



## Percutaneous Balloon Mitral Valvuloplasty: To Share Our Experience

Authors

**Indrajit Mandal<sup>1</sup>, Malay Acharyay<sup>2</sup>, Mainak Mukhopadhyay<sup>3</sup>**

Department of cardiology, Nilratan Sircar Medical College, Kolkata, West Bengal, India

Corresponding Author

**Indrajit Mandal**

Anjani Plaza, Flat-2B, 2<sup>nd</sup> Floor, 4A R.K. Chatterjee Road, Kasba, Kolkata, Pin-700042

Email- [drindumandal@gmail.com](mailto:drindumandal@gmail.com)

### Abstract

**Objectives:** We have conducted this study to share our experience with Percutaneous Balloon Mitral Valvoplasty (PBMV).

**Materials and Methods:** The study was conducted at N.R.S. Medical College over one year with 20 patients (16 female, 4 male) of severe mitral stenosis, underwent PBMV. Mean age was  $22.6 \pm 7.13$  years. 14 patients were laborer, 3 from lower middle class and 3 from upper middle class. Majority (14) came from rural area. 3 from sub-urban area and rest were city slum dweller. Nine patients had symptoms of New York Heart Association Class IV, 10 patients had Class III and 1 had Class II symptoms. Three patients had previous surgical commissurotomy. Associated aortic stenosis was seen in 03 and coronary artery stenosis in 01. Two pregnant mothers were in the study. Thirteen patients had Mitral Valve Morphologic Score (MVMS) <8, MVMS was 10 in four, 11 in 02 and 12 in one patient. 19 patients had associated Mitral Regurgitation (MR). Trivial MR in 08 patients, grade 1 in 09, and grade 2 in 02 patients. Left Ventricular Ejection Fraction (LVEF) was  $\geq 55\%$  in 13,  $<55\%$  in 5, and  $\leq 35\%$  in 2 patients. Mean Mitral Valve Area and Trans Mitral Gradient (TMG) before operation were  $0.91 \pm 0.13 \text{ cm}^2$  and  $15.05 \pm 2.24 \text{ mm of Hg}$  respectively. Doppler and 2D study were done immediately, after 48 hrs and 6m.

**Results:** After the procedure mean MVA and mean TMG were  $1.95 \pm 0.21 \text{ cm}^2$  and  $6.7 \pm 2.31 \text{ mm of Hg}$  respectively. There is statistically significant increase in MVA ( $p=0.000$ ) and TMG ( $p=0.000$ ). The only complication that 5% of patients developed was hemipericardium.

**Conclusion:** PBMV should be considered as one of the best alternative of open valvotomy owing to its simplicity, safety, effectiveness and less complications.

**Keywords:** MVA, Mitral Stenosis, Mitral Regurgitation, PBMV, TMG.

### Introduction

Rheumatic heart disease is the sequela of rheumatic fever (RF). Although any valve can be affected in the disease process but propensity to affect the mitral valve is the maximum. Stenotic lesions are more common than regurgitation. Mitral stenosis

(MS) is the concern in the era of RF which is still rampant in our overpopulated, overcrowded, poverty stricken country. Until the advent of Percutaneous Balloon Mitral Valvuloplasty (PBMV), surgical mitral valve commissurotomy, open or closed was the treatment for symptomatic mitral stenosis. In 1982 Kanji Inoue, a Japanese

cardiac surgeon first developed balloon mitral valvuloplasty using single balloon.<sup>1</sup> In comparison to surgical mitral commissurotomy, PBMV has shown equal or better success rates<sup>2,3</sup> and comparable restenosis rates<sup>3</sup>. We have conducted this study to share our experience with PBMV.

### Materials and Method

The study was conducted at N.R.S. Medical College between 2014 December to 2015 November. The study group consisted of 20 patients (16 female, 4 male). All these diagnosed case of severe mitral stenosis underwent PBMV. Mean age of the patients was  $22.6 \pm 7.13$  years. 14 patients were from labor class, three patients belonged to lower middle class family. 3 of them came from upper middle class with 2 earning family member. Majority (14) came from rural area. 3 patients were from sub-urban area and rest were city slum dweller. Nine patients had symptoms that fell into New York Heart Association (NYHA) Class IV, 10 patients had Class III symptoms and 1 patient had Class II symptoms. Three patients had previous surgical commissurotomy. Electrocardiography (ECG), Chest Xray, Two-dimensional (2D), Doppler echocardiographic evaluation were obtained before the procedure to evaluate rhythm, Mitral valve Area (MVA), TransMitral Gradient (TMG), Left Ventricular Ejection Fraction (LVEF), mitral valve morphology including calcifications, types of lesions (pure stenotic, pure regurgitation or mixed), any other valvular lesions such as AS/AR and so on. Three had concomitant aortic stenosis and one had coronary artery stenosis. Two pregnant mothers were in the study. One mother underwent PBMV at 20 week of gestation and PBMV was done for other one late at 33 weeks of pregnancy. The last mother was unaware about her disease until she presented with heart failure at 31 week of pregnancy. She had mild MR too. 15 patients had sinus rhythm and 5 had atrial fibrillation. Thirteen patients had mitral valve morphologic score (MVMC) <8, Four of them had score 10, MVMC was 12 in only one patient. Two patients showed score 11. 19 patients had associated mitral regurgitation (MR) of varying

degree. There was trivial MR in 08 patients, nine patients had grade 1 MR and two of them had grade 2 MR. Left ventricular ejection fraction  $\geq 55\%$  in 13 patients. Five patients had  $<55\%$  LVEF.  $\leq 35\%$  left ventricular ejection fraction was noted in two patients. Mean MVA and TMG before operation were  $0.91 \pm 0.13$  cm and  $15.05 \pm 2.24$  respectively. Doppler and 2D study were done immediately to rule out MR and its severity and also done 48hr later for measurement of MVA and TMG and lastly done 6 months after the procedure.

**Table-1** depicted demographic and clinical profile of the patients

Characteristics	Values and percentage(%)
<b>Demographic profile</b>	
Age :	Mean age $22.6 \pm 7.13$ years
Sex : Female	16 (80%)
Male	04 (20%)
Socio-economic condition:	
poor	14 (70%)
Lower middle class	03 (15%)
Upper middle class	03 (15%)
Domicile: Rural	14 (70%)
Sub-urban	03 (15%)
City slum dweller	03 (15%)
<b>Clinical profile</b>	
Symptoms: NYHA Class IV	09 (45%)
III	10 (50%)
II	01 (05%)
Rhythm Sinus	15 (75%)
Atrial fibrillation	05 (25%)
Previous commissurotomy	03 (15%)
Associated Aortic stenosis	03 (15%)
Coronary disease	01 (05%)
Left Ventricular Ejection Fraction: $\geq 55\%$	13 (65%)
$<55\%$	05 (25%)
$\leq 35\%$	02 (10%)
Mitral valve morphologic score (wilkin's score): <8	13 (65%)
10	04 (20%)
11	02 (10%)
12	01 (05%)
Mitral regurgitation: Trivial	08 (40%)
Grade 1	09 (45%)
Grade 2	02 (10%)
No MR	01 (05%)
Mean Mitral valve area	$0.91 \pm 0.13$ cm <sup>2</sup>
Mean Translmitral gradient before PBMV	$15.05 \pm 2.24$ mm of Hg

### Detailed Procedure

Five patients with left atrial clot were treated with warferin sodium for 6 wks before the procedure. Informed consent was taken prior to the procedure. All 20 patients underwent PBMV by the trans-septal approach with the use of the single balloon technique. The valve was dilated with one balloon in all patients. MVA was measured by direct planimetry of the valve orifice in early diastole and also by the pressure half time method from the continuous wave Doppler mitral velocity profile. TMG was measured by echocardiography and simultaneous right and left heart catheterization before and after the procedure. Residual left-to-right shunt after perforation of inter-atrial septum was checked by echocardiography.

The smallest orifice of the mitral valve, obtained in early diastole in the parasternal short axis view, was chosen for analysis. The measurement of antero-posterior and transverse diameters of the mitral valve orifice were taken at maximal valve opening in early diastole. For all mitral valve measurements, the values of 3 and 5 measurements were averaged in patients with sinus rhythm and atrial fibrillation, respectively. Mean TMG was calculated from 3 consecutive beats in patients with sinus rhythm, whereas 5 consecutive beats were averaged in patients with atrial fibrillation. The severity of mitral regurgitation was graded by Pulsed Doppler echocardiography. By semiquantitative approach the morphologic features of the stenotic mitral valve and subvalvular apparatus were evaluated and scores ranging from 0 to 4 were assigned to each of four morphologic characteristics, such as leaflet mobility, thickening, calcification and subvalvular thickening. Higher scores denote more morphologic abnormality.

### Results

After the procedure mean MVA was  $1.95 \pm 0.21 \text{ cm}^2$  and mean TMG was  $6.7 \pm 2.31 \text{ mm of Hg}$ . In our study there were statistically significant improvement of mean mitral valve area from  $0.91 \pm 0.13 \text{ cm}^2$  to  $1.95 \pm 0.21 \text{ cm}^2$  ( $p=0.000$ ) and trans-mitral gradient from  $15.05 \pm 2.24$  to  $6.7 \pm 2.31$

( $p=0.000$ ). Only complication that observed in this study was hemopericardium. Unfortunate one patient developed hemopericardium. No patient died during or immediately after the procedure.

### Discussion

In our study there were statistically significant improvement of mean mitral valve area from  $0.91 \pm 0.13 \text{ cm}^2$  to  $1.95 \pm 0.21 \text{ cm}^2$  ( $p=0.000$ ) and trans-mitral gradient from  $15.05 \pm 2.24$  to  $6.7 \pm 2.31$  ( $p=0.000$ ). These results correspond other studies<sup>4,5,6</sup>. 5% patients was complicated with hemoperitonium which is more than other study<sup>7</sup>.

### Conclusion

Although rheumatic fever and rheumatic origin mitral stenosis is almost rare in developed countries and declining in other Asian countries but it is still a countable problem in our country. Prognosis of mitral stenosis after PBMV is improved a lot. So PBMV should be considered as one of the best alternative of open valvotomy owing to its simplicity, safety, effectiveness and less complications.

### References

1. Inoue K, Owaki T, Nakamura T, Kitamura F, Miyamoto N. Clinical application of transvenous mitral commissurotomy by a new balloon catheter. *J Thorac Cardiovasc Surg.* 1984;87:394–402.
2. Turi ZG, Reyes VP, Raju BS, Raju AR, Kumar DN, Rajagopal P, Sathyanarayana PV, Rao DP, Srinath K, Peters P. Percutaneous balloon versus surgical close commissurotomy for mitral stenosis: a prospective, randomized trial. *Circulation.* 1991;83:1179–1185.
3. Arora R, Nair M, Kalra GS, Nigam M, Khalilullah M. Immediate and long-term results of balloon and surgical closed mitral valvotomy: a randomized comparative study. *Am Heart J.* 1993;125:1091–1094.
4. Cohen DJ, Kurtz RE, Gordon Stephen P.F, Piana RN et al. PREDICTOR OF LONG

TERM OUTCOME AFTER  
PERCUTANEOUS BALLOON  
VALVULOPLASTY. *New Eng J.* 1992;  
327:1329-35.

5. NobuyoshiM, Arita T, Shirai Shin-ichi, H, Hamasaki N. Percutaneous Balloon Valvuloplasty: A review. *Circulation.* 2009;119:211-19.
6. Vivian M. A, Gerard T. W, Christopher Y. C, James D. T, et al. Echocardiographic Evaluation of Mitral Valve Structure and Function in Patients Followed for at Least 6 Months After Percutaneous Balloon Mitral Valvuloplasty. *J Am Coll Cardiol.*1988;12:606-15)
7. Martinez-rios MA, Tovar S, Luna J, Eid-Lidt G. Percutaneous mitral commissurotomy. *Cardiol Rev.* 1999;7:108-116.