

# Concomitant Repair For Mild Aortic Insufficiency And Implantation Of Left Ventricle Mechanical Support

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## Abstract

Aortic valve regurgitation in patients undergoing LVAD implantation is a significant complication which occurs in up to 10% of patients in the INTERMACS database. Patients who have aortic valve regurgitation at the time of implant have been handled by several methods, including aortic valve leaflets approximation, to aortic valve replacement or even valve closure. We report a case where we used HAART Ring to repair a regurgitant aortic valve during LAVD implant for destination therapy.

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Running Title: Repair Aortic Insufficiency For Left Ventricle Assist Device

Abbreviations:

AI: Aortic Value Insufficiency

AV: Aortic Valve

DT: Destination Therapy

EF: Ejection Fraction

LVAD: Left Ventricular Assist Devices

TEE: Transesophageal Echo

Key Words

LVAD, aortic valve regurgitation, aortic valve repair, HAART Ring, complications, heart failure, non-ischemic cardiomyopathy

Abstract

Aortic valve regurgitation in patients undergoing LVAD implantation is a significant complication which occurs in up to 10% of patients in the INTERMACS database. Patients who have aortic valve regurgitation at the time of implant have been handled by several methods, including aortic valve leaflets approximation, to aortic valve replacement or even valve closure.

We report a case where we used HAART Ring to repair a regurgitant aortic valve during LAVD implant for destination therapy.

Introduction

Aortic valve insufficiency (AI) is a significant complication of left ventricular assist devices (LVAD). In a recent INTERMACS registry analysis, 10.7% of patients developed moderate to severe AI in a time dependent fashion and was associated with decreased survival.(1) Since AI is generally considered unfavorable in this population, multiple mitigation strategies have been developed. The first is prediction of patients who may develop AI which include smaller body surface area, older age, female sex, and dilated aortic roots.(2) The second is aggressive valve treatment strategies which fall into either intervention at time of surgery versus treatment post occurrence. Treatment strategies fall into two categories: valve replacement, central oversewing or even valve closure in selected cases.(3) Additionally, Impella placement may be a separate risk factor for AI in durable LVADs.(4) Central oversewing is safe and effective but in case of LVAD stoppage risks sudden death and may complicate assessment of left ventricular function. Replacement with bioprosthetic AVR has risks associated with valve thrombosis. At present neither strategy is optimal.

## Case Report

We report the use of a HAART 300 ring and associated leaflet repair during LVAD implantation in 56-year-old Caucasian female with acute exacerbation of her chronic congestive heart failure (CHF). Her history is significant for biventricular reduced ejection fraction (EF) secondary to prior chemotherapy, single vessel left anterior descending artery with previous stent, left bundle branch block, Type 2 diabetes mellitus and hyperlipidemia. Left ventricular ejection fraction was 1155. She was admitted, started on inotropes, and had therapy escalated to an Impella 5.5. She developed high panel reactive antigens and was offered a Heartmate 3 LVAD as DT. Preoperative transesophageal echo (TEE) revealed an Impella device across the aortic valve (AV) between the non-coronary and right coronary cusps. Initially no aortic insufficiency (AI) was visualized. However, after initiation of cardiopulmonary bypass and removal of the Impella, AI of mild severity was identified (Figure1). Two separate AI jets were present, larger central jet and a smaller jet in the location previously occupied by the Impella device.

## Methods

We chose to repair the aortic valve in the operating room as previously described using a HAART 300 19mm ring (Figure2). The non-coronary leaflet had a minor leaflet prolapse with mild damage to its node of Arrhenius which was corrected by two leaflet edge plication sutures of 7-0 prolene.(5) Additionally, a surgical RVAD was placed. We clamped the aorta, delivered cardioplegia, did the aortic valve repair and the LVAD graft anastomosis to the ascending aorta during one cross-clamp period. The cardiopulmonary bypass time was 196 minutes, and the aortic cross-clamp time was 96 minutes. After AV repair and LVAD implantation, TEE revealed a well seated annuloplasty ring and trivial AI with a small central jet (Figure 1). The AV leaflets did not open during systole postoperatively so a postoperative gradient could not be obtained.

IRB deemed not applicable per the University of Iowa IRB Standard Operating Procedures and Researcher Guide: *12.G Case Reports: A case history, case report or case study which are published and/or presented at national or regional meetings are not considered research if the case is limited to a description of the clinical features and/or outcome of a three or fewer patients and do not contribute to generalizable knowledge.*

## Results

In summary, we report the first use of the HAART aortic valve repair to address AI at LVAD placement. The patient had multiple previously described risk factors for AI development. In doing so we were able to perform a durable repair of the valve without either surgical closure of the valve or its replacement. We plan to follow this patient serially and consider repair in future patients with AI requiring LVAD.

Financial Conflict of Interest: None

IRB approval: N/A

Author's Contributions:

A. Singhal, J. Bang, A. Panos, A. Feider, S. Hanada, J. Rankin were involved in the design and analysis of the case, the original draft, and revised drafts of the paper and gave final approval of the version to be

published.

## References:

1. Truby LK, Garan AR, Givens RC, Wayda B, Takeda K, Yuzefpolskaya M, et al. Aortic Insufficiency During Contemporary Left Ventricular Assist Device Support: Analysis of the INTERMACS Registry. *JACC Heart Fail*. 2018;6(11):951-60.
2. Kagawa H, Aranda-Michel E, Kormos RL, Keebler M, Hickey G, Wang Y, et al. Aortic Insufficiency After Left Ventricular Assist Device Implantation: Predictors and Outcomes. *Ann Thorac Surg*. 2020;110(3):836-43.
3. Schechter MA, Joseph JT, Krishnamoorthy A, Finet JE, Ganapathi AM, Lodge AJ, et al. Efficacy and durability of central oversewing for treatment of aortic insufficiency in patients with continuous-flow left ventricular assist devices. *J Heart Lung Transplant*. 2014;33(9):937-42.
4. Rao SD, Johnson B, Olia SE, Wald J, Medina V, Rame JE, et al. Treatment With Impella Increases the Risk of De Novo Aortic Insufficiency Post Left Ventricular Assist Device Implant. *J Card Fail*. 2020;26(10):870-5.
5. Gocol R, Jasinski M, Hudziak D, Bis J, Zak A, Duraj P, et al. Surgical correction of aortic regurgitation using a HAART 300 rigid aortic ring: A novel method to standardize aortic valve repair. *Cardiol J*. 2019;26(6):799-801

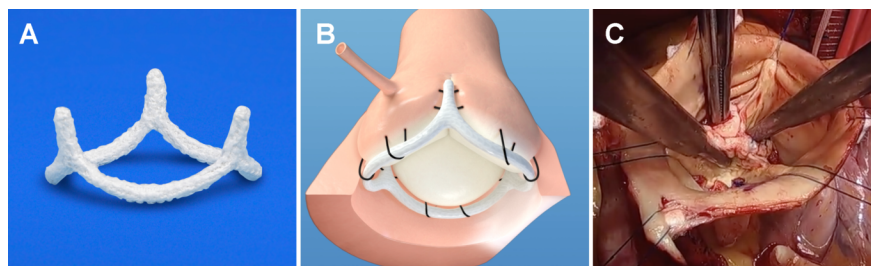
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Pre-Cardiopulmonary bypass, Mid-Esophageal Aortic Valve Short Axis View with Impella in place crossing the aortic valve

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Figure 1

Figure 2



1. Aortic Annuloplasty Ring (HAART 300 – Trileaflet Aortic Valve)
2. Illustration of aortic annuloplasty ring in the sub valvular position
3. Aortic valve post-repair with aortic annuloplasty ring