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Expanded criteria donor and donation after circulatory death renal allografts in the West of Scotland: Their place in the kidney allocation process

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ABSTRACT

Introduction: Due to the rising disparity between demand and availability, organs from expanded criteria donors (ECD) and donors after determination of circulatory death (DCD) are increasingly used. The purpose of this study was to report outcomes in recipients of ECD and DCD renal allografts from a single centre.

Methods: A retrospective analysis from a single centre for all renal transplants performed between 2001 and 2010 inclusive was undertaken. SCD (standard criteria donor) and ECD organs were compared, as were DCD and DBD (donation after determination of brain stem death) organs. Baseline data and predefined standard transplant outcomes were collected and compared using appropriate statistical tests. $P < 0.05$ was defined as significant.

Results: 729 renal transplants were performed. Comparing ECD to SCD organs, there was a significant difference in graft survival between groups (logrank for trend, $p = 0.032$) with ECD organs doing worse than SCD organs. Short-term outcomes showed a similar disparity with a higher 1-year post-transplant creatinine and delayed graft function (DGF) rate in ECD grafts. Nevertheless, outcomes were still clinically acceptable. When comparing DCD to DBD organs, no such differences were apparent, with DCD organs appearing to perform at least as well as DBD organs. In our cohort, unlike some previous studies, DGF rates were similar in both DCD and DBD groups.

Conclusions: Although ECD organs perform less well than SCD organs, outcomes are still acceptable and our results support their continuing use. When considering DCD organs, our data support the view that they should no longer be necessarily regarded as marginal grafts. Our low DGF rates are perhaps explained by local factors contributing to a short CIT.

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Introduction

Renal transplantation has experienced an exponential growth.[1] Shortage in organ supply has replaced inadequacies in immunosuppression therapy as the limiting factor for this treatment. Donor pool expansion has formed a central part of the UK strategy aimed at reversing this trend and the ambitious target of the organ donor task force, a 50% increase in donor numbers, has been reached.[1] Achieving this has involved acceptance of older donors with significant co-morbidity. This naturally leads to increased numbers of organs from expanded criteria donors (ECD) and donations after circulatory death (DCD). Although outcomes following DCD and ECD transplants are better than those on dialysis, concern remains about the risks associated with these non-traditional sources of deceased donor organs.[1,2,3]

By definition, ECD kidneys have a 70% higher relative risk of graft failure compared to standard criteria donor (SCD) kidneys because they are characterized by worse prognostic factors (relative hazard ratio = 1.70). [4–7]DCD kidney allografts have been associated with a greater risk of delayed graft function (DGF, usually defined as a need for the use of dialysis in the first postoperative week).[4] There are those who have argued that the absence of the neuroendocrine crisis associated with brain stem dead donors (DBD), that itself is associated with a major up regulation of systemic inflammation and stress, may favour the DCD kidney.[4] Until recently, DCD organs have been only allocated locally as it was believed that reducing the cold ischaemic time would be the only way to abrogate the effects of the warm ischaemia associated with circulatory arrest. However, based on published outcomes and statistical modelling of transport and cold ischaemic times, the prevailing opinion has changed.

There is therefore a need for more data on the implications of DCD and ECD kidney transplantation. This information is central to recipient counselling and optimal allocation. The purpose of this study was to compare the outcomes of SCD *versus* ECD and DCD *versus* DBD kidney transplants. By robustly defining the factors that dictate outcomes, patients, healthcare teams and policy makers will be able to make more informed decisions and allocation policies may be appropriately tailored. This will improve the overall utility and equity of kidney transplantation.

Materials and methods

Study population

The study population included all patients that received a deceased-donor renal transplant in a single centre in the West of Scotland from 2001. The scope of the investigation was limited to transplants that occurred between 2001 and 2010 inclusive, as follow-up data for transplants post 2010 were incomplete. Every transplant in the study time window was evaluated and categorised as either a standard or expanded criteria donor organ. ECDs were defined as donors aged >60 years or aged between 50 and 60 years with ≥2 of the following conditions[1]: diagnosed hypertension,[2] terminal serum creatinine >1.5 mg/dL (>133 μmol/L),[3] cause of death is stroke. SCDs were donors that did not fulfil the ECD criteria. The Scottish Electronic Renal Patient Record (SERPR) was used to populate any missing data required to accurately classify the donor–recipient pairs. Exclusion criteria included live donors, dual transplants, and subjects in whom insufficient information on expanded criteria status was available.

Study design

We carried out a retrospective analysis of all renal transplants performed at the West of Scotland Renal Transplant Unit. The study was performed with the approval of the local Clinical Effectiveness Committee and in accordance with the Declaration of Helsinki.

Standard recipient and donor demographic data were collected. This included donor age, sex, cytomegalovirus (CMV) status, cause of death, and recipient age, sex, duration of dialysis, length of hospital stay, number of previous transplants and cause of end-stage renal disease (ESRD). Additionally, the following information was obtained for each donor–recipient pair: donation after brain death (DBD) or donation after circulatory death (DCD) donor, cold ischaemic time (CIT, in hours) and age difference.

The donor–recipient pairs were then stratified according to donor groups, comparing ECD *versus* SCD renal transplantations and DBD *versus* DCD renal transplantations.

Outcomes

Short-term outcomes were defined as 1-year graft and patient survival, biopsy-proven acute rejection (BPAR), 1-year creatinine (μmol/L) and delayed graft function (DGF, defined as a post-transplant need for dialysis). The long-term outcome was 5-year death-censored graft survival.

Statistical analyses

Continuous variables were tested for normality, using the D'Agostino Person Omnibus test. Normal continuous data were expressed as mean ± standard deviation and were compared with the unpaired Student's *t*-test. Non-normal continuous data were presented as median with interquartile range and were compared using the Mann–Whitney *U* test. Categorical data were presented in percentages and were compared using Fisher's exact or X^2 tests.

5-year death-censored graft survival was estimated using the Kaplan–Meier procedure. Curves were compared using the Logrank test for trend.

Statistical analysis was performed with the use of IBM SPSS Statistics version 21 and Graph Pad Prism version 5 (GraphPad Software Inc., California USA). A two-sided $p < 0.05$ was defined as significant.

Results

Data from a total of 729 renal transplants performed between 2001 and 2010 inclusive were available for analysis. After exclusions, data from 510 procedures were analysed (see Fig. 1).