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Management of severe tricuspid valve regurgitation due to ruptured papillary muscle in a patient with mediastinitis early after heart transplant

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**Abbreviations**: CPB = cardiopulmonary bypass, PTFE = polytetrafluoroethylene 

RV = right ventricle, RVAD = right ventricular assist device, TEE = transesophageal echocardiogram, TR = tricuspid regurgitation, TTE = transthoracic echocardiogram, TV = tricuspid valve.

**Central Picture**: Complex repair of tricuspid valve for flail anterior leaflet post heart transplant.

**Central Message**: Complex repair of tricuspid valve for severe tricuspid regurgitation may be favored over replacement in some patients after heart transplant.
Introduction

Many patients who undergo heart transplantation are medically complex and may present in cardiogenic shock (CS). Such patients often require mechanical circulatory support (MCS) to bridge to transplant, which may need to be continued in the immediate post-transplant period. The rate of potential complications increases with the use of MCS, most commonly related to hematologic, neurologic, and limb complications\(^1\); however, direct damage to vessels and the heart may occur.

In this case, we present a patient who underwent heart transplant and likely suffered damage to the tricuspid valve (TV) as a result of right ventricular assist device (RVAD) cannula placement. Consent was obtained from the patient for publication of study data; this study was exempt from the Washington University Institutional Review Board.

Clinical Summary

A 44-year-old man with non-ischemic cardiomyopathy treated with HVAD (HeartWare, Inc., Framingham, MA) implantation, presented in refractory ventricular fibrillation resulting in CS. A Protek Duo (LivaNova USA Inc., Arvada, CO) percutaneous RVAD was placed to provide biventricular support.

He was upgraded to status 1, and when an appropriate heart became available underwent redo sternotomy, HVAD explantation, and heart transplant. The RVAD cannula was kept to the side and reinserted directly during right sided anastomoses. He was extubated on postoperative day 1 but required hemodialysis. On postoperative day 11, the RVAD was removed. Severe tricuspid
regurgitation (TR) with a flail leaflet causing moderate right ventricular (RV) dilatation and mild RV dysfunction was found on the first surveillance transthoracic echocardiogram (TTE). This was managed conservatively with a plan to intervene after the patient recovered. One month post-transplant, the patient developed Enterobacter mediastinitis requiring multiple extensive debridements with an open chest for several weeks. Once the cultures cleared, we proceeded with tricuspid intervention.

In the operating room, the mediastinum was accessed by reopening the wound. There were few adhesions, and the right-sided structures were easily identified. The aorta had minimal room and was dissected distally to allow cannulation. Once dissection was complete, the patient was placed on cardiopulmonary bypass (CPB) using aortic and bicaval cannulation. We performed the operation without aortic cross clamping to avoid further insult to the RV. The right atrium was opened, and the flail anterior leaflet was identified. Two polytetrafluoroethylene (PTFE) sutures were passed through medial and inferior papillary muscles and then passed through the anterior TV leaflet edge 5 mm from each side of the prolapse, in horizontal mattress fashion and left loose. A pledgeted PTFE suture was placed in a horizontal mattress through the interventricular septum underneath the septal leaflet, passed through the fibrous union of the anterior leaflet cords without crossing the cords of the septal leaflet, and was tied down. The remaining two PTFE sutures were then tied at the level of the annulus, visually estimating where the plane of the annulus laid. This served as a backup safety mechanism to avoid anterior leaflet prolapse in the case of undoing of the primary repair. Tricuspid annuloplasty was performed using a 26mm Tricuspid Physio ring (Edwards Lifesciences, Irvine, CA) (Figure 1). Saline test showed minimal leak. The right atrium was closed, and CPB was weaned off. Intraoperative
transesophageal echocardiogram (TEE) showed TR reduced to trace (Figure 2) with a mean gradient of 2 mmHg.

Two days later, the chest was closed with omental coverage of the mediastinum, pectoralis major muscle advancement flaps, and sternal and rib plating by plastic surgery. The patient was discharged home a month after.

Six months after discharge, he is doing well with good biventricular function, no TR, and encouraging signs of renal recovery. Since cardiac biopsies may disrupt the complex repair, rejection is monitored with serial TTE and blood tests for gene expression profiling, a validated diagnostic tool to monitor for rejection in transplant patients.

Discussion

TV replacement in the presence of a hemodialysis catheter, immunosuppression, and mediastinitis could be high risk for endocarditis along with a reduced quality and expectancy of life\(^2,3\). Thus, we opted to for complex TV repair over replacement. Despite short-term follow-up in this case, complex TV repair for a mechanical issue can be an effective means of managing severe TR, especially when there is need to avoid replacement.

TR is the most common valvular issue for heart transplant recipients and may result in life-limiting symptoms\(^4\). Often, it is due to RV dysfunction following transplant which may improve with time; however, TR may be due to mechanical issues\(^5\).
Overall, TR is a common problem in patients who have undergone heart transplant. It is often clinically inconsequential, but strong consideration should be given to intervention when it is severe and due to a mechanical issue. Even in medically complex situations, repair may be possible and could be encouraged.
References


Figure Legends

Figure 1. Complex repair of the tricuspid valve showing (A) the flail anterior leaflet (B) pledgeted PTFE suture placed in a horizontal mattress fashion through the interventricular septum underneath the septal leaflet and passed through the fibrous union of the anterior leaflet cords without crossing the cords of the septal leaflet, two PTFE sutures passed through medial and inferior papillary muscles through the anterior TV leaflet edge 5 mm from each side of the prolapse (C)TV after all sutures tied

Figure 2. (A) TTE demonstrating flail tricuspid leaflet with dilated RV; TEE showing (B) severe tricuspid regurgitation and (C) trace tricuspid regurgitation after complex repair.