

Impact of brain-death-induced transient myocardial dysfunction on long-term health of heart transplant recipients

Summer Undergraduate
Research Program

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Abstract

Despite the many years that brain-dead donors have been a source for heart transplants, some uncertainty remains as to the impact of brain-death on the long-term outcome of the heart transplant recipients. Cardiac dysfunction may occur in up to 42% of adults with brain death, affecting a highly significant proportion of hearts that are transplanted^{1,2}. Records of 246 donor hearts matched to recipients at UNMC between 2010 and 2017 were examined to determine long-term effect of brain-death-induced transient myocardial dysfunction (BDIMD). Data was also assessed to determine correlation between donor characteristics of age, gender, and cause of death and exhibition of BDIMD in donor hearts. It was found that 1-year and 5-year survival rates of recipients of donor hearts with BDIMD within the sample were on average lower than those seen in recipients of non-BDIMD donor hearts. While this result was not statistically significant ($p = 0.18$), the trend demonstrated in the data merits additional study into the effects of BDIMD in larger and more diverse sample sizes. No association between BDIMD and donor characteristics was found. Conclusions made by further study may aid health care workers in selection of hearts with highest survival rates for those in need.

Participants

- Data were derived from the UNMC heart recipient list from 2010 to 2017 (N = 246) and the associated heart donors from hospitals nationwide.
- The below table contains demographic information for the recipient population:

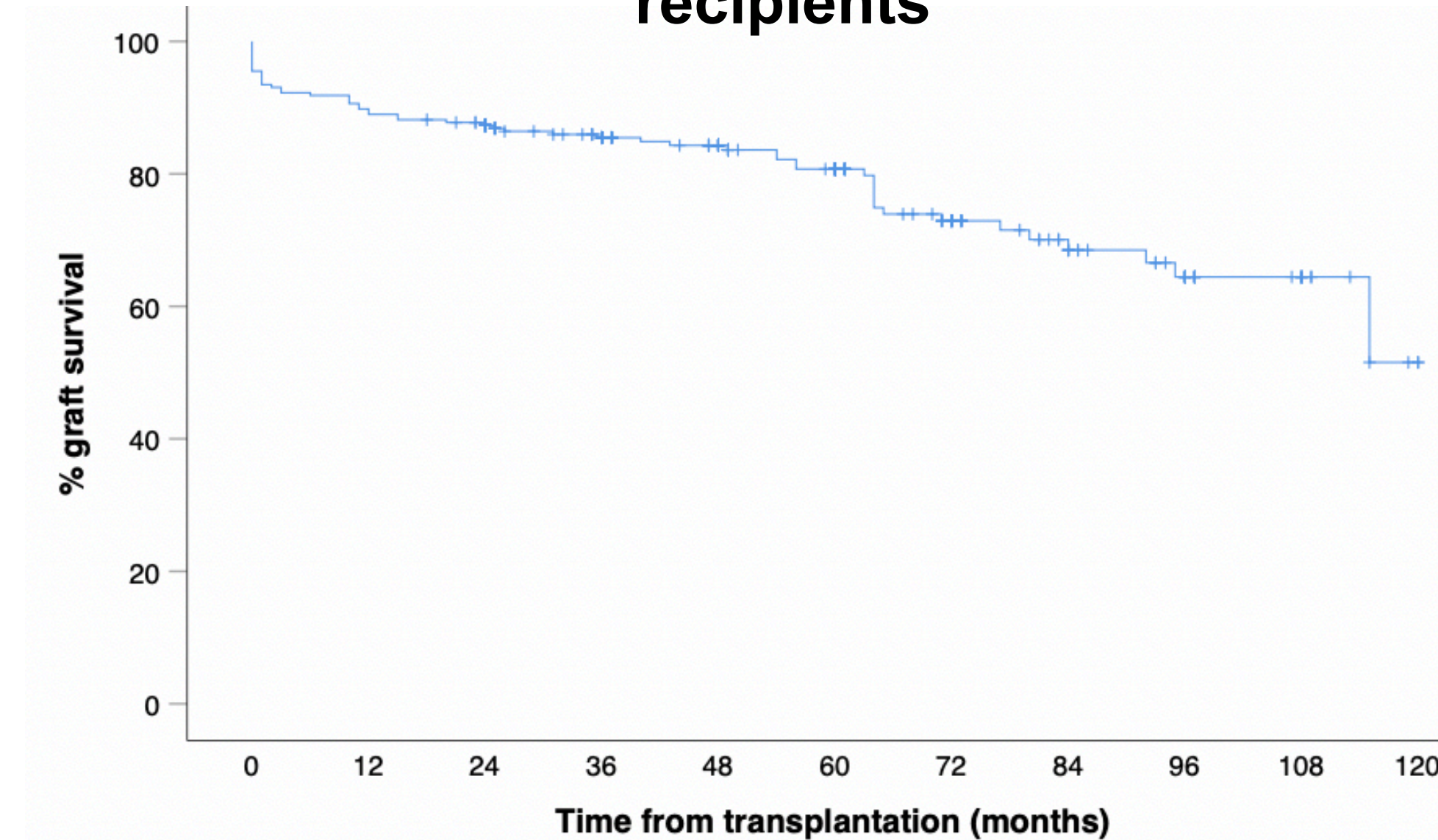
Demographics	N = 246
Age (Mean + SD)	30 ± 11 years
BDIMD Present	9.7%
Gender	
Male	73.5%
Cause of Death	
Traumatic Brain Injury	54.1%
Non-Traumatic Brain Injury	45.9%

Methods

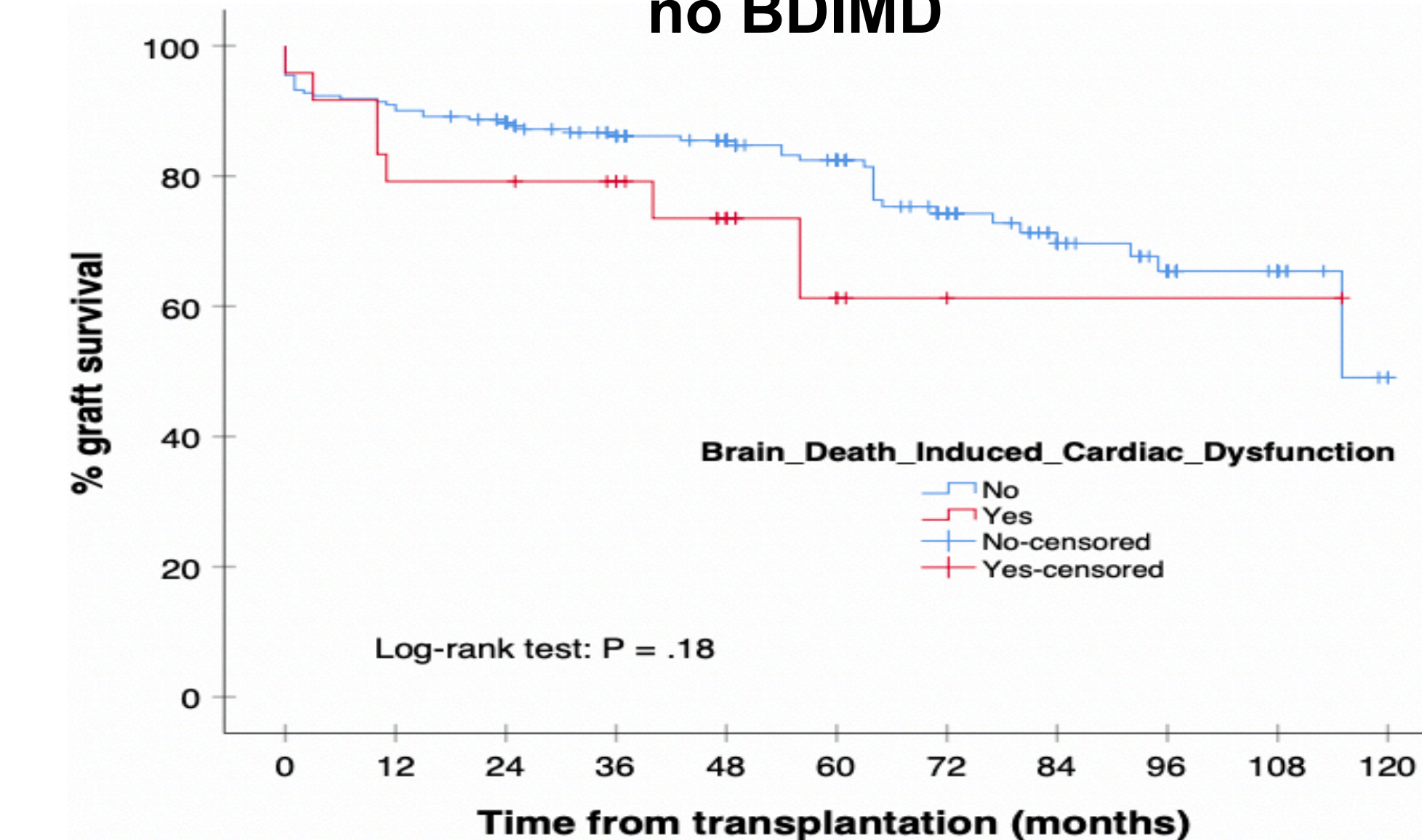
- The data were derived from UNMC records and the United Network for Organ Sharing (UNOS) UNet database.
- Diagnosis of BDIMD was based on reduced left ventricular function (ejection fraction < 55%) demonstrated by transthoracic echocardiography that improved over time.
- REDCap HIPAA-compliant software was utilized in compilation of data
- p-value for association between age and BDIMD was calculated by Mann-Whitney U test.
- p-value for association between gender and cause of death and BDIMD was calculated by chi-square test.
- p-value for association between survival rate and BDIMD was calculated by log-rank test.

Survival After Transplant

1- and 5-year survival was 90 ± 2% and 81 ± 3% for all recipients



Survival stratified by donors with BDIMD vs donors with no BDIMD



1- and 5-year survival of recipients who received an organ from donors with BDIMD was 79 ± 8% and 61 ± 14% versus 91 ± 2% and 82 ± 3% in recipients who received an organ from donors with no BDIMD ($P = .18$).

BDIMD and Donor Variables

Association between age and occurrence of BDIMD

	BDICD (N = 24)	No BDICD (N = 222)	P - value†
Donor age, years	27 (20,34)	28 (21,36)	0.71

Association between gender, cause of death and occurrence of BDIMD

	Female donors N = 65	Male donors N = 181	Females vs. Males P = .42	Traumatic brain injury N = 133	Non-traumatic brain injury N = 113	Traumatic vs. non-traumatic P = .19
BDICD N = 24	8 (12%)	16 (9%)		10 (8%)	14 (12%)	

Limitations

- Data was derived from a single medical center with a relatively small sample size
- Echocardiograms came from several organizations and were not standardized

Conclusion and Future Directions

- We found no association of donor characteristics (age, gender, cause of death) with BDIMD.
- There was a non-statistically significant trend towards lower recipient survival who received organs with BDIMD in comparison to other recipients.
- Future research will seek to extend the data set to the present day and include more variables. Research on the mechanism behind BDIMD would be beneficial in understanding its impact on survival.

References

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- Fyfe, B., et al. (1996). "Heart Transplantation" Associated Perioperative Ischemic Myocardial Injury." *Circulation* 93(6): 1133-1140.