Kidney Donor Risk Index as the Predictor for the Short-term Clinical Outcomes After Kidney Transplant From Deceased Donor With Acute Kidney Injury

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ABSTRACT

Background. The Kidney Donor Risk Index (KDRI) scoring system for deceased donors has been widely introduced for postoperative evaluation of graft function. We analyzed the usefulness of the KDRI in deceased donors with acute kidney injury (AKI).

Methods. Forty-nine recipients from deceased donors with AKI between January 2009 and December 2014 were reviewed retrospectively. Data collected from donor medical records included age, height, weight, hypertension or diabetes history, cause of death, serum creatinine (sCr), and donation after cardiac death. Graft function data including sCr, estimated glomerular filtration rate (eGFR), and acute rejection episodes were monitored for 1 year. Correlations between KDRI score and factors indicating graft function were analyzed. A cutoff value for KDRI score was calculated using a receiver operating characteristic (ROC) curve for significant graft function.

Results. The mean ages of donors and recipients were 46.81 ± 13.13 and 47.69 ± 11.43, respectively. The mean KDRI score was 1.24 ± 0.40. Univariable analysis of KDRI score and factors indicating graft function indicated that sCr at 6 to 12 months, eGFR at 1 year, and slow graft function (SGF) had statistical significance. The ROC curve of KDRI score for SGF showed an optimal cutoff value of 1.20, with sensitivity of 69.2% and specificity of 69.4% (area under the curve = 0.75) in deceased donors with AKI.

Conclusions. KDRI score in deceased donors with AKI was correlated with post-operative graft values including eGFR and SGF. KDRI could be used as a predictor for the short-term clinical outcome after kidney transplant from deceased donor with AKI.

OWING to the shortage of living donors and increasing need for organs, the use of renal grafts from deceased donors with acute kidney injury (AKI) has significantly increased. However, a graft with AKI has a high incidence of delayed graft function (DGF) and acute rejection, which can negatively affect graft survival. As a result, clinicians must decide whether or not to use a marginal kidney. Although compatible short-term outcomes in kidney transplant from deceased donors with AKI were reported [1], predicting short- and long-term graft function based on the condition of the deceased donor is very important. Various prediction systems have been developed [2].

Recently, the Kidney Donor Risk Index (KDRI) scoring system for deceased donors has been widely introduced for the risk evaluation of postoperative graft function [3]. We analyze the usefulness of KDRI scores in deceased donors with AKI.

MATERIALS AND METHODS

Patients

A total of 82 cases of deceased donor kidney transplantations were performed between January 2009 and December 2014 in our center. We retrospectively analyzed 49 patients (59.8%) who received kidneys from deceased donors with AKI.

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AKI was defined by the RIFLE [4] criteria as following: (1) risk−1.5-fold increase in the serum creatinine (sCr), or glomerular filtration rate (GFR) decrease by 25%, or urine output <0.5 mL/kg per hour for 6 hours; (2) injury−twofold increase in the sCr, or GFR decrease by 50%, or urine output <0.5 mL/kg per hour for 12 hours; (3) failure−threefold increase in the sCr, or GFR decrease by 75%, or urine output <0.3 mL/kg per hour for 24 hours, or anuria for 12 hours; (4) loss−complete loss of kidney function for more than 4 weeks; (5) end-stage renal disease−complete loss of kidney function for more than 3 months.

The immunosuppressant chosen for induction therapy was antithymoglobulin or basiliximab. The combination of a calcineurin inhibitor, mycophenolate mofetil, and corticosteroids was used mainly for maintaining immunosuppression.

Data Collection

Based on medical records, we retrospectively analyzed donor risk factors, including age, height, weight, ethnicity, history of hypertension or diabetes, cause of death, sCr, hepatitis C virus serology, and donation after cardiac death [2]. The KDRI score was retrospectively calculated with these 10 items [5].

We collected data from the medical records of recipients for 1 postoperative year on immunosuppressant use, sCr, estimated GFR (eGFR), history of dialysis, and graft biopsy history.

Based on recipient data for graft function in the immediate postoperative period, recipients were divided into 3 groups [6]: (1) immediate graft function: sCr <3 mg/dL by postoperative day 5; (2) slow graft function (SGF), sCr >3 mg/dL on postoperative day 5, but no need for dialysis; and (3) DGF, dialysis needed in the first week postoperatively. Graft biopsy results were reviewed, and cases reported as acute rejection were defined as biopsy-proven acute rejection, regardless of the type of rejection.

Statistical Analysis

The univariable analysis used to correlate KDRI score with factors indicating kidney graft function was performed using Spearman correlation and the Mann-Whitney *U* test in view of the nonparametric grouping. Using a receiver operating characteristic curve for significant graft function according to the univariable analysis, a cutoff value of KDRI score was calculated with more than 70% sensitivity and specificity. All statistical analyses were performed using SPSS software version 17.0 (SPSS Inc, Chicago, Ill, United States). A P value <.05 was considered statistically significant.

RESULTS

The mean ages of donors and recipients were 46.81 ± 13.13 and 47.69 ± 11.43 years, respectively. Baseline risk factor characteristics of donors included 4 (8.2%) with diabetes, 9 (18.4%) with hypertension, and 24 (48.9%) with a history of cerebrovascular accident. Mean HLA mismatch was 3.55 ± 1.20 and mean KDRI score was 1.24 ± 0.40. The distribution of the KDRI scores is shown in Fig 1. Thymoglobulin induction was performed in 17 recipients (34.7%; Table 1). There were no donors with hepatitis C or donations after cardiac death.

Univariable analysis of KDRI scores and factors indicating kidney graft function showed that sCr at 6 to 12 months, eGFR at 1 year, and SGF had statistical significance ($P = .013$ to .047, $P = .001$ to .007, $P = .007$; Table 2).

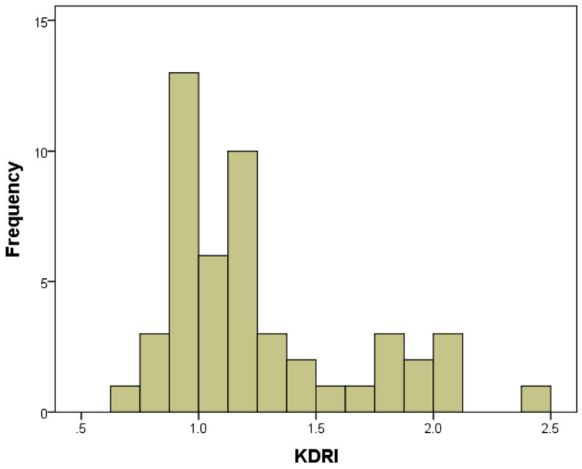

Fig 1. Distribution of kidney donor risk index (KDRI) score in deceased kidney donors with acute kidney injury.

The receiver operating characteristic curve of KDRI scores for SGF showed that the optimal KDRI cutoff value for SGF was 1.20, with sensitivity of 69.2% and specificity of 69.4% (area under the curve = 0.75) in deceased donors with AKI (Fig 2).

DISCUSSION

In evaluating high-risk donors, expanded criteria donor (ECD) criteria show a tendency to view age and underlying disease as important risk factors, rather than creatinine. In KDRI also, a negative coefficient is applied in creatinine >1.5 mg/dL, which decreases the importance of creatinine as an independent factor [5]. Recent research has focused on creatinine level being an important prognostic factor in early outcome, where preoperative final creatinine >2 mg/dL shows comparable outcome [7,8]. Thus, in evaluating

Table 1. Baseline Characteristics of Deceased Kidney Donors With Acute Kidney Injury and of Recipients

Characteristics	Total (n = 49)
Donor	
Male	44 (89.9)
Age	46.81 ± 13.13
Diabetes	4 (8.2)
Hypertension	9 (18.4)
BMI	23.81 ± 2.48
CVA as cause of death	24 (48.9)
Recipient	
Male	30 (61.2)
Age	47.69 ± 11.43
BMI	23.69 ± 3.06
HLA mismatch	3.55 ± 1.20
Thymoglobulin induction	17 (34.7)
KDRI score	1.24 ± 0.40

Abbreviations: BMI, body mass index; CVA, cerebrovascular accident; KDRI, Kidney Donor Risk Index.
Data are expressed as numbers (%) or means ± standard deviations.