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Outcomes and Surgical Complications of Live Donor Renal Transplantation – A Retrospective Study

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Abstract

Objectives: Live renal transplantation is being done in many centers across India. The objective of this study was to report our experience.

Methods: This study was conducted in Nizam's Institute of Medical Sciences, Hyderabad, India as a retrospective observational study. All patients who underwent live renal transplantation from January 2017 to June 2020 at our institution were included in the study and those who had cadaver renal transplantation were excluded. Data of all patients who underwent live renal transplantation from January 2017 to June 2020 were taken for analysis.

Results: A total of 199 patients underwent live renal transplantation at our institute during this study period. In our study immediate graft function(IGF) is seen in 86.43%, slow graft function(SGF) in 10.55% and delayed graft function(DGF) in 3.02%. On univariate analysis, donor age, sex, cold ischemia time, recipient age and pre-transplant dialysis duration had no influence on slow/delayed graft function but recipient gender and number of renal arteries in donor's kidney had a statistically significant influence on renal graft dysfunction. The death censored one-year, two-year, and three-year graft survival rates in our study were 97.37%, 97.28%, and 96.67% respectively. One-year, two-year, and three-year patient survival rates in our study were 91.30%, 90.48%, and 90% respectively.

Conclusion: The early and intermediate-term patient and graft outcomes (one-year and three-year patient and graft survival) and surgical complications were satisfactory and comparable to those in other centers.

Keywords: Live Renal Transplantation, Outcome of Renal Transplant, Complications of Renal Transplant, Live Related Renal Transplant

Introduction

Abbrevations List

1. IGF : immediate graft function.
2. SGF : slow graft function.
3. DGF : delayed graft function.
4. CKD : Chronic kidney disease.
5. ESRD : End-stage renal disease.
6. RRT : renal replacement therapy.
7. MMF : Mycophenolate mofetil.
8. ATG : Anti-thymocyte globulin.
9. KTU : Kidney Transplant Unit.
10. CVA : Cerebro-vascular accident

Chronic kidney disease (CKD) is the 12th most common cause of death and the 17th most common cause of disability globally [1]. End-stage renal disease (ESRD) represents the terminal stage of CKD as defined by a glomerular filtration rate (GFR) of <15 ml/min/1.73 m^2. The prevalence of ESRD in India is 151-232/ million population [2]. The treatment options for ESRD patients are hemodialysis, peritoneal dialysis, and renal transplantation. Many studies have proved that kidney transplantation is distinctly superior and is

associated with reduced mortality and morbidity compared to hemodialysis or peritoneal dialysis [3]. Renal transplantation is the best as well as the most cost-effective mode of renal replacement therapy (RRT) for end-stage renal disease patients with better survival and quality of life compared to dialysis [4,5]. There are two main types of renal transplantation: live renal transplantation and cadaver renal transplantation.

Since the first human kidney transplantation by Joseph Murray in 1954 [6], improvements in morbidity and mortality have been attributed to patient selection, advances in surgical techniques, perioperative patient management, and immunosuppressive regimens. Complications of renal transplantation can be classified as pathological or surgical. Pathological/ medical complications include rejection, infection, and cardiovascular events, while surgical complications involve vascular and urologic complications, lymphocele, wound infection, and hernia development. Despite all advances, graft-endangering complications are primarily of vascular etiology. Vascular complications account for 3%-15%of all cases [7]. These include thrombosis or stenosis of the renal artery or vein. Other rare complications are the formation of aneurysms, arterio-venous fistula formation, or perinephric hematomas.

Live renal transplantation is being done in many centers across India. The objective of this study was to report our experience with respect to epidemiology, peri-operative variables affecting graft function and to assess the outcomes and surgical complications of live donor kidney transplantations performed over the past three years in our center. This article was previously presented as an unmoderated e-poster at the 41st congress of the SIU held on November 10-14, 2021.

Methods

This study was conducted in Nizam's Institute of Medical Sciences, Hyderabad, India as a retrospective observational study. All patients who underwent live renal transplantation from January 2017 to June 2020 at our institution were included in the study and those who had cadaver renal transplantation were excluded. Data of all patients who underwent live renal transplantation from January 2017 to June 2020 were taken for analysis.

We performed renal transplant surgery according to standard protocol. After adequate perfusion of live donor kidney following donor nephrectomy with cold RL solution mixed with heparin and papaverine, under general anesthesia, with the patient in supine position Gibson incision was given. In the case of a single renal artery, the renal artery was anastomosed to the internal iliac artery end-end and in cases of double renal arteries; renal arteries were anastomosed to the external iliac artery end-side manner. The renal vein was anastomosed to the external iliac vein in an end-side fashion. Uretero-neosystostmy was done over a DJ stent by Lich Gregoir's extravesical technique.

In our institute, all recipients were given Inj. Methyl Prednisolone 1gm on first three consecutive days with a total dose of 3 grams and maintenance triple immunosuppression that included Tacrolimus (0.08mg/kg/day), Mycophenolate mofetil (MMF) (600mg/m2/dose), and oral Prednisolone 20mg/day. Tacrolimus was tapered according to serum drug levels, which were monitored after one month on a half-monthly basis. The dose of steroid was tapered from 20mg/day to 10mg/day at end of 6 months and continued thereafter. MMF was tapered gradually in the post-transplant period. Induction therapy was given in cases of spousal live donor transplantation with Basiliximab (20 mg in 2 doses on days 0 and 4) or Anti-thymocyte globulin (ATG) at a cumulative dose of 3mg/kg given over 3-4 days. Patients who were given an induction and anti-rejection therapy were given prophylaxis with oral Valganciclovir (450mg) on alternate days, Fluconazole (150mg) once daily and Cotrimoxazole once daily for the next 3 months.

According to our Kidney Transplant Unit (KTU) protocol, hourly charting of input, output, and vitals were done and daily charting of complete blood picture (CBP), blood urea, serum creatinine, and electrolytes was done. Renal biopsy was performed in all cases of slow/delayed graft function (SGF/DGF). All the patients were followed regularly. For the initial 2 months, patients were followed every alternate day with blood urea and serum creatinine, and complete blood counts. Later twice a week for the next two months and once a week for subsequent 2 months and after that once a month till one year and thereafter once in 3 months.

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Data pertaining to recipients like age, gender, blood group, native kidney disease, duration of dialysis, mode of dialysis, previous transplant history were noted. Graft functions after transplantation like delayed graft function, slow graft function, immediate graft function were noted down. Donor details like age, gender, history of hypertension and diabetes, number of renal arteries, and side of the kidney taken were noted. Various donor and recipient factors influencing the graft function were analyzed. Early surgical complications, medical complications, and infections were documented. Death censored graft survival at one-, two- and three-year and patient survival at one-, two- and three-year were documented. The definitions of various outcome parameters were given below [8].

1. Immediate graft function (IGF): The patient had brisk diuresis after anastomosis of donor and recipient blood vessels.
2. Slow graft function (SGF): The patient had diuresis after anastomosis, but there was a slow decline in serum creatinine. There was no requirement for dialysis after transplantation.
3. Delayed graft function (DGF): The patient had anuria after anastomosis and need for dialysis within the first week after transplantation.
4. Rejection: Both cellular and antibody-mediated rejections were defined according to Banff criteria.
5. Patient survival: This was calculated from the date of transplantation to the date of death or the date of the last follow-up.

Graft survival censored for death (Death-censored graft survival): This was calculated from the date of transplantation to the date of irreversible graft failure signified by a return to long-term dialysis or re-transplantation. In event of patient death with a functioning graft, the follow-up period was censored at the date of death.

Statistical analysis was done using SPSS version 20. For categorical variables, Fischer exact Chi-square test was used and for continuous variables, the Unpaired Student t-test was used to assess the statistical significance. For all the statistical tests, p-value less than 0.05 were considered statistically significant.

Results

This observational retrospective study was conducted on patients who underwent live renal transplantation at our institute from January 2017 to June 2020. A total of 199 patients underwent live renal transplantation at our institute during this study period. The donor and recipient characteristics were given below in Tables 1, 2. In our study immediate graft function(IGF) is seen in 86.43%, slow graft function(SGF) in 10.55% and delayed graft function(DGF) in 3.02% as given in Table *3*. The mean serum creatinine of recipients at the time of discharge, at 3 months, at 1 year, and at 2 years was 1.19 mg/dl, 1.16 mg/dl, 1.21 mg/dl, and 1.68 mg/dl respectively. The mean eGFR of recipients was 85.19, 83.02, 82.41, 81.78 at 3 months, 6 months, 1 year, and 2 years respectively. In our study, on univariate analysis, donor age, sex, cold ischemia time, recipient age and pre-transplant dialysis duration had no influence on slow/delayed graft function but recipient gender and number of renal arteries in donor's kidney had a statistically significant influence on renal graft dysfunction as given below in Table *4*. Acute tubular necrosis (ATN) was the most common biopsy finding in cases of DGF /SGF due to non-rejection etiology constituting 38.96%% and Graft rejection was seen in 42.86 % of cases of DGF/SGF. The most common surgical complication following renal transplantation in our study is perinephric hematoma and wound infection as seen in 5.53% and 5.03% respectively as shown in Table *5*.

Bacterial infections were the most common infectious complication in the early post-transplant period found in 85 (42.71%) cases followed by viral infections found in 72 (36.18%) cases. Fungal infections were found in 30 (15.08%) cases and Tuberculosis was found in 6 (3.02%) cases. The death censored one-year, two-year, and three-year graft survival rates in our study were 97.37%, 97.28%, and 96.67% respectively. One-year, two-year, and three-year patient survival rates in our study were 91.30%, 90.48%, and 90% respectively. The total number of deaths in our study was 24. Fourteen patients expired with failed renal allograft and 10 patients expired with a functioning renal allograft. Sepsis due to bacterial infections is the most common cause of mortality in our study comprising 66.66%. Other causes were CVA (massive ischemic stroke) in 16.67% of cases, fungal infections in the form of

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pneumonitis and pneumonia were found in 12.5% and sudden cardiac arrest during hemodialysis was seen in one patient.

Table 1: Donor characteristics in our study

Variables	Result
Mean Age	44.21±8.46 years
Gender- Male : Female	1:4.1
Mean cold ischemia time	61±2.5 minutes
Renal artery- Single : Double	14.3:1
Donor kidney- Left : Right	2.2:1
Mean eGFR	46.85 ml/min

Table 2: Recipient characteristics in our study

Variables	Result
Mean Age	30.7±9.5 years
Gender- Male : Female	3.7:1
Recipient blood group	O:39.2 %, B:35.18%, A: 20.6%, AB:5.02%
Cause of ESRD	CGN:33.17%, CIN:22.61%, Unknown:20.1%
Mode of Dialysis	Haemodialysis: 95.48%

CGN: Chronic Glomerulonephritis, CIN: Chronic Interstitial Nephritis

Table 3: Distribution of graft function post Transplantation

Graft function	No. of patients	Percentage (%)
IGF	172	86.43
SGF	21	10.55
DGF	6	3.02
Total	199	100

Table 4: Univariate analysis of various factors influencing Slow/ Delayed graft function.

Risk Factors	Slow/Delayed Graft Function	P-value
Donor Age	<50 years: 15 (11.02%)	0.5
	>50 years: 12 (19.04%)	

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Donor Gender	Male: 4 (11.4%)	0.5
	Female: 23 (16.7%)	
Recipient Age	<30 years: 16 (14.8%)	0.1
	>30 years: 11 (12.08%)	
Recipient Gender	Male: 26 (16.6%)	0.02
	Female: 1 (2.3%)	
Number of Arteries in donor kidney	Single: 24 (12.9%)	0.03
	Double: 3 (23.1%)	
Cold ischemia time	<60 min: 6 (8.7%)	0.22
	60-75 min: 18 (15.3%)	
	>75 min: 3 (33.3%)	
Pre-transplant dialysis duration	<6 months: 17 (13.9%)	0.903
	6-12 months: 7 (12.06%)	
	>6 months: 3 (15.8%)	

Table 5: Complications following transplantation.

Surgical complications	**No. of patients**	**Percentage (%)**
Wound infection	10	5.03
Lymphocele	9	4.52
Urinoma	2	1.0
Perinephric hematoma	11	5.53
Renal vein thrombosis	1	0.5
Renal artery thrombosis	1	0.5
Renal graft abscess	1	0.5
Incisional hernia	2	1.0
Renal graft calculus	3	1.51

Discussion

Kidney transplant resumes complete kidney function with increased risk of life-threatening infection and cardiovascular morbidity compared to the general population and the possibility of graft loss at any time [9-10]. Multiple factors related to patient and health facility for early detection and treatment of complications have a direct impact on the graft

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outcome. Moreover, poverty and ignorance with increased non-compliance to drugs and low hygienic status have shown a direct negative impact on transplant outcomes in developing countries [11]. With the emergence of nuclear and small family patterns and the rising prevalence of hypertension and diabetes in India, there has been a significant decline in the availability of suitable related donors. The short-term renal transplant outcome has improved markedly during the last few decades due to improved surgical techniques, better medical care, prevention and treatment of infections, and advancements in the field of immuno-suppressive treatment.

In our study, 21 (10.55%) had slow graft function (SGF) and 6 (3.02 %) had delayed graft function (DGF). On univariate analysis, recipient gender and number of arteries in renal allograft had an influence on slow/delayed graft function at a statistically significant level. Donor age and gender, recipient age, cold ischemia time, and duration of pre-transplant dialysis had no statistically significant relationship with slow and delayed graft function. DGF was considered to influence long-term patient and graft survival as shown in a study conducted by Ojo et al [12]. They studied the relationship between cold ischemia time and delayed graft function and overall long-term renal transplant survival among 37,216 first-time renal transplants from the US renal data registry. They analyzed the relationships using both univariate and multivariate regression analysis models. In their study, the duration of cold ischemia was strongly associated with non-immediate graft functioning as well as a high rate of long-term graft loss. They also noted that acute rejection occurred more commonly in patients with delayed graft function (36 vs. 21%; odds ratio=2.15, P=0.002). Delayed graft function was also an independent predictive variable for 5-year graft survival (relative risk=1.55, P<0.002). The combination of both an acute graft rejection and delayed graft function added up to a very poor 5-year renal graft survival rate of only 34%. A recent study by John Gill MD, and his colleagues [13], of the University of British Columbia, in Vancouver, Canada, showed the greatest donor age-associated risk of allograft loss was among recipients from living donors aged 65 and older. Recipient characteristics associated with increased risk of DGF include male sex, black race, history of diabetes, longer time on dialysis, increased BMI, frailty, elevated Panel Reactive Antibody (PRA), prior transplant, previous blood transfusions, elevated pre-transplant phosphate levels, and a mismatch in body size between the donor and the recipient [14].

Death censored one-year, two-year, and three-year graft survivals in our study were 97.37%, 97.28%, and 96.67%. It was almost similar to the one-year and three-year graft survival seen in the study by E Nemati et al. (97.4% and 96.2%) [15], and J Hassanzadeh et al. (98.3% and 96.4%) [16]. Renal allografts are always at risk of acute and chronic immunological and non-immunological injury leading to acute and chronic graft dysfunction and ultimately graft loss [17,18]. Multiple recipients and donor-related factors such as the cause of ESRD, duration of dialysis, pre-allosensitization status, type of immune-suppressive drugs used, donor age and sex, serum creatinine at 1-year post-transplant, early graft function status, and acute rejection episodes were shown to affect the graft survival rate [19,20]. One-year, two-year, and three-year patient survival in our study was 91.30 %, 90.48 %, and 90 % respectively. A total of 24 patients expired in our study. Sepsis due to bacterial infections is the most common cause of mortality in our study comprising 66.66% of cases followed by CVA (Ischemic stroke) comprising 16.67% of cases. Patient's death with graft function (DWGF) is the biggest setback of the transplant program and infections due to immune-compromised state, particularly in the early period, and cardiovascular events in the later period are major causes of mortality [9,10].

Conclusion

We analyzed demographic features of live renal transplant recipients and donors, causes of acute graft dysfunction, factors influencing delayed graft function, early postoperative complications, graft survival, and patient survival in patients undergoing live renal transplantation at our institute. On univariate analysis recipient gender and number of arteries in renal allograft had an influence on slow/delayed graft function at a statistically significant level. The early and intermediate-term patient and graft outcomes (one-year and three-year patient and graft survival) and surgical complications

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were satisfactory and comparable to those in other centers. Infections and low socioeconomic status-related non-compliance to immuno-suppressive drug regimens were the major causes of graft and patient loss at our institute.

References

1. Neuen BL, Chadban SJ, Demaio AR, Johnson DW, Perkovic V. Chronic kidney disease and the global NCDs agenda. BMJ Glob Health. 2017 Jul 6;2(2):e000380. doi: 10.1136/bmjgh-2017-000380. PMID: 29225940; PMCID: PMC5717948.
2. Modi G, Jha V. Incidence of ESRD in India. Kidney Int. 2011 Mar;79(5):573. doi: 10.1038/ki.2010.477. PMID: 21321559.
3. Shroff S. Current trends in kidney transplantation in India. Indian J Urol. 2016 Jul-Sep;32(3):173-4. doi: 10.4103/0970-1591.185092. PMID: 27555672; PMCID: PMC4970385.
4. Perović S, Janković S. Renal transplantation vs hemodialysis: cost-effectiveness analysis. Vojnosanit Pregl. 2009 Aug;66(8):639-44. doi: 10.2298/vsp0908639p. PMID: 19780419.
5. Tonelli M, Wiebe N, Knoll G, Bello A, Browne S, Jadhav D, Klarenbach S, Gill J. Systematic review: kidney transplantation compared with dialysis in clinically relevant outcomes. Am J Transplant. 2011 Oct;11(10):2093-109. doi: 10.1111/j.1600-6143.2011.03686.x. Epub 2011 Aug 30. PMID: 21883901.
6. MERRILL JP, MURRAY JE, HARRISON JH, GUILD WR. Successful homotransplantation of the human kidney between identical twins. J Am Med Assoc. 1956 Jan 28;160(4):277-82. doi: 10.1001/jama.1956.02960390027008. PMID: 13278189.
7. Kobayashi K, Censullo ML, Rossman LL, Kyriakides PN, Kahan BD, Cohen AM. Interventional radiologic management of renal transplant dysfunction: indications, limitations, and technical considerations. Radiographics. 2007 Jul-Aug;27(4):1109-30. doi: 10.1148/rg.274065135. PMID: 17620470.
8. Kwapisz M, Kieszek R, Jędrzejko K, et al.: Predictive Factors of Immediate Graft Function for Living Donor Kidney Transplant. International Journal of Medical Research & Health Sciences. 2018, 7:103-8.
9. Jha V. Post-transplant infections: An ounce of prevention. Indian J Nephrol. 2010 Oct;20(4):171-8. doi: 10.4103/0971-4065.73431. PMID: 21206677; PMCID: PMC3008944.
10. Stoumpos S, Jardine AG, Mark PB. Cardiovascular morbidity and mortality after kidney transplantation. Transpl Int. 2015 Jan;28(1):10-21. doi: 10.1111/tri.12413. Epub 2014 Aug 20. PMID: 25081992.
11. Bamgboye EL. Barriers to a functional renal transplant program in developing countries. Ethn Dis. 2009 Spring;19(1 Suppl 1):S1-56-9. PMID: 19484877.
12. Ojo AO, Wolfe RA, Held PJ, Port FK, Schmouder RL. Delayed graft function: risk factors and implications for renal allograft survival. Transplantation. 1997 Apr 15;63(7):968-74. doi: 10.1097/00007890-199704150-00011. PMID: 9112349.
13. Chang P, Gill J, Dong J, Rose C, Yan H, Landsberg D, Cole EH, Gill JS. Living donor age and kidney allograft half-life: implications for living donor paired exchange programs. Clin J Am Soc Nephrol. 2012 May;7(5):835-41. doi: 10.2215/CJN.09990911. Epub 2012 Mar 22. PMID: 22442187; PMCID: PMC3338279.
14. Siedlecki A, Irish W, Brennan DC. Delayed graft function in the kidney transplant. Am J Transplant. 2011 Nov;11(11):2279-96. doi: 10.1111/j.1600-6143.2011.03754.x. Epub 2011 Sep 19. PMID: 21929642; PMCID: PMC3280444.
15. Nemati E, Einollahi B, Lesan Pezeshki M, Porfarziani V, Fattahi MR. Does kidney transplantation with deceased or living donor affect graft survival? Nephrourol Mon. 2014 Jul 5;6(4):e12182. doi: 10.5812/numonthly.12182. PMID: 25695017; PMCID: PMC4317718.
16. Hassanzadeh J, Hashiani AA, Rajaeefard A, Salahi H, Khedmati E, Kakaei F, Nikeghbalian

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S, Malek-Hossein A. Long-term survival of living donor renal transplants: A single center study. Indian J Nephrol. 2010 Oct;20(4):179-84. doi: 10.4103/0971-4065.73439. PMID: 21206678; PMCID: PMC3008945.

17. Pratschke J, Weiss S, Neuhaus P, Pascher A. Review of nonimmunological causes for deteriorated graft function and graft loss after transplantation. Transpl Int. 2008 Jun;21(6):512-22. doi: 10.1111/j.1432-2277.2008.00643.x. Epub 2008 Feb 7. PMID: 18266771.
18. Pascual J, Pérez-Sáez MJ, Mir M, Crespo M. Chronic renal allograft injury: early detection, accurate diagnosis and management. Transplant Rev (Orlando). 2012 Oct;26(4):280-90. doi: 10.1016/j.trre.2012.07.002. Epub 2012 Aug 17. PMID: 22902496.
19. Legendre C, Canaud G, Martinez F. Factors influencing long-term outcome after kidney transplantation. Transpl Int. 2014 Jan;27(1):19-27. doi: 10.1111/tri.12217. Epub 2013 Nov 8. PMID: 24138291.
20. Shrestha BM, Haylor JL. Factors influencing long-term outcomes following renal transplantation: a review. JNMA J Nepal Med Assoc. 2007 Jul-Sep;46(167):136-42. PMID: 18274571.

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