Percutaneous Rescue for Critical Mitral Stenosis Late After Mitral Valve Repair

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We report a case of catastrophic hemodynamic compromise secondary to pannus ingrowth and severe mitral stenosis occurring years after repair of a nonrheumatic mitral valve. The initial repair included closure of a posterior leaflet cleft and implantation of an annuloplasty ring. We describe a hybrid treatment strategy for this severely compromised patient, which included initial placement of a right ventricular assist device followed by percutaneous balloon mitral valvuloplasty and, eventually, a definitive mitral valve reoperation. This case report reinforces the importance of routine clinical and echocardiographic follow-up for patients after mitral valve repair, and it includes the description of a novel therapeutic approach.

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Mitral valve repair has been shown to provide excellent long-term relief for patients with nonrheumatic mitral valve disease and severe regurgitation [1]. Mitral stenosis is an unusual mode of failure after repair of nonrheumatic mitral valve disease. Few cases have been reported in the literature. We report a catastrophic presentation of mitral stenosis to an outside hospital late after mitral valve repair. The patient's condition was thought to be too unstable to allow her to undergo mitral valve reoperation immediately, and therefore she underwent rescue with a combination of right ventricular assist device (RVAD) and percutaneous balloon mitral valvuloplasty (PBMV). To our knowledge, this is the first report of PBMV of a previously repaired nonrheumatic mitral valve.

A 34-year-old woman presented with acute congestive heart failure and cardiogenic shock, requiring intubation and support with multiple inotropic agents. She had undergone mitral valve repair through the right chest 12 years earlier for nonrheumatic mitral regurgitation. The prior repair included closure of a posterior cleft and implantation of a 25-mm flexible Duran annuloplasty ring. Intraoperative echocardiography showed a competent mitral valve with no gradient reported. Physical examination revealed depressed mental status, tachypnea, bilateral rales, peripheral edema, and cold extremities. The patient's systolic blood pressure was 80 mm Hg, with a sinus tachycardia in the 120s. A diastolic murmur was heard on cardiac auscultation. Echocardiography revealed markedly thickened mitral leaflets and severe mitral stenosis, with a mean gradient of 28 mm Hg and a calculated mitral valve area of 0.6 cm^2. The right ventricle was dilatated, with severely depressed function, compressing a small hyperdynamic left ventricle. The pulmonary artery systolic pressure was estimated to be 63 mm Hg, with a systemic systolic blood pressure of 80 mm Hg. The cause of the severe pulmonary hypertension and severe RV dysfunction was considered to be secondary to mitral stenosis; however, the patient's condition was thought to be too unstable to allow definitive cardiac reoperation.

The patient was intubated and given multiple vasopressor agents in an attempt to improve her hemodynamics. Initial resuscitative efforts were unsuccessful, and a repeated echocardiogram revealed progressive right ventricular failure. The surgeon at the initial treating facility did not think that the patient would tolerate cross-clamping and mitral valve replacement because of incipient end-organ failure. She was therefore taken to the operating at this facility, where an extracorporeal centrifugal RVAD (Centrimag, Thoratec Pleasanton, CA) was inserted through a median sternotomy. After RVAD insertion and stabilization, the patient underwent percutaneous balloon mitral valvuloplasty. Her baseline left atrial pressure, measured through the catheter, was 45 mm Hg, and her systolic pulmonary artery pressure was 71 mm Hg. Catheter measurements revealed a peak mitral gradient of 40 mm Hg (mean 28 mm Hg). The mitral valve was dilated progressively with 22-, 24-, and 25-mL Inoue balloons. Her mitral valve annulus increased from 0.6 cm^2 to 1.2 cm^2, as measured by transesophageal echocardiography, with no mitral regurgitation, and her mean gradient decreased to 15 mm Hg. After this procedure, her hemodynamics quickly improved, and the RVAD was soon explanted. Despite improved cardiac performance, this patient endured a prolonged course in the intensive care unit because of the sequelae of her initial right ventricular failure.

After 10 weeks of rehabilitation, definitive reoperation was undertaken. The mitral valve was approached through a sternotomy with single aortic and dual venous cannulation. Transseptal exposure was chosen to address both the atrial septal defect (ASD) and the mitral valve. The prior annuloplasty ring was found to be entirely overtaken by aggressive pannus overgrowth (Fig 1). The mitral orifice was severely narrowed, approximately 0.8 × 1.0 cm by direct measurement. The ring was removed, and the pannus was sharply debrided. A rerepair was not possible because of the degree of fibrous ingrowth into the native valve leaflets. Attempts to strip

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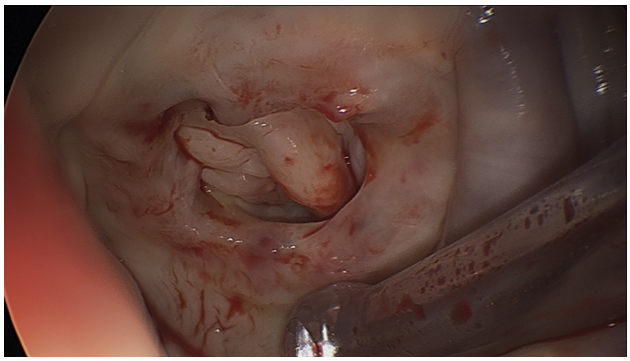

Fig 1. Intraoperative view of mitral valve with extensive pannus encroachment during reoperation.

the scar tissue from the underlying valvular structures proved futile. Considerable debridement of scar tissue was necessary to release the annulus and allow placement of an adequate-size prosthesis. A 27-mm mechanical mitral valve was implanted, and the ASD was repaired primarily. Pathologic examination of the removed valve and fibrous tissue revealed marked fibrotic changes consistent with pannus overgrowth. Predismissal echocardiography revealed a well-functioning mechanical prosthesis. The patient had an uneventful recovery and was discharged home on postoperative day 11. At her 1-month surgical follow-up visit, she was doing reasonably well, with less dyspnea, and was able to ambulate up stairs.

Comment

Mitral stenosis is an unusual mode of failure after repair of nonrheumatic mitral valve disease. We identified 6 cases previously reported. To our knowledge, this adverse event has been only reported in patients implanted with Duran rings of various sizes (25-31mm). Five of the 6 patients underwent reoperation, and the times from initial operation varied from 3 to 9 years [1–5]. There are some similarities among the 6 patients reported in the literature and the present patient. For all 7 patients, the stenosis was caused by pannus encroachment over the annuloplasty ring with extension into the orifice of the mitral valve. All patients initially received flexible Duran annuloplasty rings. Each of the patients who underwent reoperation required valve replacement because of dense ingrowth of pannus. This raises the question whether there are characteristics of the Duran ring that are more likely to promote exuberant chronic inflammation. One study found pannus ingrowth to be significantly more likely after implantation of a Duran ring than after another annuloplasty ring [5]. The Duran ring is a flexible ring with relatively wide interstices, which may promote more tissue–prosthesis contact and greater inflammation. The small number of patients reported with this adverse event precludes any definitive conclusion. However, investigation into this question may provide valuable insight into the design of future rings and prosthetic valve cuffs.

Our patient was remarkable because of her decompensated presentation. To our knowledge, this is the first report of percutaneous balloon mitral valvuloplasty being used to correct mitral stenosis after nonrheumatic mitral valve repair. The decision to use mechanical right ventricular support followed by percutaneous relief of her severe mitral gradient at the outside institution allowed our patient to be bridged to a definitive operation. This strategy may represent a useful option in other patients presenting with late adverse events after mitral valve repair. The knowledge that mitral stenosis can develop years after repair of nonrheumatic mitral valve disease underscores the importance of routine clinical and echocardiographic follow-up for patients after mitral valve repair.

The American College of Cardiology guidelines for patients after valve operations recommend an initial postoperative clinical and echocardiographic assessment. Subsequently, annual clinical follow-up is indicated, with repeat echocardiography for clinical changes, or after 10 years for asymptomatic patients. Subsequently, annual echocardiograms are recommended to monitor for recurrent valvular disease or other adverse events [6]. Physicians evaluating the conditions of patients after nonrheumatic mitral valve repair should be cognizant of the possibility of late mitral regurgitation or stenosis. For patients who present with mild symptoms and mild gradients, reoperation may not be necessary. In cases where a patient presents in extremis, stabilization and consideration of an initial percutaneous approach may allow for delayed definitive surgical repair.

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