

# Predictors of Renal Graft Failure in Heart/Kidney Transplant Recipients

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## Abstract

**Background:** Combined heart and kidney transplant has a protective effect on the cardiac graft. However little is known about the factors that impact the renal graft function post-transplant.

**Methods:** We evaluated combined heart-kidney transplant recipients at Cedars-Sinai Medical Center between March 2012 and December 2017. Recipients with primary cardiac graft dysfunction were excluded. The primary outcome was delayed renal graft function (DRGF) as defined by need for dialysis within the first week of transplantation. The secondary outcome was any dialysis requirement within the first year. A univariate logistic regression model was used to assess the association between the donor, recipient and transplant factors with the primary and secondary outcomes.

**Results:** We identified 66 combined heart-kidney transplant recipients for analysis. Elevated recipient creatinine prior to transplant was associated with DRGF (OR 1.80, 95% 1.25-2.59,  $p = 0.002$ ). The remainder of evaluated donor and recipient factors were otherwise not associated with acute renal dysfunction. Elevated pre-transplant creatinine (OR 1.73, 95% 1.21-2.50,  $p = 0.003$ ) and redo transplantation (OR 5.70, 95% 1.05-30.87,  $p = 0.043$ ) were associated with needing dialysis within the first year after transplant.

**Conclusion:** In our high volume single center experience of combined heart and kidney transplantation, recipient creatinine prior to transplant was the biggest predictor of primary renal graft failure. In addition, redo heart transplantation increases risk of dialysis within the first year.

## Background

In patients with end-stage heart failure, chronic renal disease may warrant consideration for kidney transplantation in addition to hear transplant. The incidence of patient requiring heart/kidney transplant consideration has increased in recent years with comparable outcome to those under heart-along transplantation (1, 2). Combined heart and kidney transplant has a protective effect on the cardiac graft (3). A recent study from France demonstrated a high early mortality rate pf 22% in heart-kidney transplant recipients with pre-transplant ECMO support and increasing delay between the implantation of the donor heart and kidney as significant risk factors for mortality (4). However little is known about the donor and recipients factors that impact the renal graft function post-transplant.

## Objective

We set out to assess the impact of donor, recipient and transplant characteristics on post-transplant renal graft function in combined heart and kidney transplantation.

## Materials

Combined heart-kidney transplant recipients at Cedars-Sinai Medical Center between March 2012 and December 2017.

- The primary outcome was delayed renal graft function (DRGF) as defined by need for dialysis within the first week of transplantation.
- The secondary outcome was any dialysis requirement within the first year.
- A univariate logistic regression model was used to assess the association between the donor, recipient and transplant factors with the primary and secondary outcomes.

Table 1: Patient characteristics	
Age, years ( $\pm$ SD)	55.0 (12.4)
Male , %	78.5
Body mass index, kg/m <sup>2</sup>	26.7 (6.0)
Prior creatinine, mg/dL ( $\pm$ SD)	3.3 (2.2)
Hypertension, %	39.4
Diabetes, %	36.3
Status 1A listing at transplant, %	72.7
Pre-transplant MCS, %	16.7
Redo transplantation, %	12.1

### References

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Table 2: Predictors of Renal Graft Failure	Odds ratio	95% CI	p-value
<b>Donor factors</b>			
Age	0.98	0.94-1.030	0.451
Male gender	0.91	0.29-2.91	0.886
Left ventricular hypertrophy	1.35	0.25-7.34	0.728
Creatinine	1.18	0.37-3.83	0.777
Kidney Donor Profile Index	1.00	0.97-1.02	0.758
<b>Recipient factors</b>			
Age	0.98	0.94-1.02	0.274
Male gender	0.83	0.24-2.85	0.772
Body mass index	1.00	0.99-1.00	0.202
Prior creatinine	1.80	1.25-2.59	0.002
Creatinine > 3.0 prior to transplant	6.22	1.79-21.61	0.004
Hypertension	0.56	0.18-1.71	0.306
Diabetes	0.33	0.09-1.12	0.076
Status 1A listing at transplant	0.82	0.26-2.63	0.743
Temporary mechanical circulatory support	1.39	0.36-5.42	0.633
Durable left ventricular assist device	0.43	0.05-3.95	0.457
Redo transplantation	2.63	0.59-11.77	0.208
<b>Transplant factors</b>			
Cardiopulmonary bypass time (hours)	1.24	0.55-2.79	0.607
Heart ischemic time (hours)	1.57	0.81-3.03	0.183
Female donor to male recipient	1.45	0.31-6.74	0.638

## Result Summary

- From March 2012 to December 2017, 66 combined heart-kidney transplant recipients for analysis (**Table 1**).
- The overall rate of DRGF was 30.3% and any dialysis requirement within the first year was 39.4%.
- Having an elevated creatinine prior to heart transplant was associated with DRGF (OR 1.80,  $p = 0.002$ , **Table 2**).
- Both pre-transplant creatinine (OR 1.73,  $p = 0.003$ ) and redo transplantation (OR 5.70,  $p = 0.043$ ) were associated with dialysis within the first year after transplant (**Table 3**)

Table 3: Predictors of dialysis in first year	OR	95% CI	p-value
<b>Donor Factors</b>			
Age	1.01	0.98-1.05	0.685
Male gender	1.16	0.39-3.49	0.787
Left ventricular hypertrophy	1.10	0.24-5.03	0.907
Kidney Donor Profile Index	1.01	0.99-1.03	0.557
<b>Recipient factors</b>			
Age	0.99	0.95-1.03	0.639
Male gender	0.97	0.30-3.13	0.956
Body mass index	1.00	0.99-1.00	0.148
Prior creatinine	1.73	1.21-2.50	0.003
Creatinine > 3.0 prior to transplant	4.52	1.54-13.29	0.006
Hypertension	0.41	0.14-1.18	0.099
Diabetes	0.67	0.23-1.90	0.447
Status 1A listing at TX	1.43	0.46-4.45	4.450
Temporary MCS	0.86	0.22-3.28	0.822
Durable left ventricular assist device	0.75	0.12-4.42	0.751
Redo transplantation	5.70	1.05-30.87	0.043
<b>Transplant factors</b>			
Cardiopulmonary bypass time (hours)	1.39	0.64-2.98	0.403
Heart ischemic time (hours)	1.59	0.84-2.97	0.148
Female donor to male recipient	0.91	0.20-4.20	0.653

## Conclusion

- In combined heart and kidney transplant recipients, elevated creatinine prior to transplant was the biggest predictor of delayed renal graft function.
- Both elevated pre-transplant creatinine and redo heart transplantation increases risk of dialysis within the first year.
- We suspect that unmeasured factors in this study, such as number of blood transfusions, degree of right ventricular failure and time between heart and renal implantation, may significantly impact the likelihood of DRGF and remain a topic of future study.

The authors have no relevant disclosures to endorse