Dual Kidney Transplant: A Single-Center Experience and Review of the Literature

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Abstract

Objectives: Adult dual kidney transplant is a strategy to overcome the imbalance between limited nephron mass supplied from an older donor and a recipient with a metabolic request.

Materials and Methods: In our report, we review the literature and present our single-center experience. From June 2007 until July 2012, nine hundred twenty-eight single and seventeen dual kidney transplants from deceased donors were performed.

Results: The average donor was 71.5 ± 3.6 years of age with an average serum creatinine, creatinine clearance, and an average number of sclerotic glomeruli, 106.1 ± 44.2 µmol/L, 0.97 ± 0.37 mL/s, and 22.4 ± 14.2. Immediate graft function and acute rejection episodes were observed in 75% and 6% of patients. The overall patient survival rates at 1 and 2 years after transplant were 93%. The overall graft survival rates at 1 and 2 years were 88%.

Conclusions: Previous studies and our single-center experience suggest that the dual transplant procedure may help improve results of kidney transplants from expanded criteria donors and extend the donor pool by using kidneys that would be discarded otherwise.

Key words: Dual kidney transplant, Elderly donors, Expanded criteria donors

Introduction

Earlier, we would reject organs from donors over 60 age years because of fear of diminished posttransplant function.1 In 2002, extended criteria donors (ECDs) began to be used in clinical transplant.2 However, the discard rate of these marginal donor organs was twice that of standard criteria donors (SCDs).3 One strategy in overcoming the imbalance between the limited nephron mass (supplied from older donors) and the metabolic request of the recipient is dual kidney transplant (DKT). The first DKT was performed in the United States in 1996 by Johnson and associates.4 We review the data and present our single-center experience with adult DKT.

Review of the literature

This review focuses mainly on selection of donors; it briefly describes surgical technique, immunosuppression, and posttransplant results in DKT in adults. As the data source, MEDLINE database was used. We used OVID, PubMed, and Web of Science searching platform until 2012 to collect the most relevant data. Key words were used: “dual/double” and “kidney/renal” and “transplantation.” From 84 papers, there were 55 journal articles, 22 case reports, and 7 review articles.

Selection of donors for dual kidney transplant

An accurate selection of kidneys for DKT remains crucial. There is always a chance that the selected kidneys might be suitable for single kidney transplant (SKT).5 Therefore, the role of a DKT remains unclear and is a matter of debate. Despite the proposed criteria from both retrospective and prospective studies (Table 1), selection of donors for DKT has no uniformity among transplant centers.6 Generally, donor age, donor renal function on
Table 1. Review of the Main Studies Relating to Adult Dual Kidney Transplant

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Type of Study</th>
<th>No. DKT</th>
<th>FU</th>
<th>Selection Criteria</th>
<th>Patient Survival (mo)</th>
<th>Graft Survival (mo)</th>
<th>Conclusion of the Study Highlights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remuzzi and associates</td>
<td>1999</td>
<td>P, MC</td>
<td>24</td>
<td>6</td>
<td>Age &gt; 60 y or history of HT/DM or proteinuria &lt; 3 g/24 h + Remuzzi score 4 to 6</td>
<td>100% (6)</td>
<td>100% (6)</td>
<td>AR and major surgical complication were comparable with SKT from ideal donors</td>
</tr>
<tr>
<td>Andres and associates</td>
<td>2000</td>
<td>P, SC</td>
<td>21</td>
<td>15 ± 5</td>
<td>Age 60 to 74 y with GS 15% to 50%, age ≥ 75 with GS &lt; 50%</td>
<td>100% (12)</td>
<td>95% (12)</td>
<td>PNF, AR were comparable with SKT, IF was significantly higher comparable with SKT</td>
</tr>
<tr>
<td>Bunnapradist and associates</td>
<td>2003</td>
<td>R, MC</td>
<td>403</td>
<td>36</td>
<td>Kidneys not suitable for SKT according UNOS</td>
<td>--</td>
<td>62% (36)</td>
<td>PNF was higher, DGF. AR was comparable with SKT and overall graft survival was lower, apart from DKT with donors over 55 y of age when graft survival was comparable with SKT.</td>
</tr>
<tr>
<td>Alfrey and associates</td>
<td>2003</td>
<td>R, MC</td>
<td>287</td>
<td>60</td>
<td>Kidneys refused for SKT</td>
<td>--</td>
<td>86% (12)</td>
<td>DGF was predictor for graft outcomes, graft survival is similar with SKT from donors 50 to 64 years old</td>
</tr>
<tr>
<td>Remuzzi and associates</td>
<td>2006</td>
<td>P, MC</td>
<td>54</td>
<td>14-36</td>
<td>Age &gt; 60 y + Remuzzi score 4 to 6</td>
<td>94% (26)</td>
<td>94% (26)</td>
<td>Kidneys from donors older than 60 years of age can provide excellent renal function for up to 3 years after transplant, providing that they are allocated as single or dual transplants according to biopsy findings before transplant.</td>
</tr>
<tr>
<td>Gill and associates</td>
<td>2008</td>
<td>R, MC</td>
<td>625</td>
<td>36</td>
<td>UNOS criteria if any 2 of the following criteria exist: age &gt; 60 y, eGFR &lt; 65 ml/min, sCr &gt; 2.5 mg/dL; HT or DM; GS ≥ 15% &lt; 50%</td>
<td>--</td>
<td>79.8% (36)</td>
<td>DGF was less than in SKT of ECDs and similar than in SKT of SCDs, PNF, AR was lower than in the SKT of ECDs. Graft survival (up to 4 y) was similar with SKT of ECDs and lower than in SKT of SCDs.</td>
</tr>
<tr>
<td>Andres and associates</td>
<td>2009</td>
<td>R, MC</td>
<td>85</td>
<td>36</td>
<td>Age 60-74 y with GS 15% to 50%, age ≥ 75 with GS &lt; 50%</td>
<td>--</td>
<td>83% (36)</td>
<td>Kidneys from donor age &gt; 60 y were discarded for transplant mainly because there was no elderly recipient on the waiting list and because of macroscopic or microscopic alterations.</td>
</tr>
<tr>
<td>Snanoudj and associates</td>
<td>2009</td>
<td>P, MC</td>
<td>81</td>
<td>35.1</td>
<td>eGFR of 30-60 ml/min + age &gt; 65 y</td>
<td>95.1% (12)</td>
<td>92.6% (12)</td>
<td>Allocation of kidneys for DKT according to parameters described by Remuzzi and associates, Andres and associates, and UNOS did not indicate an improvement in 12-month eGFR compared to allocation based on donor eGFR.</td>
</tr>
<tr>
<td>Fontana and associates</td>
<td>2010</td>
<td>R, SC</td>
<td>59</td>
<td>36</td>
<td>ECD + Remuzzi score 4-6</td>
<td>93% (36)</td>
<td>86.3 (36)</td>
<td>Remuzzi score is suitable for the organ allocation but it may be overprotective, excluding potentially suitable organs for a single transplant.</td>
</tr>
<tr>
<td>De Serres and associates</td>
<td>2010</td>
<td>R, SC</td>
<td>63</td>
<td>56</td>
<td>Age &gt; 75 y refused for SKT or age &gt; 75 y with sCr &lt; 1.2 mg/dl without proteinuria, GS ≥ 50%</td>
<td>98% (24)</td>
<td>90% (24)</td>
<td>DKT patients can expect long-term results comparable with single kidney ECD and increase the pool of organs from marginal donors.</td>
</tr>
<tr>
<td>Hugen and associates</td>
<td>2011</td>
<td>R, MC</td>
<td>60</td>
<td>12</td>
<td>No standard criteria with selection based on the decision at each individual center</td>
<td>93% (12)</td>
<td>87% (12)</td>
<td>DKT with successful 1-year graft survival has a lower percentage of glomerulosclerosis (13.9% vs 18.5%, P = .024), lower degree of interstitial fibrosis, and a lower final resistance (0.31 vs 0.39, P &lt; .001) as discarded kidneys.</td>
</tr>
<tr>
<td>Timsit and associates</td>
<td>2011</td>
<td>R, SC</td>
<td>55</td>
<td>34.1</td>
<td>ECD + eGFR 30 to 60 ml/min</td>
<td>97.9% (12)</td>
<td>97.9% (12)</td>
<td>After single graft loss in DKT recipient, renal function at 3 months and 1 year was significantly inferior compared with the function of both grafts in DKT recipient.</td>
</tr>
<tr>
<td>Nardo and associates</td>
<td>2011</td>
<td>R, MC</td>
<td>80</td>
<td>60</td>
<td>ECD + Remuzzi score 4 to 6</td>
<td>97.5% (60)</td>
<td>93.7% (60)</td>
<td>Preimplantation biopsy is an absolute criterion to allocate ECD kidneys to SKT/DKT or discard.</td>
</tr>
<tr>
<td>Cruzado and associates</td>
<td>2011</td>
<td>R, SC</td>
<td>79</td>
<td>120</td>
<td>ECD + Remuzzi score 4 to 6</td>
<td>60% (120)</td>
<td>93% (60)</td>
<td>Graft survivals were better in DKT than in DKT with 1 graft loss.</td>
</tr>
<tr>
<td>Fernández-Lorente and associates</td>
<td>2012</td>
<td>R, SC</td>
<td>88</td>
<td>120</td>
<td>ECD + Remuzzi score 4 to 6</td>
<td>44% (120)</td>
<td>53% (120)</td>
<td>DKT should be considered for Remuzzi score of 5 or 6 only.</td>
</tr>
</tbody>
</table>

**Abbreviations:** AR, allograft acute rejection; DGF, delayed graft function; DKT, dual kidney transplant; DM, diabetes mellitus; ECD, expanded criteria donor; eGFR, estimated glomerular filtration rate; FU, patient’s follow-up (mo); GS, percentage of sclerotic glomeruli; HT, hypertension; IF, immediate function; MC, multicenter; No. DKT, number of patients with dual kidney transplant; P, prospective; PNF, primary nonfunction; R, retrospective; SC, single center; SCD, standard criteria donors; sCr, serum creatinine; SKT, single kidney transplant; UNOS, United Network for Organ Sharing.
admission, history of hypertension or diabetes, preimplantation kidney histology, and pulsatile perfusion parameters have been used as scoring parameters. Donor estimated glomerular filtration rate (eGFR) is a criterion used for decision making in DKTs. Centers participating in dual kidney groups perform DKT with kidneys from donors with eGFR under 1.5 mL/s and > 55 years of age that have been refused for single organ transplant by local centers. However, subsequent analyses of these patients reveals that the recipients of DKTs from donors 54 to 60 years old had low serum creatinine levels up to 2 years after transplant and that may mean that these kidneys could have been used for an SKT.

Singh and associates found that donors with an eGFR of 1.2 mL/s for a DKT was a better discriminator kidney transplant function than was an eGFR of 1.5 mL/s. In a recent prospective study, Snanoudj and associates found that a donor eGFR between 0.5 and 1.0 mL/s was easily applicable to allocate ECD kidneys from donors over 65 years of age for a DKT. This finding also was confirmed by Timsit and associates, in which kidneys with an eGFR of 0.5 to 1.0 mL/s from ECD donors were used for DKTs.

Current United Network for Organ Sharing (UNOS) guidelines recommend considering DKTs if any 2 of the following criteria are present: donor age > 60 years old; an eGFR < 1.1 mL/s, rising serum creatinine at the time of recovery > 221 μmol/L; donor medical history (defined as either long-standing hypertension or diabetes mellitus); donor kidney histology (defined as moderate to severe glomerulosclerosis > 15% and < 50%). Another approach for using kidneys for a DKT is preimplantation biopsy results in an ECD. In 1999, the International Panel of Pathologists suggested a biopsy-based scoring system for older kidneys with scores ranging from a minimum of 0 (no lesions) to a maximum of 12 (marked changes in vessels, glomeruli, tubules, and connective tissue). Kidneys with a score of 3 or lower were recommended for single transplants, and scores between 4 and 6 were considered suitable for DKTs. Kidneys with a score of 7 or more were discarded. A prospective matched cohort study showed that kidneys from donors > 60 years of age were allocated to DKTs according to the Remuzzi histologic score providing they had the same graft function at 6 months as renal grafts did from ideal donors. This result also was confirmed in another prospective study by Remuzzi with a longer follow-up.

In a recent retrospective study, Fernández-Lorente and associates analyzed the effect of preimplantation histologic scores in SKTs and DKTs. Those authors confirmed that in SKTs, long-term graft survival was similar for histologic scores of 4 and ≤ 3, and in both cases, better than 5. Conversely, in DKTs, histologic scores of 4, 5, or 6 had no effect on graft survival. These results suggest that only scores of 5 and 6 should be allocated for DKTs.

The percentage of sclerotic glomeruli alone is a widely accepted parameter associated with poorer graft outcomes in SKTs and often used as a scoring parameter for DKTs. A group of Spanish authors allocated kidneys for DKTs based on donor age over 75 years or, in donors aged 60-74 years with glomerulosclerosis between 15% and 50%. In retrospective study of the UNOS data, graft with glomerulosclerosis over 20% had a similar 1-year graft survival in SKT and DKT patients. A composite score, including clinical, perioperative, and histologic parameters, also is used for DKT selection. In a study by Dietl and associates, scores based on donor age, serum creatinine, kidney weight, and degree of glomerulosclerosis was used to allocate kidneys for single or dual transplant. For each parameter, the score was 0 or 1 according to the values below or above a predefined cut-off level of 65 years for age, 159 μmol/L for serum creatinine, 30% for the degree of glomerulosclerosis, and 300 g both kidneys). The score of 1 or less resulted in an SKT, the score of 2 resulted in a DKT, and the score of > 2 resulted in refusal of the organs. At 1 year, such SKTs had similar graft survival but worse graft function when compared with dual transplant recipients.

Increasing use of pulsatile machine perfusion for ECD kidneys offered additional data that could be used for decision-making regarding kidney allocation. Stratta and associates found that ECD kidneys with flow rates of > 80 mL/min and the resistance < 0.40 mm Hg/mL/min after a minimum of 6 hours on pulsatile perfusion were acceptable for DKTs. Data by Hugen and associates in a study of 60 DKTs also showed that kidneys used for DKTs had lower final renal resistance compared with discarded kidneys.

**Surgical technique of dual kidney transplant**

Compared to SKTs, DKTs are more-demanding surgical procedures, resulting in longer surgical
times and increased risk of surgical complications. Both kidneys can be transplanted together in 1 (unilateral) or 2 (bilateral) separate iliac fossae through an extraperitoneal or a transperitoneal approach. Many transplant centers perform DKTs using bilateral technique with 2 separate extraperitoneal incisions. Boggi and associates showed a higher incidence of lymphoceles using unilateral graft placement compared with kidneys transplanted as separate grafts; also these grafts had a higher risk of hemorrhage with bilateral incisions. However, all previously described DKT techniques with standard vascular and ureteral anastomoses have been associated with significantly higher rates of early renal graft thrombosis, but similar rates of lymphocele, urinary tract fistula, and wound infection compared to SKTs. In the study by Ekser and associates with 100 unilateral DKTs, the authors reported surgical complication rates comparable to those of SKTs. On the other hand, in a recent study by Timsit and associates, unilateral placement of both allografts was associated with an increased risk of single graft loss.

Immunosuppression protocol

Most groups recommend standard triple immunosuppression protocol with the use of a calcineurin-inhibitor. Cruzado and associates analyzed 2 groups of patients who received either cyclosporine-based immunosuppression (cyclosporine, mycophenolate mofetil, and prednisolone) or calcineurin-inhibitor–free protocol (thymoglobulin induction, sirolimus, mycophenolate mofetil, and prednisolone), and did not find differences in graft function or survival using calcineurin-inhibitor–free immunosuppression. Another paper compared calcineurin-inhibitor–free with cyclosporine-based immunosuppression protocols and reported significantly lower rates of delayed graft function (DGF) and a lower rate of cytomegalovirus infection in the sirolimus group with no difference in creatinine at 1 year. The incidence of acute rejection in DKT recipients was shown to be lower than it was in SKTs, which suggests the possibility that increasing the antigenic load does not enhance immune response.

Outcomes of dual kidney transplant

To date, many case reports, retrospective, and some prospective studies have analyzed early and long-term results of DKTs and have compared them to SKT outcomes. Table 1 describes the results of all prospective and large retrospective studies with at least 50 patients enrolled, studying patients after adult DKT. The publications were selected according to systematic review in PubMed database until 2012.

Materials and Methods: Our experience

Study design

For the purpose of our study, we retrospectively examined our database. In the time between June 2007 and July 2012, nine hundred twenty-eight single, and seventeen adult DKTs from deceased donors were performed. We analyzed the posttransplant outcomes (considering graft and patient survival rates, occurrence of DGF defined as the need for dialysis within the first week after transplant; acute rejection episodes [biopsy confirmed]; reoperation rate and cause; and serum creatinine at 1, 6 months, and 12 month after DKT). Grafts were considered “nonviable” in the following cases: graft nephrectomy, recipient’s death, and return to dialysis. The loss of 1 graft out of 2 was classified as a “functioning kidney graft.”

Indication criteria for dual kidney transplant

Kidneys from donors aged > 65 years with eGFR < 1.1 mL/s or donors aged > 65 years, with a history of hypertension or diabetes, were considered for DKT. During the retrieval, kidneys were examined macroscopically for scars and quality of vessels. After perfusion, a wedge biopsy of both kidneys was performed. Indications to use the kidneys for DKT/SKT or to discard them, was assessed based on the results of glomerulosclerosis together with the donor’s clinical data. If glomerulosclerosis was more 20%, DKT was indicated. If glomerulosclerosis was more 50%, the kidneys were usually discarded. Although the Remuzzi criteria are not used for kidney selection in our transplant center, we evaluated them retrospectively.

Recipient criteria and surgical procedure

The recipient candidates for DKT in our center ≥ 60 years of age, with no previous kidney transplant, panel reactive antibody level < 20%, body mass index < 30, and had acceptable aortoiliac vessels and adequate dimensions of the abdomen, allowing placement of 2 renal grafts. Patients with general contraindications for renal transplant (ie, previous surgery on aortoiliac vessels, anticoagulant therapy, and large polycystic kidney disease) were excluded.
kidneys) were not considered for DKT. All protocols were approved by the ethics committee of the institution before the study began, and the protocols conformed with the ethical guidelines of the 1975 Helsinki Declaration. Written, informed consent was obtained from all patients enrolled into the DKT program. Kidney grafts were recovered using the standard multiorgan retrieval technique. Grafts were preserved separately under hypothermic conditions or using a hypothermic machine perfusion system (LifePort Kidney Transporter, Pulsatile Flow, Model LKT-100-P; Organ Recovery Systems, Itasca, IL USA). After bench surgery, 2 kidney grafts were implanted sequentially either bilaterally, using separate incisions, or unilaterally. A urethral stent was not used routinely, and it was left for the transplant surgeon’s consideration.

Clinical variables
We recorded the following donor parameters: age, sex, hypertension, diabetes mellitus, last serum creatinine and eGFR-MDRD CrCl (eGFR according to MDRD formula), type of preservation (hypothermic preservation or machine perfusion), cold ischemic time, and graft biopsy results (containing at least 10 glomeruli and at least 1 artery) including level of glomerulosclerosis (evaluated and expressed as the percentage value of global sclerotic glomeruli). Donors > 60 years of age or between 50 and 59 years of age, with at least 2 of the following 3 risk factors: death from stroke, pre-existing hypertension or chronic kidney disease with serum creatinine levels greater than 133 μmol/L were assigned as ECD. 27 Considered recipient parameters were: age, sex, time on the waiting list, number of HLA mismatches, percentage of panel reactive antibodies at the time of transplant, and indication for a kidney transplant.

Immunosuppression
All patients received induction therapy with thymoglobulin; maintenance triple therapy included cyclosporine/tacrolimus, mycophenolate mofetil, and steroids. We try to reduce the possible calcineurin-inhibitor nephrotoxicity.

Statistical analyses
The data are expressed as mean values ± standard deviation, median (interquartile range) or frequencies (percentage). Graft and patient survival rates were assessed using the Kaplan-Meier method. Statistical analyses were performed with SPSS software (SPSS: An IBM Company, version 13.0, IBM Corporation, Armonk, NY, USA). Values for P < .05 were considered to be significant.

Results

Donor characteristics
The average donor age was 71.5 ± 3.6 years, with a female predominance of 12 (71%). Risk factors, hypertension, and diabetes were present in 16 patients (94%) and 5 patients (29%). Traumatic, cerebrovascular, and hypoxic cause of brain death among the donors for DKT occurred in 2 (12%), 13 (76%), and 2 patients (12%). The average serum creatinine and eGFR-MDRD CrCl of donors were 106.1 ± 44.2 μmol/L and 0.97 ± 0.37 mL/s. All donors were assigned as ECD. The average number of sclerotic glomeruli per sample was 22.4 ± 14.2, and the average Remuzzi score for both kidneys was 6.3 ± 1.1. Pulsatile machine perfusion was used in 3 donors (18%).

Recipient characteristics
The average recipient age was 65.9 ± 4.7 years, with a male predominance of 13 (77%). The recipient’s kidney disease were diabetic nephropathy in 2 (12%), glomerulonephritis in 6 (35%), IgA nephropathy in 3 (18%), lupus nephritis in 1 (6%), nephrosclerosis in 1 (6%), polycytosis (6%), and tubulointerstitial nephritis in 3 patients (18%). The median time on the waiting list was 164 days (range, 108-390 d). The median number of HLA mismatches and pretransplant panel reactive antibodies were 3% (range, 2.5% to 4%) and 2% (range, 0% to 5%). Mean cold ischemic time was 18.1 ± 4.1 hours and bilateral technique of transplant was used in 16 recipients (94%).

Posttransplant outcome
The overall patient survival rates at 1 and 2 years after transplant were 93% for both. The overall graft survival rates at 1 and 2 years was 88% for both. Overall, 6 grafts in 3 patients were lost. Two patients underwent bilateral graft nephrectomy, 1 because of massive vascular thrombosis and 1, owing to multiorgan failure (who died 1 year later from cardiovascular disease). One patient lost both grafts, the first one on the seventh postoperative day
because of a vascular complication, and the second one during fourth posttransplant year owing to infectious complications. This patient is still alive.

Patient and graft survival curves are shown in Figure 1. Four patients had delayed graft function (25%) and 1 patient had an acute rejection episode (6%). Mean serum creatinine at the first and sixth month, and during the first and second years were 141 ± 44.2, 132 ± 26.5, 159 ± 26.5, and 186 ± 106.1 µmol/L. We observed posttransplant diabetes, pneumonia, and cardiovascular episodes in 2 (12%), 1 (6%), and 1 patient(s) (6%). Lymphocele and complex wound healing (ie, intestinal evagination) occurred in 2 (12%) and 1 patient(s) (6%), while neoplastic complications were not observed. Ureteric complications were observed in 2 patients (12%), 1 requiring reoperation for ureteric necrosis, and 1 requiring temporary nephrostomy for ureteric stricture.

Discussion

The first prospective controlled multicentric trial, which was designed to compare outcomes of DKT versus SKT was published by Remuzzi and associates in 1999.14 This study gave the fundamental knowledge for use of kidneys for a dual transplant, which would be otherwise discarded. Currently, a DKT is used as an option in many transplant centers. Dual kidney transplant gives us a chance to use kidneys from “marginal donors.” Some prospective and retrospective studies (Table 1) compared DKT with transplant of single ECD kidneys. These studies found lower or similar DGF rates after a DKT.12,17,18

Graft survival after a DKT compared with an SKT at 5 years (69% vs 61%) and 8 years (69.7% vs 59.4%) has been reported as comparable.28,29

Despite good DKT outcomes, decision-making remains the main dispute. The ongoing question is which kidneys should be used for single, and which for dual transplants, and which kidneys should be discarded. Despite the number of DKT selection parameters (see review part of this paper), there is no uniformity among transplant centers.6 To date, there is only 1 prospective controlled study that evaluated allocation algorithm. In this study, Snanoudj and associates10 used allocation criteria proposed by Remuzzi and associates,14 Andres and associates17 and UNOS criteria.18 However, he did not find any improvement in 12-month eGFR of DKT compared with allocation based on donor eGFR. The only consensus found among centers is the basic of conditions for ECD, which are generally accepted as the starting point for further decision-making. Assessing of the functional status of ECD kidneys, the results of preimplantation biopsy and additional parameters during preservation together with transplant center experience remain an effective and safe strategy for DKT selection.

The first report of DKT in the Czech republic30 was published by our team in 2008 and since the DKT program was nationally established. In this report, we retrospectively analyzed our own single-center experience of 17 recipients after DKT. Donors aged > 65 years with eGFR < 1.1 mL/s or donors aged > 65 years with a history of hypertension or diabetes were considered for DKT. After perfusion, wedge biopsy of both kidneys was performed and the final decision for accepting or discarding SKT/DKT was based on the assessment of all available parameters of the donor. The information obtained from pre-implantation biopsies in our institute focuses mainly on glomerulosclerosis.

Our selection criteria are similar to those used by UNOS. If any 2 of the following donor criteria exist (age > 60 years; eGFR < 1.1 mL/s, sCr > 221 µmol/L; presence of hypertension or diabetes with glomerulosclerosis between 15% and 50%), DKT is considered. In our study, the average donor age was 71.5 ± 3.6 years with average serum creatinine, creatinine clearance and average number of sclerotic glomeruli, 106.1 ± 44.2 µmol/L, 0.97 ± 0.37 mL/s, 1 and 22.4 ± 14.2. The Remuzzi score was retrospectively evaluated in 14 donors and for both
kidneys the average score was 6.3 ± 1.1. Eight recipients had Remuzzi score in range 4-6. Such results proved to be acceptable for DKT by a prospective study.14,15 Conversely, 3 patients with the score of 7 also had good posttransplant outcomes, comparable with recipients with a score of 4 to 6. We also had 2 patients with Remuzzi score of 8, and 1 with a score of 9, in whom posttransplant function was lost during the early posttransplant period, as this scoring system predicts. Despite Remuzzi’s approach for ECD kidney transplants was proved accurate in many prospective and retrospective studies,14-16,31-33 we cannot confirm this, probably because of the small number of patients in our study.

The early and intermediate results in our retrospective single-center study are comparable with many retrospective and some prospective studies (Table 1). Immediate graft function and acute rejection episodes were observed in 75% and 6% of patients. These data are comparable with the largest DKT study published by Gill and associates,12 where the occurrence of DGF and acute graft rejection were 29.3% and 5%. Overall graft survival at 2 years after transplant in our study was 88%, which is comparable with some studies.10,11,21 The main limitation of this study is its retrospective fashion and small study group.

In conclusion, previous studies and our single-center experience suggest that the dual transplant procedures may activate improve the results of kidney transplants from ECDs and extend the donor pool by using kidneys that would otherwise be discarded. However, DKT does not, per se, guarantee the same outcomes as an SKT from a standard criteria donor.

References


