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Evaluation of long-term outcomes of deceased donor renal transplantation in patients with end-stage renal disease

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ABSTRACT

Introduction: Kidney transplantation is the most viable and cost-effective treatment option for patients with end-stage renal disease (ESRD). However, the limited availability of living donors opens up the option of utilizing deceased donor for kidney transplantation.
Objectives: This study evaluated the long-term graft and recipient outcomes of deceased donor kidney transplantation (DDRT) in patients with ESRD.
Patients and Methods: A retrospective analysis of ESRD patients who underwent DDRT (January 2002 to December 2018) was conducted. Transplant medical records were reviewed for the recipient's demographic profile, causes of ESRD, type of transplants, type of induction treatment, and five-year follow-up data related to graft survival and mortality.
Results: A total of 147 DDRT recipients with a mean age of 43.1 years were included. Male preponderance (66.67%) was observed. The common causes of ESRD were chronic glomerulonephritis (44.7%) and diabetic nephropathy (22.7%). Post-transplantation, patients were administered with induction therapy (anti-thymocyte globulin (ATG), 57.14%; basiliximab, 27.21%; and other induction agents, 15.65%). Patient survival rate at 1-year, 3-year and 5-year follow-up were 91%, 86% and 73%, respectively and graft survival rates were 89%, 79%, and 68%, respectively. Infection (87.07%) was the leading cause of death, followed by cardiovascular disease (11.56%).
Conclusion: Long-term outcomes up to 5-years related to patient survival and graft survival in ESRD patients' post-DDRT were satisfactory and suggested the use of DDRT as a replacement option for living donors.

Original

Implication for health policy/practice/research/medical education:
In a study on 147 deceased donor renal transplantation recipients with a mean age of 43.1 years, we found, long-term outcomes of deceased donor renal transplantation in patients with end-stage renal disease were satisfactory and suggested the use of deceased donor renal transplantation as a replacement option for living donors.
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Introduction

The global burden of patients with end-stage renal disease (ESRD) is rising at a humongous speed. The prevalence rate of chronic kidney disease in India has reached 10.2%, which is similar to the global prevalence rate of 13.4% (1,2). However, the incidence of ESRD in India is 151 cases per million populations and about 220 000–275 000 new patients need renal replacement therapy every year (3,4).

Between the available treatment modalities for ESRD patients, which include chronic dialysis and kidney transplantation, kidney transplantation has been proved to be associated with better survival rates, improved quality of life and cost-effectiveness (5-7). In India, the deceased donor organ donation rate has increased from 0.08 to 0.34 per million population per year while renal transplantation using a living donor is more frequent than using deceased donor (8-10). The lack of an effective organ procurement network, lack of facilities for taking care of potential donors, and poor public education are the main culprits for this disparity trend. However, the only possible solution to bridge the increasing gap between the demand

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for renal transplantation and available donor population is the deceased donor renal transplantation (DDRT). Several previous global, as well as Indian studies, have evaluated outcomes of DDRT in respective populations (11-16) are yielded inconsistent results on deceased donor renal transplantation patients survival and graft survival.

Objectives

The aim of present study is to determine the long-term outcomes related to graft and patients' survival in deceased donor kidney transplantation.

Patients and Methods

Patients

A retrospective analysis of 147 deceased donor renal transplants performed (January 2002 and December 2018) at department of nephrology, Sri Ramachandra institute of higher education and research, Chennai, India. Transplant medical records were reviewed and data were collected which included recipient's demographic profile, causes of ESRD, type of transplants,type of induction treatment, and five-years follow-up data related to graft survival and mortality.

Methods

All patients were recipients of the first transplant, and there were no cases of second transplant or ABO incompatible transplant. To lower the risk of acute allograft rejection, induction therapy was administered to all kidney transplant subjects with the tacrolimus-based immunosuppressive regimen. This included the use of either immunosuppressive agents like daclizumab, antithymocyte globulin (ATG), basiliximab or other agents. The induction agent protocol was a single dose of ATG and two doses of basiliximab on day 1 and day 4. Patients were followed up at one, three and five-year's intervals to determine graft survival and patients' survival rates.

Ethics issues

The study was conducted in accordance with Tenets of the Declaration of Helsinki. The present investigation was approved by the committee of clinical research ethics of Sri Ramachandra Institute of Higher Education and Research, Chennai, India.

Statistical analysis

All data were analyzed using the Statistical Package for Social Sciences (version 16.0; SPSS, Chicago). The qualitative data were expressed as frequency counts, percentages and the quantitative data were expressed as means with standard deviation (SD).

Results

The demographic characteristics of the studied individuals are documented in Table 1. Of the total 725 kidney transplant recipients screened, 578 (79.72%) were from living donors and 147 (20.28%) from deceased donors. The mean age of patients who received DDRT was 43.1 years. Amongst DDRT recipients, there were 98 (66.7%) males and 49 (33.3%) females (M: F ratio: 1:2). The primary kidney diseases were chronic glomerulonephritis (63.7%), diabetic nephropathy (18.7%) and hypertensive nephrosclerosis (6.6%). The primary renal diseases were chronic glomerulonephritis (n=80; 54.47%) followed by diabetic nephropathy (n=48; 32.60%) and chronic interstitial nephritis (n=19; 12.93%) were observed as causes of ESRD. Majority of patients received ATG (n=84; 57.14%) as the induction therapy while 40 patients (27.21%) received basiliximab and 23 patients (15.65%) received other induction agents (Table 1).

Table 1. Baseline characteristics of the study patients

Patient's characteristics	Patients with DDRT, N=147
Age (y), mean ±SD	43.1 ±10.7
Gender, No. (%)	
Male	98 (66.67)
Female	49 (33.33)
Causes of ESRD, No. (%)	
Diabetic nephropathy	48 (32.60)
Chronic glomerulonephritis	80 (54.47)
Chronic interstitial nephritis	19 (12.93)
Type of induction therapy, No. (%)	
ATG	84 (57.14)
Basiliximab	40 (27.21)
Others	23 (15.65)

ATG, antithymocyte globulin; DDRT, deceased donor renal transplant; ESRD, end-stage renal disease.

Kaplan-Meier survival analysis showed a decreasing trend in patient survival rates at 1-year (91%), 3-year (86%) and 5-year (73%) follow-up. Infection was the most prevalent cause of mortality observed in the majority of patients (n=128, 87.07%), while cardiovascular diseases contributed to 11.56% of deaths and remaining 1.36% of deaths were due to other reasons. Graft survival rates were highest at 1-year follow-up (89%) compared to those at 3-year (79%) and 5-year (68%) follow-ups (Table 2).

Discussion

The present study revealed that, the long-term outcomes related to graft and patient survival in patients with DDRT were acceptable. The mean age of patients with DDRT was 43.1 years and male preponderance was observed with male: female ratio of 2:1. These observations concord with the previous studies which reported mean age in the range of 36-51 years with male preponderance (11,13,17,18).

In the present study, the most common cause of ESRD was chronic glomerulonephritis (54.47%) followed by diabetic nephropathy (32.60%) and chronic interstitial nephritis (12.93%). A recent study by Tam et al (11) reported similar results showing the highest prevalence of

Table 2. Patients' follow-up data and patient survival and graft survival rate

Parameters	Patients with DDRT, N=147
Patient survival Probability (%)	
1-year	91
3-year	86
5-year	73
Graft survival probability (%)	
1-year	89
3-year	79
5-year	68
Causes of death	
Infection	128 (87.07)
Cardiovascular diseases	17 (11.56)
Others	2 (1.36)

chronic glomerulonephritis (63.7%) followed by diabetic kidney disease (18.7%) and hypertensive nephrosclerosis (6.6%) as primary renal diseases. Another Indian study by Kute et al, reported corroborative observations showing chronic glomerulonephritis and diabetic nephropathy as the common causes of ESRD (18). These results indicate that patients with primary renal diseases like chronic glomerulonephritis or diabetic nephropathy have a high risk of progressing to ESRD.

In the present study, individuals were followed up to five years post DDRT to assess long-term survival. Patient survival rate at 1-year, 3-year, and 5-year follow-up were 91%, 86% and 73%, respectively. However, mortality rates were highest at 5-year (27%) follow-up than those at 3-year (14%) and 1-year (9%) follow-up. Hence survival rates are decreasing at a constant rate with an increase in the follow-up time of these patients. However, these survival rates are in an acceptable range. Similarly, the probability of graft survival was highest at 1-year follow-up (89%) compared to those at 3-year (79%) and 5-year (68%) follow-ups. These results suggest that although, graft survival rate decreases from 1-year to 3-year o 5-year follow-up time, the long-term survival outcomes of graft survival were acceptable.

A recent Indian study by Gopalakrishnan et al, reported a similar decreasing trend in patient survival as well as graft survival during 5-year follow-up) (12). They showed patient survival was 80.34% at 1 year, 79.7% at 2 years, 78% at 3 years, and 76% at 5 years. The graft survival was 82.6% at 1 year, 82% at 2 years, 81.5% at 3 years, and 80% at 5 years. In another study from western India, patient survival rates at 1-year and 5-year follow-up were 81.7% and 77.5% and graft survival rates were 92.6% and 88.3%, respectively (16). The study by Swami et al (14), also showed 83.8% and 79.2% patient survival and 92% and 61.3% graft survival at 1-year and 3-year follow-up, respectively. These observations accord with the present study and suggest overall acceptable long-term outcomes of DDRT in patients with ESRD.

Studies by Swami et al (14) and Gopalakrishnan et al (12) have reported high mortality in 1-year post-transplantation and the most common cause of deaths was infection and sepsis. The present study reported infection as the most prevalent cause of mortality observed in the majority of patients (87.07%), while cardiovascular diseases contributed to 11.56% of deaths. A recent study by Tam et al, reported similar observations which showed the most common cause of death post-transplant was infection followed by cardiovascular disease in patients with ESRD (11). Observations of a study by Mohamed Ali et al, showing the majority of deaths due to infections and cardiovascular diseases, are parallel to the present study (19). The factors responsible for the high infection rate in these patients may include a delayed presentation and diagnosis, long duration of hemodialysis before the transplant, tropical climate, unhygienic conditions, and socioeconomic factors (20-22). In a previous study, Samhan et al, concluded that the recipients of renal allograft in developing countries may be more prone to infections, a leading cause of mortality (23).

Conclusion

The present study observations indicated the satisfactory long-term outcomes related to graft and patient survival in ESRD patient's post-DDRT up to 5 years and suggested the possible replacement of living donors with deceased donors in kidney transplantations in India.

Study limitations

Study limitations include a retrospective design of the study and lack of data related to the donor's demographic profile and clinical profile.

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Authors' contribution

JJ and VM conceived the study and collected the data. VK and JM performed the analysis. RE analyzed the data and drafted the final manuscript; all authors read, revised, and approved the final manuscript.

Conflicts of interest

None.

Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

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