



Donor-Recipient Age Difference and Graft Survival in Living Donor Kidney Transplantation

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ABSTRACT

Background. In paired living kidney exchange donation from an old donor to a young recipient, it may be argued that elderly donors provide an inferior quality kidney. However, the impact of donors older than recipients on transplant outcomes remains unclear.

Methods. We retrospectively reviewed the charts of primary living kidney transplantation patients who were divided into two groups based on the age difference between donor and recipient (recipient age subtracted from donor age, donor-recipient < 20 vs ≥ 20). The donor-recipient age difference < 20 group comprised 75 and donor-recipient age difference ≥ 20 group, 25 subjects. Outcome measures included serum creatinine, acute rejection episodes as well as graft and patient survivals at 1 and 5 years after transplantation.

Results. The mean donor age difference cohorts of < 20 and ≥ 20 years showed donor ages of 33 ± 8 and 54 ± 8 years, respectively. The mean recipient age in both groups averaged under 40 years. The acute rejection rate within the first year posttransplantation was greater among age difference ≥ 20 years. The mean serum creatinine values of the donor-recipient age difference < 20 group was lower than the ≥ 20 years group at 1 and 5 years posttransplant. The 1-year difference was associated with an increased creatinine value at 5 years. However, death-censored graft survival of the age difference of the ≥ 20 years group was not different (hazard ratio [HR] = 0.1, 95% confidence interval [CI] = 0.01–1.37, $P = .08$). Patient survival of the age difference ≥ 20 years group showed no difference compared with the age difference < 20 years group (HR = 0.25, 95% CI = 0.01–6.35, $P = .4$).

Conclusion. Although the cohort of a donor-young recipient age difference ≥ 20 years showed a greater risk of an acute rejection episode early posttransplantation, it did not affect graft or patient survivals. When considering paired kidney donation, older age donors should not necessarily be limited.

THE LONG KIDNEY TRANSPLANT waiting list has led to the use of expanded-criteria donors and paired kidney donation. Over the past few years, the percentage of older living kidney donors has also increased, but transplantation of an old donor into a young recipient has been sometimes refused. Older living donors are presumed to provide an inferior-quality kidney and to elicit a greater immune response in young recipients.¹ However, the impacts of donor-recipient age difference on long- and short-term graft and patient survivals in living donor kidney transplantation are still uncertain.^{2–4} The goal of this study was to analyze the relationship between the donor-recipient

age difference on allograft outcomes among living donor renal transplantations.

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PATIENTS AND METHODS

We included primary living donor renal transplant recipients from 1992 to 2003 who received regular follow-up over 5 years. As much as possible, we excluded factors that affect patient and organ survival, such as retransplantation, multiple-organ graft recipients, recipient age > 50 years panel-reactive antibody > 30%, or cardiovascular disease history at transplantation. We included 100 patients with ≥ 80 mL/min/1.73 m² creatinine clearance, who were divided into two groups based on the donor versus recipient age difference (recipient age subtracted from donor age): <20 group ($n = 75$) and ≥ 20 group ($n = 25$). We analyzed biopsy-proven acute rejection episodes within the first year posttransplantation; mean serum creatinine values at 1 and 5 years posttransplant; death-censored graft survival rate; and patient survival.

Statistical Analysis

Continuous data are presented as mean values (standard deviations) and categorical data percentages. Categorical variables were compared using chi-square tests, and continuous variables using Student *t* test or the Mann-Whitney *U* test when appropriate. Patient and graft survival rates were analyzed using the Kaplan-Meier method. Cox regression analysis was used to obtain hazard ratios (HR). The analyses were performed using SPSS 15.0 (SPSS, Chicago, Ill, USA) with $P < .05$ considered to be statistically significant.

RESULTS

Mean recipient age among the donor-recipient age difference ≥ 20 years group was younger than the < 20 years cohort (Table 1). Mean serum creatinine values at 1 and 5 years posttransplant and biopsy-proven acute rejection episodes within the first year posttransplant are shown in Table 2. The donor-recipient age difference < 20 years group showed a better outcome in serum creatinine values (relative risk = 3, 95% CI = 1.29–4.72). Multivariate analysis of donor and recipient age, body mass index, dialysis duration, and diabetes in each group showed no impact on 1- and 5-year patient survivals in the two groups (HR = 0.25, 95% confidence interval [CI] = 0.01–6.35). There was no difference in death-censored graft survival

Table 1. Baseline Characteristics Classified by Donor-Recipient Age Difference

	< 20 y	≥ 20 y	<i>P</i> value
<i>n</i>	75	25	
Mean donor age (y)	33 \pm 8	54 \pm 8	<.001
Mean recipient age (y)	39 \pm 8	29 \pm 7	.01
Female donor (%)	40	64	.04
Female recipient (%)	39	20	.07
BMI (kg/m ²)	22 \pm 3	21 \pm 3	.47
Duration of dialysis (y)	3 \pm 5	28 \pm 4	.42
Diabetes (%)	4	0	.31
Immunosuppressants (%)			.32
Pd + CsA + MMF	74.7	84	
Pd + FK506 + MMF	25.3	16	
HLA-DR mismatch (<i>n</i>)	1 \pm 0.4	0.9 \pm 0.4	.69

BMI, body mass index; Pd, prednisolone; CsA, cyclosporine; MMF, mycophenolate; HLA, human leukocyte antigen

Table 2. Differences in Creatinine Levels and Acute Rejection Rate by Donor-Recipient Age Difference

Outcome	< 20 y	≥ 20 y	<i>P</i> value
Serum creatinine (mg/dL)			
1 y	1.1 \pm 0.5	1.5 \pm 0.5	.01
5 y	1.5 \pm 1.0	2.0 \pm 1.3	.04
Acute rejection rate (%)	10.7	32	.02

rate within the first 5 years posttransplantation between the <20 year and the ≥ 20 year group (96% vs 92%; HR = 0.1, 95% CI = 0.01–1.37; Fig 1).

DISCUSSION

In this study, mean serum creatinine values at 1 year posttransplant were associated with increased creatinine values at 5 years and related to an increased risk of an acute rejection episode within the first year posttransplant for the donor-recipient age difference ≥ 20 group. This result supports the assumption that older kidneys, when transplanted into younger recipients, can show a greater decline in renal function because of the lower functional renal mass, age-related predisposition to ischemia, and limited capacity to respond appropriately to physiological challenges.⁵ To better understand the relationship between donor-recipient age difference and allograft outcomes, we excluded variable recipient factors that affect survival rates. There was no difference in patient survival and death-censored graft survival rates within the first 5 years. However, 72/100 patients (data not shown) whose renal function has been followed 10 years after transplantation showed 80% (44/52) graft survival for the donor-recipient age difference < 20 years versus 65% (13/20) for the age difference ≥ 20 group. This result is distinct from the report that there is no difference in death-censored graft survival for a donor-recipient age difference > 30 years versus ≤ 10 –20 years within first 10 years post transplantation.⁶ In contrast, Noppakun et al reported recipients over the age of 50 years showed no difference in death-censored graft survival regardless of the donor's age. However, there was a difference in 10-year graft survival according to the donor age when the age of the recipient was less than 50 years.⁷

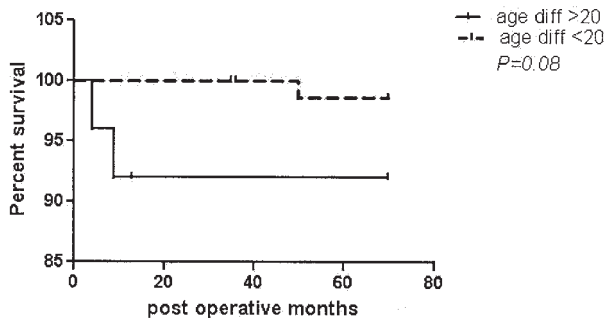


Fig 1. Kaplan-Meier graft survival by donor-recipient age difference.

Our data were similar to this result. Therefore, donor age could be an important determinant of organ survival among young recipients who have a low risk of death after transplantation. Recently, paired exchange kidney transplantation has been performed more frequently. However, when a young recipient matches with an old donor, the recipient tends to avoid the transplantation. Our study did not show an absolute effect of donor age.

Our study had a few limitations. The number of enrolled patients was few. Some confounding factors may be present.

However, our result that the donor-recipient age difference ≥ 20 years group showed no difference in 5-year survival compared with donor-recipient age differences < 20 years, which also showed a 65% 10-year-graft survival rate, was considerable. Nowadays, it is crucial for us to choose between the economic and health benefits of transplantation for waiting list patients on dialysis. From the results of our study, we should not unnecessarily limit an older donor age but carefully select older donors in the kidney matching programs.

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