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Case Report

Anaesthesia Section

Anaesthetic Considerations for Balloon Mitral Valvuloplasty in Pregnant Patient with Severe Mitral Stenosis: A Case Report and Review of Literature

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ABSTRACT

Even though, the incidence of Mitral Stenosis (MS) has reduced grossly, it still remains a health problem in developing countries and is the most common rheumatic valvular lesion encountered in pregnant patients. The already compromised cardiac status of a pregnant female deteriorates further by the presence of MS. So, pregnancy is a common situation during which untreated and frequently poorly tolerated MS are first diagnosed. Percutaneous Balloon Mitral Valvuloplasty (BMV) may be life saving in such a setting and a multidisciplinary approach in the management reduces the mortality and morbidity during the procedure. Anaesthetic management of such a procedure has hardly ever been reported. We report a case of a 23-year-old woman presenting at 28 weeks gestation with severe MS and severe pulmonary hypertension (52 mmHg) who underwent successful percutaneous BMV under monitored anaesthesia Care. The anaesthetic considerations in such situations are being discussed.

Keywords: Monitored anaesthesia care, Percutaneous balloon mitral valvuloplasty, Pregnancy, Severe mitral stenosis

CASE REPORT

A 23-year-old gravida-1-para-1 female at 28 weeks gestation presented with dyspnoea, palpitation and intermittent heartburn sensation which started at around 20 weeks gestation and increased progressively over two months for which she consulted a local physician. She was diagnosed as a case of Rheumatoid Heart Disease (RHD) with severe MS and after starting medical management, she was referred to our institute for further management.

The patient's functional status was New York Heart Association (NYHA) class III with no history of haemoptysis or Cerebrovascular Accident (CVA). Her Blood Pressure (BP) was 100/70 mmHg and Heart Rate (HR) 127/min. She was thin built with short stature (142 cm) and body-weight of 34 kg. Auscultation revealed a mid-diastolic murmur at apex with bilaterally clear chest. A left parasternal heave grade 3/3 was also present. The patient was on oral metoprolol 50 mg twice daily and acitrom 1 mg once daily. She had no known drug allergies and no history of tobacco, alcohol, or illicit drug use. Her Echocardiography (ECHO) revealed the following: mitral valve had pliable leaflets with thick doming Anterior Mitral Leaflet (AML) and restricted Posterior Mitral Leaflet (PML) (dark zone present); mitral valve area 0.7 cm^2 with Peak Gradient (PG) 23 mmHg and Mean Gradient (MG) 16 mmHg; tricuspid valve normal; aortic valve tricuspid with mild aortic insufficiency; Right Ventricular Systolic Pressure (RVSP) 87.44 mmHg; right sided chambers normal; left atrium mildly dilated (40 mm) and Left Ventricle (LV) size and contractility normal with an ejection fraction of 41%.

Right heart catheterization and percutaneous Balloon Mitral Valvuloplasty (BMV) were planned. Before the procedure, a complete assessment was done by Maternal and Reproductive Health (MRH) department. Patient had not undergone any antenatal check-up earlier. There was no history of antenatal folic acid, iron or calcium intake. She had received a single dose of Tetanus Toxoid (TT) three weeks back. She had no past surgical history. On abdominal examination, fundal (uterine) height was 26 weeks size; liquor appeared to be reduced (oligohydramnios); Foetal Heart Sound (FHS) present and Foetal Heart Rate (FHR) 140 bpm. Her haematological and biochemical investigations were Within Normal Limits (WNL). Coagulation profile was also normal (INR 1.10). Chest radiograph revealed cardiomegaly and ECG showed sinus tachycardia. Patient and her relatives were explained regarding high risk of preterm labour and delivery associated with the procedure.

Patient was administered injection Hydroxyprogesterone 500 mg i.m. along with second dose of antenatal Tetanus Toxoid, a day Before Planned Procedure (BMV). The procedure was planned under Monitored Anaesthesia Care (MAC) with consideration of physiological changes in pregnancy and avoiding factors precipitating Atrial Fibrillation (AF). Nitroglycerine (NTG) patch was applied on the uterine fundus one hour prior to procedure with a consideration to remove it if there is severe hypotension during the procedure refractory to other pharmacological and non-pharmacological methods. Patient was taken to catheterization laboratory, 18-gauge Intravenous (IV) cannula and standard American Society of Anaesthesiologists (ASA) monitors were placed for monitoring BP, HR, SpO_2 and ECG. Left uterine displacement was achieved by placing a wedge under the right side. Metoclopramide 10 mg IV and ranitidine 50 mg IV were given prior to start of procedure. On table, patient's BP was 106/68 mmHg, HR 152/min, ECG irregularly irregular s/o AF and SpO_2 92% on room air with a respiratory rate of 30/min. Patient was given high flow oxygen with venti mask @10 L/min. Diltiazem 5 mg was given IV and repeated once after which the HR settled down to 108 /min with normal sinus rhythm and SpO_2 99%. Besides other emergency drugs, amiodarone, phenylephrine and metoprolol were kept ready. Conscious sedation was provided to patient with intravenous infusion of propofol 25 µg/kg/min and

injection fentanyl in small increments to a total of 100 µg. Patient was essentially awake and able to communicate throughout the procedure. BMV was done using an inoue 26 balloon (Toray, Japan) through right femoral route. Adequate shielding was done throughout the procedure to minimize foetal radiation exposure.

Vitals remained stable throughout and the procedure was uneventful. After the procedure, BP was 110/70 mmHg and HR 98/min. Right lower limb was kept immobilized for six hours and NTG patch was removed after 24 hours.

Mean Pulmonary Artery (PA) pressure (52 mmHg) and mean Pulmonary Capillary Wedge Pressure (PCWP) (49 mmHg) decreased to 46 mmHg and 29 mmHg respectively post-procedure. The procedure yielded successful BMV, with reduction in Peak, Mean and End-Diastolic Gradients (PG, MG and EDG) across the mitral valve from 23 mmHg, 16 mmHg and 15 mmHg to 18 mmHg, 11 mmHg and 4 mmHg respectively and increase in mitral valve area from 0.7 cm^2 to 1.5 cm^2. The RVSP decreased from 87.44 mmHg to 71 mmHg and ejection fraction was 58% with no regional wall motion abnormalities. Patient was discharged on post-procedure day1 after a complete evaluation by MRH department.

DISCUSSION

Despite its declining trend, rheumatic MS still remains a health problem in developing countries and forms 88% of heart diseases complicating pregnancy in tertiary referral centres in India [1]. With worsening stenosis, the symptoms of dyspnoea on exertion, orthopnoea, and paroxysmal nocturnal dyspnoea occur, although many patients may remain asymptomatic despite very high left atrial pressure. Very commonly, untreated and frequently poorly tolerated MS are first diagnosed during pregnancy as in our case. BMV may be life saving in such setting and a multidisciplinary approach in management prevents decompensation and reduces mortality and morbidity.

Narrowing of mitral valve (normal size 4 to 5 cm^2) and increased HR of pregnancy limits LV filling resulting in decreased stroke volume and cardiac output. As a result, heart cannot cope up with situations warranting increased metabolic demand or increased blood volume [2].

Basic goals for anaesthetic management of MS patients are to avoid tachycardia; revert acute AF to sinus rhythm; avoid aortocaval compression; maintain adequate venous return and Systemic Vascular Resistance (SVR); and prevent increased pulmonary vascular resistance.

If MS is diagnosed before pregnancy, mitral commissurotomy is preferred. Percutaneous BMV is being done for palliation in pregnant patient with a reported success rate of nearly 100%. Valve replacement is reserved for severe cases with calcified valve and in mural thrombus [3]. Lately, BMV using the Inoue balloon technique has become the accepted treatment for patients with severe symptomatic MS [4]. With successful balloon valvuloplasty, the valve area increases to >1.5 cm^2 without a substantial increase in mitral regurgitation [5]. Although the maternal outcome in BMV and open commissurotomy are the same, the foetal loss is eight times higher in open commissurotomy [6]. Any invasive procedure during pregnancy is preferably done during the second trimester.

For non-obstetrical procedures in pregnant patients, MAC or regional anaesthesia is generally preferred over general anaesthesia so as to avoid risks of aspiration and difficult airway management and to minimize foetal exposure to potent anaesthetic agents. Percutaneous BMV in a pregnant patient can be done with patient in awake state with minimal dose of opioids to avoid foetal bradycardia. Apple et al., had also reported the use of minimally invasive IV anaesthesia for percutaneous BMV in a pregnant patient earlier [7]. Even though the patient is breathing spontaneously, they should be monitored closely for aspiration risks as a result of physiologically decreased gastrointestinal motility during pregnancy. In view of radiation exposure to foetus, the procedure should ideally be performed only after 14 weeks of gestation. Keeping the radiation exposure time to minimum and complete abdominal lead shielding further ensures minimal risk for foetal abnormalities after percutaneous BMV [4]. Ease of inoue balloon ensures short procedure time and hence lessens the total fluoroscopy time [8].

Any new onset AF may result into haemodynamic deterioration and decreased cardiac output in these patients with poor cardiac reserve and hence requires faster intervention and cautious use of medication to avoid harm to the foetus and to prevent thromoembolism. All possible precipitating factors for AF should be identified and eliminated before and during anaesthesia with effective treatment of arrhythmias to avoid further complications. The initial goal should be to control the rate; however, in order to maintain consistent blood-flow to the patient's end organs including the placenta, sinus rhythm should be restored as soon as possible. The European Society of Cardiology established guidelines in 2011 for management of cardiovascular diseases in pregnancy [9]. Beta-blockers are the first choice for rate control of AF in pregnancy, followed by Calcium-Channel Blockers (CCBs) [9]. Because no drug is absolutely safe, pharmacologic therapy is best avoided during pregnancy or used only when necessary [10]. In our case, the most probable factor precipitating AF was hypoxaemia as it could be easily converted to sinus rhythm with oxygen supplementation and CCB without resorting to any other antiarrhythmic drugs or interventions such as amiodarone, digitalis, cardioversion etc. Diltiazem was preferred over Amiodarone because of relatively lesser toxicity to foetus but one has to remain prepared to deal with hypotension while administering diltiazem as it can reduce SVR and produce hypotension. Anticoagulation is beneficial even in the absence of AF [11].

Pulmonary hypertension in the peripartum period can be managed by avoiding increases in Pulmonary Vascular Resistance (PVR) due to hypothermia, acidosis, hypercarbia, hypoxia, high ventilation pressures, pain and sympathetic agents such as epinephrine and norepinephrine. Treatment includes the use of pulmonary or parenteral vasodilators such as nifedipine, prostacyclin and nitric oxide in addition to anticoagulation because of the increased risk of thromboembolism [12].

CONCLUSION

BMV can be safely done in pregnant patients after 14 weeks gestation under MAC provided minimal radiation exposure is ensured. Prevention and early identification and treatment of AF are very important. Management of AF should be the same as in non pregnant women, but requires faster intervention and cautious use of medication to avoid harm to the foetus. A better understanding of impact of MS on pregnancy and a multidisciplinary approach in management helps in reducing mortality and morbidity.

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