

# Perioperative Risk Factors Associated With Delayed Graft Function Following Deceased Donor Kidney Transplant

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## Introduction

Kidney transplantation is the therapy of choice for patients with end stage renal disease with superior survival and quality of life over dialysis. With an emphasis on the use of higher risk donor organs in the setting of increasingly higher risk recipients, a need exists for the identification of modifiable risk factors associated with poor outcomes. The aim of this analysis is to identify perioperative risk factors associated with delayed graft function (DGF) with a particular emphasis on modifiable variables which may be optimized to improve graft and patient outcomes.

## Methods

After IRB approval, all consecutive adult (age  $\geq 18$  years) patients who underwent a deceased donor kidney transplant at our institution between January 2016 and July 2017 were identified, excluding multi-organ recipients, resulting in a study population of 294 patients. Recipient and donor data was obtained from retrospective review of electronic records and the United Network for Organ Sharing DonorNet<sup>®</sup> database. All donor kidneys were placed on hypothermic machine perfusion (HMP) pumps with the RM3 Renal Preservation Machine (Waters Instruments Inc. Rochester, MN). Cold storage time was defined as the time from donor cross-clamp until the allograft was placed on the HMP pump and total cold ischemia defined as the donor cross-clamp until the allograft was taken out of ice. Recipient blood pressures were evaluated at baseline (i.e. pre-induction), 5 minutes and 30 minutes post-reperfusion, and immediately upon arrival to the recovery room or ICU. The primary outcome was the occurrence of DGF, defined as the need for dialysis within seven days of transplantation.

## Results

The incidence of DGF was 27% (79/294). Under logistic regression, eight independent risk factors for DGF were identified including recipient body mass index (BMI), intraoperative phenylephrine administration, baseline mean arterial pressure (MAP)  $<112$  mmHg, cold storage time, donation after cardiac death, donor history of coronary artery disease (CAD), donor terminal creatinine, and a HMP pump resistance  $\geq 0.23$  mmHg/mL/min, see Table 1.

Comorbidities associated with metabolic syndrome were more common in recipients with DGF when compared with non-DGF, including BMI  $\geq 30$  kg/m<sup>2</sup> (47 vs 28% respectively,  $P=0.002$ ), diabetes (53 vs 31% respectively,  $P=0.001$ ), dyslipidemia (72 vs 47% respectively,  $P=0.001$ ), and CAD (35 vs 18% respectively,  $P=0.002$ ).

Phenylephrine administration was required more commonly in patients who developed DGF (32 vs 18% in non-DGF recipients,  $P=0.01$ ). Recipients who developed DGF were more likely to have a baseline MAP prior to induction of general anesthesia  $<112$ mmHg (65 vs 50% in non-DGF recipients,  $P=0.02$ ).

Cold storage and cold ischemia times were significantly longer in DGF vs non-DGF allografts (30.6 vs 26.4 hours [ $P =0.009$ ] and 18.4 vs 9.6 hours [ $P =0.002$ ], respectively).

The 30-day surgical complication rate based on the Clavien-Dindo classification was higher in recipients with DGF vs non-DGF (32 vs 14% respectively,  $P=0.002$ ). Allografts with DGF had a significantly lower six-month estimated glomerular filtration rate (eGFR) (50.6 vs 73.3 mL/min for non-DGF,  $P<0.001$ ), and increased incidence of one-year graft failure (10 vs 1% for non-DGF,  $P =0.002$ ).

**Table 1:** Perioperative Predictors Associated with Delayed Graft Function

	OR	95% CI	P-value
Preoperative Recipient Risk Factor			
Recipient BMI $\geq 30$ kg/m <sup>2</sup>	3.8	1.947-7.548	0.0001*
Intraoperative Recipient Risk Factor			
Baseline MAP $<112$ mmHg	2.2	1.098-4.326	0.0260*
Phenylephrine usage	2.2	1.040-4.820	0.0392*
Donor Risk Factors			
Cold storage time $\geq 16$ hours	2.8	1.378-5.666	0.0044*
Donation after cardiac death	4.4	1.872-10.225	0.0007*
Donor with history of CAD	5.8	2.133-16.033	0.0006*
Terminal creatinine $\geq 1.9$ mg/dL	4.3	2.041-8.855	0.0001*
HMP Pump Risk Factor			
Resistance $\geq 0.23$ mmHg/mL/min	2.2	1.132-4.307	0.0201*

Abbreviations: BMI, body mass index; MAP, mean arterial pressure; CAD, coronary artery disease; HMP, hypothermic machine perfusion pump; OR, odds ratio; CI, confidence interval.

\* $P < 0.05$  denotes statistical significance.

## Conclusions

This study identifies the association between DGF and recipient metabolic syndrome, donor risk factors, recipient baseline MAP, and intraoperative use of phenylephrine. An association between DGF and an increased rate of postoperative surgical complications, decreased eGFR, and graft failure at one year was identified. This data identifies a possible baseline relative hypotensive etiology of DGF and may represent a subset population in which variables such as fluid and vasopressor management may be modified to optimize patient outcomes.

## References

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