

Effects on Contralateral Kidney after Living Donor Nephrectomy

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ABSTRACT

Background: After live donor nephrectomy (LDN) there is compensatory hypertrophy in contralateral kidney .

Aim: In this study we investigated effects of nephrectomy on the contralateral kidney. Effects on contralateral kidney studied in this study are renal parenchymal volume (RPV), glomerular filtration rate and renal function tests

Method: From July 2010 and January 2014, 517 live related kidney transplants were done at Sharif Medical and Dental College, Department of Urology and Renal transplantation, Lahore of which 500 kidney donors were enrolled in this study. Renal parenchymal volume (RPV) was calculated by ultrasonography (U/S) and U/S was done before surgery, 07 days, 3 months and one year postoperatively. Technetium 99m Diethylene Triamine Penta Acetic acid (DTPA) scan was used for measurement of glomerular filtration rate (GFR). DTPA scan was performed before surgery, 03 months and 01 year postoperatively. The function of the contralateral kidney was assessed by doing blood serum test (RFTs) which was done before surgery, 03 day, 7 day and 01 year postoperatively.

Results: The RPV of the contralateral kidney was 163 ± 29.7 cm(3) before surgery and then increased by 21.23% to 195.5 ± 39.9 cm(3) 07 days, by 24.17% to 146.60 ± 25.86 cm(3) at 3 months and by 26.1% to 196.4 ± 38.0 cm(3) at one year. In this study, we also found that those contralateral kidney who got smaller size before surgery compared to donor kidney achieved bigger gain in size in the post-operative period ($p=0.005$). Those contralateral kidneys who achieved $\geq 20\%$ increase in RPV, 07 day postoperatively are more likely to show further increase in GFR at 01 year ($p=0.024$).

Conclusions: After donor nephrectomy there is immediate increase in PRV of the contralateral kidney with increase in GFR. Initially there is increase in SCr but within normal range. Study of these effects on contralateral kidney after donor nephrectomy favours the live kidney donor transplant.

Keywords: LDN (living donor nephrectomy), RPV (renal parenchymal volume), RFTs (renal function tests),

INTRODUCTION

Living donor renal transplant is the best treatment among other modality used ESRD¹. This treatment is not only associated with better long term graft outcomes but also gives an opportunity to have a continuity in general wellbeing of the patient by doing it at a pre-emptive stage². During the whole process of living donor renal transplant donor care is of prime importance. The challenges of living kidney donor work-up and post-operative care are very different in developing countries as compared with developed countries because of lack of resources. Therefore it is very important to ensure that the donor is left with the kidney with highest function and also post operatively they maintain these good functions throughout their life.

The compensatory increase in renal reserve of the residual kidney is a well-studied phenomenon that results in increase of residual kidney GFR by 15-20%^{3,4}. When renal transplantation was still in infancy, living donor kidney retrieval was a debate due to per-operative and long-term risks^{5,6}. More sophisticated investigation tools and modern developments in anesthesia and ICU care changed the old concepts. Data shows that live kidney donation is safe and with low mortality⁷ & morbidity⁸. There is no change in the life expectancy of living kidney donors as that of age-matched healthy individuals^{7,8,9,10}. These donors were investigated to see impact of donation on remaining renal function by many authors¹¹. However, the anatomical and

physiological changes occurring in the remaining kidney are interesting. Here we explore the changes that occur in contralateral kidney. Non-invasive techniques will be used.

MATERIALS & METHODS

This Study includes 500 LRD (living related donors). Among them females are 150 (30%) and 350 were males (70%) with age of (29.7 ± 10) years. Maximum dimensions of length, width and thickness of contralateral kidneys were measured with renal ultrasound. Renal volume calculated by multiplying length x width x thickness in ml [12]. The split renographic clearance studies was the base for donor kidney selection. If the GFR difference < 10 ml/min in two kidneys were labelled as normal and in B/L kidneys were regarded as having same function [13]. But when the GFR exceeded < 10 ml/min, the kidney with highest function was saved for the donor and with lesser function was given for transplantation. Donors were followed for the changes in renal volume and function at 3, 7 days, 3- months and in one year after donating. USG were done postoperatively to measure the volume, S Cr, renographic clearance for GFR. On 3rd and 7th postoperative day only S Cr was advised.

RESULTS

Total 500 living donors were included in this study, 150 females and 350 males. The Rt. kidney was taken 21 out of 500 cases (4.2%), shown in (Table 1). GFR of Rt. kidney was $<$ left kidney in 13-cases [2.6%] (Table 2). Equal GFR was observed in 491 cases, 8 cases were of females in child bearing age so right kidneys were selected because

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it is more likely to be compressed by the gravid uterus^{14,15}. Donated kidney Mean GFR was (48±6.9) ml/min and the remaining Kidney GFR (51.9±5.4) ml/min (P <0.05).

Result of remaining kidney function and volume after donor nephrectomy is shown (Table 3). S. Cr rises in 380/500 donors (76%). Mean Serum Cr. was (0.7± 0.17) mg/dl preoperatively and the Mean Serum. Cr was 1.4±0.18 mg/dl on third post-operative day. statistically significant rise (P<0.001). However, all the readings were still within the normal post-operatively. Isotope renography showed a rise of GFR in the rest kidney ranging from five to sixty four percent (mean 34 percent) of the pre -donation value in all the donors. Renal parenchymal volume (RPV) increased in all donors from 7- 45 percent of the earlier volume. The mean pre-donation value was (163.7 ± 29.7) ml and post-donation was (196±39.0)ml. It was noted that compensatory hypertrophy was completed at the end of first postoperative week, and effective renal plasma flow was 32.5% higher than preoperative value of remaining kidney. This increase remained stable for a year. The degree of compensatory hypertrophy in male patients was higher (46.9%) than in females (26.7%) at the end of 1 week. Compensatory hypertrophy occurred in all age groups but in patients less than 30 years old was more pronounced.

Fig. 1: Gender wise data

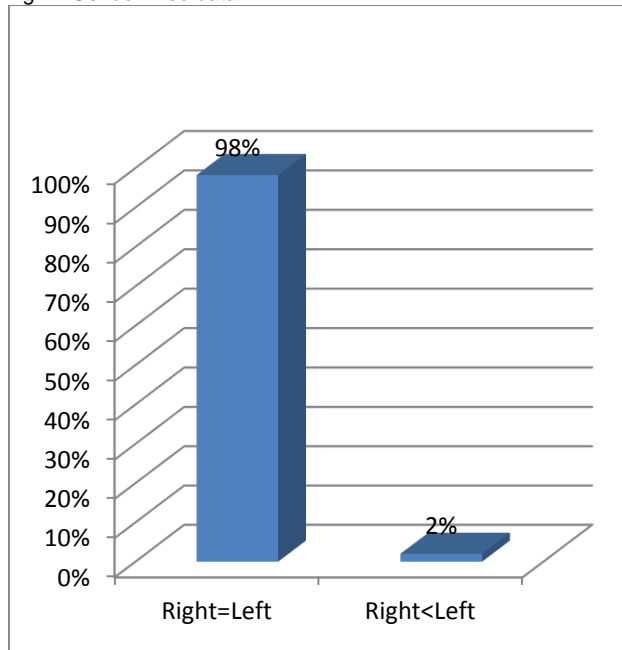


Table 1: Demographic data of the living related donors

Age (years)	29.7±10
Gender	
Male	350(70%)
Female	150(30%)

Table 2: Selection of kidney

Donated Kidney	No.
(R)Kidney	21
(L) Kidney	479

Fig. 2: Selection of kidney

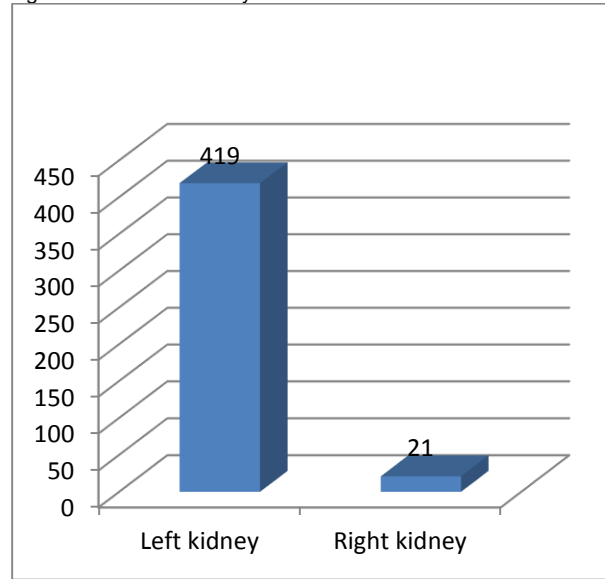


Fig. 3: Comparison of GFR

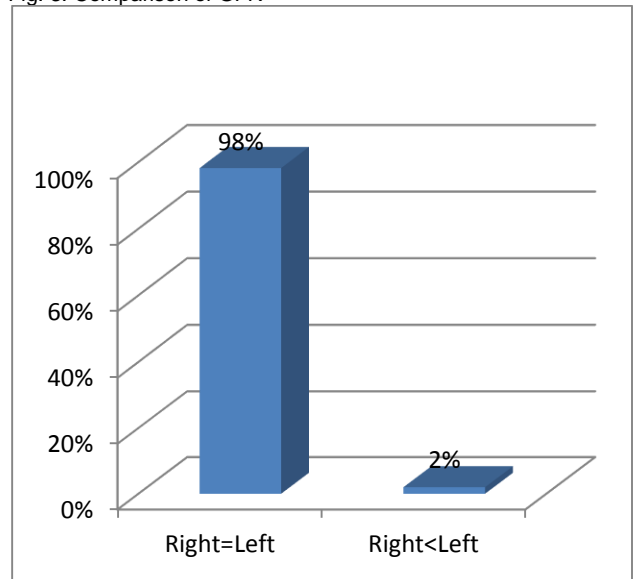


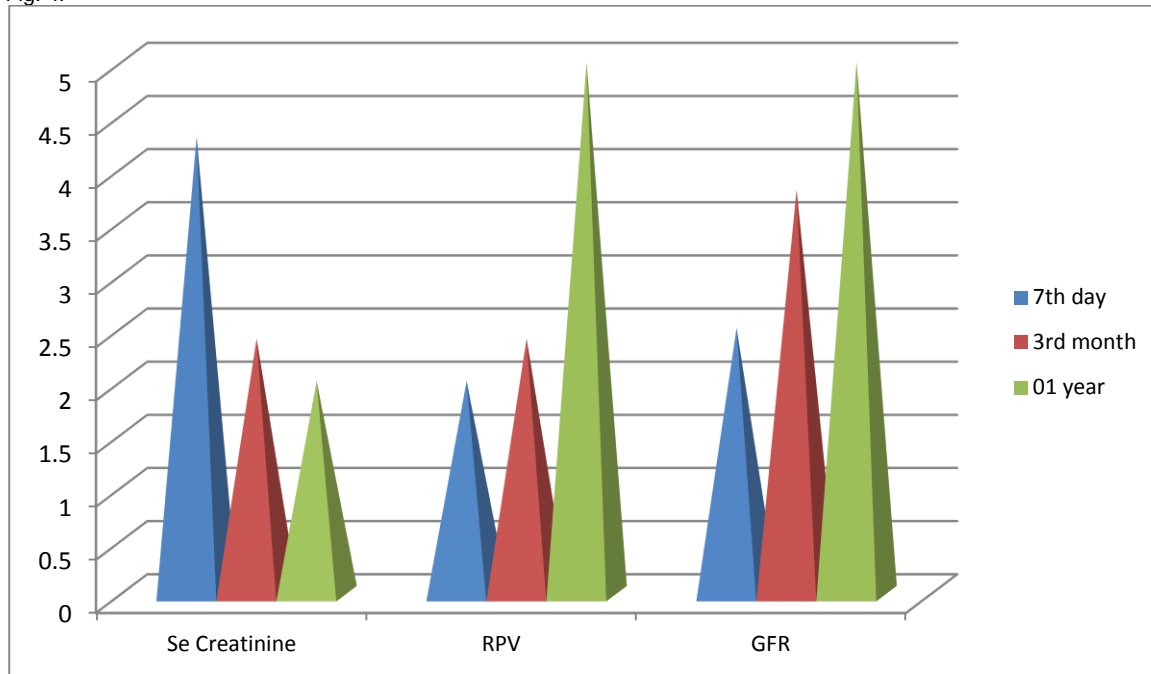
Table 3. Comparison of renographic GFR between right and left kidneys before donor nephrectomy

GFR	Number
Right=Left	491 (98.2%)
Right<Left	13 (2.6%)

Table 3: Pre-operative and post-operative values of renal function and volume (mean±SD)

	Creatinine (mg/dl)	GFR (ml/min)	Renal volume(ml)
Pre op	0.7±0.17	51.9±5.4ml/min	163±29.7
Postop (3rd day)	1.4±0.18		
Postop (7 th day)	1.2±0.13		195.5±39.9
Postop (3d month)	1.1±0.12	69.9±9.3	196.8±39.0
Postop (1 year)	1.0±0.17	73.4±3.4	196.4±38.0
P value	<0.001	<0.001	<0.001

Fig. 4:



DISCUSSION

Depends on various factors living related donor kidney transplantation is a better option. LRD has better outcomes than recipients of cadaveric donor transplants in terms of long-term survival time[16]. This surgery can be properly planned and performed as an elective procedure. The dialysis period can be shortened by early donor selection . Despite the fact some transplant centers do not encouraging the LRD and hesitate to perform living donor transplant. They consider peri-operative morbidity and mortality a significant limitation^{17,8} . Najarian et al¹⁹ discussed 5cases of mortality among 19,368 LRD nephrectomies performed in USA between 1980 - 1991, which is < 0.04 percent incidence. Bay and Hebert published the cases from sixteen series and reported an incidence of major complications is only 1 percent [20]. However, Cosimi²¹ reported survival studies indicate that 5-year life expectancy of one sided nephrectomy in 35 year old male donor is 99.1 percent compared to 99.3 percent normal expectancy. Various Study have failed to identify a significantly increased the incidence of either hypertension or impaired renal function in LRD followed-up to 19 years after one sided nephrectomy [22]. There was no mortality noted in this study.

We observed Serum Cr. levels up to 1- year post donation and found with in normal range, in all the case which were included in this study. In spite of showing a statistically significant variation in 76 percent of the subjective study. Above said findings were also reported by Sobh et al [23] and Vincenti et al [24]. Najarian et. Al. [19] found that no difference in mean S Cr between LRD and their sibling controls. Mean renal volume of the remaining kidney was increased by 15 percent pos operatively which said to be explained by cellular hypertrophy and hyperplasia mainly of PCT [25]. Lithium clearance for the

assessment of water and salt reabsorption by proximal tubules supported this study. Reabsorptive power of the kidney causes compensatory hypertrophy of the nephrons. Secretory capacity of the PCT had increased up to 75percent of the previous levels after 6-months follow op of unilateral nephrectomy patients.

CONCLUSION

For better outcome of LRD transplantation differential GFR has great significant. Donor should be left with better functioning kidney. This study also showed that, anatomical and physiological changes occur early in the post-operative period. Long-term follow-up study are required to confirm these changes either permanent or temporary .Keeping in view of these observation we can say that living donor nephrectomy(LDN) is a safe procedure as for as morbidity and mortality of donors is concerned.

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