**Impact of wait times for cardiac transplantation on outcomes after implantation of left ventricular assist devices (LVAD)**

Background: The optimal timing for orthotopic heart transplantation (OHT) after the implantation of left ventricular assist devices (LVAD) is unknown. In determining the optimal time for OHT after LVAD, the need for clinical stability and time to recover from major surgery is balanced by the risk of LVAD complications and the formation of adhesions and scarring. Some have argued that performing OHT early after LVAD placement poses an increased risk of morbidity and mortality to patients.

Methods: Using data from the Nationwide Inpatient Sample (NIS) from 1998 to 2011, we identified patients 18 years of age or greater who underwent implantation of a LVAD and for which the date of procedure was available. We calculated in hospital mortality for those patients who underwent OHT during the same hospitalization as a function of time from LVAD to OHT, adjusting for age, sex, race, household income, and number of comorbid diagnoses. We also compared in hospital mortality for those patients who underwent LVAD placement without OHTto mortality for patients who underwent OHT after LVAD placement. Finally, we analyzed the effect of time to OHT after LVAD placement on the length of hospital stay.

Results: 2200 patients underwent implantation of a LVAD in this cohort. 164 (7.5%) patients also underwent OHT during the same hospitalization, which occurred on average 32 days (IQR 7.75 - 66 days) after LVAD implantation. Of patients who underwent OHT, patients who underwent transplantation within 7 days of LVAD implantation experienced increased in-hospital mortality compared to patients who underwent transplant after 8 days(26.8% vs. 12.2%, p = 0.0483). There was no statistically significant difference in patient demographics with regards to age, sex, race, household income, or number of comorbid diagnoses. Compared to patients who underwent LVAD implantation but did not undergo OHT, patients who underwent late OHT after LVAD had decreased mortality (12.2% vs. 27.0% p < 0.001). Patients who underwent early OHT after LVAD did not show a similar mortality benefit (26.8% vs. 27.0%, p = 0.946). Patients who waited longer after LVAD implantation for OHT had longer hospital stays (39.3 ± 33.2 days for the first quartile, 48.87 ± 25.6days for the second quartile, 85.8 ± 40.1 days for the third quartile, 151.2 ± 52.6 days for the fourth quartile).

Conclusions: In this cohort of patients who received LVADs, the rate of in-hospital mortality after OHTwas lower for patients who underwent late OHT (greater than 8 days from LVAD implantation) when compared to patients who underwent OHT within 1 week of LVAD implantation, but a longer wait for OHT after LVAD placement correlated with longer hospital stays post OHT.

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| **Table 1.** Baseline demographics for early and late in-hospital Orthostatic Heart Transplant (OHT) after Left Ventricular Assist Device (LVAD) Implantation | | | | | |
|  | OHT 0 - 7 days after LVAD | OHT 8 - 31 days after LVAD | OHT 32 - 65 days after LVAD | OHT 66 days or more after LVAD | p-value (early group vs. pooled other groups) |
| (n = 41) | (n = 38) | (n = 42) | (n = 43) |
| LOS after OHT (SD) | **23.8 ± 21.4** | **21.7 ± 15.8** | **27.6 ± 37.1** | **27.1 ± 22.8** | **p = 0.6571** |
| LOS after OHT (survivors) (SD) | **29.1 ± 21.9** | **20.2 ± 12.8** | **23.4 ± 20.6** | **28.8 ± 22.9** | **p < 0.001** |
| Mortality (%) | **11 (26.8)** | **5 (13.2)** | **5 (11.9)** | **5 (11.6)** | **p = 0.0483** |
| Age, mean (SD) | 50.6 ± 12.6 | 48.6 ± 12.7 | 47.4 ± 15.3 | 46.3 ± 13.1 | p = 0.1667 |
| Sex, n (%) | | | | | |
| Male | 8 (19.5) | 6 (15.8) | 7 (16.7) | 9 (20.9) | p = 0.9999 |
| Female | 33 (80.5) | 32 (84.2) | 35 (83.3) | 34 (79.1) |
|  |  |  |  |  |  |
| Race, n (%) | | | | | |
| White | 25 (61.0) | 19 (50.0) | 23 (54.8) | 22 (51.2) | p = 0.4154 |
| Black | 3 (7.3) | 5 (13.2) | 8 (19.0) | 6 (14.0) |
| Hispanic | 3 (7.3) | 7 (18.4) | 2 (4.8) | 5 (11.6) |
| Asian/Pacific Islander | 2 (4.9) | 0 (0.0) | 1 (2.4) | 4 (9.3) |
| Native American | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Other or unknown | 8 (19.5) | 7 (18.4) | 8 (20.0) | 6 (14.0) |
|  |  |  |  |  |  |
| Median household income, n (%) | | | | | |
| $1-24,999 | 4 (9.8) | 8 (21.1) | 8 (19.0) | 8 (18.6) | p = 0.2309 |
| $25,000-34,999 | 10 (24.4) | 10 (26.3) | 10 (23.8) | 7 (16.3) |
| $35,000-44,999 | 12 (29.3) | 8 (21.1) | 10 (23.8) | 13 (30.2) |
| $45,000 or more | 12 (29.3) | 12 (31.6) | 14 (33.3) | 14 (32.6) |
| Unknown | 3 (7.3) | 0 (0.0) | 0 (0.0) | 1 (2.3) |
| Number of concomitant diagnosis, mean ± SD | 11.9 ± 3.1 | 12.3 ± 3.0 | 12.5 ± 3.2 | 12.5 ± 3.2 | p = 0.2961 |