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Expanded Criteria Donors for Kidney Transplantation: Quality Control and Results

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ABSTRACT

Although the number of kidneys from expanded criteria deceased donors (ECDs) is growing in most transplant centers, the limits for acceptance of these kidneys and the safety standards have still not been fully established. We evaluated 342 kidney transplants performed between January 1999 and December 2004. In 77 (22.5%) of these, the kidneys were from ECDs, that is, donors age >60 years and with one of the following characteristics: hypertension, death due to cerebrovascular accident (CVA) or glomerular filtration rate (GFR) <70 mL/min. The results of the ECD transplants were compared with 265 transplants during the same period from standard donors (SDs), that is, donors age <60 years and GFR > 70 mL/min. All the ECD kidneys underwent biopsy and were accepted for transplantation only if the score was <7. The ECDs (66.5 ± 4.3 years) in comparison with the SDs (48.0 ± 16.0 years) had a greater frequency of death due to CVA (94.8% vs 49.8%) and a lower GFR (80.4 ± 25.0 vs 111 ± 41.6 mL/min; $P < .05$). Of the ECDs, 97.4% had a history of hypertension versus 24.3% of the SDs. Kidney biopsies were performed in 116 SD kidneys because the donor age was >55 years or there was a history of hypertension. The median score for the kidney biopsies of the ECD kidneys was 3 versus 2 for the SD kidneys. Graft survival was not significantly different until the fifth year. The GFR at 12 months was significantly different (SDs, 58.0 ± 22.7 vs ECDs, 48.9 ± 16.5 mL/min; $P < .05$). Although the GFR in the ECD kidneys was lower than that of the SD kidneys, it could still be adequate for recipients older than 50 years of age. Accordingly, the acceptance criteria for ECD kidneys based mainly on the kidney biopsy score and donor GFR benefit the recipients.

THE EVER-GROWING NEED for more organs to be made available for transplantation has encouraged the search for the limits of donation. Accordingly, the criteria to accept kidneys for transplantation have been expanded and organs are now being transplanted that only a few years ago would not have been accepted. The use of these organs is necessary in order that a greater number of possible recipients may benefit. Thus, donors older than 60 years of age composed 38.2% of all donors in Spain in 2004. Unfortunately, 24.6% of the kidneys retrieved were not considered suitable for transplantation.[1] The donors whose kidneys were most often discarded were older than 60 years of age, had died due to cerebrovascular disease, and had accompanying disease. These marginal donors are considered to be expanded criteria donors (ECDs), and they can provide valid organs once any structural or functional alterations have been ruled out, thereby maintaining or increasing the number of possible kidneys available for transplantation in most centers. The uncertainty surrounding where to place the limits for acceptance or refusal of these marginal donors, without reducing the quality of life and life expectancy of the recipient, are still under debate.[2]

PATIENTS AND METHODS

We studied 342 kidney transplantations performed between January 1999 and December 2004. In 77 (22.5%) of these, the kidneys were from ECDs, that is, donors older than 60 years of age and with one of the following: hypertension, death due to cerebrovascular

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Table 1. Main Characteristics of Organ Donors and Transplant Recipients

	Donors					Recipients				
Kidneys From	Age (y)	CVA (%)	HT (%)	GFR (mL/min)	RB Score	Age (y)	Cold Ischemia (h)	PN, *n* (%)	Delayed Graft Function, *n*, (%)	GFR_{12m} (mL/min)
SD (n = 265)	44.8 ± 16.0	49.8	24.3	111 ± 41.6	2.3 ± 1.8, #2	49.8 ± 13.0	15.3 ± 4.9	7 (3.0)	141 (53.2)	58.0 ± 22.7
ECD (n = 77)	66.5 ± 4.3*	94.8*	97.4*	80.4 ± 25*	4.2 ± 1.8, #3	58.7 ± 7.8*	15.3 ± 4.6	3 (3.8)	46 (59.7)	48.9 ± 16.5*

Plus-minus values are mean ± SD; # median; $P < .05$.

SD, standard donors; ECD, expanded criteria donors; RB, renal biopsy (median); PN, primary nonfunction; GFR, glomerular filtration rate; HT, hypertension; CVA, cerebrovascular accident.

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accident (CVA) or glomerular filtration rate (GFR), calculated from the Cockroft-Gault equation, below 70 mL/min. The kidneys obtained from multiorgan donations were perfused with Wisconsin solution and maintained in simple hypothermia until implantation. All the ECD kidneys were studied by emergency wedge biopsy, which the pathologist evaluated and scored semiquantitatively (0 to 3), according to five types of alterations: glomerular sclerosis, hyaline arteriolopathy, vascular intimal fibrosis, tubular atrophy, and interstitial fibrosis. Kidneys were accepted for transplant if the score was ≤7. The basic immunosuppression was triple therapy (steroids, cyclosporine, or tacrolimus and mycophenolate mofetil).

Thirty-two percent of older recipients received induction with anti-IL-2R monoclonal antibodies (basiliximab or daclizumab), together with a delay until posttransplant day 4 to 7 in the introduction of calcineurin inhibitors. The results of the transplants were compared with 265 transplants during the same period but with the kidneys proceeding from standard donors (SDs), that is, donors age <60 years and GFR > 70 mL/min. Differences between groups were compared with the Wilcoxon and chi-square tests as appropriate. Survival was estimated by Kaplan-Meier and compared with the log-rank test.

RESULTS

Table 1 shows the main features of the donors and kidneys that were suitable for transplantation. The ECDs were logically older and had a greater frequency of death due to CVA, a history of hypertension, and a lower GFR than the SDs. The median kidney biopsy score for the ECD was 3 versus 2 for the SD (P = NS). Kidney allocation was based on compatibility of blood group, HLA matching, and a negative cross-match. No differences were detected between the groups in cold ischemia time, delayed graft function, or primary graft failure. The presence of urological complications, however, was more common in the ECD recipients. The GFR at 12 months was significantly different (ECD, 48.9 ± 16.5 vs SD, 58.0 ± 22.7 mL/min; $P < .05$). No differences were detected in graft survival at 12, 24, or 60 months between the ECDs (89%, 85%, 79%) versus SDs (89%, 84%, and 82%, respectively).

DISCUSSION

Those kidneys from ECDs older than 60 years of age and with a suitable gross appearance and biopsy score had an acceptable function and similar survival to those obtained from ideal or standard donors younger than 60 years of age. The only appreciable differences in the evolution of the two types of kidneys concerned the number of urological complications, which were more common in the ECD kidney recipients. The arbitrary score of 7 for the biopsy may occasionally result in possibly valid kidneys being discarded, though a safety margin is reasonable to favor a judicious use of these kidneys, since in the best cases the mass of nephrons in the ECD kidneys is near the limit for these kidneys to be transplanted individually and to reach a sufficient function to maintain the recipients, who are preferably age matched, out of dialysis, with a good quality of life, and with a greater survival than if they had continued on dialysis.[3] Transplanting kidneys with a reduced nephron mass according to age and associated vascular disease makes them more vulnerable, or sensitive, to cold ischemia and acute rejection, which would result in a reduced residual kidney function; accordingly they should be transplanted as soon as possible and with individualized immunosuppression schedules.[4]

Different studies agree that the preimplant kidney biopsy is an objective test, useful to minimize the uncertainty associated with postimplant renal function.[5] It provides sufficient information to discriminate between apparently similar donor kidneys. Serum creatinine, as a calculated glomerular filtrate, seems to be less precise due to the interference of transitory hemodynamic factors, to a greater or lesser extent, during the preextraction dying phase. Our experience suggests that the score in the ECD kidney biopsy enables ECD kidneys to be accepted or refused with greater guarantees. Nevertheless, preimplant kidney biopsy is still not universally accepted, since frozen pathological studies are less precise and have greater interobserver variation.[6]

The tendency to distribute ECD kidneys to older recipients should be considered as a safety measure, since older recipients are less liable to episodes of acute rejection and because survival of their kidney function is somewhat lower, and therefore less transcendental than in younger recipients.[7]

The limits for ECD kidneys to be used in our series resulted in a significant safety margin, quality of the kidneys, and suitability for transplantation. Widening the limits of acceptability of ECD kidneys will require analysis of series with wider margins.

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