Original Article

IMMEDIATE AND MIDTERM EFFECTS OF SUCCESSFUL PERCUTANEOUS TRANSVENOUS MITRAL COMMISSUROTOMY ON PULMONARY HYPERTENSION

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ABSTRACT

OBJECTIVE: This study was conducted to assess the immediate and mid-term effects of percutaneous transvenous mitral commissurotomy (PTMC) on pulmonary artery pressure and mitral valve area in patients with mitral stenosis and severe pulmonary-hypertension.

METHODS: This Quasi- experimental study was conducted in Cardiology Department, Punjab Institute of Cardiology Lahore from March 2007 to March 2008. It included 60 consecutive patients of tight mitral stenosis with severe pulmonary hypertension diagnosed by echocardiography. PTMC was done by standard Inoue balloon technique. The left atrial pressure and pulmonary artery systolic pressure were also recorded during the procedure. The decrease in pulmonary artery systolic pressure and increase in mitral valve area were recorded immediately and at 3 months after the procedure. The data was analyzed by using software SPSS. The difference between pulmonary artery pressures and mitral valve areas immediately and at midterm follow up were compared by applying paired sample t- test and p value < 0.05 was considered significant.

RESULTS: The study included 60 patients out of which 68% were female patients and the mean age was 26 ± 8.6 years. Shortness of breath (NYHA class III in 86.7% patients) was main presenting complaint. Fifty two (86.6%) patients were in normal sinus rhythm and 8 (13.3%) patients had atrial fibrillation and Wilkins score was between 5 and 8. Immediately after PTMC, pulmonary artery systolic pressure decreased from 88 ± 13.7 to 60 ± 12.4 mm Hg on echo ($p=<0.001$) and 86 ± 13.5 to 58 ± 12.3 mm Hg on cardiac catheterization ($p<0.001$), mean left atrial pressure decreased from 30 ± 6.7 to 13 ± 7.9 mm Hg ($p=0.099$) and mitral valve area increased from 0.7 ± 0.1 cm^2 to 1.4 ± 0.2 cm^2 ($p<.001$). On midterm follow up mean pulmonary artery systolic pressure was 55 ± 12.4 mm Hg as compared to 60 ± 12.4 mm Hg imndiately after PTMC ($p=<0.001$). Mean mitral valve area at midterm was 1.6 ± 0.2 cm^2 as compared to 1.4 ± 0.2 cm^2 immediately after PTMC-($p<0.001$).

CONCLUSION: It is concluded from this study that PTMC results in increase in mitral valve area leading to decrease in left atrial and pulmonary artery pressure immediately and at mid-term follow up periods.

KEY WORDS: Mitral stenosis, pulmonary hypertension, PTMC.

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Author's Contribution

MAI: Conducted PTMC study and presented at Punjab Institute of Cardiology, Lahore, wrote the article. MAR: Helped in PTMC study , reviewed the article and re analyzed data and corrected article. NAS: Table and figures. AH,AN, and SH: were consultant in-charge of the study and gave frequent advice, corrections and did the proof reading.

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INTRODUCTION:

Mitral stenosis is one of the commonest long term complications of rheumatic fever[1]. Incidence and severity of rheumatic mitral stenosis have declined in developed countries, the disease is still highly prevalent in many poorer and most densely populated areas of the globe[2]. Patients with mitral stenosis who are asymptomatic or minimally symptomatic frequently remain so for years and balloon mitral valvotomy or surgical valvotomy is carried out in symptomatic patients with moderate to severe stenosis, MVA < 1.0 cm^2 or patients with mild stenosis who are symptomatic during ordinary activity and who develop pulmonary artery systolic pressure exceeding 60 mm of Hg or mean pulmonary capillary wedge pressures exceeding 25 mm of Hg during exercise[3]. Pul-

monary hypertension in mitral stenosis caused by elevated left atrial pressure is due to two components, reactive pulmonary arterial vasoconstriction and morphologic changes in the pulmonary vasculature. Balloon valvuloplasty results in decrease of pulmonary pressure corresponding to the acute decrease in left atrial pressure with continued decrease in pulmonary pressure noted up to 21 months[4]. Percutaneous transvenous commissurotomy (PTMC) is a treatment of choice for symptoms of mitral stenosis, especially in young patients with rheumatic fusion of mitral cornmissures of still pliable valve leaflets as assessed initially and followed with echocardiography aiming for mitral valve area (MVA) increased 80 to 100% and decrease in pulmonary artery pressure after PTMC[5].

It is cost effective in developing countries with limited health budget[6]. It provides good short and long term results in a wide range of patients and it has virtually replaced surgical commissurotomy in the management of mitral stenosis[7].

In this study, we wanted to observe the efficacy of successful PTMC by measuring increase in mitral valve area and fall in pulmonary artery pressure (immediate and mid term) in patients with mitral stenosis.

MATERIAL AND METHODS:

This study was conducted at Cardiology Department, Punjab Institute of Cardiology Lahore from March 2007 to March 2008. It was a quasi –experimental study with non probability purposive sampling. Data from 60 consecutive patients of mitral stenosis undergoing PTMC was collected after informed consent. All patients of tight mitral stenosis with severe pulmonary hypertension of all age groups and both sexes undergoing PTMC were included . Patients with clot in left atrium, Mitral regurgitation > grade 2 , Wilkins score> 8 , associated aortic stenosis or regurgitation, unsuccessful or partially successful PTMC and Post PTMC complications like acute mitral regurgitation, pericardial tamponade and atrial septal defect were excluded from the study. The tight mitral stenosis and severe pulmonary hypertension was diagnosed by experienced cardiologist on GE Vivid 7 echocardiography machine and pulmonary artery systolic pressure and mitral valve area was also noted. PTMC was done by standard Inoue balloon technique. Left atria! pressure and pulmonary artery systolic pressure were measured before and after PTMC. The decrease in pulmonary artery pressure and increase in mitral valve area was noted within 24-48 hours (immediate) of PTMC and on 2-3 months follow up (midterm) with the help of echocardiography.

DATE ANALYSIS: The data was analyzed by using software SPSS version 11.0 for windows. Numerical variables were presented as mean and standard deviation while qualitative variables were presented as frequency and percentage. The difference between pulmonary artery pressures and mitral valve areas immediately and at midterm follow up were compared by applying paired sample t-test and p value < 0.05 was considered significant.

RESULTS:

This study included 60 patients of both genders and all ages. There were 41(68%) female and 19 (32%) were male patients. The mean age of the

Table 1 : Clinical Features Of The Patient

Mean age (years)		26+8.6
Sex	**Male/Female**	19(32 %) / 41 (68 %)
SOB	**FC-I**	1 (1.7 %)
	FC-II	5 (8.3 %)
	FC-III	52 (86.7 %)
	FC-IV	2(3.3 %)
Palpitation		59(98.3 %)
Raised JVP		6 (10%)
TIA		1(1.7%)
Thromboembolism		1(1.7%)
Syncope		0
NSR		52 (86.7 %)
Atrial Fibrillation		8 (13.3 %)

SOB;Shortness of Breath, TIA; Transient Ischemic

Table 2: Wilkins Score

Wilkins Score	5	5(8.3 %)
	6	23 (38.3 %)
	7	28 (46.7 %)
	8	4 (6.7 %)

Table 3: Comparison of hemodynamic data before and immdiately aftet PTMC

Data	Before PTMC	Post PTMC	P Value
PASP(echo)	88±13.7	60±12.4 (midterm 55±11.3)	<0.001
PASP(Cath)	86±13.5	58±12.3	<0.001
LAP(Cath)	30±6.7	13±7.97	<0.001
MVA	0.7±0.17	1.4±0.27 (midterm 1.6±0.2)	<0.001

PTMC; Percutanous Transmitral Commissurotomy,PASP;Pulmonary Artry Systolic Pressure, LAP;Left Atrial Pressure, MVA;Mitral Valve Area

study population was 26 ± 8.6 years. The main presenting complaint was shortness of breath and palpitation. Regarding shortness of breath, 1 (1 .7%) patient was in NYHA functional class 1, 5 (8.3%) patients were in functional class II, 52 (86.7%) were in functional class III and 2 (3.3%) were in functional class IV. Palpitation was present in 59 (98.3%) of patients. History of TIA and thromboembolism was present in 1 (1.7%) patient while no patient had history of syncope. Normal sinus rhythm was present in 52 (86.6%) patients and 8 (13.3%) patients had atrial fibrillation. Jugular venous pressure was raised in 6 (10%) patients (Table 1).

All patients in the study were having Wilkins score between 5 and 8. Wilkins score 5 was present in 5 (8.3%) patients, 23 (38.3%) patients were having a score of 6, 28 (46.7%) patients were having score of 7 and 4 (6.7%) patients were having a score of 8 (Table 2).

Mean pre PTMC pulmonary artery systolic pressure on echocardiography was 88 ± 13.7 mm Hg and immediately after PTMC it was 60 ± 12.4 mm Hg (p<0.001). Mean pre PTMC pulmonary artery systolic pressure on cardiac catheterization was 86 ± 13.5 mm Hg and immediately after PTMC, it was 58 ± 12.3mm Hg (p<0.001). Mean left atrial pressure on cardiac catheterization before PTMC was 30 ± 6.7 mm Hg and it was 13 ± 7.9 mm Hg immediately after PTMC (p=O.099). Mean mftral valve area before PTMC was 0.7 ± 0.1 cm^2 and immediately after PTMC, it was 1.4 ± 0.2 cm^2 (p<0.001) (Table 3). On mid-term follow up, mean pulmonary artery systolic pressure on echocardiography was 55 ± 12.4 mm Hg as compared to 60 ± 12.4 mm Hg immediately after PTMC (p<0.001). Mean mitral valve area was 1.6 ± 0.2 cm^2 and compared to 1.4 ± 0.2 cm^2 immediately after PTMC (p<0.001).

DISCUSSION:

Percutaneous transvenous mitral commissurotomy (PTMC) has recently been developed as an alternative to surgical commissurotomy for patients with rheumatic mitral stenosis. Since its introduction in the eighties by Inoue, percutaneous balloon valvotomy has been established as treatment of choice for symptomatic mitral stenosis. Especially young patients with rheumatic fusion of the mitral commissures and no calcification of the still pliable valve leaflets are candidates for this procedure. In these patients balloon valvotomy is expected to give results comparable or even superior to operative commissurotomy[5].

In this study, immediate and mid-term effects of PTMC were evaluated in 60 patients. The mean age of the study population was 26 ± 8.6 years. The female patients were 41(68%) while 19 (32%) patients were male. A mean age of 53 years and female to male ratio of 24 (72.7%) to 9 (27.3%) were described by Hoffman et al. The difference in mean age may be due to the etiological factor as degenerative mitral valve disease is more common in western world and in our society rheumatic heart disease is the most common cause of mitral stenosis which occur at younger age.

The main presenting symptoms were shortness of breath in NYHA functional class-III

which was seen in 52 (86.7%) patients and palpitation in 59 (98.3%) of patients. Similar findings were also described in a study by Alfonso et al[4]. Fifty (86.7%) patients were in sinus rhythm while 8 (13.3%) patients were having atrial fibnllation. Similar incidence of atrial fibrillation of 14.5% was reported in the study by Arora et al[8].In this study majority of patients had Wilkins score of 6 (38.3%) and 7 (46.7%) and mean score was 6.5. Patients with mean Wilkins score of 7.7+ 1.3 were included in study by Mattos et al[9] and patients with a mean score of 8.41 + 1.31 were studied by Astudillo et al[10] .In this study mean score was low because patients were included with Wiikins score

of 8 or less.

A significant decrease in mean pulmonary artery systolic pressure was seen immediately after PTMC. Before PTMC, the mean pulmonary artery systolic pressure on echocardiography was 88.± 13.7 mm Hg and it was 60 ± 12.4 mm Hg immediately Post-PTMC (p<0.00l) while on cardiac catheterization, Pre-PTMC mean pulmonary artery systolic pressure was 86 ± 13.5 mm Hg and immediately Post-PTMC it was 58 ± 12.3 mm Hg (p<0.001). Alfonso et al described fall in pulmonary artery systolic from a Pre-PTMC level of 77 ± 15 mm Hg to a Post-PTMC level of 60 ± 17 mm Hg. A significant decrease in pulmonary artery pressure was also recorded by Mattos et al[9].

There was a significant decrease in mean left atrial pressure immediately after PTMC as Pre-PTMC it was 30 ± 6.7 mm Hg and Post-PTMC it was 13 ± 7.9 mm Hg(p<0.001). Arora et a1[8] also showed a decrease in mean left atrial pressure from 32.1 ± 9.8 to13.1 ± 6.2 mm Hg. Rajbhandari et at[11] also showed that left atrial mean pressure decreased from 21 mmHg mean to 7 mmHg. Mean mitral valve area increased from 0.90 ± 0.14 cm^2 to 1.82 ± 0.21 cm^2. Similarly a significant increase in mitral valve area from 0.79 ± 0.2 cm^2 to 1 .82 ± 0.5 cm^2 was also showed by Alfonso et a1[4].

There was also fall in mean pulmonary artery systolic pressure at midterm follow up. Mean pulmonary artery systolic pressure at mid-term was 55 ± 11.3 mm Hg as compared to 60 ± 12.4 mm Hg immediately Post-PTMC (p<0.001). Alfonso et al[4] also showed a further decrease in mean pulmonary artery systolic pressure at mid-term follow up. In this study, a further increase in mitral valve area was found at midterm follow up. It was 1.6 ± 0.2 cm^2 at mid-term as compared to Post-PTMC area of 1.4 ± 0.2 cm^2 (p<0.001). At present no study is available for mitral valve area at 3 months follow up. There are certain studies which showed a slight decrease in mitral valve at longer follow up periods.

CONCLUSION:

It is concluded from this study that PTMC results in increase in mitral valve area leading to decrease in left atrial and pulmonary artery pressure immediately and at mid-term followup.

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