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ROLE OF CARDIAC ANAESTHESIA IN MANAGEMENT OF THIRD TRIMESTER ANTENATAL BMV AND FETAL OUTCOME : OUR EXPERIENCE.

Cardiovascular

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ABSTRACT

Post rheumatic Mitral Stenosis is the most common valvular heart disease complicating pregnancy in India. Antenatal BMV is usually done in the 2nd trimester. Pregnancy changes are at peak in the 3rd trimester. Hence, patients who present for the first time in the third trimester can pose challenges in their anesthesia management. Anxiety about the procedure and fetal outcome warrants administration of conscious sedation. Our aim was to study the anaesthesia requirements and fetal outcome in 3rd trimester women undergoing Balloon mitral valvotomy for rheumatic mitral stenosis. We retrospectively analyzed anaesthesia management of balloon mitral valvotomy during the 3rd trimester in 20 patients. Our conclusion is Balloon Mitral Valvotomy is an effective treatment for severe Mitral Stenosis in pregnant females presenting in their third trimester. However, better outcome of procedure in these patients needs a thorough understanding of the consequences of MS in pregnancy. Careful anaesthesia management and patient selection for particular anaesthesia intervention is mandatory for better fetomaternal outcomes.

KEYWORDS

Rheumatic Heart Disease, Mitral Stenosis, Balloon Valvotomy, Pregnancy, Anesthesia

INTRODUCTION:

Rheumatic fever is endemic in developing countries like India. Post rheumatic mitral stenosis is the most common valvular heart disease complicating pregnancy in India.[1,2,3,4] Pregnant females already have compromised cardiovascular status and mitral stenosis deteriorates physiological changes during pregnancy further. Therefore, in such patients poorly tolerated mitral stenosis is first diagnosed during pregnancy.[5]

Heart with mitral stenosis becomes inefficient to tolerate the physiological increase in heart rate and blood volume. This can cause rise in mean left atrial pressure and pulmonary venous pressure. These physiological changes of pregnancy are at its peak during the third trimester and peripartum period leading to heart failure and pulmonary oedema.[6,7,8] In the immediate postpartum period, autotransfusion from the uterus can cause sudden increase in preload leading to decompensation.[3] Moreover, regardless of optimal medical treatment, most of the patients remain symptomatic entailing intervention to relieve mitral stenosis. During pregnancy percutaneous balloon mitral valvotomy (BMV) is safe and effective intervention compared to surgical mitral valvotomy.[9]

Antenatal Balloon Mitral Valvotomy is usually done in the second trimester.[10] However, patients who presented for the first time in the third trimester can pose challenges in their management. As the hemodynamic changes are highest during this period.[3] Also these patients are very anxious regarding the procedure and pregnancy outcome. For the better surgical and pregnancy outcome these patients may need sedation.[11] However the anaesthetic drugs used for maternal sedation can cause detrimental effects on the fetus. To minimize these effects, meticulous monitoring and titrated dosing is important.[12,13] Managing a pregnant patient for BMV in her third trimester needs a multidisciplinary team approach involving Cardiac Anaesthesiologist, Cardiologist, Obstetrician, Pediatrician and Cardiac surgeon.[3]

We report anaesthesia management of 20 cases of pregnant females for Balloon mitral valvotomy in their 3rd trimester.

AIMS/ OBJECTIVES:

To study the anaesthesia requirements in 3rd trimester women undergoing Balloon mitral valvotomy for rheumatic mitral stenosis.

OBJECTIVES:

- To assess the need of anaesthesia intervention in 3rd trimester females for BMV.
- To assess the effect of intervention on FHS.
- To assess the need of emergency cesarean sections for fetal deterioration after intervention.

Cases:

We retrospectively analyzed antenatal balloon mitral valvotomy performed between 2018-2022. We chose 20 patients operated for BMV in their third trimester. Of that 2 patients were excluded from the study, as one patient developed cardiac tamponade and Closed Mitral Commisurotomy was done under GA. Another patient developed severe MR post BMV; open Mitral Valve Replacement was done after an emergency Cesarean section under GA.

All the patients had the functional status of NYHA III with no history of hemoptysis or Cerebrovascular Event. Mean pre-procedure blood pressure was 110/70 mmhg, mean heart rate was 102/min, mean FHS was 139/min. None of the patients had Atrial fibrillation preoperatively.

In all the patients, complete assessment, counseling and consent was taken. Patients and their relatives were explained about the risk of preterm delivery associated with the procedure. Procedure was planned under monitored anesthesia care. NPO status was adequate in all patients. 18G cannula secured, standard monitoring including Electrocardiography, Pulse Oximetry, Invasive blood pressure and Fetal heart sounds monitoring was done. Left uterine displacement was provided by placing wedge under the right side, abdominal shielding was done throughout the procedure.

All patients had a urinary catheter. Metoclopramide 10 mg and pantoprazole 40 mg given, IV Dilzem 5mg was considered in patients with heart rate more than 120/min. Emergency drugs; IV Phrenin, IV Diltiazem, IV Amiodaron, IV Metoprolol, IV Atropine, IV Noradrenaline infusion were kept ready. Intubation drugs were kept handy. In anxious patients, conscious sedation with incremental doses of IV Fentanyl up to maximum of 2 mcg/kg and IV Midazolam in titrated doses not more than 1 mg administered.

BMV was done using Inoue Balloon via the right femoral route. Right lower limb was kept immobilized for 6 hrs in all 18 patients. Arterial blood gas was done in all patients before removal of the arterial cannula.

OBSERVATIONS & RESULTS :

Balloon mitral valvotomy was carried out in 18 patients successfully. **(Chart 1)**

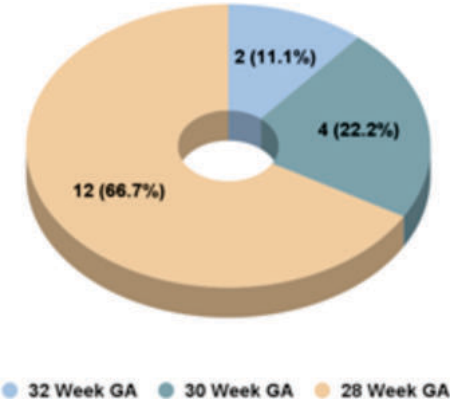

Chart 1: Distribution of gestational age of cases.

8 out of 18 patients needed conscious sedation **(Chart 2)**; among those seven were anxious and one required Transesophageal echo cardiography to rule out clot in the left atrium. The average dose of IV Midazolam and IV Fentanyl needed was 1 mg and 40 mcg respectively.

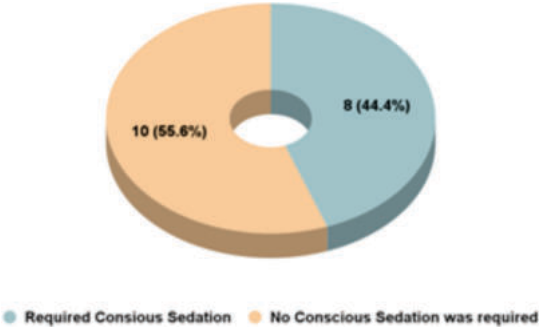

Chart 2 : Distribution of Conscious sedation in cases

Remaining 10 patients underwent the procedure under monitored anaesthesia care. All 18 patients were conscious, oriented and hemodynamically stable at the end of the procedure. **(Table 1) (Chart 5)**

Table 1 : Haemodynamic Parameters (LA - Left atrium; LAP- Left atrial pressure; TMG - Trans mitral gradient)

	LA size (mm)	Pre- BMV LAP Peak/Mean (mmHg)	Post-BMV LAP Peak/Mean (mmHg)	Pre-BMV TMG Peak/Mean (mmHg)	Post-BMV TMG Peak/ Mean (mmHg)
Case 1	20	24/15	16/10	16/7	6/0
Case 2	45	58/44	25/18	46/32	9/2
Case 3	50	32/22	19/10	21/11	11/2
Case 4	18	28/12	16/8	24/8	14/6
Case 5	63	24/19	15/12	23/13	5/2
Case 6	60	38/24	20/16	30/16	18/4
Case 7	50	47/30	19/13	39/22	10/4
Case 8	16	42/28	24/20	36/22	12/8
Case 9	62	55/45	32/22	49/39	24/14
Case 10	31	50/40	22/12	46/36	12/2
Case 11	60	49/39	27/17	45/35	11/1
Case 12	35	52/35	50/34	48/31	44/28
Case 13	41	54/42	32/22	48/36	16/6
Case 14	42	29/19	23/13	23/13	11/1
Case 15	36	38/28	38/29	28/18	23/14
Case 16	16	43/34	34/25	39/30	22/13
Case 17	41	15/10	12/8	11/6	4/0
Case 18	48	45/35	42/32	38/28	19/9

The average FHS in 8 patients receiving conscious sedation at the end of the procedure was 135/min. None of the patients showed fetal bradycardia. The average FHS in the remaining 10 patients was 136/min. **(Chart 3)**

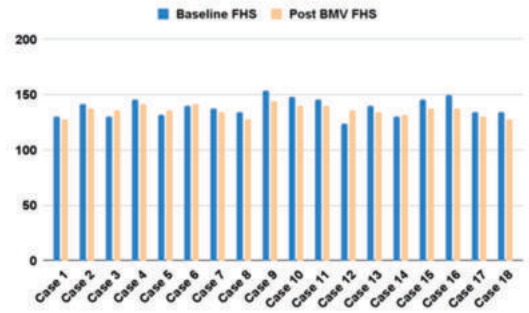

Chart 3 : Distribution of fetal heart sound (FHS) in cases before and after BMV.

None of the patients needed a cesarean section for fetal deterioration. BMV was successful at the end of the procedure. **(Chart 4)**

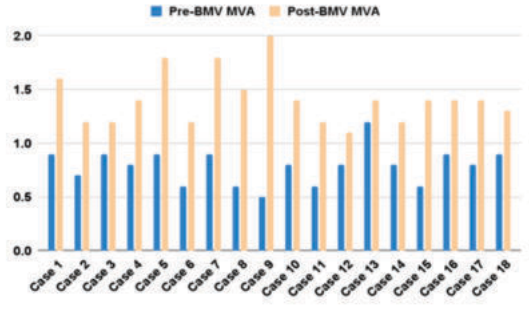

Chart 4 : Distribution of mitral valve area (MVA) before and after BMV.

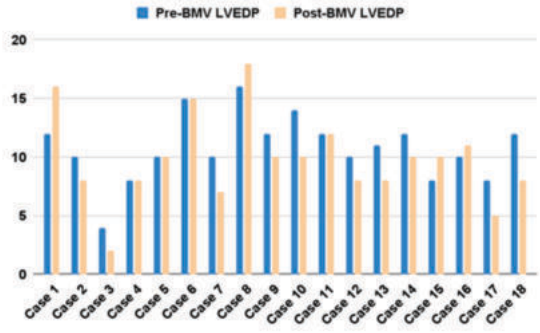

Chart 5 : Distribution of LVEDP (Left ventricular end diastolic pressure) pre-BMV & post-BMV.

DISCUSSION:

Rheumatic heart diseases with isolated Mitral stenosis (MS) is the predominant health problem in developing countries like India. It accounts for 88% of the heart diseases in pregnancy needing referral to tertiary centers.[1,2,3] As the severity of MS progresses, the symptoms of dyspnea on exertion, orthopnea and paroxysmal nocturnal dyspnea occur. Many patients may remain asymptomatic and present with symptoms for the first-time during pregnancy. Pregnancy changes mimic the symptoms of MS. Also, as the pregnancy progresses the patients with severe MS fail to compensate for the increased demand and decompensate.[3]

Percutaneous BMV is the preferred treatment during pregnancy for palliation. Maternal outcomes after BMV and Open mitral commissurotomy are the same. The fetal loss is higher with the Commissurotomy compared with BMV (8:1).[9] In severe cases with calcified valve and mural thrombus valve replacement is the treatment option. Any invasive procedure during pregnancy should be preferably done during the 2nd trimester. But females who present for the first time during the 3rd trimester pose challenges in their management.[6,7,8]

Also, unique situations like COVID-19 pandemic can delay the diagnosis and treatment during early pregnancy.[16] The hemodynamic changes are at their peak in the 3rd trimester. Cardiac decompensation and pulmonary oedema may occur as a consequence of fixed cardiac output and tachycardia.[3]

Difficult intubating conditions are associated with pregnancy. Also, Pregnancy induced decreased gastrointestinal motility increases the aspiration risk. [14] Therefore, spontaneously breathing patients should also be monitored closely.

The goals of anaesthesia management in these patients are:
- Avoid tachycardia.[3]
- Maintain sinus rhythm.[3]
- Avoid Aortocaval compression.[3]
- Maintain adequate Systemic vascular resistance.[3]
- Prevent increased Pulmonary vascular resistance (prevention of pain, hypoxia, hypercarbia, acidosis).[3]

TEE assessment under conscious sedation to rule out the possibility of clot in the left atrium (in suspected cases on TTE) and reduce the duration of radiation exposure.[17,15]

Minimize radiation exposure to the fetus (maintain patient compliance, complete abdominal shielding and by keeping the radiation exposure time to minimum.)[10]

Along with above mentioned changes, the anxiety about the procedure and fetal outcome warrants administration of conscious sedation.[11]

In our case series, 8 out of 18 patients needed conscious sedation with IV Midazolam and /or IV Fentanyl. In 1 patient out of above 8, sedation was needed to do TEE to rule out clot in Left Atrial appendage, which was suspected on Transthoracic echocardiography.

The maximum dose of IV Midazolam administered was 1mg and of IV Fentanyl was 40mcg. This small dose was not found to affect the fetal heart sounds when compared with the patients not receiving either. The change in FHS from baseline was not clinically significant in both groups. **(Chart 3)**

None of the patients needed an emergency cesarean section for fetal deterioration after the procedure.

BMV was successful at the end of the procedure **(Chart 4)** and all the 18 patients were hemodynamically stable at the end of BMV. **(Chart 5) (Table 1)**

CONCLUSION:

Balloon Mitral Valvotomy is an effective treatment for severe Mitral Stenosis in pregnant females presenting in their third trimester. However, better outcome of procedure in these patients needs a thorough understanding of the consequences of MS in pregnancy. Careful anaesthesia management and patient selection for particular anaesthesia intervention is mandatory for better fetomaternal outcomes.

Further studies recommended with larger sample size and multicentric approach.

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