

Outcomes of Advanced Age in Renal Transplantation

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Abstract

Introduction: Kidney transplantation (KT) is the preferred treatment modality for end-stage renal disease (ESRD). There are some professionals who believe advanced aged (AA) recipients (age ≥ 60 years) do less well with renal transplants and are therefore a poor use of a scarce resource.

Objective: Our objective was to identify outcomes in KT patients age ≥ 60 vs. age < 60 .

Methods: We conducted a ten-year retrospective cohort study of 1,685 consecutive adult (≥ 18 yrs.) cadaveric kidney transplants from January 1999 through December 2008. The impact of recipient and donor variables on the primary outcome was tested in exploratory univariate logistic regression analysis. Factors significantly associated with graft failure were entered into a multivariate logistic regression model.

Results: There were 500 (29.6%) patients age 60 and older. The mean age was 50.8 ± 13.7 years. Overall, 324 (19%) grafts failed after kidney transplant with a mean follow-up of 7.8 ± 3.6 years. The mean time to graft failure was 4.86 ± 3.42 years. During the same follow-up period, mortality occurred in 393 (23.3%) patients. Five recipient factors were associated with 5-year graft failure in the multivariate model: age, prior transplant, HLA mismatch, increased serum creatinine at initial discharge and delayed graft function. Likewise, expanded criteria donors were associated with increased 5-year graft failure. Interestingly, a unit increase (1-year) in recipient age was associated with a 3% decrease in odds of 5-year graft failure (OR=0.97; 95% CI [0.96-0.98]; $p < 0.0001$).

Conclusion: Based on outcomes, patients with advanced age should be considered for kidney transplantation. Further research is indicated to fully understand the contributors to superior graft survival and death in older transplant patients.

Introduction

ESRD is best treated with kidney transplantation. As we live longer and the rates of ESRD continue to increase, more patients with advanced age present for kidney transplantation [1,2]. Patients over the age of 50 comprise the majority of patients with ESRD (60%) [1]. Also, the numbers of older patients on the kidney transplant waitlist has nearly doubled in the prior decade, (1) and the rate of transplants over the age of 60 has increased [1,2]. The objective of our study was to evaluate the differences in organ and patient survival between renal transplant recipients age 60 years or greater vs. those younger than age 60.

Methods

After obtaining Institutional Review Board approval, we conducted a retrospective cohort study of consecutive adult patients (age ≥ 18) at our center who underwent kidney transplantation from January 1, 1999 – December 31, 2008. Patients were excluded if they received simultaneous organ transplantation or records were incomplete. Electronic medical records and the transplant database were reviewed on each patient during the dates of the study with a follow-up of 5 years. We examined the impact of various recipient and donor variables on patient and graft survival to fit a multivariate model. Continuous variables were reported as a mean

± standard deviation and compared using the Mann-Whitney U test. Categorical variables were compared using the Chi-squared test. Kaplan Meier analysis with the log-rank test was used for time to event analysis. The statistical significance for all comparisons was set at 5%. Data analyses were performed using SAS 9.4.

Results

Between January 1, 1999 and December 31, 2008, our center performed 1,857 adult (age ≥ 18) kidney transplants. We excluded 172 patients who underwent simultaneous kidney transplants with an additional solid organ transplant and/or their records were missing data. There was a total of N=1,685 transplant recipients from 1,383 donors. The mean age at transplant was 50.8 ± 13.7 years with 500 recipients (29.7%) age ≥60 and 1,185 recipients (70.3%) age <60. The mean body mass index was 26.8 ± 5.3 kg/m². The Caucasian race represented 71.4% of all recipients. A total of 202 (12%) patients underwent a prior solid organ transplant with 37 (18%) age ≥60 and 165 (82%) age <60 (Table 1)

Baseline Characteristics	Recipient(N = 1,685)	Donor(N= 1,383)
Age (yr.)	50.8 ±13.7	36.9 ±15.9
<60	70.30%	
≥60	29.70%	
Gender, Male	60.70%	53.70%
Body Mass Index (kg/m ²)	26.8 ±5.3	25.8 ±5.6
Race, White or Caucasian	71.40%	n/a
Previous organ transplantation, yes	12%	n/a
<60	81.80%	
≥60	18.20%	
Data are mean ±standard deviation or n (%).		

Table 1: Baseline Characteristics of Recipients and Donors.

Extended criteria donors (ECD) were allocated in 210 (12%) kidney transplants, with 115 (55%) age ≥ 60 and 95 (45%) age <60 (p< 0.0001) (Figure 1).

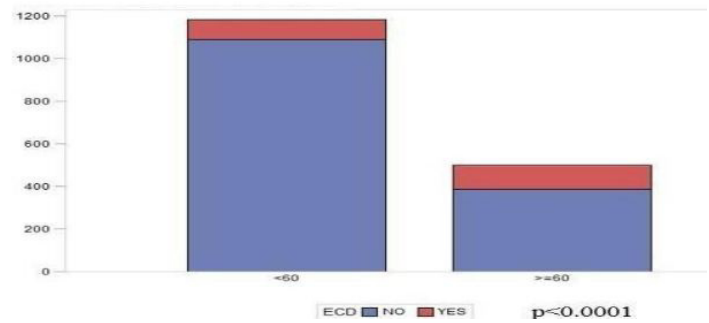


Figure 1: Expanded Criteria Donors by Recipients.

Extended criteria donors (ECD) were allocated in 210 (12%) kidney transplants, with 115 (55%) age ≥ 60 and 95 (45%) age <60 (p < 0.0001)

The length of stay was statistically significantly longer with 8 days for recipients age ≥ 60 and 7 days for recipients age < 60 (p = .02). There was no statistically significant difference in mortality during the transplant admission with 4 deaths (0.8%) in recipients age ≥60 and 5 deaths (0.4%) in recipients age <60 (p = 0.46). There were no statistical differences in infections or complications (MI, UTI, sepsis, pneumonia, DVT, cardiac stent, and stroke) within one year of kidney transplantation between the two groups (Table 2).

Outcomes and Complications	Age <60	Age ≥60	p-value
	(n=1,185)	(n=500)	
Delayed graft function	175 (14.8%)	83 (16.6%)	0.34
Length of hospital stay, median	7	8	0.02
In-hospital mortality	5 (0.4%)	4 (0.8%)	0.46
Myocardial Infarction	7 (0.6%)	5 (1.0%)	0.55
Urinary Tract Infection	142 (12.0%)	82 (16.4%)	0.22
Sepsis	36 (3.0%)	18 (3.6%)	1.00
Pneumonia	11 (0.9%)	11 (2.2%)	0.11
Deep Venous Thrombosis	34 (2.9%)	22 (4.4%)	0.31
Cardiac Stent	5 (0.4%)	1 (0.2%)	0.67
Stroke	3 (0.3%)	2 (0.4%)	0.67

Table 2: Patients Outcomes and Complications after Renal Transplantation.

After five years, we experienced 179 (10.6%) graft failures censored for patient death with 37 in age ≥ 60 vs. 142 in age <60 , with a mean time to failure of 4.86 ± 3.42 years ($p=.01$) (Figure 2).

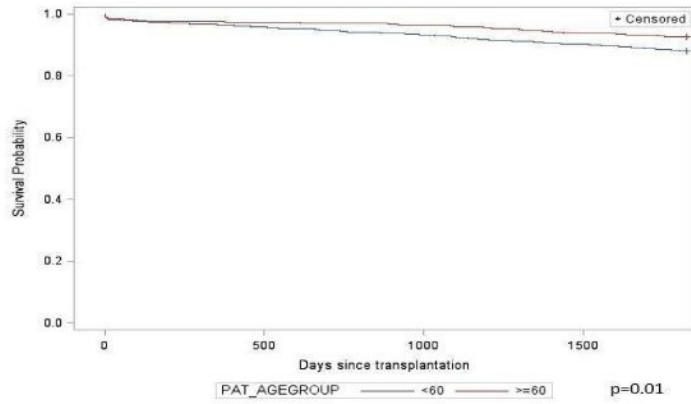


Figure 2: Kaplan-Meier Plot of Cumulative 5 Year Graft Failure Censored for Patient Death.

After five years, we experienced 179 (10.6%) graft failures censored for patient death with 37 in age ≥ 60 vs. 142 in age <60 , with a mean time to failure of 4.86 ± 3.42 years ($p=.01$) Five-year graft failure non-censored for patient death resulted in 320 events with 112 in age ≥ 60 vs. 208 in age <60 ($p=0.03$) (Figure 3).

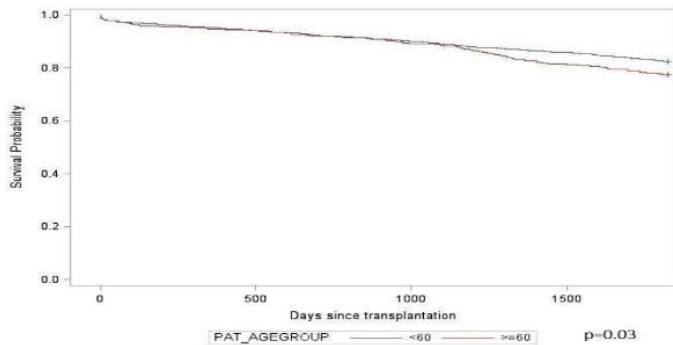


Figure 3: Kaplan-Meier Plot of Cumulative 5 Year Graft Failure Non-Censored for Patient Death.

Graft failure non-censored for patient death resulted in 320 events with 112 in age ≥ 60 vs. 208 in age <60 ($p=0.03$) The one-year patient survival for patients age ≥ 60 was 96.2% (19 deaths) vs. 97.9% survival for patients age <60 (25 deaths); $p = .05$ (Figure 4).

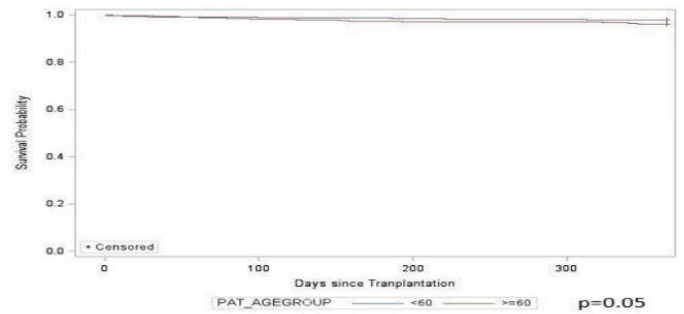


Figure 4: One-year patient survival.

The five-year patient survival decreased to 81.8% (91 deaths) for patients age ≥ 60 and 91.5% survival (101 deaths) for patients age <60 ($p < 0.0001$) (Figure 5).

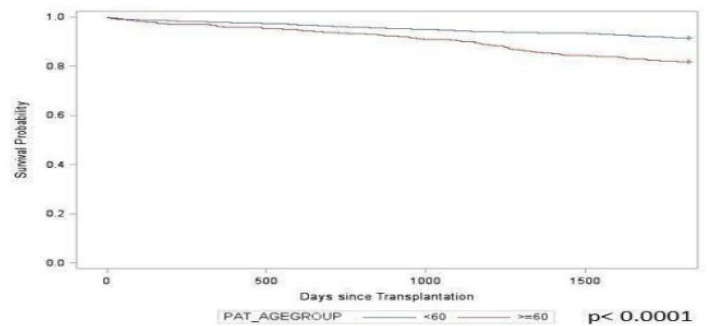


Figure 5: Five-year patient survival.

There were 5 recipient factors (age, prior transplant, HLA mismatch, increased serum creatinine at discharge and delayed graft function, and 1 donor factor (ECD) which correlated with 5-year graft failure (Table 3). Recipients age ≥ 60 y were 3% less likely to have graft failure unrelated to death when compared with the patients <60 y (OR=0.97 [0.96-0.98]; $p < 0.0001$).

Covariate	Odds ratio (95% CI)	p-value
Patient Age	0.97 (0.96-0.99)	<.0001
Prior transplant (No vs. Yes)	0.68 (0.42-1.00)	0.05
HLA mismatch	1.20 (1.08-1.33)	0.0009
Serum creatinine at discharge	1.50 (1.32-1.69)	<.0001
Delayed graft function (No vs Yes)	0.65 (0.43-0.99)	0.04

Expanded Criteria Donor (No vs Yes)	0.52 (0.33-0.82)	0.01
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Table 3: Significantly Correlated Recipient and Donor Variables.

Discussion

As the American population continues to age, and the epidemic of obesity continues, we can expect to transplant more and more patients over the age of 60 due to ESRD. Our study demonstrates there are recipient and donor factors associated with an increase in graft failure in kidney transplantation including but not limited to a prior transplant, HLA mismatch, extended criteria donors, serum creatinine increase and delayed graft function. However, advanced age of the recipient correlated with a 3% decrease in odds of 5-year graft failure. Studies have demonstrated a higher mortality rate for older kidney transplant patients [3-5] with no difference in death-censored graft survival suggesting that many older kidney transplant recipients may not live long enough to experience a graft failure. Our findings were consistent with a higher 5-year graft survival for patients age ≥ 60 (92.6%) vs. patients age < 60 (88%), ($p=.005$); yet a lower 5-year patient survival at 81.8% for patients age ≥ 60 vs. 91.5% for patients age < 60 ($p<.00001$) (Figure 5). Perhaps our outcomes are biased by a more comprehensive work-up or selection of our older patients as there were no statistical differences noted in our complications, and our older patients have a 1-day longer mean length of stay for the transplant admission (8 vs. 7 days; $p=.02$) (Table 2).

Despite these nuances, kidney transplantation even with advanced age provides a greater survival benefit over hemodialysis (16.1 death rate/100 patient-yrs.), and those on the transplant waitlist (6.3 death rate/100 patient yrs.) [6- 12]. Wolfe et al. [6] demonstrated the risk of transplant-related death was 2.8 times that of patients on the waiting list until 106 days post-transplant after which the risk of death becomes much lower for transplant recipients with similar survival in the two groups at 244 days. Our study indicated recipients age ≥ 60 y were 3% less likely to have graft failure compared with the patients < 60 y (OR=0.97 [0.96-0.98]; $p<0.0001$). The leading cause of death with advanced age kidney transplantation remains as cardiovascular disease and infection [13,14] our findings demonstrated lower survival rates in our advanced age renal transplant patients; however, there was no significant difference in cardiovascular or infectious complications during the transplant admission suggesting these events occurred later after discharge from the hospital.

Conclusion

The five-year graft survival for kidney transplantation in patients with advanced age (≥ 60) is better than with patients

< 60 . Recipients age ≥ 60 were 3% less like to experience graft failure unrelated to death when compared with patients

< 60 . In addition, the mortality outcomes of older patients with a transplant are better than similarly aged patients on dialysis or the transplant waitlist. These findings support continued efforts to transplant kidneys in patients with advanced age as expeditiously as possible. Our results are limited to a single center retrospective cohort study.

Conflict of Interest: The authors do not have any disclosures to report.

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