorter, though statistically insignificant, than the left side ( $86 \pm 12$  seconds versus  $90 \pm 12$  seconds). The number of days that the donor remained hospitalized after the surgery was also similar for both sides ( $2.43 \pm 0.77$  days for the right versus  $2.55 \pm 1.48$  days for left). Graft outcome in terms of creatinine clearance was not

statistically significant. Table-II summarizes statistical analysis of various intra-and early postoperative parameters studied, depicting no significant statistical difference.

**Table-I: Indications for selection of right kidney for donor nephrectomy (n=41).**

Indications	No
Multiple left renal arteries	25
Left better functioning kidney	14
Right mid-ureteric kink	02

**Table-II: Intra- and post-operative studied variables.**

	Right LDN	Left LDN	p-value
Operation time (minutes)	110 ± 18.1	121 ± 17.4	0.3514
Warm ischemia time (seconds)	86 ± 12	90 ± 11	0.1860
Postoperative stay (days)	2.6 ± 1.25	2.41 ± 1.34	0.5612
Creatinine levels (at 4 weeks) umols/dL	112 ± 18	118 ± 15	0.4713

LDN: Live Donor Nephrectomy

One major and five minor (4.1%) complications were encountered. All of these complications were encountered on left-sided LRDN. Three of these patients complained of continued scar pain for three months and was managed by simple non-NSAID analgesics. One patient had post-operative wound infection managed conservatively, and one more patient had transient urinary retention. The only major complication encountered was an intra-operative bleeding episode due to slipped ligature of left renal artery that was managed immediately by re-clamping and tying the artery. All the renal grafts started immediate function after they were revascularized. At the end of four weeks, creatinine level of the recipients for the right side being 112 ± 18 umol/dL versus 118 ± 15 umol/dL for the left side, p-value being 0.4713. No significant difference in graft outcome was noted.

## DISCUSSION

The number of candidates on the waiting list for kidney transplant is on the rise every year<sup>7</sup>. To match the difference between the recipient and the donors, the west has successfully pursued the cadaveric transplant program, however there is no legislation in this regard for a similar deceased donor program in this part of the world. Therefore, live kidney donors remains the only option in our clinical and social set up. In order to use the live donor nephrectomy services, it is essential that high volume transplant centers must

judiciously run this program in the best possible manner for the maximum benefit and safety both for the recipients as well as for the donor. In this regard the initial concerns about the safety and efficacy of the LRDN have been well addressed by earlier studies<sup>8-11</sup>. It is a universally accepted consideration that the donor should be left with a better kidney and at the same time the relatively suboptimal kidney (right or left) should be harvested for the renal transplant<sup>9,10</sup>. In patients in whom left kidney displays multiple arteries or anatomic anomalies, the indication for right LRDN becomes evident<sup>1</sup>. Conventionally, live open donor nephrectomy is preferred on the left side due to the anatomical impediment of right sided short renal vein. Furthermore, retraction of liver and repair of defect in inferior vena cava further increases the technical complexities of the right donor nephrectomy. However, with increasing experience for donor nephrectomy, many centers have drifted safely towards the right sided LRDN.

In AFIU, at least two transplants are performed every week that has led to considerable experience in renal transplant surgery. Results of this study document the safety and outcome of both sided LRDN and reaffirms that the results are comparable for both sides. The number of right LRDN in this study was 28.67%. This figure is much higher than only 4% right LRDN reported in a large series in which 96% of their 738 consecutive LRDNs were left-sided<sup>12</sup>. However, authors in that study used laparoscopic approach rather than open approach, which could be a reason for a smaller number of right-side nephrectomies. With increasing experience more and more centers are reporting right LRDN with incidence reaching more than 20 percent in some recent reports<sup>13-16</sup>.

In our study, the reasons to perform the right LRDN was; multiple left renal arteries (25 cases), left better functioning kidney (14 cases) and right mid-ureteric kink (2 cases). These results are comparable with other studies<sup>14,17-19</sup>. In one of the studies, the reasons for choosing the right kidney for transplant were right renal cysts, small renal size and more than two left renal arteries<sup>2</sup>.

No significant difference in warm ischemia time, total operative time or any difficulty in anastomosis of right renal vein on the recipient external iliac vein was found in present study. These observations were comparable with other studies where warm ischemia time, total operative time and preoperative technical difficulties were comparable to the left donor nephrectomy

and the right donor nephrectomy was declared equally safe with long term functional parameters comparable to the left sided procedure<sup>2,17-19</sup>. Chung and associates proved the efficacy and practicability of right LRDN and reported no difference in technical problems both in the donor and the recipients as regards renal vein and the ureteral anastomosis<sup>17</sup>. Pandarinath and group compared right (n=24) versus left (n=164) LRDN and also documented no difference in terms of total operation time, ischemia time, intraoperative events, blood loss and post-operative parameters<sup>18</sup>. In their experience of 73 patients of right LRDN, Lind *et al* documented no significant difference in perioperative and post-operative complications as well as graft dysfunction<sup>19</sup>. Similarly many other studies also proved insignificant difference during right renal donor nephrectomy as regard to warm ischemia time, total operative time and perioperative technical difficulties in harvesting the right renal vein and also anastomosing it in the recipient external iliac vein<sup>16,20,21</sup>.

Present study found that right donor nephrectomy may be performed rather more swiftly due to absence of its tributaries (namely; adrenal, gonadal and lumbar) which are often encountered during the left LRDN. Kumar *et al* also documented the same observation and stated the operative time for RLDN to be 26 minutes shorter than the left live donor nephrectomy<sup>15</sup>. Wang *et al*, in their meta-analysis of 15 studies also documented shorter operative time for right donor nephrectomy (weighted mean difference was 13.44 minutes)<sup>16</sup>. Pandarinath and group also documented that the right live donor nephrectomy is performed quicker than the left due to absence of right renal vein tributaries<sup>18</sup>.

In our study, the difference in mean hospital stay for both right and left live donor nephrectomies was insignificant (2.4 days). Comparable results were also documented by other authors in their analytical study of similar groups<sup>15,16</sup>.

Wound infection and scar pain (4.1%) were the most common minor postoperative complication we found in our study and that too occurred in left sided nephrectomies. This may be related to larger number of operations (71%) on left side. Wound infection, a minor complication was the commonest perioperative morbidity (3.5%) reported in another study in which the authors concluded that the right-sided procedure is safe and justified<sup>22</sup>. In the experience of Yasumura and colleagues for 247 live related donor nephrectomies, again commonest perioperative complication was

wound infection in 13 cases (5.3%) and only ten (8.1%) donors had mild but chronic scar pain. In long term sequel they reported postoperative hypertension in 2.4 percent (3 patients)<sup>23</sup>. Other authors also reported UTI (5%) and wound infections (4%) as the most common postoperative sequelae<sup>20,24,25</sup>.

The only major complication encountered in this study was slipping of the ligature of left renal artery. Whereas this could prove catastrophic in postoperative period, it occurred intra-operatively and was dealt with immediate resuturing without much of blood loss. Hemorrhage due to ligature slipping has been reported in the literature as a cause of considerable morbidity and mortality especially if it happens postoperatively<sup>24,25</sup>.

Graft outcome is one of the most important parameter as far as the success of the renal transplant is concerned. It is directly related to the ischemia time (both warm and cold ischemia time). The ischemia time is completely affected by the surgeon's operative swiftness as well as his technical expertise in dissecting the renal vascular pedicle in the course of graft harvesting as well as during the meticulous dissection while performing the bench surgery. In our study none of the grafts showed any delay in recovery and the mean creatinine levels were comparable for both right and left renal graft at the end of 4 weeks<sup>18,20</sup>.

## CONCLUSION

Right live-related donor nephrectomy is equally safe and feasible option with similar intra-and post-operative complications as for left side. Therefore, whenever required, it is safe to leave the donor with a better functioning kidney.

## CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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