Off pump repair of left ventricular rupture following mitral valve replacement: The crucial assistance of the IntraAortic Balloon Pump

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A B S T R A C T

INTRODUCTION: Left ventricular (LV) rupture is a not as frequent, but potentially lethal complication of mitral valve replacement or repair.

PRESENTATION OF CASE: We report a case of a 67-year-old man who underwent mitral valve replacement and Cox Maze IV procedure. A massive bleed from the LV rupture was noted postoperatively while the patient was extubated. The control of bleeding was impossible until an IntraAortic Balloon Pump (IABP) was inserted. A bovine pericardial patch was applied, overlapping an extensive epicardial area, perimetrically of the hematoma. Between the epicardium and the pericardial patch we applied an autologous fibrin sealant.

DISCUSSION: The off-pump technique used to repair the LV rupture after a MVR, is more feasible when the patient is supported by an IABP that subsequently decreases the tension of the myocardial suture site.

CONCLUSION: The IABP, is a necessary device, that decreases the tension along the suture site post a left ventricular rupture following a MVR.

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1. Introduction

The rupture of the left ventricle is a rare but potentially fatal complication of mitral valve replacement (MVR). This complication has a reported incidence of 1.2% and a mortality rate of up to 75%.1 These injuries have been classified on the basis of their location into 3 types. Type I ruptures are located in the posterior atroventricular groove, Type II in the posterior ventricle at the base of the papillary muscle, and Type III in the anatomical area between the first two types.1

Different methods of repair have been recommended for acute ruptures, including external and internal patch repair.1 Additionally, some authors introduced the supplementary classification by time patterns: early, delayed, and late rupture.1 Delayed rupture is the most dreaded scenario in the ICU, making it very difficult to control the bleeding and to undertake further surgical management. The mortality rate for this condition is considerably high.1

2. Presentation of case

A 67 year old man with a background of a chronic obstructive pulmonary disease (COPD), presented to us with palpitations. On the ECG a paroxysmal atrial fibrillation was revealed. He also had an Echo which showed a severe mitral stenosis, and a moderate mitral regurgitation. We performed an elective MVR with a 27-mm mechanical mitral prosthesis (Sorin®) and a modified Cox-Maze IV procedure with radiofrequency (AtriCure®). The mitral valve was exposed with a Waterston's groove incision. There was extensive annular calcification thus an extensive debridement was performed. The valve was not amenable to a reconstructive operation. No complications occurred during the operation and the patient was in good condition, with a sinus rhythm and acceptable blood pressure. At ten hours postoperatively and while the patient was extubated a massive bleed occurred (900 cc were drained within 15 min via the chest drain) following hypotension with tachycardia. An emergency reternotomy was performed. The predominant site of rupture was the epicardial hematoma along the posterior wall of the left ventricle. A cell saver was initiated and cell saved blood was washed and retransfused. Both attempts of bleeding control failed, at off-pump,using a Tefion felt patch over the affected area turned out to fail. An IAB catheter (Datascope®) was inserted percutaneously, through the femoral artery. It was difficult to make a precise localization of the myocardial tear in the spreading hematoma beneath the fatty tissue. Hence, we noticed that by using the IABP the bleeding was reduced to an acceptable level. A bypass was not re established. A bovine pericardial patch was applied overlapping an extensive epicardial area,and was sutured perimetrically from the hematoma. Between the epicardium and the pericardial patch we applied an autologous fibrin sealant made of fibrinogen PPP, providing a substantially reinforced local seal (Vivostat®). A manual pressure with a gauze was applied for 30 min

Abbreviations: LV, left ventricle; MVR, mitral valve replacement; MVA, mitral valve area; CPB, cardio pulmonary bypass; COPD, chronic obstructive pulmonary disease; IABP, IntraAortic Balloon Pump; MVR, Mitral Valve Replacement.

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In the present case, the excessive debridement of calcium from the mitral annulus and the chordae may have caused a type I rupture. The left ventricular rupture can occasionally occur despite taking all the precautions and preservations of the posterior mitral cusp and its attachments. The IABP assists by providing “counterpulsation”, whereby the arterial pressure is increased during left ventricular (LV) diastole and additional blood is pumped and displaced out of the arterial side of the circulation. The increase in aortic compliance produced by balloon deflation during systole lowers the aortic and LV systolic pressure, thus unloading the heart. In many cases severe pump failure, LV end-diastolic pressure may decrease or remain unchanged, 4 LV ejection fraction and stroke volume increase, 5 and the cardiac output may remain unchanged or slightly increase.

4. Conclusions

We demonstrated that IABP, is a necessary device, to a left ventricular rupture post MVR by decreasing the tension along the suture site.

Conflict of interest statement

None.

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None.

Ethical approval

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contributions

All authors (1) have made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data; (2) have been involved in drafting the manuscript or revising it critically for important intellectual content; and (3) have given final approval of the version to be published. Each author has participated sufficiently in the work to take public responsibility for appropriate portions of the content.

References

1. Masroor S, Schor J, Carrillo R, Williams DB. Endoventricular pocket repair of type I myocardial rupture after mitral valve replacement: a new technique using pericardial patch, Teflon felt, and BioGlue. Annals of Thoracic Surgery 2004;77:1439–41.
2. Bavaria JE, Furukawa S, Kreiner G, Gupta KB, Streicher J, Edmunds Jr LH. Effect of circularity assist devices on stunned myocardium. Annals of Thoracic Surgery 1990;49:123–8.
3. Marks JD, Pantalos GM, Long JW, Kinoshita M, Everett SD, Olsen DB. Myocardial mechanics, energetics and hemodynamics during intraaortic balloon and transvalvular axial flow hemopump support with a bovine model of ischaemic cardiac dysfunction. ASAIO Journal 1999;45:602–9.
4. Tsangalou EP, Anastasiou-Nana MI, Nanas JN. Intra-aortic balloon counterpulsation for the treatment of myocardial infarction complicated by acute severe heart failure. Congestive Heart Failure 2009;15:35–40.
5. Weiss AT, Engel S, Gotsman CQ, Shefer A, Hasin Y, Bitran D, et al. Regional global left ventricular function during intra-aortic balloon counterpulsation in patients with acute myocardial infarction shock. American Heart Journal 1984;108:249–54.

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