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High-risk Coronary Artery Bypass Grafting and Mitral Valve Replacement in a HIV Positive Patient

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ABSTRACT

Certain subsets of high-risk mitral valve patients are not suitable candidates for transcatheter therapies. The objective of this report is to present a young patient with combined mitral valve and coronary artery disease to illustrate these challenges.In this report, we present a 47-year-old man with longstanding HIV infection who was referred with severe mitral regurgitation (MR) and profound cardiomyopathy to highlight the importance of decision-making and perioperative management.A 47-year-old HIV positive man with New York Heart Association class IV congestive heart failure was found to have severe MR (mixed Carpentier Type I and IIIB pathologies). The last viral load titer of the patient was undetectable. Cardiac catheterization revealed a chronic total occlusion of the middle of left anterior descending artery, ostial obtuse marginal and 70% posterior descending artery lesion, as well as severe pulmonary hypertension (PAP of 70/30 (mean: 43)), and a pulmonary vascular resistance of 4.6 Woods units. Preoperative cardiac magnetic resonance imaging showed left ventricular ejection fraction of 20%, right ventricular ejection fraction of 30%, nonviable circumflex distribution and scattered viability in the anterior and inferior cardiac walls. He underwent a high-risk coronary artery blood grafting plus mitral valve (MV) replacement (with intra-aortic balloon pump support). The postoperative course was complicated by gastrointestinal bleeding requiring transfusion, aspiration pneumonitis, atrial flutter and difficile colitis. However, the patient recovered appropriately, and remained asymptomatic and healthy in three months follow-up postoperatively. Application of transcatheter MV or device-assisted therapies for high-risk patients with severe MR might be limited due to financial, medical or social situations. In these instances, high-risk mitral valve surgery may still be the choice treatment in the selected patients.

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Introduction

Mitral regurgiation (MR) is the second most common cardiac valve disease. This condition is present in 24% of adults with valvular heart diseases and 7% of the patients are older than 75 years (1). Surgical mitral valve (MV) replacement is the treatment of choice for appropriate recovery of mitral regurgitation (MR) and insufficiency (MI) (2). Alternative treatment of MV replacement is valve repair.

Studies have shown that MV repair not just have a modest survival rate, but also a two-fold rate of freedom from reoperation compared to the replacement modality (3). More recently, transcatheter approaches for MV repair are trialed for improved safety and morbidity reduction. The MitraClip (Abbott Laboratories, Chicago, Illinois, USA) method has shown promise in reducing the 30-day morbidity, but it is subpar in terms of one-

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year survival, reoperation need, or recurrent severe MR (1, 4-6). Determination of the long-term feasibility of transcatheter devices is already under study.

Certain subsets of high-risk patients with MV problem are not suitable candidates for the transcatheter therapies. When the severe MR patient is ineligible for ventricular assist device or transplanation, most probably will be relegated to hospice care. In this report, we present a young patient with combined MV and coronary artery disease to illustrate these challenges.

Case Presentation

In this report, a 46-year-old male with twenty years history of human immunodeficiency virus (HIV) infection with current undetectable levels viral load was referred with New York Heart Association (NYHA) class III-I and symptoms of shortness of breath and exertion dyspnea. In the echocardiography severe MR (mixed Carpentier Type I and IIIB pathologies), pulmonary hypertension, and profound biventricular dysfunction was demonstrated. Cardiac magnetic resonance imaging (MRI) showed a right ventricular ejection fraction (RVEF) of 30%, left ventricular ejection fraction (LVEF) of 20%, ischemic MR, and scattered areas of viable myocardium (Figure 1). Cardiac catheterization showed chronic total occlusion of the middle left anterior descending (LAD) coronary artery, high-grade ostial obtuse marginal (OM) coronary artery, and 70% posterior descending artery (PDA) stenotic lesion. Right cardiac catheterization revealed a mean pulmonary artery pressure of 43 (70/30) and pulmonary vascular resistance of 4.6 Woods units.

He was evaluated for, but not eligible for, a permanent ventricular assist device. Subsequently, this case was presented in a multidisciplinary cardiology meeting, and the decision was made to offer him a high-risk coronary artery bypass grafting (CABG) and MV replacement operation based on his young age, areas of viable myocardium, and the potential reversibility of his pulmonary hypertension.

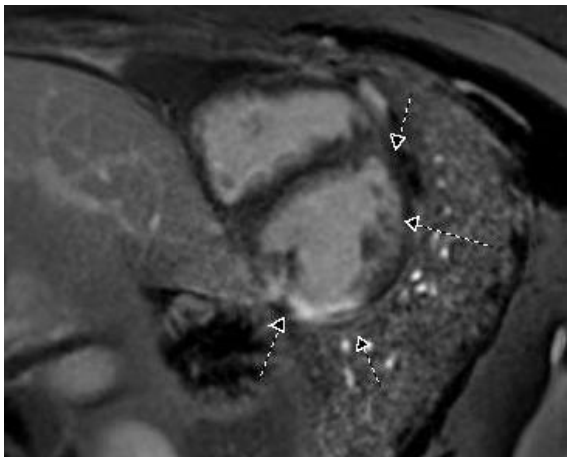

Figure 1. Cardiac MRI shows biventricular dilatation with LVEF 20%, RVEF 30%, and no LV thrombus with largerly nonviable inferior and inferiolateral walls as well as some scattered anterior and inferior wall viability

After a meticulous preoperative evaluation and detailed explanation of the risks and benefits, the patient elected to proceed with the operation, given his poor quality of life and the risks of this conservative management.

After acquiring consent, the patient was admitted to the operating room. The patient was sedated and prepared for operation. The patient was intubated and placed under general endotracheal anesthesia. A trans-esophageal echocardiogram showed pulmonary artery pressures close to the systemic pressures, so the anesthesia maintained with dobutamine and milrinone. The pulmonary artery pressures then decreased to 60% of the systemic ones. An intra-aortic balloon pump was inserted, which improved the pulmonary artery pressure to 40-50% of the systemic ones.

Median sternotomy was performed for exposing the heart. While the left internal mammary artery (LIMA) was being harvested and skeletonized, the left saphenous vein graft (SVG) was acquired endoscopically. After harvesting the conduit vessels, appropriate measurements were obtained to install the cardiopulmonary bypass. Antegrade and near-continuous retrograde cardioplegia were applied to decrease the body temperature to 32 degrees Celsius.

Three CABG anastamoses were placed: LIMA to LAD, SVG to PDA, and SVG to diagonal artery. Attention was then diverted to replacing the MV. After visualization, the left atriotomy and dissection of the Waterston's groove, a 33mm Magna Mitral Ease Valve (Edwards Lifesciences, Irvine, California) was placed with chordal-sparing. After closure of the left atriotomy, the SVG conduits were sutured onto the aortic root. The patient was separated from the cardiopulmonary bypass device with inhalation of nitric oxide (NO), milirinone, epinephrine, dobutamine, Levophed, and the intra-aortic balloon pump set at 1:1. After proper closure of the operating field, the patient was taken to the intensive care unit. Due to stable hemodynamics, the intra-aortic balloon pump was removed on the same day.

Post-operatively, the patient reported "coffee ground" emesis which was managed with conservative management. Atrial flutter was also noticed at this time, which was managed with amiodarone. After resolution of the emesis, the patient was noted to have increased dyspnea and was managed with oxygen therapy, nebulizers,

postural drainage, and percussion.

The patient also became increasingly fluid overloaded and had to be aggressively diuresed. Computed tomography scan of the lungs showed diffuse multifocal pneumonia. After aggressive diuresis and fulfillment of the administration of antibiotics, the patient's hypoxia resolved and he was discharged without need to home oxygen therapy. The patient presented without any complaints on 30-day postoperative follow-up.

Discussion

Severe MR is usually managed via the conventional surgical approach and is recommended for symptomatic severe MR or asymptomatic severe MR with poor LVEF or certain cardiomyopathaies (4, 5). Surgery can be performed with minimal complications and with mortality rates similar to the general population (1, 5). The reoperation rate at 10 and 20 years is 94 and 92%, respectively (1). MV repair with annuloplasty rings have shown promising and similar results to that of MV replacement. MV repair has shown superior results compared to the replacement in terms of improving the left ventricular remodeling. The greatest disadvantage of MV repair compared to the replacement is recurrence of MR (2). Besides, the survival and morbidity in cases with complicated comorbidities is under debate.

After the successful introduction of the transcatheter aortic valve implantation procedures, attention to the percutaneous and catheter approaches for MV repair and replacement increased (2). Many minimally invasive devices are currently undergoing trials to assess their efficacy and safety. The Carillon Mitral Contour System (Cardiac Dimensions, Inc., Kirkland, Washington, USA) uses an indirect annuloplasty approach to fix MR. In this method, by uilizing the close anatomical relationship of the coronary sinus and the posterior mitral leaflet, the device is inserted transcutaneously via the jugular vein, through the right atrium, and then into the coronary sinus. Afterwards, two anchor stents are deployed: one before the beginning of the great cardiac vein and the other one exactly at the beginning of the coronary sinus ostium. A spring-like material exists between the anchors, which contracts and approximates the posterior mitral annulus closer to the anterior wall and effectively reduces the regurgitation (5, 6). This device has 82% successful installation rate and has 82% event-free safety for at least twelve months (5).

However, this method has complications and so limitation in special cases with an anatomical variation should be considered (6). When the branches of circumflex artery are between the mitral annulus and coronary sinus, in 30% of such cases, due to compression of these arteries, infarction events have been reported (5, 6). Therefore, this device has decreased in favor.

A direct annuloplasty approach using a transvenous and transseptal route is also introduced with the Valtech Cardio B (Vlatech Cardio, Or Yehuda, Israel). By this device, an annuloplasty ring is implanted with securement via nitinol screws in a commisure-to-commisure fashion. This device is currently undergoing clinical trials (5).

The more preferred transcatheter approach is edge-to-edge approximation with the MitraClip. This device is inserted through the femoral vein to reach the right atrium and then transeptally to the left atrium. Afterward, a clip is placed on the edges of the posterior and anterior mitral leaflets, approximating the P2 and A2 aspects of the MV. This technique effectively reduces the MR via producing a double-orifice structure of the MV during the diastole (5, 6). The eligibility criteria for the MitraClip pertain to anatomy, including a coaptation length less than 2 mm, coaptation depth less than 11 mm, flail gap less than 10 mm, and flail width less than 15 mm (5). The MitraClip has undergone comparison with the conventional surgery in the EVEREST I and II clinical trials. The primary efficiency endpoint of one-year survival rate, reoperation risk, and recurrent severe MR was subpar compared to the surgical approach (73% with MitraClip versus 55% with surgery).

Both interventions induce similar improvements in the symptoms of heart failure at the first year, but the surgical group might experience more complications at the first thirty days. So, freedom from a major adverse event at 30 days post operation, is better with MitraClip (15% versus 48%). The most common complication of this method is need to blood transfusion, but even with exclusion of transfusion, the MitraClip is still superior. In a subgroup analysis, the patients older than 70 years with functional MR acquired better primary endpoint rates with the MitraClip (4). This approach is approved by U.S foods and Drugs Federation and is accepted due to high safety and minimal 30-day adverse outcomes.

The MitraClip device is considered for the patients older than 70, have functional MR, and are considered high-risk for other surgical approaches. The patient presented in this report is a 46-year-old male with HIV infection. Therefore, he does not qualify in terms of age. In addition, due to severe MR, he also required a 3-vessel CABG; a concurrent surgical MV replacement, the gold-standard approach, could easily be performed.

Furthermore, the interventional and surgical

teams were aware of the risk of HIV infection. The EVEREST II trial demonstrated a higher re-intervention rate, after using the MitraClip (4), and so re-exposure of the teams to this risk in case of failure of the first attempt was probable. Therefore, a surgical approach by minimizing the risk of HIV exposure with one-time intervention was more appropriate.

Generally speaking, the application of the transcathter MV or assist device therapies for the high-risk MV patients may be limited due to financial, medical, or social aspects. In these instances, high-risk MV surgery might remain appropriate in the selected patients. However, the further studies are essential to investigate the co-morbidities that would disqualify a patient for percutaneous intervention.

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Conflict of Interest

The authors declare no conflict of interest.

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