



ORIGINAL ARTICLE

Reduction in pulmonary artery pressures on right heart cath after percutaneous transmitral commissurotomy.

Naeem Hameed¹, Shahid Abbas²

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ABSTRACT... Objectives: To find out the reduction in pulmonary artery pressures on right heart Cath after percutaneous trans mitral commissurotomy. **Study Design:** Cross-sectional Observational study. **Setting:** Catheterization Lab Faisalabad Institute of Cardiology, Faisalabad. **Period:** April 2022 till October 2022. **Material & Methods:** After approval from hospital ethical committee 67 patients of severe mitral stenosis having pliable valve suitable for PTMC on TTE followed by TEE to exclude its contraindications and then finalized for PTMC procedure were enrolled in study after informed consent. PTMC was performed through femoral route using INNOUE balloon. Pre PTMC and post PTMC Right ventricle pressures were measured on table in cath lab. **Results:** Mean age was 33.8 ± 8.4 with 28.4% (n=19) were male, 71.6% (n=48) were females. 79 % patients had NYHA III symptoms of dyspnea. Mean LA diameter was 50.4mm and mean MVA was 1.02 cm². 65.7% patients had A.fib before PTMC. Others were in sinus rhythm. Majority of patients had severe pulmonary hypertension before PTMC which had significant reduction (mean 23mmHg) in catheterization lab 10 minutes after PTMC procedure. **Conclusion:** PTMC is quite effective procedure with significant reduction of not only LA pressure but also of right ventricle indicating its effectiveness from the day of procedure.

Key words: INNOUE Balloon, Percutaneous Mitral Commissurotomy, Transthoracic Echo, Transesophageal Echo.

INTRODUCTION

Valvular heart disease has been the disease of low and middle socioeconomic countries. The prevalence of rheumatic heart disease in school-age children is estimated at between 1 and 6 per 1,000 in Asia and between 3 and 14 % in Africa.^{1,2} Developed countries do develop VHD but etiology is different from that of underdeveloped countries. The reason behind this difference is Rheumatic heart disease which is disease of low socioeconomic class. This is because recurrent streptococcal bacterial infection of throat called pharyngitis leads to production of antibodies which cross react with heart valves in potentially vulnerable individuals. This results in Rheumatic heart disease. A study found that in 2015 there were 33.4 million cases of RHD worldwide and 0.39 million deaths due to RHD.³

The most common valve affected is Mitral valve

followed by aortic, tricuspid and pulmonary valve. Mitral valve disease either stenosis or regurgitation results in increase in pulmonary pressure leading to dyspnea. Any symptomatic individual with severe MS should be intervened as per AHA guidelines. For patients with rheumatic etiology, we have option of percutaneous intervention or Surgery of valve. If stenosis is severe and valve is pliable then percutaneous intervention is preferred.⁴ Purpose of intervention is to increase mitral valve area so that the pulmonary pressures can be reduced to improve symptoms of congestion.

Inoue balloon is the most common technique used to open mitral valve through percutaneous route. This is done using transseptal puncture and passing from right atrium to left atrium. Puncture needle is used for this purpose. Recently radiofrequency puncture needles are introduced.

1. FCPS (Cardiology), Resident FCPS Interventional Cardiology, Faisalabad Institute of Cardiology, Faisalabad.
2. FCPS (Cardiology), Professor of Cardiology, Faisalabad Institute of Cardiology, Faisalabad.

Correspondence Address:

Dr. Naeem Hameed
Department of Cardiology
Faisalabad Institute of Cardiology, Faisalabad.
dr_naeem80@hotmail.com

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But studies show similar results with both.⁵ Increase in valve area above 1.5 cm² is considered as successful procedure with reduction in LA pressure <18mmHg. We measure LA pressure immediately pre procedure and immediately after inflation of Inoue balloon. Reduction of LA pressure is marker of successful procedure. As reduction in LA pressure leads to reduction in pulmonary capillary pressure thus there is reduction of Pulmonary artery pressure.⁶ Average reduction in pulmonary artery pressure has not been assessed in many studies conducted for mitral valve commissurotomy. Reduction of PAP can be used to assess the resolution of symptoms after the procedure. It also predicts long-term outcome of disease in terms of symptoms.⁷ Failure in reduction of PA pressure after PTMC has poor long-term prognosis.⁸

It was found in a previous study that there are certain predictors which affects the reduction in PA pressure after PTMC thus can be a predictor of resolution of symptoms. These include age >30 years, symptoms >5 years, left atrial diameter, presence of sinus rhythm or atrial fibrillation, RV diameter and NYHA class before procedure.⁹ It was also found that PTMC should be done before pulmonary vascular resistance become irreversible. Otherwise, it will not be effective in its reduction and clinical benefits associated with it.¹⁰

One study conducted to assess reduction in PA pressure 24 hour after PTMC with echocardiography.¹¹ The pulmonary artery systolic pressure fallen from baseline by 37.92 ± 4.19 mmHg after the commissurotomy 24 hours after procedure. This study will help in assessment of long-term resolution of symptoms and affect on mortality by calculating PA pressure on table during the procedure. If there is no significant reduction in PA pressure, then procedure can be continued with another better inflation in the same procedure.

MATERIAL & METHODS

This cross-sectional study was conducted at Faisalabad institute of Cardiology, Faisalabad over a period of six months from April 2022 till

October 2022 involving 67 patients. Patients of severe mitral stenosis having pliable valve suitable for percutaneous mitral commissurotomy (PTMC) on transthoracic echo followed by TEE finalized for PTMC procedure were enrolled in study. Patients of both genders with any age having suitable valves with no history of lungs disease, no history of stroke, no history of MI, no associated cardiomyopathy, No ischemic heart disease, no other valvular lesion were included. Patients who developed MR during procedure were dropped from enrolment later on. Severe Pulmonary hypertension was defined as patients having pulmonary artery systolic pressure more than 60mmHg on right heart Cath in the absence of pulmonary valve stenosis, moderate PH as 45 to 60 mmHg and Mild PH as 30 to 45mmHg.

Approval from hospital ethical committee (Letter No. 12-2022/DME/FIC/FSD) was obtained and informed consent was taken from patients for using their data in research. The demographic information and other data of these patients like age, sex, NYHA symptoms of dyspnoea, Transthoracic echo parameters including LA size, Mitral valve area, Mitral valve gradients, TVPG (Tricuspid Valve Pressure gradient) were calculated before procedure. PTMC was done through femoral route using INNOUE balloon sized according to height of patient using formula height in cm + 10/10. Right ventricle pressures measured with MP catheter before doing mitral valve commissurotomy. Two inflations were given across mitral valve at submaximal and highest mentioned diameter pressure. On table transthoracic echocardiogram was done to assess mitral valve opening and any associated MR. 5 minutes after commissurotomy second inflation, again Right ventricle pressures measured with MP catheter. Patient kept admitted for 24 hours. TTE was done on next day measuring valve area and TVPG. Data was analyzed by using SPSS version 25.0 and all quantifications were for respective variables.

RESULTS

Out of 67 patients, 19(28.4%) were male and 48 (71.6%) were female. The average age of patients was 33.8 ± 8.4 years. Mean Pulmonary artery

systolic pressure (PASP) at base line was 61.4 ± 13.4 mmHg. 79.1% (n=53) patients had NYHA class III symptoms of dyspnea with remaining 20.9% (n=14) had NYHA II symptoms. Majority of patients had 2 to 3 years of dyspnea symptoms with minimum 6 months duration and 1 patient had symptoms from 7 years. LA diameter was another factor which was assumed to be affecting PASP being a compliant chamber with its dilatation depending on time duration of stenotic valve. Mean LA diameter was found to be 50.4 ± 3.35 . Severity of stenosis also affects PASP. Mean MVA was found to be 1.02 ± 0.13 .

Characteristics	Value
Age (years)	33.8 ± 8.4
Gender	
Male	28.4 % (n=19)
Female	71.6 % (n=48)
NYHA class	
Class II	20.9% (n=14)
Class III	79.1% (n=53)
Mean LA diameter (mm)	50.4 ± 3.35
MVA (cm ²)	1.02 ± 0.14
Rhythm before PTMC	
Atrial Fibrillation	65.7% (n=44)
Sinus rhythm	34.3% (n=23)
PASP (mmHg)	61.43 ± 13.3

Table-I. Baseline characteristics and pre-PTMC

Post PTMC parameters were measured on table and 24 hours after PTMC using Transthoracic echocardiogram. On table RV pressure measurements showed 37% mean reduction of pressures which was 23mmHg on average with majority of patients having around 20mmHg reduction. One patient had > 40mmHg reduction in PAP and only 2 patients had < 10mmHg reduction. MVA was significantly improved in majority of patients with mean 1.96cm^2 total area from 1.02 pre PTMC. There was also reduction of TVPG and gradients across mitral valve. Table 2 shows details of all these parameters.

Parameter	Value
PASP (mmHg)	38 ± 8.03
MVPG (mmHg)	6.67 ± 2.1
TVPG (mmHg)	38.1 ± 7.4
MVA (cm ²)	1.96 ± 0.24
Reduction in PASP	37% (23mmHg)

Table-II. Post Percutaneous Trans Mitral Commissurotomy (PTMC) Parameters

DISCUSSION

PTMC seemingly effective procedure if done without facing complications and good end results. It has good immediate and mid term results based on different studies.¹² Successful PTMC based on criteria of increase in mitral valve area of $>1.5\text{cm}^2$ and decrease in LA pressure $< 18\text{mmHg}$ without more than mild MR. It is mandatory to assess suitability and rule out contraindications before procedure. This procedure is ideally done with collaboration of interventional cardiologist and imaging expert.¹³

Preprocedural Transthoracic and Transesophageal Echo is done to assess preprocedural details.¹⁴ Clinically aim of any treatment is more subjective than objective. There are chances of failure of procedure also with rates ranging from 1 to 17%.¹⁵ In case of mitral stenosis, chronic increase in LA pressure associated with increase in PCWP and PAP. Chronic increase in PCWP and pulmonary capillaries pressure may lead to irreversible changes at microvascular level and perivascular areas. It may be suspected that even after PTMC, one may have high pulmonary pressure even after achieving targets of MVA and LA pressures thus persistence of symptoms of dyspnea.

Studies are done on measurement of TVPG and pulmonary pressures 24 hour or 48 hours after PTMC using echocardiography but invasive monitoring studies are not done. Based on TTE one study conducted by Nouman ali et al. showed $> 37\text{mmHg}$ reduction of pulmonary pressures measured 24 hours after PTMC.¹⁰ One more study conducted by M saad et al. Showed $> 20\%$ reduction of pulmonary pressures 48 hours after PTMC measured by TTE.⁸ Our study was based on immediate measurement of PASP in cath lab after PTMC procedure. This is an indirect way of assessment of effects chronicity of disease on reversibility of pulmonary pressures or such immediate reduction occurs or not and whether this immediate reduction has long term effects in certain patients. This study was conducted on 67 patients over a period of 6 months. Majority of patients were of younger age but duration of symptoms was longer. This might be due to aggressive pattern of disease and less awareness

in this patient group as RHD is mainly disease of socioeconomic status. Such patients have social as well as economic barriers in getting early healthcare facility. Majority of such patients were female. Youngest patient was found to be of 12 years and maximum age patient in our study was 65 years old female. It shows that this disease has diverse age group which it can affect as its pathophysiology has many factors. We found a reduction in PAP of 23mmHg which was almost 37% on average. This significant reduction was in consistent and little better than with study conducted by Hannoush et al.¹⁶ Mean MVA was 1.02. This was a little larger than MVA after PTMC conducted by Fawzy et al.¹⁷

Majority of patients in our study were in atrial fibrillation (65.7%). Mean MVA was quite low most probably due to aggressive nature of disease in our area. Pulmonary pressures were quite high corresponding with the symptoms of the patient. Majority of patients were taking diuretics and heart rate control medications to control symptoms but still pulmonary pressures were on higher side. Innuoe balloon inflations were considered based on improvement in valve area either single inflation or two inflations based on table echocardiography and even three inflations in about 10% of cases. Echo was done to look for

splitting of commissures and valve regurgitation severity if any develops. This might be another factor in significant improvement in pulmonary artery pressure as based on echo results, additional inflations were given to achieve optimal results. This reduction in PAP was better than a study conducted by Ghani et al.¹⁸ We also found that PAP reduction was more pronounced in patients with sinus rhythm and those with relatively small LA size and less duration of symptoms. Miura S reported association of less reduction of PAP in patients with a. Fib.¹⁹ Age was not found to be any additive factor. This was consistent with the results of KIM et al.²⁰

CONCLUSION

PTMC is quite effective procedure with significant reduction of not only LA pressure but also of right ventricle indicating its effectiveness in reducing

dyspnoea from the day of procedure.


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AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Naeem Hameed	Data collection and manuscript writing.	
2	Shahid Abbas	Proof reading.	