



Clinical Experience and Outcomes with HeartMate II to HeartWare Left Ventricular Assist Device Exchange: A Multicenter Experience of 24 Cases

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BACKGROUND

- Despite improvements in pump design and durability, LVAD patients still suffer from life-threatening complications such as pump thrombosis (PT) and infection and often require device exchange.
- Surgical exchange from HM2 to HM2 is safe and associated with low mortality,^{1,2} however recurrent PT rates can be as high as 30% following device exchange.³
- With newer generation LVADs and expanding device indication, options to upgrade to a different pump at time of exchange is increasingly attractive and may be associated with improved long term adverse event profiles

METHODS

- We studied patients who underwent pump exchange from HM2 to HVAD at 4 different, large volume LVAD implant centers (Allegheny General Hospital, Penn State Health Milton S. Hershey Medical Center, University of Virginia Medical Center, Duke University Hospital) for PT or LVAD infection.
- Confirmed PT was defined as detectable pump thrombus via direct visual inspection after the device was explanted.
- LVAD infection requiring exchange was defined as an LVAD-specific infection that failed aggressive antibiotic treatment and/or surgical debridement of infected site.
- Surgical approaches included redo median sternotomy or minimally invasive thoracotomy with subcostal approach.
- The primary endpoint was to assess the safety and feasibility of surgical exchange from HM2 to HVAD. Secondary outcomes included evaluation for perioperative complications, recurrent PT, NYHA functional class and mortality.

RESULTS

Table 1. Surgical characteristics and peri-operative management.

Characteristic	N= 24 (%)
Surgical approach	
Redo-Sternotomy	19 (79)
Left anterior thoracotomy and subcostal approach	5 (21)
HVAD outflow graft	
To aorta	5 (21)
To existing partial HM2 outflow graft	19 (79)
Pump pocket repair required	4 (17)
Pump thrombosis confirmed	
Yes	20 (91)
No	2 (9)
Cardiopulmonary bypass time, median minutes (range)	126 (49 – 246)
Total operative time, median minutes (range)	303 (65 – 688)
Concomitant procedures	5 (21)
Valve repair/replacement	2 (40)
RVAD placement	2 (40)
Other	1 (20)
PRBC units transfused, median (range)	3.5 (0 – 18)
FFP units transfused, median (range)	2 (0 – 19)

Table 2. Clinical outcomes following HM2 to HVAD exchange.

Characteristic	N= 24 (%)		
Length of stay, median days (range)			
ICU	6.5 (2 – 59)		
Total	17 (5 – 96)		
Post-implantation RV failure requiring:			
Prolonged inotropic support	7 (29)		
Requiring RVAD	2 (29)		
Recurrent thrombosis	2/22 (9)		
Days from exchange to event, median (range)	254 (235 – 273)		
CVA after the exchange:			
Hemorrhagic	2 (50)		
Embolic	1 (25)		
Transient ischemic attack	1 (25)		
Days from exchange to event, median (range)	68 (7 – 211)		
BTT patients remained OHT eligible	6/9 (67)		
NYHA functional class at:	30 days	90 days	1 year
1	2/20 (10)	2/17 (12)	1/15 (7)
2	9/20 (45)	8/17 (47)	10/15 (67)
3	7/20 (35)	5/17 (29)	4/15 (27)
4	2/20 (10)	2/17 (12)	0
Mortality:			
30 days	2 (8)		
90 days	3 (13)		
1 year	8 (33)		

RESULTS cont.

- Twenty-four patients underwent HM2 to HVAD exchange due to PT (92%) and pump infection (8%).
- Patients were male (75%), white (88%), with ischemic cardiomyopathy (54%), initially classified as INTERMACS 1-3 (90%) at time of first pump, and destination therapy (62%).
- Most common surgical approach across centers was redo sternotomy (79%), with one center (Hershey) preferring a minimally invasive thoracotomy with subcostal approach. There were no statistically significant differences in terms of number of intraoperative PRBC and FFP units transfused, operative and CPB time, total and ICU length of stay (limitation - low number of cases).
- The majority of BTT patients were still transplant eligible after exchange (67%).
- Recurrent PT was noted in 2 (9%) patients at 235 and 273 days.

CONCLUSIONS

- The surgical exchange from HM2 to HVAD is feasible and safe, despite the differences in device specifications and surgical complexity.
- Differential pump exchange can be performed successfully using less invasive technique.
- This is the largest study to date to evaluate HM2 to HVAD exchange
- More study is needed to determine best surgical technique when exchanging the HM2 to newer devices and if longevity and long term adverse events can be improved.

REFERENCES

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