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Renal Failure

ISSN: 0886-022X (Print) 1525-6049 (Online) Journal homepage: http://www.tandfonline.com/loi/irnf20

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To cite this article: Mrinal Pahwa, Arun Chawla, Tanveer I. Dar, Yusuf Saifee, Archna R. Pahwa, Vipin Tyagi, Sudhir Chadha & Harsh Jauhari (2014) Live donor kidney transplantation in India: effects of donor and recipient age on graft survival, Renal Failure, 36:2, 222-224, DOI: 10.3109/0886022X.2013.846795

To link to this article: http://dx.doi.org/10.3109/0886022X.2013.846795

Published online: 04 Nov 2013.

RENAL FAILURE

http://informahealthcare.com/rnf
ISSN: 0886-022X (print), 1525-6049 (electronic)

Ren Fail, 2014; 36(2): 222–224
 DOI: 10.3109/0886022X.2013.846795

informa healthcare

CLINICAL STUDY

Live donor kidney transplantation in India: effects of donor and recipient age on graft survival

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Abstract

Introduction: The increasing gap between demand and supply of human kidneys has resulted in the use of more expanded criteria donor organs are used. The influence of age on short- and long-term survival of renal allograft has not been well studied in Indian population. *Materials and methods*: Two hundred and seventy-eight patients were evaluated retrospectively who underwent kidney transplantation from Jan 2008 to June 2011. Patients were divided into 6 groups: group A (donor age 20–40 years, recipient age <50 years), group B (donor age 20–40 years, recipient age >50 years), group C (donor age 40–60 years, recipient age <50 years), group D (donor age 40–60 years, recipient age >50 years), group E (donor age >60 years, recipient age <50 years) and group F (donor age >60 years, recipient age >50 years). Uni-variate analysis was used to assess the effect of donor and recipient age as predictive factors for graft outcome, using the Kaplan–Meier method (log-rank) with $p < 0.05$ considered significant. *Results*: Graft survival was found to be lowest in elderly recipients and in patients with donor age >60 years. Renal function was superior using younger donors both in short and long term. The incidence of acute rejection was found to be lower in elderly donor group than in younger, although the difference was not statistically significant. *Conclusion*: Donor's higher age did not show significant impact on allograft survival although, kidney allografts demonstrated decreased short and long term renal function.

Keywords

Graft rejection, graft survival, living donor, primary graft dysfunction, renal transplantation

History

Received 24 July 2013
Revised 4 September 2013
Accepted 8 September 2013
Published online 4 November 2013

Introduction

Kidney transplantation is considered the best therapeutic option in end-stage renal disease (ESRD) because of improved quality of life and prolongation of survival for many recipients.[1] As the prevalence of ESRD increases in most countries, the demand for kidney transplantation exceeds the supply of available organs. As a result the use of donors above 50 years of age has increased in both deceased and living donor (LD) kidney transplantation. Indeed, currently 50% of all currently transplanted kidneys are from donors more than 50 years of age.[2] A further increase in older organ donors and recipients is to be expected, as changing demographics will impact the current age distribution of donor and recipients. The United Nations has predicted that the population of elderly individuals (>60 years) will increase worldwide from 580 million in 1998 to almost 2 billion in 2050.

Although transplantation of kidneys from older donors is generally considered beneficial as compared with dialysis, transplant outcome is critically influenced by donor age. However, adjusted annual death rates are higher whereas the estimated remaining lifetime is reduced when organs with suboptimal quality are grafted.[3] More recently, it has been shown that the benefit of older kidney transplants is linked to recipient criteria such as waiting time, cause of kidney failure, and age.[4] In addition, compromised repair mechanisms in older donor kidneys as a consequence of injuries such as the ischemia/reperfusion injury or brain death may also play a crucial role.[5]

The purpose of this study is to assess the influence of donor age on short-term and long-term graft survival in live related donor kidney transplantation.

Materials and methods

Five hundred and thirty-two patients who underwent kidney transplant from January 2008 till March 2011 were evaluated retrospectively for graft and patient survival. As preoperative evaluation, donors underwent the standard preanesthetic workup and viral serology. To evaluate the kidney function and anatomy, donors underwent nuclear renogram using DTPA and contrast enhanced computed tomography (CECT) of abdomen along with CT angiography of renal vessels. Recipients who got their kidneys from live related donors were only included. Patients with known causes of early graft

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dysfunction like cyclosporine toxicity, cytomegalovirus infection, sepsis, and acute tubular necrosis were excluded. Those patients who were lost to follow-up or whose follow-up details were not present were also not included in the study. Acute rejection episodes were confirmed by biopsy and included all episodes in first 3 months. After exclusion, 278 patients were divided into following 6 groups:

- Group A (donor age 20–40 years, recipient age <50 years)
- Group B (donor age 20–40 years, recipient age >50 years)
- Group C (donor age 40–60 years, recipient age <50 years)
- Group D (donor age 40–60 years, recipient age >50 years)
- Group E (donor age >60 years, recipient age <50 years)
- Group F (donor age >60 years, recipient age >50 years).

Around 140 patients were lost to follow-up and 112 patients were excluded as they developed early graft dysfunction or acute rejection. Furthermore 10 patients were excluded as they underwent cadaveric kidney transplant. Following parameters were studied in the sample population: serum creatinine at 7 days, 1 month, 6 months, 1 year and 3 years postoperatively. The follow-up ranged between 6 and 42 months. Uni-variate analysis was used to assess the effect of donor and recipient age as predictive factors for graft outcome, using the Kaplan–Meier method (log-rank) with $p < 0.05$ considered significant.

Results

Among 278 adult patients who underwent live kidney transplantation at our institution from January 2008 to March 2011, 213 were males (76.1%) with a mean age at transplantation of 39 years.

Patients were divided into six groups according to donor and recipient age. There was no statistically significant difference in serum creatinine values at 1 and 3 year ($p = 0.17$) between group A and F. Mean serum creatinine values at 1 and 3 years for all the groups were as shown in Table 1.

Among the 6 groups classified according to donor/recipient age matching: Group F (old donor/old recipient) had the lowest 1-year and 3-year graft survival rates of 86.95% and 86.95%, respectively. The cumulative incidence of acute rejection episodes among patients who received grafts from an older donor (>60 years) was lower (15.45% vs. 16.66%) than that for young donor grafts (20–40 years) but the difference was not statistically significant.

Kaplan–Meier survival curve allograft survival censoring for death with a functioning graft was not significantly different between the six groups ($p > 0.2$) (Figure 1).

Discussion

One of the major issues in kidney transplantation is the growing disparity between organ supply and demand, leading to longer waiting times and more deaths while awaiting the procedure. Some strategies, like the acceptance of allografts from older donors, have been presented to increase the donor pool. However, older donor age is associated with a higher prevalence of delayed graft function, an increased need for postoperative dialysis and a higher serum creatinine level at discharge among recipients of older donor kidneys.[6]

Sakellariou et al. reported the results of engrafting living donor kidneys from age-matched recipients, showing no difference in graft survival between kidneys from living donors older versus younger than 45 years.[7] Darmady observed that the 5-year graft survival rate of kidneys from donors between age 21 and 30 years was twice that obtained with donors between age 61 and 84 years.[8] Also, the United Network of Organ Sharing (UNOS) registry from 1987 to 1995 showed an 81% 5-year survival rate of HLA-matched kidneys for donors aged 21–30 years. This success decreased to 39% when the donor age was 60 years.[9] Other studies have reported conflicting results: Morrissey et al. reported superior renal function among kidney allografts from younger donors. Comparing older versus younger donors in the same study, allograft survivals at 1, 2, and 3 years, which were censored for death with a functioning allograft, did not differ.[10] Another study, Stratta et al. noted no differences in patient and kidney graft survival rates and morbidity between

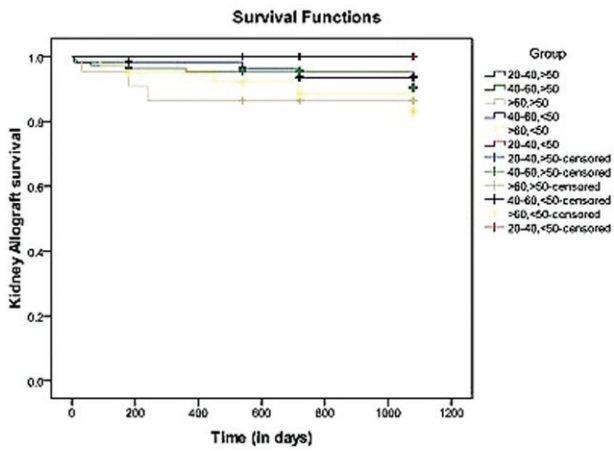

Figure 1. Kaplan–Meier survival curve estimates of allograft survival censored for death with allograft function comparing six groups. Graft survival was similar between the groups ($p > 0.2$, log rank test).

Table 1. Table showing acute rejection rates, S. Creatinine values and graft survival in all the groups.

	Group A	Group B	Group C	Group D	Group E	Group F
Number of patients	61	56	61	31	46	23
Acute rejection (%)	14.75	14.28	18	16.12	19.3	23.4
Serum creatinine						
1 yr	1.19	1.4	1.68	1.46	1.6	1.83
3 yr	1.27	1.53	1.82	1.64	1.72	1.95
Graft survival						
1 yr	96.72	94.64	91.8	93.54	91.3	86.95
3 yr	91.8	92.85	88.52	90.32	89.13	86.95

younger versus older donors: initial, 1-week, as well as 1-, 3-, 6-, 12- and 18-month graft functions were also similar.[11]

Darmady postulated that the higher graft failure rate of older kidneys may be due to nephron aging changes with ''decreased adaptability'' after transplantation.[8] But Speybroeck et al. suggested the cause of the graft failure would more likely be immunologic or technical rather than directly attributable to ''nephron aging''.[12] Fijter et al. suggested that the loss of older kidneys was related to an increased incidence of acute rejection episode in the first few post-transplantation months.[13] Grafts from older donors may already display tissue inflammation at the time of procurement and transplantation, which in turn may increase immune recognition.

In our study, kidney allografts from older donors displayed a higher incidence of acute graft rejection and higher serum creatinine values at 1 and 3 years after kidney transplantation. These factors did not affect graft survival, which was similar, although a little lower, comparing older versus younger donors. The current study indicated that the use of older donors presents an increased but acceptable risk for graft function and survival, which must be weighed against the patient's expected survival and the risks of continuous dialysis.

Declaration of interest

The authors report no conflict of interest and no source of funding.

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