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Percutaneous Balloon Mitral Valvotomy and Percutaneous Coronary Intervention of Left Anterior Descending Artery in Combined Procedure

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Authors' contributions

This work was carried out in collaboration among all authors. Authors AJ and GS designed the study and wrote the first draft of the manuscript. Author NOB managed the analyses of the case. Authors VP and AG managed the literature searches. All authors read and approved the final manuscript.

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Case Study

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ABSTRACT

In countries like India rheumatic heart disease (RHD) is still a common problem, and with improvements in diagnosis and treatment, the lifespan of these patients is increased. With increase in the lifespan, these patients may develop coronary artery disease (CAD) and present as acute coronary syndrome (ACS). In some cases especially RHD with severe mitral stenosis (MS), thrombus that develop in left atrium may embolize in one of the coronary arteries, leading to acute coronary syndrome. We report a case of 51 year old female who was a known case of rheumatic heart disease and now presented with acute coronary syndrome. Patient was hemodynamically unstable and underwent percutaneous balloon mitral valvotomy (PBMV) and percutaneous coronary intervention (PCI) simultaneously. We here discuss the possible complications that need to be addressed in such scenario and how can we approach such cases. This is first of such intervention at our institute and also there are very few such records available online. Patient tolerated the procedure well with significant clinical improvement.

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Keywords: Percutaneous balloon mitral valvotomy; percutaneous coronary intervention; severe mitral stenosis; left anterior descending artery stenosis; rheumatic heart disease.

ABBREVIATIONS

RHD : Rheumatic Heart Disease;
MS : Mitral Stenosis;
PCI : Percutaneous Coronary Intervention;
BMV : Balloon Mitral Valvotomy;
ACS : Acute Coronary Syndrome;

1. INTRODUCTION

RHD remains one of the leading cardiac diseases in tropical developing countries like India. Around 25%–30% of all cardiac visits to hospitals are related to RHD [1]. Patient with RHD can present with left ventricular (LV) dysfunction due to multiple causes including primary rheumatic myocarditis, secondary to LV remodelling due to altered hemodynamics in valvular pathology, cardio-embolic phenomenon involving coronaries, or co-existing coronary artery disease (CAD) itself. Mitral stenosis (MS) is most common valvular pathology in RHD. In countries like India where rheumatic heart disease is still a common problem, with improvements in diagnosis and treatment, the lifespan of these patients is increased. With increase in the lifespan, these patients may develop coronary artery disease and present as acute coronary syndrome. In the study by Lacy, et al. [2], the patients were evaluated for the presence of concurrent CAD (50% or greater occlusion in at least one major coronary artery), they found that 31.3% of the patients with MS had CAD and 19% had occlusive CAD, and 36.3% of the patients with Mitral Regurgitation (MR) had CAD and 18% had occlusive CAD, and 58.9% of the patients with Aortic Stenosis (AS) had CAD and 21% had occlusive CAD, and 36.6% of the patients with Aortic Regurgitation (AR) had CAD and 30% had occlusive CAD. In some cases especially RHD with severe MS, thrombus that develop in left atrium may embolize in one of the coronary arteries, leading to acute coronary syndrome. Management of RHD patient with significant valve dysfunction and significant coronary artery disease is primarily revascularisation of affected vessels by coronary artery bypass graft (CABG) Surgery and valve replacement. In selected patients with pliable mitral valve and single vessel disease, percutaneous interventions are possible, like PBMV and PCI. However, there are limited guidelines about management of overtly symptomatic patients with ACS in cases of RHD who may not tolerate major surgical intervention.

2. CASE REPORT

51 year old female, known case of RHD with MS, admitted in peripheral hospital with multiple episodes of paroxysmal nocturnal dyspnea in last 1 month. She developed acute onset chest pain and New York Heart Association (NYHA) functional class IV breathlessness a day before she was transferred to our hospital. Patient was transferred to our hospital in the night on oxygen support and ionotropic support. On admission-her pulse rate was 110/min, blood pressure was 100/80 mmHg on inotropes and bilateral crepts were present on auscultation. Routine blood investigations were normal, arterial blood gas (ABG) showed hypoxia. Her electrocardiogram (ECG) showed sinus rhythm with poor R wave progression with ST segment downsloping depression in I avL V4 V5 V6 and T inversion in I avL (Fig. 1). Old ECG obtained from the patient's previous records showed normal progression of R wave with no significant ST-T changes (Fig. 2). Echocardiography showed severe MS (Mitral valve area (MVA) by planimetry - 0.67 cm^2, Wilkins score 7/16, MV gradient- 15/10 mmHg) (Fig. 3) with Left ventricular ejection fraction (LVEF) 35%- basal, mid, distal, anteroseptal, anterior and anterolateral segments hypokinetic. Troponin T was significantly raised (50 ng/ml). Patient didn't respond well to the medical management, so she was taken in cath lab for percutaneous balloon mitral valvotomy (PBMV) and urgent coronary angiography (CAG). Right femoral venous and arterial access obtained. Pulmonary artery pressure was 54/22 mmHg, aortic pressure was 138/80 mmHg, Pulmonary capillary wedge pressure (PCWP) was 23 mmHg (mean) and LV-end diastolic pressure was 12 mmHg (Fig. 4). Gradient across mitral valve was 11 (Fig. 4). CAG showed LAD (Left Anterior Descending) artery mid segment thrombotic 90% stenosis (Fig. 5). In view of the general condition of the patient, BMV was planned first, because PCI requires injectable heparin as anticoagulation and transeptal puncture is usually done without giving any anticoagulation. ACCURA balloon No.26 was used and serial inflation of 26 mm was given for 1 sec (Fig. 6). Post balloon dilatation gradient reduced to 2 mmHg and the MVA improved to 1.54 cm^2 (Fig. 7). Patient was taken up for PCI to LAD. Then

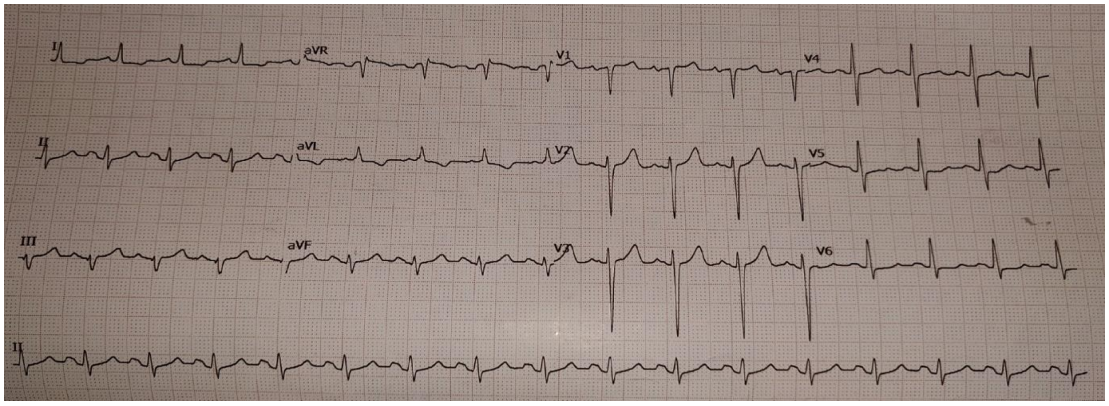

Fig. 1. ECG at the time of presentation. Showing T inversion in I avL, ST sagging in lateral leads, poor R wave progression

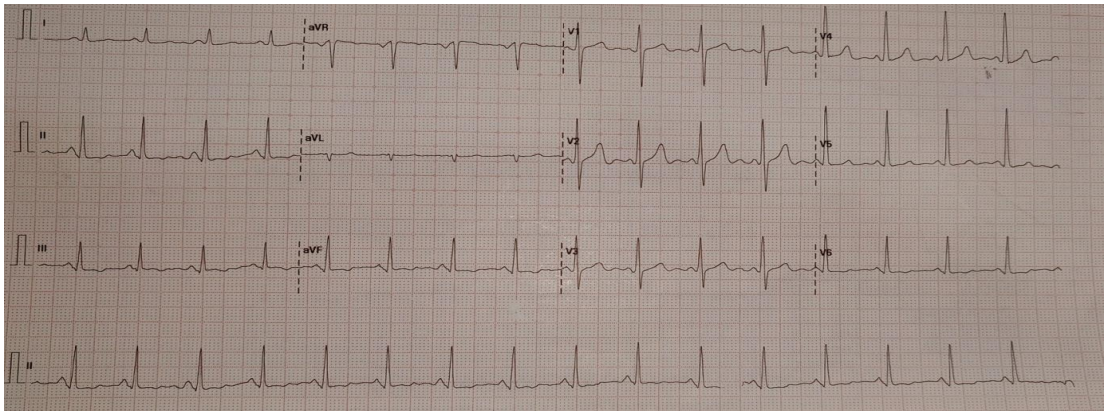

Fig. 2. ECG from old records of patient. No significant ST-T changes and sinus rhythm

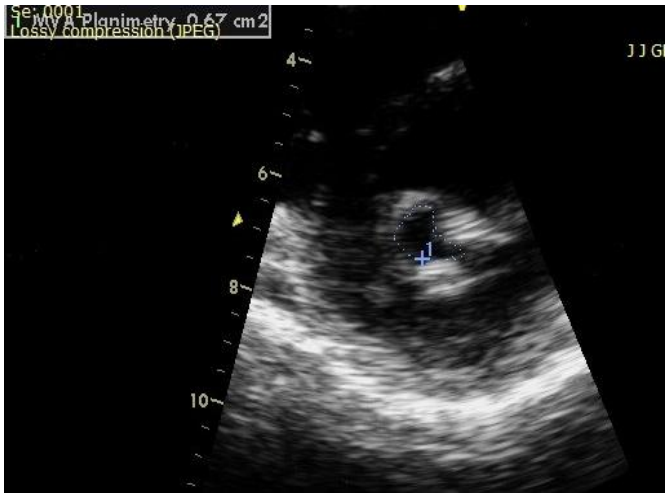

Fig. 3. ECHO image showing pre BMV MVA of 0.67 cm^2

LAD was stented with Drug Eluting Stent (DES) 2.75 x 24 mm after predilatation. Stent was post dilated with NC balloon 2.75 x 13 mm. Post stenting check shoot showed TIMI III flow with no residual lesion (Fig. 8). Patient tolerated procedure well. Patient was shifted to post

operative monitoring and care. Post procedure patient improved clinically. Over next few days she was off oxygen support and ionotropes were tapered. Gradually she became ambulatory without symptoms during routine activities. Patient was discharged after 5 days of procedure. Patient is asymptomatic on subsequent weekly follow ups in last 1 month.

3. DISCUSSION

In countries like India, patients with RHD are commonly found to have CAD, more often, if presentation is in late middle age or in elderly age group. There is limited data of incidence of primary coronary artery disease in patients of RHD. In study by Jose, et al. [3], the overall prevalence of CAD in RHD patients undergoing valve surgery was 12.2%. In another study, done by Dinesh, et al. [4] showed that 9.05% of RHD patients (above 40 years of age) have significant CAD. The Left Anterior Descending (LAD) artery is the most common vessel involved. Acute coronary syndrome in RHD patients can be secondary to cardioembolic phenomenon involving coronaries or due to atherosclerotic

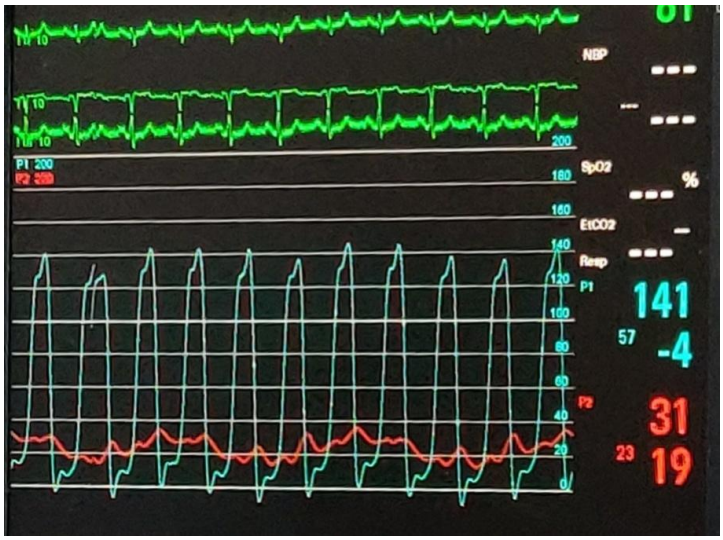

Fig. 4. Pressure tracing. Blue represent LV pressures and red represents PCWP (LA pressure)

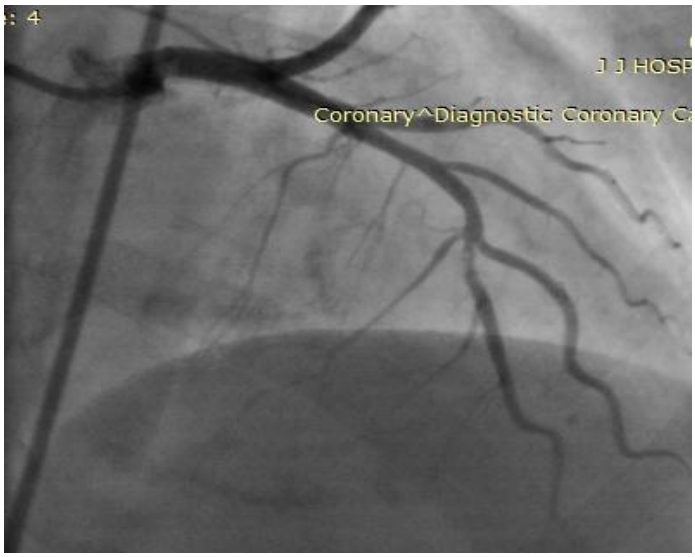

Fig. 5. CAG showing LAD mid thrombotic lesion causing significant stenosis

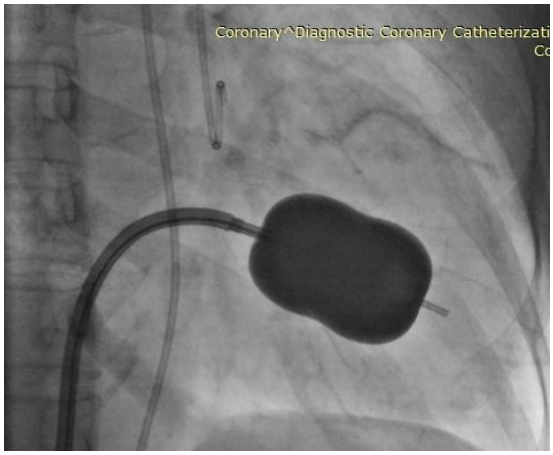

Fig. 6. Balloon inflation with ACCURA Balloon No. 26 placed across mitral valve and its inflation

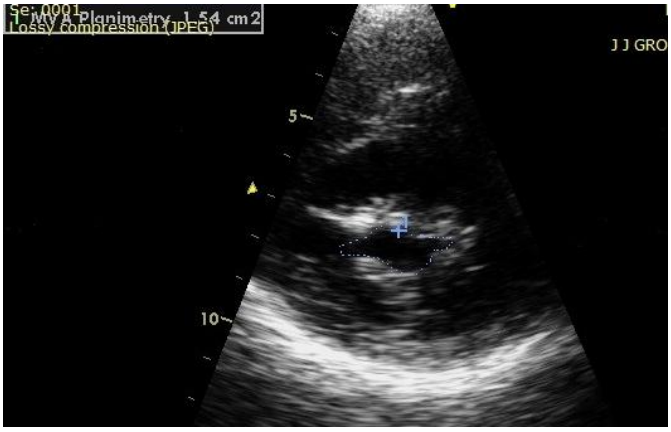

Fig. 7. ECHO image showing post BMV MVA of 1.54 cm^2

disease involving native vessels. Acute coronary syndrome secondary to thrombo-embolic phenomenon was reported in studies by Radhakrishnan, et al. [5], Niniek Purwaningtyas, et al. [6], Cardoz J, et al. [7]. Ideally transesophagial echocardiography should be done to rule out thrombus in left atrial appendage even if the patient is in sinus rhythm. Differentiating these two etiologies, denovo thrombosis or thromboembolic phenomenon, needs intravascular imaging with IVUS (Intravascular Ultrasound) or OCT (Optical Coherence Tomography), either of which was not done in our patient due to hemodynamic instability and financial constraints. Coronary embolism appears to be the most reasonable explanation for acute myocardial infarction with angiographically normal coronary arteries [8]. In our patient, the coronaries were otherwise normal except for a thrombus in mid LAD which makes embolic phenomenon more likely as a cause. Transesophageal echocardiography (TEE) was not done initially as patient was hemodynamically unstable. However, after hemodynamic stabilization TEE was done which showed no appendigeal/atrial thrombus in left atrium. Underlying diseases predisposing to coronary emboli includes valvular heart disease (40%), cardiomyopathy (29%), coronary atherosclerosis (16%), chronic atrial fibrillation (24%) and mural thrombi in 18 (33%) [9]. There are limited available records of patients undergoing PCI and BMV in the same setting. Patients undergoing PCI needs to be heparinised and loaded with dual antiplatelets and in setting of BMV where septal puncture carries inherent risk of pericardial effusion and cardiac tamponade, PCI carries high risk to the patient. Most of the patients with coexisting CAD and RHD are referred for valve replacement with CABG. However, sometimes patients may not be stable enough or willing for major operative

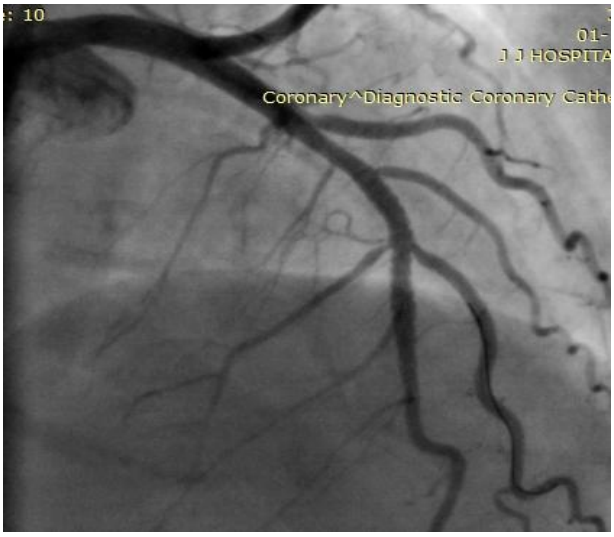

Fig. 8. CAG post PCI with drug eluting stent in mid LAD. Good result. TIMI III flow

intervention. In our patients we first started with BMV as mitral valve was pliable and there was no significant Mitral regurgitation. Patient was heparinised after septal puncture and after echo confirmation of no pericardial effusion. Patient was given loading dose of clopidogrel during the procedure, chewed and kept sublingually, although she was on dual antiplatelets for her ischemic event before procedure as well. The overall procedure was done with due care under fluoroscopic guidance and patient stood procedure well. Similar report of BMV and PCI done in same sitting simultaneously done by Paul G J, et al. [10] was also safe. Paul G. J, et al. [10] also initiated with BMV and later PCI was done. With our experience and limited available online records it is understood that patients with ACS and RHD can undergo both transluminal valvular and coronary intervention in the simultaneously with acceptable safety under adequate caution and care.

4. CONCLUSION

In selected patients with pliable mitral valve and single vessel disease presenting with ACS who are hemodynamically unstable, percutaneous intervention with BMV and PCI may be done to stabilize the patient hemodynamically and symptomatically.

CONSENT

As per international standard, patient's written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

As per international standard, ethical approval has been collected and preserved by the author.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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