

## Percutaneous mitral balloon valvuloplasty in patients with previous surgical mitral commissurotomy

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### Abstract

This prospective observational study was done in National Institute of Cardiovascular Diseases and hospital Dhaka, during the period April 2002 to July 2008. In this study the immediate results of balloon mitral valvuloplasty with mitral restenosis patients with previous surgical mitral commissurotomy was evaluated. We have done 50 cases of percutaneous balloon mitral valvuloplasty in patients who had the history of previous surgical commissurotomy. Out of these 50 patients 8 patients were male and 42 patients were female. The age range was 25-55 years with duration of surgical commissurotomy (SC) of 2-18 years past. The result of balloon mitral valvuloplasty (BMV) was successful in 48 cases and failed in 2 cases due to huge left atrium, balloon did not negotiate from LA to LV. Mitral valve area (MVA) before the procedure was 0.5-0.9 sq cm with mean  $0.7 \pm 2$  sq cm. Following procedure the MVA was 1.6-2.04 cm<sup>2</sup> with a mean of  $1.8 \pm 0.2$  cm<sup>2</sup>. Gradient across mitral valve (MV) before and after the procedure was 20-44 mm Hg with a mean of  $32 \pm 12$  mm Hg and 8-12 mmHg with a mean of  $10 \pm 2$  mm Hg. MVA  $\geq 1.8$  cm<sup>2</sup> was achieved in 41 cases & 1.8-1.6 cm<sup>2</sup> in 7 cases. Mitral regurgitation  $\geq 1$  grade occurred in 8 cases. So we conclude that BMV in patients with mitral restenosis following SC can be performed successfully with low risk of major cardiac complications.

**Key words:** Surgical commissurotomy (SC), balloon mitral valvuloplasty (BMV)

### Introduction

The prevalence of mitral stenosis in developed countries, is 0.5 /100,000. Its prevalence in developing countries is at least 10 times higher than in developed countries.<sup>1</sup> Closed mitral commissurotomy is still considered as a treatment of choice in developing countries in particular for economic reason. It is estimated that about 10-30% of patients developed restenosis 5-10 years after an initial successful surgical commissurotomy.<sup>2</sup> The efficacy of Percutaneous balloon mitral valvuloplasty (BMV) in patients with unoperated mitral stenosis has been well documented though there exists less clear-cut data on its effectiveness in patients with mitral restenosis following closed mitral commissurotomy (CMC). Therefore, in this study, we analyzed our results obtained with balloon mitral valvuloplasty in patients with mitral restenosis after previous surgical commissurotomy.

### Methods

This study was done in National Institute of Cardiovascular Diseases (NICVD), Dhaka, Bangladesh. We performed 50 cases of BMV in patients who had the history of previous surgical commissurotomy. Among 50 patients undergoing BMV who received the procedure for symptomatic mitral restenosis after the duration of 2-18 years past the CMC.

There were 42 female and 8 male with age range 25 to 55 years. Echocardiographic score of the mitral apparatus, baseline mitral valve area were determined by echocardiography Presence of mitral regurgitation as determined by Color Doppler echo.

**Table I: Demonstrable baseline clinical characteristics of study subjects (N=50)**

Variables	No. of patients
Age (Years)	40±15
Female: Male	42:8
NYHA*	
Class II	13
Class III	35
Class IV	02
Atrial Fibrillation	30
Mitral regurgitation	
Grade 0	24
Grade 1	16
Grade 2	10
Echo score (Wilkins)	
<8	14
8-11	36

\*NYHA- New York Heart Association

**Balloon mitral valvuloplasty technique**

Balloon mitral valvuloplasty was performed using an appropriate sized Inoue balloon catheter determined from the height of the patients and the stepwise dilatation technique.<sup>3-4</sup> The reference balloon size (RBS) in mm was determined from the height of the patient using the formula  $RBS = H/10+10$  in mm where H is the patients height in cm e.g. if the height is 160 cm then the RBS will be  $160/10+10 = 16+10 = 26$  mm.<sup>3-4</sup> Balloon mitral valvuloplasty was terminated once a satisfactory hemodynamic result defined as a decrease of at least one half the initial transmitral gradients with no further reduction despite two or three more dilations using larger balloon sizes of 0.5-1.0 mm increments was obtained (Fig:1 & 2).

**Echocardiography**

All patients underwent 2D-E, M mode and Colour Doppler echocardiographic examination before and 2-4 weeks after balloon mitral valvuloplasty. Transesophageal echocardiography was performed 1-2 days prior to balloon mitral valvuloplasty to those patients having the history of previous left atrial thrombus or haziness found in left atrial appendage by transthoracic echocardiography. In this study mitral valve area (cm<sup>2</sup>) were determined by planimetry and Doppler Pressure half time (PHT). Mitral valve area and subvalvular morphology was graded according to the Wilkins scoring system which assigns higher scores to values with more severe disease.<sup>5</sup>

**Table II: Depicts hemodynamic changes and mitral valve area before and after the procedure (n=50)**

<b>Transmitral peak pressure gradient (mmHg)</b>	
Before the procedure	30±12
After the procedure	10±5
<b>Angiographic Mean left atrial pressure (mmHg)</b>	
Before the procedure	40±15
After the procedure	15±5
<b>Mitral valve area (cm<sup>2</sup>)</b>	
Before the procedure	0.7±0.2
After the procedure	1.7±0.5
<b>Optimal Commissurotomy</b>	<b>41 case (82%)</b>

**Table III: Showing complications arise after procedure (N=50)**

<b>Variable</b>	<b>Numbers</b>
Mitral regurgitation ≥ 1 grade	8
Free wall puncture	0
Acute LVF	0
Systemic thrombo-embolism	0
Puncture site hematoma	1
Arterio-venous fistula	0
Failed procedure	2

**Definition**

Optimal commissurotomy – A valve area improvement of ≥ 50% or a final valve are ≥ 1.5 cm<sup>2</sup>, without resulted ≥ grade 3+ angiographic mitral regurgitation.

**Results**

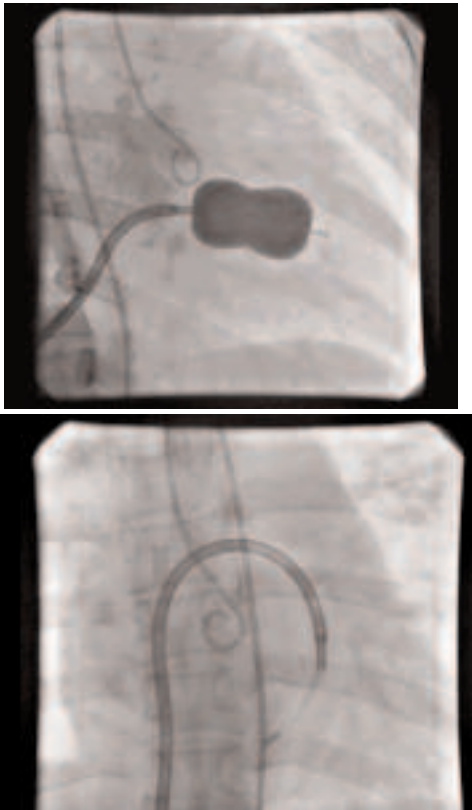
All procedures were completed without any major complications. In particular there were no cardiac perforation, no systemic embolism, need for emergent mitral valve surgery or death. The result of balloon mitral valvuloplasty (BMV) was successful in 48 cases and failed in 2 cases due to huge left atrium, balloon did not negotiate from LA to LV. Mitral valve area (MVA) before the procedure was 0.5-0.9 sq cm with mean 0.7± 0.2 sq cm. Following procedure the MVA was 1.6-2.04 sq cm with a mean of 1.7±0.5 sq cm. Peak gradient across mitral valve (MV) before and after the procedure was 20-44 mm Hg with a mean of 30±12 mm Hg and 8-12 with a mean of 10±5 mm Hg. Adequate MVA ≥ 1.8 sq cm was achieved in 41 cases. MVA 1.8-1.6 achieved in 7 cases. Mitral regurgitation ≥ 1 grade than previous occurred in 8 cases. The pre and post procedural mean angiographic left atrial pressure was 40±15 mmHg and 15±5 mmHg respectively. The hemodynamic and echo results are depicted in table II. Optimal commissurotomy was done in 82% of patients. An increase in mitral regurgitation ≥1 grade than previous occurred in 8 cases.

**Discussion**

This series further confirms the safety and immediate efficacy of BMV for restenosis after surgical commissurotomy, with 82% showing good immediate results.<sup>6-12</sup>

The composite end point of good immediate results used in this study associates a mitral valve area 1.5 cm<sup>2</sup> and no regurgitation >2/4, such conditions generally providing normal hemodynamic.<sup>13-14</sup> Patients who have a history of prior

commissurotomy have more severe impairment of valve anatomy. Our findings are consistent with the work of Feldman et al.<sup>15</sup> who showed that the impairment of valve anatomy was not a predictor of poor results of BMV. Valve calcification and the duration between surgery and BMV have been identified as predictors in other series<sup>6-8</sup>, but not in ours. It should be noted that valve calcification, when present, was generally mild or moderate in the patients of this series. There was no procedural related mortality and no cardiac perforation, stroke or emergency mitral valve surgery in the study.



Only limited data exist on the short and midterm results of balloon mitral valvuloplasty in patients with mitral restenosis after previous surgical commissurotomy.<sup>16-19</sup> The results of balloon mitral valvuloplasty in such a setting have been mixed. Davidson et. al.<sup>16</sup> noted that balloon mitral valvuloplasty in these patients was associated with a significant smaller gain in mitral valve area and less sustained clinical benefits compared with those without prior mitral surgery. In contrast, our findings concurred with several other past studies<sup>6-8</sup> in that balloon mitral valvuloplasty yielded similar immediate improvement in the valve area and an identical risk of resultant mitral regurgitation. More recent data in

a study from Boston<sup>10</sup> revealed that although the immediate and midterm results in patients with mitral restenosis after previous surgical commissurotomy were generally inferior to those without past mitral surgery, these differences were no longer observed when patients with favorable overall mitral echo score ( $\leq 8$ ) were compared. However, the present study differs from some of these studies<sup>17-19</sup> with respect to the incidence of technical failures, resultant severe mitral regurgitation and morbidity. Serra et.al.<sup>19</sup> observed technical failure and major cardiac related complications in 11% of patients in their study. Medina et. al.<sup>17</sup> in turn, noted resultant severe mitral regurgitation in 9.5% of patients and cited a 4.7% mortality rate. In contrast, there was no technical failure, severe mitral regurgitation or death in our patients with previous surgical commissurotomy. Possible explanations for these major discrepancies include the use of the Inoue balloon in the present study as opposed to the double balloon technique used in all the above mentioned studies and patient selection. This study demonstrates that balloon mitral valvuloplasty is safe in patients with mitral restenosis following prior surgical commissurotomy. In conclusion it can be said that balloon mitral valvuloplasty in patients with mitral restenosis following surgical commissurotomy can be performed successfully with low risk of major cardiac complications. For these reasons balloon mitral valvuloplasty should be considered a logical first line of following surgical commissurotomy treatment strategy for selected patients of mitral restenosis.

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