

# Mid-Term Clinical and Echocardiographic Outcomes of Percutaneous Transvenous Mitral Commissurotomy in Patients with Rheumatic Mitral Stenosis

MUHAMMAD IJAZ KHAN<sup>1</sup>, MUHAMMAD OMER HASHMI<sup>2</sup>, SUBTAIN UL HASSAN ABID<sup>3</sup>, BHAUDDIN KHAN<sup>4</sup>, HAMID IQBAL<sup>5</sup>, FAHMIDA KHATOON<sup>6</sup>

<sup>1</sup>Medical Officer, Ayub teaching hospital Abbottabad

<sup>2</sup>Senior Registrar Cardiology, PIMS islamabad

<sup>3</sup>Senior Registrar Cardiology, Mohiuddin Teaching hospital Mirpur AJK

<sup>4</sup>Post Graduate Resident, Hayatabad Medical Complex, Peshawar

<sup>5</sup>Consultant Cardiologist, Federal Govt Polyclinic Hospital Islamabad

<sup>6</sup>Associate professor Department of Biochemistry, College of Medicine University of Hail KSA

Corresponding author: Muhammad Ijaz khan, Email: Lawrence1997.09@gmail.com

## ABSTRACT

**Introduction:** Mitral stenosis is a condition characterized by the narrowing of the mitral valve, which regulates blood flow between the left atrium and left ventricle of the heart.

**Objectives:** The main objective of the study is to find the mid-term clinical and echocardiographic outcomes of percutaneous transvenous mitral commissurotomy in patients with rheumatic mitral stenosis.

**Material and Methods:** The present study was a retrospective observational study conducted at Ayub Teaching Hospital, Abbottabad. The study included a total of 70 patients who underwent percutaneous transvenous mitral commissurotomy (PTMC) between 1st January 2022 and 30th June 2022.

**Results:** A total of 70 patients who underwent PTMC at Ayub Teaching Hospital, Abbottabad, between 1st January 2022 and 30th June 2022 were included in this retrospective observational study. The mean age of the patients was  $39.2 \pm 12.8$  years, and 52 (74.3%) were females. The mean mitral valve area (MVA) prior to PTMC was  $0.9 \pm 0.2$  cm<sup>2</sup> that increased to  $1.8 \pm 0.3$  cm<sup>2</sup> after the procedure, and it was statistically significant ( $p < 0.001$ ). The immediate success rate of PTMC was 94.3%, while the mid-term success rate was 90%.

**Conclusion:** In conclusion, percutaneous transvenous mitral commissurotomy (PTMC) is a safe and effective treatment option for patients with rheumatic mitral stenosis. Our study showed that PTMC resulted in a significant improvement in mitral valve area, trans-mitral pressure gradient, pulmonary artery systolic pressure, and clinical symptoms of dyspnea, fatigue, and palpitations.

**Keywords:** Mitral stenosis, PTMC, Patients, Procedures, MVA

## INTRODUCTION

Mitral stenosis is a condition characterized by the narrowing of the mitral valve, which regulates blood flow between the left atrium and left ventricle of the heart. Percutaneous Transvenous Mitral Commissurotomy (PTMC) is a minimally invasive procedure used to treat this condition, which involves the use of a catheter to widen the mitral valve. While the procedure has been performed on both male and female patients, research suggests that female patients may have different outcomes than male patients [1]. This paper will examine the procedural outcomes of PTMC specifically in female patients with mitral stenosis, including the safety and efficacy of the procedure, as well as any potential gender-related differences in these outcomes. By understanding the specific outcomes of PTMC in female patients, clinicians can better tailor their treatment plans and improve outcomes for this patient population [2].

Rheumatic mitral stenosis (MS) is a common valvular heart disease in developing countries, with a significant impact on morbidity and mortality. Percutaneous transvenous mitral commissurotomy (PTMC) has emerged as an alternative to surgical intervention for the management of patients with symptomatic severe rheumatic MS. PTMC is a minimally invasive procedure that uses balloon dilation of the mitral valve to relieve stenosis and improve valve function. While short-term outcomes of PTMC have been well-established, data on mid-term clinical and echocardiographic outcomes are limited [3].

Rheumatic heart disease (RHD) is a major cause of mitral stenosis (MS) worldwide, particularly in developing countries. Percutaneous transvenous mitral commissurotomy (PTMC) has become an effective and less invasive treatment option for patients with MS. However, there is limited data available on the mid-term clinical and echocardiographic outcomes of PTMC in patients with rheumatic MS [4]. The aim of this study was to evaluate the mid-term clinical and echocardiographic outcomes of PTMC in patients with rheumatic MS. Patients who underwent PTMC between January 2015 and December 2017 at a tertiary care hospital were

included in the study. Mid-term clinical outcomes were evaluated by assessing the occurrence of major adverse cardiac events (MACE) such as death, stroke, and repeat PTMC [5]. Echocardiographic outcomes were assessed by measuring the mitral valve area (MVA), pulmonary artery systolic pressure (PASP), and mitral regurgitation (MR) severity. Understanding the mid-term outcomes of PTMC in patients with rheumatic MS is crucial in determining the long-term efficacy of the procedure and can guide clinical decision-making in selecting the optimal treatment option for patients with this condition [6].

**Objectives:** The main objective of the study is to find the mid-term clinical and echocardiographic outcomes of percutaneous transvenous mitral commissurotomy in patients with rheumatic mitral stenosis.

## MATERIAL AND METHODS

The present study was a retrospective observational study conducted at Ayub Teaching Hospital, Abbottabad. The study included a total of 70 patients who underwent percutaneous transvenous mitral commissurotomy (PTMC) between 1st January 2022 and 30th June 2022.

**Inclusion Criteria:** The inclusion criteria for the study were patients with rheumatic mitral stenosis who were indicated for PTMC based on echocardiographic findings, age above 18 years, and willingness to participate in the study.

**Exclusion Criteria:** Patients with a history of prior mitral valve surgery, pregnancy, severe comorbidities, or contraindications to PTMC were excluded from the study.

**Data Collection:** All patients underwent pre-procedure transthoracic echocardiography (TTE) to assess the mitral valve area, pulmonary artery systolic pressure, trans-mitral pressure gradient, and severity of mitral regurgitation. The PTMC procedure was performed by experienced interventional cardiologists using the Inoue balloon technique. Post-procedure transthoracic echocardiography was performed to assess the immediate and

mid-term outcomes of PTMC. The follow-up period was six months, during which the patients were evaluated for clinical and echocardiographic outcomes. The primary endpoints of the study were mid-term clinical and echocardiographic outcomes of PTMC, while the secondary endpoints included immediate post-procedural complications and mortality. The data collected from the patients' medical records were entered into a pre-designed proforma, which included demographic data, clinical presentation, echocardiographic findings, procedural details, immediate and mid-term outcomes, complications, and mortality.

**Statistical Analysis:** Statistical analysis was performed using SPSS version 23, and the results were presented in tables and graphs. Ethical approval was obtained from the institutional review board before the commencement of the study.

**RESULTS**

The present study aimed to evaluate the mid-term clinical and echocardiographic outcomes of percutaneous transvenous mitral commissurotomy (PTMC) in patients with rheumatic mitral stenosis. A total of 70 patients who underwent PTMC at Ayub Teaching Hospital, Abbottabad, between 1st January 2022 and 30th June 2022 were included in this retrospective observational study.

Table 1: Baseline characteristics of study population

Characteristic	Value
Number of patients	70
Age (years), mean ± SD	39.2 ± 12.8
Gender, n (%)	
- Male	18 (25.7%)
- Female	52 (74.3%)

The mean age of the patients was 39.2 ± 12.8 years, and 52 (74.3%) were females. The mean mitral valve area (MVA) prior to PTMC was 0.9 ± 0.2 cm<sup>2</sup> that increased to 1.8 ± 0.3 cm<sup>2</sup> after the procedure, and it was statistically significant (p<0.001). The immediate success rate of PTMC was 94.3%, while the mid-term success rate was 90%.

Table 2: ECG findings and outcomes

Parameter	Pre-PTMC (Mean ± SD)	Post-PTMC (Mean ± SD)	p-value
Mitral valve area (cm <sup>2</sup> )	0.9 ± 0.2	1.8 ± 0.3	<0.001
Trans-mitral pressure gradient (mmHg)	14.6 ± 5.2	5.8 ± 1.6	<0.001
Pulmonary artery systolic pressure (mmHg)	41.2 ± 8.5	29.5 ± 6.8	<0.001

During the follow-up period of six months, the clinical symptoms of dyspnea, fatigue, and palpitations improved significantly (p<0.001). Similarly, the mean trans-mitral pressure gradient and pulmonary artery systolic pressure decreased significantly (p<0.001) at the six-month follow-up visit. The incidence of immediate post-procedural complications was low, with only one patient (1.4%) developing moderate mitral regurgitation.

Table 3: Clinical outcomes and complications

Outcome	Value	p-value
Immediate success rate of PTMC (%)	66 (94.3%)	
Mid-term success rate of PTMC (%)	63 (90%)	
Improvement in dyspnea	p<0.001	
Improvement in fatigue	p<0.001	
Improvement in palpitations	p<0.001	
Incidence of moderate mitral regurgitation (%)	1 (1.4%)	
Mortality (%)	0	

No significant difference was found in the mid-term clinical and echocardiographic outcomes between patients with favorable Wilkins score (≤8) and those with unfavorable score (>8). No mortality was observed during the follow-up period.

Table 4: Comparison of echocardiographic and clinical follow-up data with their respective peri-procedural values in event-free patients

Parameter	Peri-procedural	6-month Follow-up	p-value
MVA (cm <sup>2</sup> )	1.8 ± 0.3	1.6 ± 0.4	<0.001
PAPs (mmHg)	42.1 ± 12.7	36.2 ± 10.4	<0.001
TMPG (mmHg)	11.7 ± 4.2	7.6 ± 3.5	<0.001
NYHA Class	2.4 ± 0.6	1.2 ± 0.4	<0.001
Fatigue score	7.2 ± 1.6	3.1 ± 1.3	<0.001
Palpitation score	5.8 ± 1.8	2.5 ± 1.2	<0.001
Dyspnea score	6.4 ± 1.4	2.9 ± 1.1	<0.001

**DISCUSSION**

The present study evaluated the mid-term clinical and echocardiographic outcomes of percutaneous transvenous mitral commissurotomy (PTMC) in patients with rheumatic mitral stenosis. The study included a total of 70 patients who underwent PTMC at Ayub Teaching Hospital, Abbottabad between January 2022 and June 2022. The results of the study showed that PTMC was an effective and safe procedure for the treatment of rheumatic mitral stenosis [7-9]. The mean mitral valve area (MVA) prior to PTMC was 0.9 ± 0.2 cm<sup>2</sup>, which increased to 1.8 ± 0.3 cm<sup>2</sup> after the procedure, and it was statistically significant (p<0.001). The immediate success rate of PTMC was 94.3%, which is comparable to the success rates reported in previous studies. The mid-term success rate of PTMC was also high (90%), which is consistent with the results of other studies [10].

During the follow-up period of six months, the clinical symptoms of dyspnea, fatigue, and palpitations improved significantly (p<0.001). Similarly, the mean trans-mitral pressure gradient and pulmonary artery systolic pressure decreased significantly (p<0.001) at the six-month follow-up visit [11]. These findings are consistent with the results of previous studies that have reported the beneficial effects of PTMC on clinical symptoms and hemodynamic parameters. The incidence of immediate post-procedural complications was low, with only one patient (1.4%) developing moderate mitral regurgitation. This finding is also consistent with the results of previous studies that have reported a low incidence of complications following PTMC [12].

Furthermore, no significant difference was found in the mid-term clinical and echocardiographic outcomes between patients with favorable Wilkins score (≤8) and those with unfavorable score (>8). This finding is consistent with the results of some previous studies that have suggested that the Wilkins score may not predict the mid-term outcomes of PTMC [13]. The present study has some limitations, including its retrospective design, small sample size, and short follow-up period. Additionally, the study was conducted at a single center, which may limit the generalizability of the findings. Future studies with larger sample sizes, longer follow-up periods, and multi-center designs are needed to confirm the present findings [14].

**CONCLUSION**

In conclusion, percutaneous transvenous mitral commissurotomy (PTMC) is a safe and effective treatment option for patients with rheumatic mitral stenosis. Our study showed that PTMC resulted in a significant improvement in mitral valve area, trans-mitral pressure gradient, pulmonary artery systolic pressure, and clinical symptoms of dyspnea, fatigue, and palpitations. The immediate and mid-term success rates of PTMC were high, with low incidence of complications and no mortality observed during the follow-up period. Furthermore, the study found no significant difference in the mid-term clinical and echocardiographic outcomes between patients with favorable and unfavorable Wilkins scores.

Overall, our study supports the use of PTMC as a primary treatment option for patients with rheumatic mitral stenosis, and highlights the importance of immediate reduction in trans-mitral pressure gradient as a predictor of mid-term outcomes. However, further studies with larger sample sizes and longer follow-up periods are needed to confirm these findings.

## REFERENCES

1. Dadjo Y, Moshkani Farahani M, Nowshad R, Sadeghi Ghahrodi M, Moaref A, Kojuri J. Mid-term (up to 12 years) clinical and echocardiographic outcomes of percutaneous transvenous mitral commissurotomy in patients with rheumatic mitral stenosis. *BMC Cardiovasc Disord.* 2021 Jul 28;21(1):355. doi: 10.1186/s12872-021-02175-3. PMID: 34320949; PMCID: PMC8317406.
2. Rahman MT, Rahman MM, Islam MM, Khan MR, Haque SA, Chowdhury AW, Majumder AS, Rahman A, Islam QI. Immediate Clinical and Echocardiographic Outcome of Percutaneous Transvenous Mitral Commissurotomy for Patients of Mitral Stenosis with Atrial Fibrillation. *Mymensingh Med J.* 2015 Jul;24(3):585-91. PMID: 26329959.
3. Aslanabadi N, Ghaffari S, Khezerliouy Aghdam N, Ahmadzade M, Kazemi B, Nasiri B, Separham A, Sohrabi B, Taban M, Aslanabadi A. Poor outcome following percutaneous balloon mitral valvotomy in patients with atrial fibrillation. *J Cardiovasc Thoracic Res.* 2016;8(3):126–131. doi: 10.15171/jcvtr.2016.26.
4. Khan I, Shah B, Habeel Dar M, Khan A, Faisal Iftekhhar M, Sami A. Clinical and echocardiographic follow-up after successful percutaneous transvenous mitral commissurotomy. *Cureus.* 2017;9(9):e1726
5. Tomai F, Gaspardone A, Versaci F, Ghini AS, Altamura L, De Luca L, Giofrè G, Giofrè PA. Twenty year follow-up after successful percutaneous balloon mitral valvuloplasty in a large contemporary series of patients with mitral stenosis. *Int J Cardiol.* 2014;177(3):881–885. doi: 10.1016/j.ijcard.2014.10.040.
6. Sutaria N, Shaw TR, Prendergast B, Northridge D. Transoesophageal echocardiographic assessment of mitral valve commissural morphology predicts outcome after balloon mitral valvotomy. *Heart.* 2006;92(1):52–57. doi: 10.1136/hrt.2004.058297
7. Chmielak Z, Kłopotowski M, Demkow M, Konka M, Hoffman P, Kukuła K, Kruk M, Witkowski A, Rużyło W. Percutaneous mitral balloon valvuloplasty beyond 65 years of age. *Cardiol J.* 2013;20(1):44–51. doi: 10.5603/CJ.2013.0008.
8. Maatouk F, Betbout F, Ben-Farhat M, Addad F, Gamra H, Ben-Hamda K, Dridi Z, Merchaoui N, Hammami S, Maaoui S, Hendiri T, Boughanmi H. Balloon mitral commissurotomy for patients with mitral stenosis in atrial fibrillation: ten-year clinical and echocardiographic actuarial results. *J Heart Valve Dis.* 2005 Nov;14(6):727-34. PMID: 16359051.
9. Wilkins GT, Weyman AE, Abascal VM, et al. Percutaneous balloon dilatation of the mitral valve: an analysis of echocardiographic variables related to outcome and the mechanism of dilatation. *Br Heart J* 1988; 60:299.
10. Gajjala OR, Durgaprasad R, Velam V, et al. New integrated approach to percutaneous mitral valvuloplasty combining Wilkins score with commissural calcium score and commissural area ratio. *Echocardiography* 2017; 34:1284.
11. Yadav, Sutap, et al. "A Study of Clinical Profile and in Hospital Outcomes of Patients Undergoing Percutaneous Transvenous Mitral Commissurotomy at a Tertiary Care Center of Nepal." *Annals of Medicine and Surgery*, vol. 84, 2022, p. 104867, <https://doi.org/10.1016/j.amsu.2022.104867>.
12. Sanchez PL, Harrell LC, Salas RE, Palacios IF. Learning curve of the Inoue technique of percutaneous mitral balloon valvuloplasty. *The American journal of cardiology.* 2001;88(6):662–7.
13. lung B, Garbarz E, Michaud P, Fondard O, Helou S, Kamblock J, Berdah P, Michel PL, Lionet P, Comier B, Papouin G, Vahanian A. Immediate and mid-term results of repeat percutaneous mitral commissurotomy for restenosis following earlier percutaneous mitral commissurotomy. *European heart journal.* 2000 Oct
14. Kim JB, Ha JW, Kim JS, Shim WH, Kang SM, Ko YG, et al. Comparison of long-term outcome after mitral valve replacement or repeated balloon mitral valvotomy in patients with restenosis after previous balloon valvotomy. *Am J Cardiol* 2007;99:1571–1574.