

Hemodynamic Changes in Patients Undergoing Percutaneous Transvenous Mitral Commissurotomy (PTMC)

Hemodynamic
Changes in
Percutaneous
Transvenous
Mitral
Commissurotomy

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ABSTRACT

Objective: To analyze the impact of PTMC on hemodynamic and anatomic outcomes.

Study Design: A descriptive observational study

Place and Duration of Study: This study was conducted at the Cardiology Department, Nishtar Medical University & Hospital Multan & CPE Institute of Cardiology, Multan from June 2020 to June 2021.

Materials and Methods: The study included fifty patients with isolated rheumatic mitral stenosis who underwent PTMC. The study included fifty patients with isolated rheumatic mitral stenosis who underwent PTMC. Mitral valve area, TMVG, and size of LA are measured in all patients through 2D transthoracic echo (with Toshiba Xario 2100). Echo was done before and 24 hours after PTMC. LA pressures before and after PTMC were measured in the cath lab.

Results: The mean age of the subjects was 35.24±8.75 years. A number of male patients were 29 while that of females was 21. MV area before PTMC was .92±.087 cm² which expanded to 1.68±.15 cm² six weeks after PTMC. LA pressures after PTMC was also significantly reduced, it decreased from 25.8±7.4 mmHg before PTMC to 10.87±5.7 mmHg after it (p-value <0.001). Pulmonary artery systolic pressure and TMVG were also significantly reduced after PTMC.

Conclusion: For managing patients with rheumatic MS, PTMC is found to be effective and safe. It significantly improves hemodynamic and anatomic outcomes in these patients.

Key Words: Percutaneous transluminal mitral commissurotomy (PTMC), left atrial pressure, rheumatic mitral valve stenosis.

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INTRODUCTION

Mitral valve stenosis (MVS) is one of the most common complications of rheumatic fever (RF)¹ Although in developed states, the rate of RF has decreased dramatically², but still a prevalent health condition in developing nations. In Pakistan, about 2.2% of people suffer from RF, while every 1.8 in 1000 people are reportedly diagnosed with rheumatic heart disease (RHD)^{3,4}.

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Symptoms of RHD appear long after the occurrence of the disease. Mitral stenosis results in pulmonary hypertension as flow across the valve decreases leading to blood backflow.⁵ In most patients symptoms of RHD (NYHA class IV) are observed after fifteen years. In MS with a favorable prognosis, the standard treatment procedure is

Percutaneous trans luminal mitral commissurotomy (PTMC).^{6,7} At advanced stages like high Wilkin's score or moderate to severe mitral regurgitation, surgery is mostly recommended. The success of PTMC is usually determined by the Trans-mitral valve gradient (TMVG). The success of the procedure is indicated by the major difference in pre and post-operative value of TMVG value.

MATERIALS AND METHODS

A descriptive observational study was conducted from June 2020 to June 2021 in NMU & CPE Institute of Cardiology. The study included fifty patients with isolated rheumatic mitral stenosis who underwent PTMC. Those aged more than 50 years, having spinal deformity and both aortic and mitral valve disease were excluded. Written consent was taken from all the

included patients. Approval from the ethical board was also sought before conducting the study.

Mitral valve area, TMVG, and size of LA are measured in all patients through 2D transthoracic echo (with Toshiba Xario 2100). Echo was done before and 24 hours after PTMC. LA pressures before and after PTMC were measured in the cath lab. SPSS v23 was used for all readings. Pre and post-PTMC values were compared using paired sample statistics.

RESULTS

The mean age of the subjects was 35.24 ± 8.75 years. The number of male patients was 29 while that of females was 21. In 13 patients with mitral stenosis, pre-operative arterial fibrillation was diagnosed. MV area before PTMC was $.92 \pm .087$ cm² which expanded to $1.68 \pm .15$ cm² six weeks after PTMC. LA pressures after PTMC was also significantly reduced, it decreased from 25.8 ± 7.4 mmHg before PTMC to 10.87 ± 5.7 mmHg after it (p-value <0.001). Pulmonary artery systolic pressure and TMVG were also significantly reduced after PTMC. (Table 1)

Table No.1: Study variables - Pulmonary artery systolic pressure and TMVG after PTMC

Study Variable	Pre-PTMC	Post-PTMC	P-value
Mitral Valve Area (cm ²)	.92±.087	1.68±.15	<.001
LA area (cm)	4.68±.88	4.42±.07	.001
LA Pressure (mmHg)	25.8±7.4	10.87±5.7	<.001
TMVG (mmHg)	16.78±3.72	5.66±1.43	<.001
Pulmonary Artery Systolic Pressure (mmHg)	53.22±30.44	30.76±9.0	<.001

DISCUSSION

The rheumatic mitral stenosis is highly related to changes in the anatomy of LA and electrophysiological shifts resulting from an increase in LA afterload and its direct association with RHD.^{8,9} There also is an increased risk of AF because of these changes. In this study, 26% of patients had AF before PTMC. Another study showed that 23.55 patients had PF pre-PTMC.¹⁰ Inoue et al was the first to report PTMC in 1984 and since then it became the treatment of choice for managing moderate to severe MS.¹¹ It is significant in reducing mortality and morbidity.^{12,13} Moreover, according to the studies PTMC is also significant in reducing the risk of AF in the long term.¹⁴ The focus of our study was to analyze the impact of PTMC on hemodynamic factors. The present study shows that TMVG was significantly reduced from 17.88 ± 2.71

before PTMC to 4.65 ± 1.44 mm Hg after it. LA area was also reduced from $4.68 \pm .88$ cm to $4.42 \pm .07$ cm.

Another study also demonstrates the significant impact of PTMC on hemodynamic outcomes. According to the results, MV area increased from $.8 \pm .088$ cm² pre PTMC to 1.77 ± 0.14 cm² after it. LA diameter decreased from $5.66 \pm .83$ cm before PTMC to $4.33 \pm .07$ cm after it. Right ventricular systolic pressure (RVSP) also changed from 62.34 ± 10.98 mmHg before PTMC to 57.51 ± 9.67 mmHg 24 hours after it and to 46.49 ± 7.83 mmHg 6 months after it.¹⁰ Another study also found that PTMC significantly improves hemodynamic and anatomic factors in MS patients. It was found that the diameter of LA was reduced from 46.33 ± 6.35 mm to 41.19 ± 5.66 mm after PTMC, and PAP was also significantly reduced from 55.23 ± 30.65 mmHg to 29.77 ± 9.10 mmHg.¹⁵

Another study was conducted on follow-up of the patients who had undergone PTMC, it was found that young age is associated with good outcomes and in 71% of patients, improvement was seen. Within 6 months of the procedure, the restenosis rate was 8.33% and the mortality rate was 7.14%. Moreover, patients undergoing PTMC for restenosis had a better survival rate than those undergoing MV replacement.¹⁶ Studies have shown that long-term follow-up shows favorable results of PTMC.¹⁷ The limitation of our study is that patients were followed up for 1 week only and not for the long term.

CONCLUSION

For managing patients with rheumatic MS, PTMC is found to be effective and safe. It significantly improves hemodynamic and anatomic outcomes in these patients.

Author's Contribution:

Concept & Design of Study: Muhammad Shahid
 Drafting: Hadi Yousuf Saeed, Fawad Qadir
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 Revisiting Critically: Muhammad Shahid, Hadi Yousuf Saeed
 Final Approval of version: Muhammad Shahid

Conflict of Interest: The study has no conflict of interest to declare by any author.

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