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Middle and Long-term Outcomes of Dual Kidney Transplant: A Multicenter Experience

S.V. Impedovo, E. De Lorenzis, A. Volpe, L. Gesualdo, G. Grandaliano, S. Palazzo, G. Lucarelli, C. Bettocchi, C. Terrone, P. Stratta, M. Quaglia, M. Battaglia, and P. Ditonno

ABSTRACT

Introduction. Dual kidney transplantation (DKTx) to reduce the disparity between demand and supply of organs was evaluated in two Italian centers (Bari and Novara).

Materials and Methods. Between October 2000 and October 2011, we performed 97 DKT (26 ipsilateral/71 bilateral) following routine biopsy of all kidneys obtained from expanded criteria donors by Remuzzi-Karpinsky scores. The reference group was 379 single grafts from donors older than 60 years single kidney transplantation ([SKT] $\times >$ 60).

Results. Good postoperative renal function was observed in 56 DKTx (57.7%); whereas acute tubular necrosis requiring dialysis was observed in 41 (42.3%) patients. After a mean follow-up of 60 months, DKTx graft survivals were 96%, 93%, and 90% and patient survivals, 96%, 91%, and 91% at 1, 3, and 5 years, respectively. Complications in expanded criteria donor kidney transplantations included a high rate of cytomegalovirus (CMV) disease especially dual kidney cases. DKTx represented the only independent risk factor for CMV disease upon multivariate analysis (odds ratio [OR] 2.33, 95% confidence interval [CI] 1.28–4.2; $P = .006$). We did not observe any significant difference in graft or patient survival between DKTx and SKTx $>$ 60 years.

Conclusions. We observed good outcomes up to 5 years after transplantation in terms of graft and patient survival despite the use of inferior grafts. Comparing DKTx and SKT $>$ 60, we noted that the mean Karpinski score for SKTx was significantly better than DKTx, although patient and graft survivals were similar. This trend confirms that the use of a biopsy to allocate expanded criteria donor kidneys may be too protective; therefore, the criteria to select DKTx require further refinement.

THE success of kidney transplantation over the past 20 years has led to increased use of this therapy, the "gold standard" treatment for patients with end-stage renal disease (ESRD), for it improves quality of life and long-term survival. However, the lack of donations on the one hand and the growing number of patients who develop ESRD on the other hand, have increased the gap between the demand for and supply of organs. To address the critical shortage of donor kidneys, the use of cadaver kidneys from suboptimal donors, referred to as expanded criteria donors,[1] has been adopted at transplantation centers. Some expanded criteria organs are discarded because they do not have the appropriate characteristics to ensure sufficient renal function in a recipient. To overcome this problem, two organs from the same donor may be allocated to a single recipient seeking to provide adequate a nephron mass not possible with a single kidney from that donor.[2] In these cases, it is essential to establish the quality of the kidney before surgery. To make this assessment, one can evaluate renal function, history of hypertension, cause of

From Urology, Andrology and Kidney Transplantation Unit (S.V.I., S.P., G.L., C.B., M.B., P.D.), the Renal, Dialysis and Transplantation Unit (L.G., G.G.), Department of Emergency and Organ Transplantation, University of Bari, Bari; and the Urology, Nephrology and Kidney Transplantation Unit (E.D., A.V., C.T., P.S., M.Q.), University of Easter Piedmont, Azienda Ospedaliero-Universitaria "Maggiore della Carità", Novara, Italy.

Address reprint requests to Stefano Vittorio Impedovo, Department of Emergency and Organ Transplantation, Urology, Andrology and Kidney Transplantation Unit, Piazza G. Cesare 11, 70124 Bari Italy. E-mail: stefanovittorio@gmail.com

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death, macroscopic appearance, and histological examination. Based on these evaluations, the transplantation team may decide to use the kidney. In this study, we evaluated the outcomes of dual kidney transplantations (DKTx) performed in two Italian transplantation centers (Bari and Novara) for middle- and long-term results compared with single kidney transplantations (SKTx) from donors older than 60 years (SKTx > 60 years).

PATIENTS AND METHODS

All kidney transplantations were performed in two transplantation centers (Bari and Novara; Italy) between February 1998 and October 2011 or November 1998 and October 2011, respectively.

The study focused on DKTx and SKTx from donors older than 60 years. DKTx was adopted first in October 2000 at the Bari center and in June 2004 at the Novara center. Expanded criteria donors were defined by United Network for Organ Sharing criteria as those older than 60 years, or between 50 and 60 years with at least 2 risk factors (hypertension, serum creatinine ≥1.5 mg/dL, and cerebrovascular cause of death).[3] Beyond these criteria, we considered expanded criteria donors to be those with prolonged cold ischemia times or a history of drug abuse regardless of age. Routine biopsy of all kidneys obtained from expanded criteria donors were histologically evaluated using the system proposed by Remuzzi-Karpinsky.[4] Only biopsy specimens with at least 25 glomeruli per kidney were considered to be representative of the organ. Using these criteria, a graft was considered suitable for SKTx if the global score was between 0 and 3; DKTx for 4–6. If the global score was over 6, it was discarded. Selection criteria for DKTx were based on age over 45 years, no previous graft, AB0 compatibility, negative crossmatch, and best possible HLA A, B, and DR match. The patients who entered the DKTx waiting list showed low immunological risk as evidenced by a low panel reactive antibody. Dual kidneys were prepared as two single kidney transplants on the back table.

The surgical technique was ipsilateral in 26 and bilateral in 71 DKTxs. The monolateral placement of both kidneys was performed extraperitoneally through a single, longer paramedian incision; ureters anastomosed side-to-side at their spatulated ends were reimplanted into the bladder using the Lich-Gregoire technique. Bilateral DKTx used kidney placements extraperitoneally through two separate Gibson incisions (n = 61) or one midline approach (n = 10). All ureters were stented with double J catheters 4.7Ch. Kidney rejection was monitored by laboratory findings.

All DKTx recipients underwent antibody induction therapy with an interleukin 2 receptor (IL-2R) inhibitor (basiliximab [20 mg pretransplantation and on posttransplantation day 4]; n = 89; 91.7%) or antithymocyte globulin (1 mg/kg/d for 5 to 7 days; n = 8; 8.3%). Five patients (5.1%) received cyclosporine-based (trough levels 180 to 200 ng/mL) and 90 patients (92.7%) tacrolimus-based maintenance treatment (trough levels 8 to 12 ng/mL). Two recipients (2.2%) were prescribed mammalian target of rapamycin inhibitor. All patients underwent a tapered steroid regimen; methylprednisolone 500 mg perioperatively, 125 mg in the first day after surgery, 75 mg on the second day, and prednisone 25 mg for the next 15 days. Mycophenolate mofetil (2 g/d) was started on the first day.

Delayed graft function was considered if the recipient required at least one dialysis in the early posttransplantation period. Primary nonfunction (PNF) was defined as a case when the renal graft never worked at any time during the posttransplantation evolution with recipient continuing to require dialysis.

Cytomegalovirus (CMV) infection was determined by laboratory or clinical effects: namely, antigenemia (leukocyte antigen pp UL83 [pp65] or of CMV DNA by polymerase chain reaction, or gastrointestinal disease, encephalitis, retinitis, nephritis, or myocarditis and/or indirect effects like fungal or bacterial superinfections.

The donor variables collected from the data base were: age, gender, body mass index (BMI), cause of death, serum creatinine levels, and clearance at the time of the death, and Remuzzi biopsy score. Recipient-dependent variables were: age, gender, BMI, renal failure etiology, dialysis time, cold ischemia duration, immediate renal function, delayed graft function, PNF, hospital stay, acute rejection episodes, CMV disease, actuarial graft and patient survivals, complications, and causes of death.

The results of the quantitative variables were expressed as mean values ± SD and those of the qualitative variables, proportions. Student *t* and chi-square tests were used to test differences between the quantitative and qualitative variables, respectively. Multivariate analysis by logistic regression was performed to determine the CMV risk. Graft and patient survivals were calculated with Kaplan Meier analyses. The log-rank test was used to compare survival curves. Two-tailed tests were used for all comparisons; $P < .05$ was considered statistically significant (using MedCalc Software, version 9.2.0.1, Ostend, Belgium).

RESULTS

In the two transplantation centers, the 97 DKTx had a The mean follow-up time was 52.4 (± 32.3) months. Table 1 shows the DKTx donor and recipient characteristics.

The causes of ESRD among DKTx recipients were undetermined (n = 48), glomerular nephropathy (*n* = 18), chronic pyelonephritis (n = 18), autosomal-dominant polycystic kidney disease (n = 7), hypertensive nephroangiosclerosis (n = 4), lupus nephritis (n = 1), or gestosis (n = 1).

Good postoperative renal function was observed among 56 DKTx patients (57.7%), whereas acute tubular necrosis requiring dialysis developed in 41 (42.3%) patients.

Table 1. Baseline Donor and Recipient Characteristics

Donors	
Mean age (y)	71.3 ± 8.4 (33–88)
Male/female	48/49
Cerebrovascular death (%)	81.9%
Mean estimated creatinine clearance by MDRD formula (mL/min)	56.7 mL/min ± 17.4 (16.6–104)
Mean serum creatinine (mg/dL)	1.2 mg/dL ± 0.58 (0.5–4.5)
Mean Remuzzi-Karpinsky score	4.4 ± 1
Mean cold ischemia time (h)	21.7 ± 4.3 (10–36)
Mean BMI (kg/m^2)	25.8 ± 3.85 (17.6–40.8)
Recipients	
Mean age (y)	57.2 ± 5.7 (45–71)
Male/female	58/39
Mean BMI (kg/m^2)	25.0 ± 4.1 (17.2–40)
Mean time of dialysis before transplantation (mo)	60.4 ± 37.9 (9–144)

Abbreviations: MDRD, Modification of Diet in Renal Disease; BMI, body mass index.