

## **Effect of percutaneous mitral valvuloplasty on pregnant mother and fetus — a tertiary care hospital experience from a developing country**

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### **Abstract**

This study evaluated the short and long-term consequences of Percutaneous Mitral Valvuloplasty (PMV) in pregnant patients and their offspring, in a tertiary care setting, Karachi, Pakistan.

The hospital database was used to retrieve all patients who underwent PMV during pregnancy in the period 1998-2007. The follow up data of the patients and the born children were obtained from the hospital records and also by contacting the patients via phone.

Six patients underwent PMV but follow-up was available for 5 patients only. All 5 patients were admitted due

to severe mitral stenosis with symptoms of dyspnea and palpitation. Mean age was  $27 \pm 5.3$  years with a mean gestational age at the time of procedure of  $22.20 \pm 1.6$  weeks. The mean valve area increased from  $0.94 \pm 0.22$  cm<sup>2</sup> pre-operatively to  $1.62 \pm 0.50$  cm<sup>2</sup> post-operatively. The ejection fraction changed from a mean of  $50 \pm 11.7$  % to  $56 \pm 2.2$  %. There were no maternal deaths, abortions or stillbirths. Developmental milestones were achieved at the appropriate ages in all babies.

PMV appears to be a safe and effective intervention for patients with severe MS during pregnancy.

**Keywords:** Mitral stenosis, Percutaneous Mitral

### Introduction

Mitral stenosis (MS) is the most common valvular lesion seen in pregnancy worldwide and is often the most poorly tolerated.<sup>1</sup> Problems associated with mitral stenosis in pregnancy are due to further narrowing of mitral valve and the haemodynamic change that take place.<sup>2</sup> Pregnancy is a burden even in normal patients by causing an increase of 30% to 50% in intravascular volume. This can lead to an increase in transmitral gradient and left atrial pressure and also cause flash pulmonary oedema.<sup>3</sup> Maternal mortality for patients with MS are significantly higher (6.8%) for those who are New York Heart Association (NYHA) class 3 and 4 than patients who are NYHA class 1 and 2 (0.4%), particularly during labour and delivery.<sup>4</sup>

These symptoms usually become apparent by the 20th week of pregnancy and can be aggravated even further at the time of labour and delivery. Maternal death is rare when careful attention is paid to the management of congestive heart failure.<sup>5</sup> Percutaneous Mitral valvuloplasty (PMV) is indicated in symptomatic patients with mitral stenosis.<sup>2,6</sup> For pregnant patients, however, medical management is recommended and PMV only if the patient fails medical management during pregnancy with repetitive or persistent heart failure. There exists more than ten years experience with PMV in pregnant patients in the literature.<sup>7</sup> However, the safety and efficacy of this procedure has not been clearly established for pregnant patients. Surgical commissurotomy is indeed effective but with higher maternal mortality rate (1.7%-3.1%) and infant mortality rate ranging from 5% to 33%.<sup>4,8</sup>

In our part of the world, MS is the major lesion found during pregnancy, the main cause of which is rheumatic heart disease.<sup>9,10</sup> This is attributed to poor socio-economic status, overcrowded living conditions and poor access to medical care.<sup>9</sup> The data from Pakistan is scarce, and to our knowledge few studies have been done regarding the effects of PMV on pregnancy outcome and the newborn child.

The objective of this study was to evaluate short and long-term consequences of PMV, in a tertiary care setting,

### Methods

The Aga Khan University Hospital database was used to retrieve all patients who underwent PMV during pregnancy between the period of 1998 and 2007. The follow up data of the patients and the born children were obtained from the medical records available and follow up was done by contacting the patients via phone.

All pregnant women presenting with mitral valve disease (Mitral stenosis and regurgitation) and undergoing PMV from 1998-2007 were included in this study. Patients who were not available for follow-up were excluded from the study.

Patients were followed up to document residual symptoms of mitral valve disease (NYHA class), procedure-related complications, need for surgical intervention post-PMV. Possible maternal confounding factors such as comorbidities were also documented. Pregnancy outcomes such as weight of the new-born, CTG (cardiotocography), mode and complications of delivery, post-natal well-being as well as developmental milestones or delays were also recorded.

A baseline echocardiogram was performed in all patients. PMV was performed after taking an informed written consent as per standard protocol. Antibiotic prophylaxis was initiated in all patients thereafter. The procedure was performed under local anaesthesia and lead abdominal protection was used in all patients.

Summary statistics are presented using mean and standard deviation (mean ± SD) for continuous variables and using frequencies for categorical variables.

### Results

From 1998 to 2007, a total of 56 patients underwent PMV at the Aga Khan University Hospital, Karachi, Pakistan. Out of the 39 females, 6 were pregnant and had mitral stenosis for which they had mitral valvuloplasty done. Follow-up for 5 patients was available as there was a loss to follow up of 1 patient. Average follow-up for this study was 4.5 years conducted in March 2009. These five women were admitted due to severe mitral stenosis with common presentation of dyspnoea and palpitations. Other symptoms included

Table-1: Patient profiles.

No.	Weeks of gestation at delivery	Para/ gravida	Mode of delivery	Weeks of gestation at time of surgery (wks)	Child's age at the time of research	Problems during pregnancy to fetus	Child's weight at time of delivery (kg)	Developmental defects after birth
1	31+	G1 P0	NVD	26	3 y 6m	none	1.8	none
2	28	G1 P0	LSCS	22	3 y	Suboptimal CTG+IUGR	1.4	none
3	32+	G1P0	NVD	21	8 m	none	2.0g	none
4	37	G8 P3 +5	LSCS	22	7 y 1 m	Suboptimal CTG+ IUGR at 34 weeks	2.5 kg	none
5	37	G2P1+0	LSCS	20	10 m	None	2.6 kg	none

CTG: Cardiotocography. NVD: Normal Vaginal Delivery. LSCS: Lower Segment Caesarian Section. IUGR: Intrauterine Growth Retardation.

**Table-2: Pre and post-procedure echocardiogram.**

Patient	Pre/Post	EF* /%	MPG*/mmhg	MVA*/cm2	Pul.HTN*	Pasp	L.A clot	MR	Other
1	PRE	50	08	0.9	Severe	70	No	moderate	-
1	POST	55	03	2.3	-	-	No	Mild to moderate	-
2	PRE	55	20	0.6	Severe	70	Thrombus at L.A appendage	No MR	-
2	POST	60	13	2.1	Mild	55	No	Moderate	-
3	PRE	60	23	1.5	Severe	-	No	mild to moderate	ASD* 11mm L/R shunt
3	POST	55	11	1.7	moderate	40	No	mild	ASD* 11mm L/R shunt
4	PRE	30	07	0.8	-	-	No	-	-
4	POST	55	04	0.9	-	-	No	mild	-
5	PRE	55	34	0.9	severe	135	No	Trace to mild	-
5	POST	55	25	1.1	Moderate	90	No	None	-

\*EF = ejection fraction; MPG = mean pressure gradient; MVA=mitral valve area; PUL.HTN =pulmonary hypertension; ASD = atrial septal defect; Pasp= pulmonary artery systolic pressure.

**Table-3: Post-procedure Change in baseline characteristics.**

Patient	Age	NYHA	Worsening of symptoms	Stroke	AF
1	20	1-2	N	N	N
2	24	1-2	N	N	N
3	35	1-2	N	N	N
4	33	1-2	N	N	Y(post-op)
5	25	1-2	N	N	N

exertional chest pain, productive cough and atrial fibrillation. One of the patients also had a history of atrial septal defect. The mean age of patients was  $27.0 \pm 5.3$  years, with a mean gestational age at the time of procedure of  $22.2 \pm 1.6$  weeks.

Follow-up of the infant after birth was also available for all five patients and is presented in Table-1.

There was a noteworthy increase in valve area and decrease in mean pressure gradient (MPG) after PMV (Table-2). The mean valve area increased from  $0.94 \pm 0.22$  cm<sup>2</sup> pre-operatively to  $1.62 \pm 0.50$  cm<sup>2</sup> post-operatively. The ejection fraction changed mildly from a mean of  $50 \pm 11.7\%$  to  $56 \pm 2.2\%$ .

Only one patient had atrial fibrillation and hypertension post-procedure. Most patients did not show any recurrence of symptoms or any problem related to previously diagnosed mitral stenosis after the valvuloplasty and there was improvement in NYHA class of heart failure in all patients (Table-3). One patient had to undergo mitral valve replacement after one year due to persistent symptoms (chest pain and dyspnoea). Two patients had infant birth through normal vaginal delivery while the other three had them through Caesarean section. There were no maternal deaths, abortion or stillbirths seen. Two patients delivered prematurely and Intrauterine growth retardation with sub-optimal Cardiotocography (CTG) were seen in their foetuses (50%). The infants were born with a mean weight of  $2.1 \pm 0.50$  kg. These infants were followed up till July 2007 over a period of average 158 weeks. Their mean age was  $36.2 \pm 5.9$

months. All babies were normal at birth and maintained normal growth and development without any thyroid disease or malignancy. Developmental milestones were achieved at the appropriate ages in all babies.

## Discussion

PMV has largely replaced surgical valvulotomy or MVR in MS in the absence of contraindications<sup>11</sup> and newer approaches to valve replacement are being carried out.<sup>12</sup> The aim of PMV during pregnancy is to relieve symptoms and prevent adverse effects on foetal well being due to the haemodynamic compromise. In Pakistan where antenatal diagnosis of MS is frequently missed,<sup>13</sup> this becomes a very important tool to help mother and baby during pregnancy but the adverse effects and potential complications associated with the procedure has always been a concern to the health of mother and infant alike, especially due to the use of contrast and radiation during the procedure.<sup>14,15</sup> This radiation can have potential teratogenic effects. The nature and severity of the harmful effects to the embryo or foetus associated with radiation are related to the gestational age at which the exposure occurs.<sup>16</sup> Fatal effects include organ malformation, severe mental retardation and malignancy, especially leukaemia.<sup>17,18</sup>

Our findings are consistent with other data in which the major symptoms, gestational age at the time of procedure, outcomes of pregnancy and long-term follow up closely correlate with our patients.<sup>7,19,20</sup> However, the percentage of pre-term delivery was higher in our series, which is likely

because of the small sample size and were not seen in other studies.<sup>21</sup> No abnormalities in growth or development were seen. Two cases of premature delivery were seen leading to a procedure. This caused us to speculate that this might be related to the effects of either mitral stenosis during pregnancy and its effects on the foetus or due to mitral valvuloplasty and the radiation being used.<sup>22-24</sup> However, there is no reported case of abortion or still birth in our study. Although still birth and abortion rates are very low, they were present in other studies.<sup>19,24</sup> The functional class improved dramatically to NYHA class 1 or 2 which is again consistent with other studies in literature.<sup>7,19,20</sup>

Although certain protective measures were carried out during the procedures in our study, including the use of abdominal shield and the procedure being done only in women over 20 weeks of gestation, there was still a further need to investigate and follow-up the mothers and the infants to identify any long term side effects of this procedure.

Our study is a small observation especially in terms of long-term follow-up of patients who required PMV and long-term follow-up of their children. Though it is difficult to draw conclusions due to the small sample size but our observation shows that PMV is a relatively safe procedure, both for the mother and the child even after a long-term follow-up like an average of 4.5 years (234 weeks) in our study.

In summary, for pregnant patients who have severe mitral stenosis and persistent heart failure along with pulmonary hypertension, mitral valvuloplasty is a safe, feasible and effective treatment with no obvious long-term complications for both mother and foetus.<sup>2,5,7,18-21,24</sup>

## Conclusion

PMV appears to be a safe and effective intervention for patients with severe MS during pregnancy. Larger definitive studies, however, need to be executed especially in our population.

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