Original Article

Efficacy Of Percutaneous Transvenous Mitral Commisurotomy To Immediately Reduce Pulmonary Hypertension In Patients With Severe Rheumatic Mitral Stenosis

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Abstract

Objective: In patients with severe rheumatic mitral stenosis, to ascertain the rate of the efficient percutaneous transvenous mitral commisurotomy (PTMC) for lowering lung pressure.

Materials and methods: In this study, a total of 196 patents were examined after receiving permission from the institutional ethical and scientific assessment committee. All of the patients who had signed up had thorough physical examinations and histories completed before undergoing transthoracic and transesophageal echocardiography. A technique utilising the right femoral bone was used to execute PTMC. Under local anesthetic, the Seldinger method was used to provide right femoral arterial and venous accesses. Inoue balloon was utilized in accordance with the patient's height. Pulmonary artery pressure was measured in each patient during the procedure in cath lab (both in pre- and post-PTMC period). SPSS (version 23.0) was used to identify the impact modifiers, effectiveness was stratified based on age, gender, the length of severe rheumatic mitral stenosis, occupation, and socioeconomic level. A statistically significant outcome was determined using the post-stratification chi square test, with a P value of 0.05.

Results: The mean age in this research was 30 years, with an SD of 2.16. Patients made up 68% of the population were female and 32% were male. Initial mean pulmonary artery pressure was 47.41±11.02 and final mean pulmonary artery pressure was 33.24±7.83. Furthermore, PTMC was successful in 85% of patients and unsuccessful in 15%.

Conclusion: In patients with severe rheumatic mitral stenosis, our research found that PTMC was 85% successful in lowering pulmonary artery pressure.

Keywords: rheumatic mitral stenosis, percutaneous transvenous mitral commissurotomy (PTMC), pulmonary artery pressure, femoral artery and venous access, transthoracic and transesophageal echocardiography, inoue balloon, cath lab procedure

INTRODUCTION

40% of people with this syndrome are rheumatic cardiac patients who develop pure mitral stenosis (MS).1 Due to the high frequency of a condition called rheumatic fever in this country, mitral stenosis still occurs often.1 The latency period after a rheumatic fever event is 10–20 years or more before symptoms appear.2 Mitral stenosis is usually complicated by pulmonary hypertension (PH). In order to be diagnosed with pulmonary arterial hypertension (PAH), One must have a mean pulmonary-capillary wedge pressure of more than 25 mmHg at rest or more than 30 mmHg during exercise, and one's left ventricular end-diastolic pressure must be less than 15 mmHg.3 When therapy is required, 50% of people with mitral stenosis have moderate pulmonary hypertension, whereas 25% have severe PAH.4 The long-term prognosis and symptoms are substantially influenced by pulmonary hypertension.2 It is believed that a number of factors contribute to the development of pulmonary hypertension in people with mitral stenosis. Pulmonary venous hypertension induces reactive pulmonary constriction of the and morphological changes in the pulmonary vasculature, and elevated left atrial and pulmonary venous pressures passively transfer backward into the pulmonary vascular.2 Following mitral valve replacement, surgical mitral commissurotomy, or percutaneous balloon mitral commissurotomy, pulmonary hypertension often regresses. The 1984 first description of Percutaneous Balloon Mitral Commissurotomy (PTMC) showed promising short- and intermediate-term outcomes.5,6 One of the most used echocardiographic grading methods is the Wilkins score, which evaluates whether the mitral valve's shape is suitable for PTMC.7 Its efficiency and long-term effects have now received extensive documentation.8-10 It has also been shown that after PTMC, LA pressure drastically decreases.6 Following PTMC, pulmonary artery pressures also drop.8,9 The decrease in pulmonary hypertension is attributed to the improvement in the mitral valve area and subsequent decompression of the left atrium and pulmonary venous beds after PTMC.11 Vahanian et al. claim that one of the four techniques—Inuoe, double inflatable balloon, metallic commissurotome, single balloon, and multitrack system—is often used during PTMC to provide antegrade access to the mitral valve by a transseptal puncture.9 The parameters that influence alteration as well as the level of reversal in pulmonary hypertension among patients getting balloon valvuloplasty have not been adequately explored, despite the fact that some authors have offered prediction models about the general outcome of the patients following PTMC.5,12 Pulmonary hypertension starts to gradually decline after PTMC, then it gradually declines more and more.9 Both the persistent morphologic alterations in the pulmonary vasculature and the remaining mitral stenosis lead to certain cases of pulmonary arterial hypertension that remain after PTMC. Age, mean left atrial pressure, and right ventricular size all independently predicted the drop in systolic lung pressure after surgery in the regression analysis. Previous research has connected less reversible pulmonary circulation changes to age-related increases in PAH severity. While Hannoush et al.13 saw a less pronounced fall in PASP in the older age group, the Moaquin et al.7 experiment showed older patients to have more severe pulmonary hypertension, defined as those over the age of 35. In one study, 85% of the target population experienced significant reductions in mean left atrial pressure (pre-ptmc 33.257; post-ptmc 17.886; p0.01), right ventricular systolic pressure (pre-ptmc 68.7518; post-ptmc 48.8212; p0.01), and pulmonary arterial pressure (pre-ptmc 45.9912). Several previous trials have already shown the study's safety.3,7,9,11-14 One of the most significant and deadly side effects of mitral stenosis in people with rheumatic heart disease is pulmonary artery hypertension. Both the symptomatology and long-term prognosis are greatly influenced by pulmonary hypertension. It is questionable how well PTMC works to lower pulmonary artery pressure and how often people respond well to PTMC. Even if there have already been some studies on this subject, the objective of my research is to gather the most recent and accurate data about the effectiveness of PTMC in treating patients with severe rheumatic mitral stenosis by lowering pulmonary artery pressure. Such information will make it easier to identify patients who would most likely benefit from PTMC. Once the findings are obtained, they will be discussed with the local cardiologists who are qualified to treat rheumatic mitral stenosis with PTMC.

MATERIALS AND METHODS

The Cardiology Department of the Postgraduate Medical Institute at LRH in Peshawar performed this research from July 25, 2020, to January 25, 2021. The estimated sample size was 196 with a 95% confidence interval and a 5% margin of error, taking in mind that 85% of the population had improved14 due to PTMC and that the left atrial pressure had decreased by 48%. The research comprised both male and female patients aged 15 to 40 with a mitral valve area 1.0cm^2 and symptoms lasting at least 4 months.

Following a thorough medical history assessment, clinical examination, review of prior records, liver, kidney, and pulmonary function testing, as well as transthoracic and transesophageal echocardiography, the following individuals were excluded from the research.

i. MVA >1.00 cm^2
ii. LA/LAA thrombus
iii. Affected LV performance
iv. Additional valve diseases such as mitral regurgitation, aortic regurgitation, and aortic stenosis
v. A previous mitral valve operation
vi. Congenital mitral stenosis
vii. Primary pulmonary hypertension, interstitial lung diseases, chronic obstructive pulmonary disease, and atrial and ventricular septal defects are other causes of high pulmonary artery pressures

The aforementioned circumstances serve as confounding elements and, if present, will inject bias into the study's findings.

The hospital's ethical and CPSP research committees gave their permission before the study could be carried out. All patients who met the aforementioned inclusion criteria and who presented to the emergency room or were admitted to the ward were included in the study. All patients received an explanation of the study's goals and advantages, and they all provided signed informed consent.

After a thorough medical history and physical examination, all enrolled patients underwent trans thoracic and trans esophageal echocardiography (Siemens' Acuson cv-70) to evaluate for the fraction of ejection, left ventricular end diastolic diameter, left atrial clot/left atrial attachment thrombi, and other valvular pathologies. Investigations comprising pulmonary function tests, renal function tests, and liver function tests were conducted in order to thoroughly fulfill the inclusion and criteria for exclusion.

A technique utilising the right femoral bone was used to execute PTMC. Under local anesthetic, the Seldinger method was used to provide right femoral arterial and venous accesses. Left and right heart pressure tests, as well as a left ventriculogram, were carried out to determine the pulmonary artery pressure, the mitral valve gradient, and to rule out mitral regurgitation. The Brockenbrough atrial puncture needle and Mullin's Sheath have been moved to the superior vena cava. A needle tip was used to pierce the septum. It was decided to use an Inoue balloon based on the patient's height. Each patient's pulmonary artery pressure was checked both before and after the PTMC operation in the cath lab. All of the aforementioned details, including demographic information, were entered in a previously created Perform

SPSS (version 23.0) was used to analyze the data. For continuous variables such age, initial mean pulmonary artery pressure, final mean pulmonary artery pressure, and duration of severe rheumatic mitral stenosis, mean and standard deviation were determined. For qualitative characteristics including gender, employment, socioeconomic position, and effectiveness, frequencies and percentages were determined. To identify the impact modifiers, effectiveness was stratified based on age, gender, the length of severe rheumatic mitral stenosis, occupation, and socioeconomic level. A statistically significant outcome was determined using the post-stratification chi square test, with a P value of 0.05. All of the results were presented in tables and charts.

RESULTS

In this research, 196 patients' ages were dispersed among them, and it was found that 78 (40%) of the patients were between the ages of 31 and 40, while 118 (60%) were between the ages of 15 and 30 (30 years old on average, with an SD of 2.16). Analysis of the gender distribution among 196 patients revealed that 63 (32%) were male and 133 (68%) were female (as shown in table no 2). Analysis of the severity of severe rheumatic mitral stenosis in 196 patients revealed that 69 (35% of patients) had the condition for less than six months and 127 (65%) had it for more than six months. Status of socioeconomic status among 196 patients was analyzed as

94(48%) patients were poor, 73(37%) patients were middle class, 29(15%) patients were rich. Initial mean pulmonary artery pressure was 47.41±11.02 and final mean pulmonary artery pressure pulmonary was 33.24±7.83.

PTMC was successful in 167 (85%) of the 196 patients who had the procedure, however it was ineffective in 29 (15% of the patients). The following provide a stratification of effectiveness based on age, gender, diabetes, high blood pressure, and mitral stenosis severity.

Table 1: Baseline patients' demographics characteristics.

Variables		n	%
Age	15- 30	118	60%
	31 - 40	78	40%
Gender	Male	63	32%
	Female	133	68%
Duration of symptoms	≤ 6 Months	69	35%
	> 6 Months	127	65%
Employment status	Employee	82	42%
	Un employee	114	58%
Socioeconomic status	(monthly income <25,000 Rs)	94	48%
	(monthly income 25,000-50,000 Rs)	73	37%
	(monthly income >50,000 Rs)	29	15%

Table 2: Efficacy of PMTC

EFFICACY	**FREQUENCY**	**PERCENTAGE**
Effective	167	85%
Not effective	29	15%

Table 3: Stratification of efficacy WRT age, gender and duration of symptoms

Age		15-30 years	31-40 years	P value
	Effective	100	67	0.824
	Non effective	18	11	
Gender		**Male**	**Female**	
	Effective	53	114	0.7700
	Non effective	10	19	
Duration of symptoms		**≤ 6 Months**	**> 6 Months**	
	Effective	58	109	
	Non effective	16	13	0.0360

DISCUSSION

Rheumatic heart disease patients who develop pure MS account for 45% of all individuals with this condition.1 This nation still has a high prevalence of mitral stenosis due to the prevalence of rheumatic fever.1 The latency period after a rheumatic fever event is 10–20 years or more before symptoms appear.2 Mitral stenosis is usually complicated by PH. In order to be diagnosed with PAH, one must have a left ventricular end-diastolic pressure of less than 15 mmHg and a mean pulmonary-capillary wedge pressure of more than 25 mmHg at rest or more than 30 mmHg with activity.3 50% of individuals with mitral stenosis have mild pulmonary hypertension at the point

when treatment is necessary, whereas 25% have acute PAH.4 The long-term prognosis and symptoms are substantially influenced by pulmonary hypertension.2

The mean age in this research was 30 years, with an SD of 2.16. Patients made up 68% of the population were female and 32% were male. The mean pulmonary artery pressure at baseline was 47.4111±02, and at end-point it was 33.247±83. Furthermore, PTMC was successful in 85% of patients and unsuccessful in 15%. Similar results were seen in a study by Noor A et al.13where 85% of the anticipated population experienced a 48% decrease in mean left atrial pressure (pre-ptmc 33.257±09; post-ptmc 17.886±38; p0.01) and a 29% decrease in right ventricular systolic pressure (pre-ptmc 68.7518±67; post-ptmc 48.8212±9614

A sixty-year-old man with severe rheumatic MS was reported to have dyspnea that was New York Heart Association (NHYA) class III to IV in another research by Sial JA et al15. Coronary angiography of the left anterior coronary artery indicated significant occlusive coronary artery disease. (LAD). In the same session, a LAD percutaneous coronary intervention (PCI) and PTMC were performed. Both surgeries were completed successfully and without incident. Patient had cardiac tamponade after 30 minutes of transitioning to the coronary care unit (CCU), which was effectively treated. Following the patient for three months, it was determined that he was doing well. A recent echocardiography revealed modest mitral stenosis with normal left ventricular function. Furthermore, in individuals with severe rheumatic mitral stenosis, PTMC was 85% efficient in lowering pulmonary artery pressure.

Nawaz et al.14 stated that the mean age was 30 years with a standard deviation of 7.1112. Patients made up 60% of the population who were female and 40% who were male. In patients with severe rheumatic mitral stenosis, PTMC was 82% successful in lowering pulmonary artery pressure.

CONCLUSION

Our study concludes that PTMC was 85% effective in reduction of pulmonary artery hypertension in patients of severe rheumatic mitral stenosis.

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