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# Risk assessment and decision making in deceased donor kidneys

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## Backgrounds

According to the US data, the number of kidney donors is constantly increasing, while the number of waiting patients is rapidly increasing, and in Korea, the organ shortage problem is also serious. The use of marginal donor kidneys, including the elderly donors or those with acute kidney injury, has been proposed as an alternative strategy to solve this problem. Therefore, we need to perform the appropriate risk assessment and decision making in deceased donor kidneys for the solution against organ shortages and improvement of allograft outcomes.

## The new change of kidney allocation system

Recently, not only detailed scoring system for the quality of donor, but also optimal matching of donor to recipients is an important issue. In regard to the assessment of deceased donors (DDs), previously used expanded criteria donor (ECD) criteria had some limitations to predict clinical outcomes accurately. Therefore, Kidney Donor Risk Index (KDRI) and Kidney Donor Profile Index (KDPI) were developed as new donor risk scoring systems. The reason for the change in the allocation system was that the previous allocation system only relied on waiting time, the rate of kidney discard was high, the patient's approach varied widely, and there was a lack of validation studies in other countries. Furthermore, the ECD criteria is a binary score considering 4 donor factors (age, history of hypertension, cerebrovascular accident as a cause of death, preprocurement creatinine). In other words, kidneys meeting ECD thresholds are allocated first to candidates willing to accept these kidneys, and kidneys not meeting ECD thresholds are allocated to all candidates on the waiting list as SCD kidneys.

## Characteristics of KDRI & KDPI

KDRI & KDPI is a continuous score considering 10 donor factors (donor age, height, weight, ethnicity, history of HTN and DM, cause of death, serum creatinine, HCV status, and donor after circulatory death). KDPI is the score used to measure the quality of a deceased donor kidney based on the KDRI calculation and the range is 0-100 percentile. This implies a relationship between donor factor and graft survival, and lower KDPI is associated with increased donor quality and expected lifespan of the graft. In other words, the concept of longevity matching is applied, which is that kidneys with a KDPI score ≤ 20% are allocated first to candidates with the longest 20% estimated post-transplant survival (EPTS). EPTS is a score that is calculated by taking into account how long the candidate age, dialysis duration, previous organ transplant history, DM accompanied on whether to live with a functioning kidney is the range is 0-100%. It can be said that the transplant specialist measures the donor's quality and assesses whether it is appropriately donated to the candidate. It can be useful for deciding whether to grant or decline a donation. Furthermore, it is possible to predict graft survival rate according to KDPI. In other words, because kidney transplantation (KT) with high KDPI donors shows a high short-term mortality risk but low long term mortality risk, the allograft survival of recipients from high KDPI donors is higher compared to that of patients on the waitlist waiting for low KDPI kidneys. Therefore, the KDPI should be applied actively for the risk and prognosis assessments.

## Risk assessment and decision making in deceased donor kidneys

## 1. Risk assessment using KDPI

We compared clinical outcomes between the high KDPI and low KDPI groups. As a result, a high KDPI score was a significant risk factor for death-censored allograft failure, and the KDPI scoring system is useful in predicting allograft outcomes in a Korean DDKT cohort. Also, the pretransplant donor biopsy (PTDB) can be helpful for risk assessment and decision making in deceased donor

kidneys. Indication for PTDB included donor age 65 years, renal dysfunction (estimated creatinine clearance < 60 mL/min), or proteinuria >1 g/day. The scores of each structure were summed up yielding a final score ranging from 0 to 12 per kidney, and PTDB-based allocation of marginal grafts led to a limited discard rate of 15% for kidneys with KDPI of 80-90 and of 37% for kidneys with a KDPI of 91-100. Therefore, PTDB allows the safe KTs with KDPI in the highest range that may otherwise be discarded.

However, there are some limitations of KDPI. The application of KDPI in very old aged recipients may not be effective. In one study, when very old recipients aged 70-79 years received high quality kidney, graft survival and patient survival were not always improved. Furthermore, the predictive power of KDPI is moderate and the pediatric recipients are not included in the modeling process because they are made using the graft outcome of adult transplant recipients, which is problematic for application to pediatrics. In addition, graft survival is determined by many factors related to recipients not considered by KDPI. As a result, KDPI should be used with this additional information to make informed decisions about the suitability of the donor kidney of a particular graft candidate. In conclusion, although the UNOS criteria have been in use for a long time, this indicator has significant limitations in risk assessment and decision making in deceased donor kidneys. By assessing the risk factors of graft failure and the quality of donor kidneys, KDRI & KDPI can help you decide whether to receive an ECD kidney or a possible SCD donor. KDRI & KDPI can also be used as a tool to predict graft survival and patient survival. Community residents with older or longer waiting times than dialysis patients waiting for better quality organs can be better served with a high KDPI kidney. However, like the ECD criteria, KDPI has shown an insufficiency on validation in countries other than the US. In the recent, European cohort and Korea cohort showed the result as follows; KDPI as a potentially useful tool for donor quality assessment. Finally, It will be necessary to create appropriate criteria to evaluate realistic marginal donors based on KDPI.

## 2. Risk assessment for kidney recipients with donor-derived infection

Transmission of unexpected donor-derived infection has been observed in KT, and absolute prevention is not possible. Transmission of infection is facilitated by the viable cells of vascularized organs. Moreover, immunosuppressive drugs can amplify the risk of infection by donor kidneys. Screening of donors for common pathogens involves both epidemiologic history and microbiological assays, and is highly effective for preventing the transmission of HIV and hepatitis B and C viruses, especially. The most important factor in the risk assessment of donor-derived infection is suspicion on the part of the clinicians caring for recipients.

## 3. Risk assessment for kidney recipients with donor-derived or transmitted cancer

Donor-derived or transmitted cancer is rare but frequently causes to graft loss and death. However, the risk of cancer transmission cannot be detected because the presence of cancer was not known at donation. Some studies reported that the risk of cancer transmission was significantly associated with donor age. Therefore, we should monitor donor-derived or transmitted cancer regularly in case of KT from elderly donors. Furthermore, all potential candidates should be counseled about the benefits and risks of current transplantation.