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The use of elderly living donors in renal transplantation

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Abstract. The safety and the results of using living donors above the age of 60 years were studied. In 235 consecutive donors the complications were not different in elderly ($n = 70$) compared to younger donors. Graft survival and function were studied in 232 consecutive 1-HLA-haplotype mismatched grafts. Graft survival at 1 year was equivalent (87% vs. 92%), but after 2–6 years graft survival was inferior in recipients of older grafts ($n = 62$). The recipients of older grafts were 10 years older, and patient death with functioning graft was a more frequent cause of graft loss. Up to 4 years serum creatinine levels were significantly higher, but stable, in recipients of older grafts; at 5 years the difference was not significant. It is concluded that the use of elderly living donors is safe. Taking recipient age into consideration, graft survival is not different in the two groups. Graft function in older grafts is some what inferior, but stable.

Key words: Living donors, elderly – Elderly kidney donors

The use of living donors in renal transplantation is by no means universally accepted [5], and the guidelines for screening potential donors differ. Bay and Hebert [1] stated that age greater than 55 years was a criterion for exclusion as a living donor. Their survey of twelve other US centres revealed a similar practice [1]. At our centre living-donor transplantation accounts for approximately 35% of all kidney transplants and we have never imposed an upper age limit for accepting living donors.

The purpose of this study was to elucidate the short-term complication rate in younger and elderly donors, and to evaluate the influence of donor age on the results of living donor transplantation.

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Material and methods

Short-term complications (within 3 months) were recorded in all living donors ($n = 235$) nephrectomized between 1 March 1985 and 1 January 1988. Younger donors (mean age 42.0 years, range 21–59 years; $n = 165$) were compared with elderly donors (mean age 66.2 years, range 60–81 years; $n = 70$).

In order to study the influence of donor age on graft survival (GS) and function, all HLA-haploidentical living donor transplantations ($n = 232$) performed between 1 January 1983 and 1 January 1988 were analysed. All recipients were followed-up until 1 January 1990 with no exclusions. Grafts from younger donors (mean age 41.4 years, range 22–54 years; $n = 170$) were compared with grafts from elderly donors (mean age 66.3 years, range 60–81 years; $n = 62$). All recipients were treated with cyclosporin and prednisolone. After 1 March 1985 the patients were randomized to treatment with either cyclosporin/prednisolone or cyclosporin/prednisolone/azathioprine. During follow-up cyclosporin treatment was discontinued in 11 patients (seven out of 170 patients with younger donor grafts, and four out of 62 patients with older grafts). Rejections were treated with intravenous bolus doses of methylprednisolone and steroid-resistant rejections (always verified by graft biopsy) were treated with anti-thymocyte globulin (Fresenius).

In order to study the influence of recipients' age on GS, those aged above and below 55 years at transplantation were compared. The age limit of 55 years was chosen because this is near the mean age for all patients starting renal replacement therapy in Norway.

The donors were selected on the basis of no symptoms or signs of cardiovascular, pulmonary or renal disease, Albustix-negative urine with normal sediment, normal serum creatinine and creatinine clearance above 90, 80 and 70 ml/min per 1.73 m^2 for donors aged < 60, 60–70 and > 70 years, respectively. Creatinine clearance was deter-

Table 1. Number (percentage) of complications in elderly and younger donors

Complication	Donor age (years)	
	> 60 ($n = 70$)	< 60 ($n = 165$)
Postoperative pneumonia	9 (13)	18 (11)
Blood transfusion	5 (7)	7 (4)
Wound infection	1 (1)	2 (1)
Myocardial infarction	1 (1)	0
Peri/postoperative atrial fibrillation	2 (3)	0

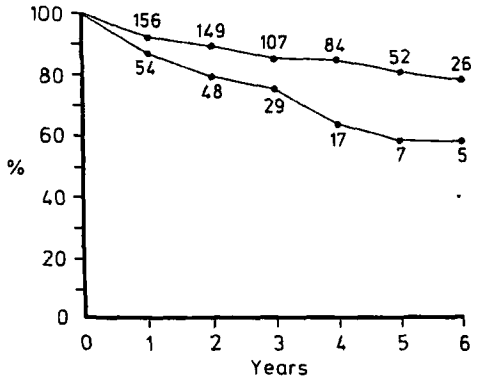

Fig. 1. Actuarial graft survival with numbers at risk in recipients of grafts from donors above *(lower line)* and below *(upper line)* the age of 60 years

mined in duplicate and in the case of borderline values supplemented by isotope determination of GFR and ERPF. Otherwise the preoperative workup of the donors followed the guidelines given by Bay and Hebert [1].

Statistical methods

Actuarial GSs were calculated by the Kaplan-Meier method. Differences between the groups were tested with the two-tailed T-test of two independent sample means (serum creatinine) and the Chi-squared test (graft survival).

Results

Short-term complications in donors below vs. above 60 years of age are given in Table 1. The incidence of postoperative pneumonia requiring antibiotic therapy, wound infection and the need for blood transfusion were equal in the two groups. The most serious complication was a non-fatal myocardial infarction in a 65-year-old donor who had concealed from us that he suffered from angina pectoris, knowing that this would have excluded him as a donor for his son. He later successfully underwent coronary by-pass surgery. No donor death has been recorded.

Actuarial GS in recipients of HLA-haploidentical grafts from donors below vs those above 60 years of age is shown in Fig. 1. One-year GS was equivalent (92 vs. 87%, $P > 0.05$), while GS after 2–6 years was higher in recipients of younger grafts. GS after 6 years was 78% in recipients of younger grafts vs. 58% in recipients of older grafts. Mean age of recipients of younger grafts was 32.5 years compared to 42.8 years of recipients of older grafts.

Table 2. One-year graft survival

Recipient age (years)	Donor age (years)				Total	
	>60		<60			
	Graft survival (%)	No. of transplants	Graft survival (%)	No. of transplants	Graft survival (%)	No. of transplants
>55	69	13	91	22	83	35
<55	92	49	92	148	92	197
Total	87	62	92	170		

Table 3. Causes of graft loss

Cause of loss	Donor age (years)			
	>60 ($n = 62$)		<60 ($n = 170$)	
	No. of losses	Percentage loss	No. of losses	Percentage loss
Patient death with functioning graft	10	16.1	13	7.6
Rejection	9	14.5	12	7.1
Recurrence of primary renal disease	1	1.6	6	3.5

Since GS appeared to be influenced by recipient age (1-year GS 92% and 83% in recipients younger and older than 55 years, $P < 0.05$; Table 2), transplantations were stratified for donor as well as recipient age. One-year GS was significantly influenced by donor age in elderly ($P < 0.05$), but not in younger recipients (Table 2).

Causes of graft loss are given in Table 3. Patient death with functioning graft was a more frequent cause of graft loss in recipients of older grafts (16% of all recipients vs. 8% of the recipients of younger grafts, $P < 0.05$).

Mean serum creatinine was significantly higher in recipients of older grafts after 1–4 years (Fig. 2). At 5 years the difference was not significant. The numbers at risk at each point are given in Fig. 1.

Discussion

The use of elderly living donors raises the important questions as to whether it is safe for the donor and concerning the long-term results in these grafts. The short-term complications were not different in the elderly compared with the younger donor group. The long-term complications were not evaluated in the present study. In a previous long-term follow-up study [9] we found that the compen-

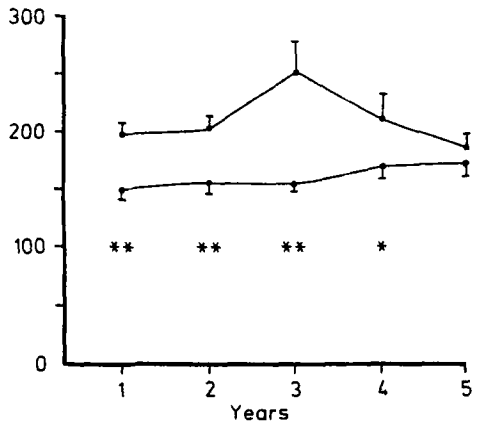

Fig. 2. Serum creatinine (μmol/l) in recipients of grafts from donors above *(upper line)* and below *(lower line)* the age of 60 years (mean values with indication of SEM). * $P < 0.05$; ** $P < 0.01$

satory increase in creatinine clearance in the remaining kidney was inversely related to donor age. Increase in blood pressure or urinary protein excretion at follow-up were not related to donor age. The long-term effects on renal function and blood pressure in renal donors are, for obvious reasons, of less concern in the elderly group. With the selection criteria used, we have not seen any cases of chronic renal failure in elderly donors, and the lowest value for creatinine clearance at follow-up was 39 ml/min per 1.73 m^2 [9].

It has been suggested that kidneys from elderly living donors do less well after renal transplantation [3, 8]. However, short-term results [2, 4, 6, 7] do not reveal any difference in GS. The groups compared are, however, small and in most of the studies [2, 6, 8] donor age below or above 45 to 50 years is compared. Grekas et al. [4] compared small groups of recipients (12–25 patients) of grafts from living donors below 50 years, 51 to 65 years and above 66 years of age, and could not find any difference in patient survival or GS after 1–2 years.

Recipient age has been shown to affect post-transplant survival and function, and as pointed out by Matas et al. [6] all survival studies must take recipients age into account. In our study GS in recipients of younger and older grafts was equal after 1 year, while 1-year GS was inferior in elderly recipients. After 2–6 years the GS was somewhat inferior in the recipients of older grafts, mostly due to a higher rate of patient death with functioning graft in this group. The difference in the mean age of 10 years between the two groups may explain this. We also found a higher rate of graft loss due to histologically verified rejection in the recipients of older grafts. The limited functional reserve of kidneys from older donors may be more easily exhausted by insults both from rejections and perhaps also from cyclosporin nephrotoxicity. The rate of cyclosporin discontinuation was, however, low and not different in the two groups.

Sakellariou et al. [7] could not find any difference in GS up to 6 years comparing grafts from living donors above and below the age of 60 years. They observed, however, an unexplained but significant higher mortality rate in the recipients of younger grafts (34%) compared to recipients of older grafts (13%).

In earlier reports [2, 4] no significant differences in graft function related to donor age were found, but the observation time was only 1–2 years. In our study graft function evaluated by serum creatinine was inferior in the recipients of older grafts, but up to 5 years the difference and the creatinine values were stable. The difference in graft function could be expected from the decline of renal function with age. Both the stable serum creatinine and the stable GS after 4 years may indicate that late graft loss due to slow deterioration of renal function in grafts from elderly donors will not be a problem within this time period.

The use of elderly donors is safe and, taking recipient age into consideration, GS is not much different in grafts from younger donors. The recipients of grafts from elderly living donors have a higher, but stable, serum creatinine at 1–5 years. The elderly donor group is often well motivated and represents an important donor source.

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