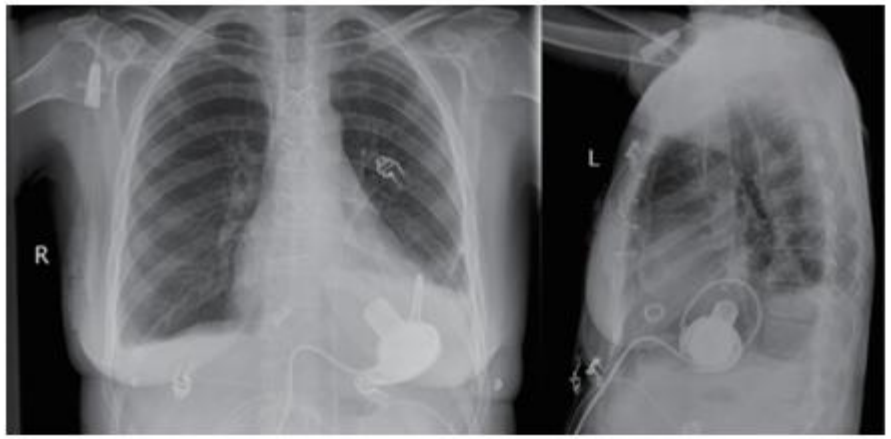

Figure 1 Heartware VAD (HVAD).

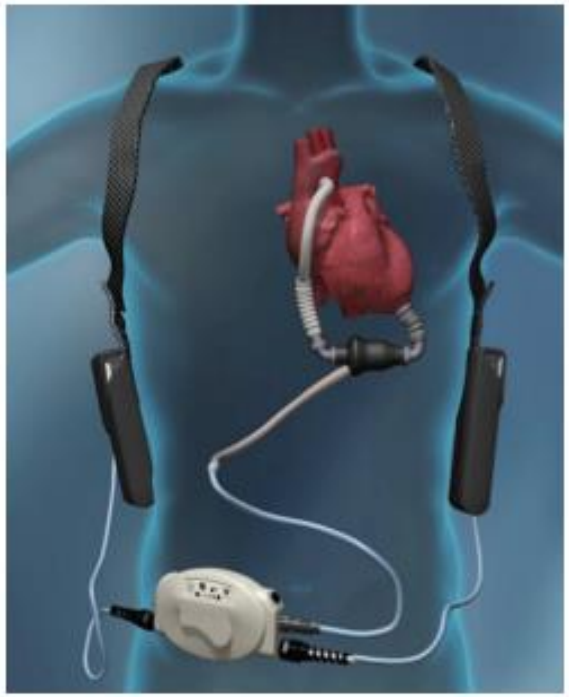

Figure 2 Heartmate II [reprinted from (7)].

Bridge to heart transplantation: Preoperative etiology, intraoperative anesthesia management and postoperative follow-up findings and complications in patients with heart support device

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INTRODUCTION:

- Despite advances in medical technology and renewed interest in preventive care, heart failure remains a major cause of morbidity and mortality worldwide. In part because of advances in the treatment of heart failure, more patients than ever before are living with advanced heart failure. The standard of care for patients with end-stage heart failure continues to be heart transplantation for those considered suitable candidates. However, the disparity between available donor hearts and recipients on the heart transplant list continues to increase. With the advent of durable and reliable mechanical circulatory support (MCS), bridge transplantation (BTT) therapy has become the standard of care for many patients with end-stage organ dysfunction or life-threatening deterioration of existing heart failure. While cardiac transplantation remains the gold standard, the availability of viable options for long-term mechanical support in patients with advanced stage heart failure ushered in the current era of MCS as a bridge to cardiac transplantation.
- In order to provide sufficient time for heart transplantation and to maintain life, a left ventricular support device is fitted to patients with heart failure. This bridge mechanism in heart transplantation imposes some burdens on the patient. These can be seen starting from the postoperative period and beyond. We examined the relationship between the negativities and complications that occur in this process and mortality and morbidity.

STATISTICAL ANALYSIS:

- Statistical analyses were performed with SPSS version 25.0 program. The Shapiro-Wilk test was used to examine the suitability of variables for normal distribution. Mean, standard deviation, median, minimum and maximum values were used when presenting descriptive analyses. When evaluating variables that did not show normal distribution in two independent groups, Mann Whitney U Test was used, and when evaluating in more than two groups, Kruskal Wallis Test was used. Differences between groups were determined with Dunn's Benferroni Test. When presenting categorical variables, frequency and percentage values of variables were used. Relationships between categorical variables were examined with Chi-Square and Fisher's Exact Test. Kaplan-Meier analysis was used to determine survival times. Cases where p-value was below 0.05 were evaluated as statistically significant results.

METHODS:

- 71 patients who received LVAD implants between January 2003 and December 2023 were recorded. Demographic informations, comorbidities, smoking and alcohol using, cardiac operation history, EUROSCORE II, intraoperative inotrope use and type of inotrope, ecmo, iabp and hemodialysis requirement in the first 48 hours of postoperative period, brand of the device, history of re-sternotomy, etiology of heart failure, preoperative ejection fraction, cardiopulmonary bypass and crossclamping time, postoperative blood transfusion, extubation time, duration of stay in intensive care and hospital, need for tracheostomy, 28-day survival and survival up to the study period, postop 0,1 and 2. day the turnover and flow parameters and complications related to the support device will be recorded.

RESULTS:

- Seventy one patients (61 male) were included in the study. There is no significant relationship between mortality and gender. Similarly, there are no significant relationships between mortality and smoking and alcohol use, age, and BMI. 55.22% of the patients had coronary artery disease, 47.76% had arrhythmia, 28.36% had diabetes mellitus, and 20.9% had chronic kidney disease. There is no significant relationship between mortality and comorbidity variables.
- In the postoperative period, the patient is given some inotropic agents intravenously. Some of these agents are dobutamine, dopamine, epinephrine, norepinephrine. The frequency of norepinephrine infusion in patients who died (82.76%) was significantly higher than in patients who survived (56.25%) (p=0.026). In the postoperative period, 5.97% of the patients required IABP, 13.64% required ECMO, and 21.21% required hemodialysis. Postoperative iabp (12.5%), ecmo (22.58%) and hd (35.48%) rates were significantly higher in patients with ex than in patients with survival (p=0.050, p=0.023, p=0.009, respectively). Although mortality was higher in patients with complications of assisted device-related bleeding (28.3%) and thromboembolism (28.13%), it was not statistically significant.Although no relationship was found between the measurement of LVAD time according to mortality status, the LVAD time in deceased patients was significantly lower than in surviving patients. We performed tracheostomy on 13.85% of our patients. As the length of hospital and ICU stay increased, the need for tracheostomy increased significantly (p=0.007, p=0.001, respectively).
- Although the average European System for Cardiac Operative Risk Evaluation(EuroSCORE) was found to be higher in patients with Ex, there was no significant relationship between the high Euroscore score and mortality. We thought that the lower the preoperative, the higher the mortality rate, but the data showed the opposite. No statistically significant relationship was found between preoperative ejection fraction measurement and mortality (p=0.205). We recorded the flow and rpm parameters of the mechanical support device until the 72nd postoperative hour. Although we could not find a relationship between postoperative rpm and flow measurements and mortality status, we found that postoperative rpm and flow measurements were lower in patients who died.

- In patients with postoperative revision(%16,42), the frequency of norepinephrine and epinephrine infusions was higher, while the frequency of dopamine infusions was significantly lower. We implanted 3 different brands of mechanical support devices to our patients: Heartware(%78,69), Heartmate 2(%11,48), Heart Mate 3(%9,84). We wondered if mortality was affected by brand. The frequency of being ex is similar across brands (p=1.000) The etiologies of heart failure in our patients are dilated cardiomyopathy, restrictive cardiomyopathy, and endocarditis. No significant relationship was found between the etiology of heart failure and mortality.
- The median survival time from the date of operation to the follow-up period was 99±11,294 months. Median survival time differs significantly between the LVAD brand groups from the date of operation to the follow-up period ($p<0.001$). Median survival time for Heartware was 113±8.754 (95% CI 76.8-121.14) months, while it was significantly higher in the Heart Mate 2 and Heart Mate 3 groups ($p<0.001$, $p=0.033$, respectively). The 28-day survival rate was calculated as 90.8±0.036%.

CONCLUSION:

- There are many factors that affect mortality and morbidity after LVAD implantation. In this process extending to heart transplantation, the mortality and morbidity of this process can be reduced by controlling the preoperative, intraoperative and postoperative parameters. If we can reduce the need for postoperative IABP, ECMO, hemodialysis and tracheostomy, we plan to reduce mortality to some extent.