Living Donor Transplantation: Long-Term Evolution Related to Age Matching

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ABSTRACT

The lack of donors is favoring living kidney donor (LKD) transplantation worldwide, quite often beyond the classic age-matching rules. We analysed renal function (RF) at 1 and 5 years in all donor and recipients as well as death-censored graft and patient survival. LKD recipients were divided into 4 subgroups: young recipients-young donors (YR-YD; N = 355), elderly recipients-young donors (ER-YD; N = 13), young recipients-elderly donors (YR-ED; N = 67), and elderly recipients-elderly donors (ER-ED; N = 38). "Elderly" was defined as ≥60 years. RF was better in those who received a young allograft (YR-YD/ER-YD) at any time ($P < .001$). There was a trend toward higher proteinuria among the recipients of an old allograft (YR-ED/ER-ED) at any time (P = not significant [NS]). However, our population showed low levels of proteinuria and this was not a risk factor for graft failure. Logistic regression model showed that creatinine level at 1 year is a good predictor of graft losses. Graft survival was worse in the allografts from elderly donors ($P < .001$). Analysing the young recipients, renal survival was inferior in those who received an old kidney (YR-ED; $P < .00005$) as well as mortality rates at 14 years ($P = .03$). The RF of young (N = 295) and elderly donors (N = 98) was optimal with no progression to ESRD or deaths registered during follow-up. In conclusion, young recipients of elderly kidneys pay the price of a worse RF, allograft prognosis, and patient prognosis. The pair YR-ED is a doable option, but we recommend age matching when it is possible.

END-STAGE RENAL DISEASE (ESRD) is an increasing problem worldwide. Kidney transplantation is the best treatment in terms of patient survival, quality of life, and long-term costs. In contrast, the waiting lists are becoming longer, which is making the matching criteria more flexible with time. Among different options, living kidney donation (LKD) appears to have the best clinical outcomes and is another good source of allografts. In this scenario, greater flexibility is especially reflected in age matching transgressing the classical rule of "old-for-old" and "young-for-young." Our aim was to study the renal function (RF), allograft survival, and patient survival of living donors and recipients in 2 European centers.

METHODS

We retrospectively studied living kidney donors and recipients from 2 hospitals: Charité Campus Mitte (Berlin) and Hospital Clinic (Barcelona).

All cases included were adults. Variables were collected at 1 and 5 years after transplantation.

The cut-off age to create comparative groups was set arbitrarily at 60 years.

Initially, 4 cohorts were created according to age at time of transplantation: young recipients (YR), young donors (YD), elderly recipients (ER), and elderly donors (ED). To make a deeper analysis, 4 subgroups were created among the recipients again depending on the age at transplantation: (1) young recipients-young donors (YR-YD); (2) elderly recipients-young donors (ER-YD); (3) young recipients-elderly donors (YR-ED); and (4) elderly recipients-elderly donors (ER-ED). Normal variables were expressed as mean ± standard deviation and t test was performed as an inference method. Asymmetric variables were expressed as median with its interquartile range and

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0041-1345/15
http://dx.doi.org/10.1016/j.transproceed.2015.09.002

Table 1. Four Main Group Characteristics

Variable	YR	YD	ER	ED	*P*
Sample size (N)	408	295	65	98	
Age (y)	38 ± 11	45 ± 8	64 ± 4	65 ± 4	<.05
Gender	M = 62%	M = 38%	M = 65%	M = 28%	<.05
	F = 37%	F = 62%	F = 35%	F = 72%	
Proteinuria/24 h (1 y)	157 (110–239)	107 (76–141)	215 (129–404)	101 (78–129)	<.05
Proteinuria/24 h (5 y)	157 (98–352)	95 (72–128)	180 (90–548)	105 (78–137)	<.05
Systolic BP (1 y)	121 ± 34	126 ± 12	120 ± 43	127 ± 27	NS
Systolic BP (5 y)	123 ± 23	122 ± 14	141 ± 18	122 ± 10	<.05
Diastolic BP (1 y)	71 ± 21	76 ± 9	63 ± 23	72 ± 15	NS
Diastolic BP (5 y)	75 ± 14	77 ± 10	72 ± 7	71 ± 7	NS
CMV (IgG positive)	28.9%	21.7%	38.5%	25%	<.05
HCV (antibodies)	5.1%	0%	6.2%	0%	-

Abbreviations: M, male; F, female; BP, blood pressure; NS, not significant; CMV, cytomegalovirus; Ig, immunoglobulin; HCV, hepatitis C virus.

nonparametric tests (Kruskal-Wallis, Mann-Whitney, and Wilcoxon) were used. Nominal data were analyzed using the chi-square test. Survival analysis was performed in the 4 groups of recipients using Kaplan-Meier estimates. Death-censored allograft survival was recorded at 5 years. The statistical method used to establish differences in survivals rates was the log-rank test. Statistical difference was set at <.05. Multivariate analysis using multiple regression was conducted to determine which variables were related to the main events in our study: graft losses and patient deaths. Confidence interval was set at 95%.

RESULTS

A total of 866 patients were included. Demographic and main characteristics are depicted in Tables 1 and 2.

As shown in Table 2, cytomegalovirus (CMV) were more prevalent in the ER-YD, whereas positive hepatitis C virus serology (HCV) was more frequent in the ER-ED subgroup.

RF

In Fig 1, serum creatinine and Modification of Diet in Renal Disease-4 (MDRD-4) are shown. RF significantly improved at 5 years in the donors. However, the recipients had worse RF at 5 years with significance only in the young recipients ($P < .0001$).

When it comes to the recipient subgroup analysis, RF was better in those who received a young allograft (YR-YD/ER-YD) at any time ($P < .001$).

Proteinuria

Proteinuria was higher in recipients than in donors at any time point (Table 1), without significant intragroup changes over time (P = not significant [NS]).

Recipients of an old allograft (YR-ED/ER-ED) had higher levels of proteinuria at 5 years (Table 2).

Analyzing the evolution of proteinuria with time, the YR-ED cohort was the only group that showed a trend to increase at 5 years whereas the rest tended to decrease (P = NS).

In general, proteinuria was low and could not be identified as a risk factor for graft loss in our patient cohort.

Table 2. Main Characteristic of the Recipient Subgroups

Variable	YR-YD	ER-YD	YR-ED	ER-ED	*P*
Sample size (N)	355	13	67	38	
Age (y)	38 ± 12	63 ± 3	40 ± 9	65 ± 4	.0001
Gender	H = 61%	H = 62%	H = 58%	H = 68%	.05
	M = 39%	M = 38%	M = 42%	M = 32%	
Proteinuria/24 h (1 y)	160 (108–269)	176 (108–370)	198 (139–524)	242 (118–344)	NS
Proteinuria/24 h (5 y)	155 (95–355)	112 (58–667)	240 (142–444)	186 (133–645)	.049
Diabetes (1 y)	2.8%	7.7%	7.5%	10.5%	
Diabetes (5 y)	2.5%	7.7%	7.5%	10.5%	
Systolic BP (1 y)	119 ± 33	125 ± 43	126 ± 38	116 ± 45	.0001
Systolic BP (5 y)	123 ± 21	138 ± 19	123 ± 29	143 ± 17	.0001
Diastolic BP (1 y)	70 ± 20	67 ± 23	73 ± 22	60 ± 23	.0001
Diastolic BP (5 y)	75 ± 14	75 ± 9	74 ± 18	70 ± 5.8	.0001
CMV	27.3%	84.6%	31.3%	36.8%	.002
HCV	4.8%	0%	6%	10.5%	-
Time on dialysis (d)	898 (304–2952)	1129 (541–1842)	1119 (403–2181)	750 (412–1422)	NS
Cold ischemia (min)	55 (45–60)	52 (41–71)	45 (38–71)	50 (40–69)	NS
Warm ischemia (min)	128 (2–249)	4 (1–219)	2 (1–180)	127 (3–186)	NS
DGF	6/157 (3.8%)	1/13 (7.7%)	3/31 (10.7%)	0/19 (0%)	-

Abbreviation: DGF, delayed graft function.