IMMEDIATE OUTCOMES OF PERCUTANEOUS TRANSLUMINAL MITRAL COMMISSUROTOMY IN PATIENTS OF MITRAL STENOSIS

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ABSTRACT

BACKGROUND: Percutaneous Transluminal Mitral Commissurotomy (PTMC) is the treatment of choice for mitral stenosis. Patients with valvular calcification, thickened fibrotic leaflets and subvalvular fusion have adverse immediate outcomes of PTMC.

OBJECTIVE: To determine the frequency of immediate outcomes of percutaneous transluminal mitral commissurotomy in patients of mitral stenosis.

This is descriptive cross sectional study conducted in the Cardiology Unit Govt. Lady Reading Hospital Peshawar from Jan, 2008- Feb, 2012, five hundreds and seventy seven patients of mitral stenosis.

METHODS: Mitral patients with or without pre existing mild mitral regurgitation admitted in Cardiology Unit, Lady Reading Hospital, Khyber Teaching Hospital and Hayat Abad Medical Complex Peshawar were included in the study. After performing PTMC according to the standard protocol, data regarding failure of the procedure, severe mitral regurgitation, cardiac tamponade, thromboembolism and in-hospital death was recorded.

RESULTS: Out of 577 patients, 220 (38.13%) were males and 357 (61.87%) were females. The mean age of the patients was 31.96 ± 10.01 years. Failure of the procedure of PTMC was found in 38 (7%) patients, severe mitral regurgitation in 27 (5%) patients, cardiac tamponade in 1 (0.17%) patients, thromboembolism in 3 (0.52%) patients and In-hospital death occurred in 5 (0.867%) patients.

CONCLUSION: PTMC is a safe and effective procedure with good immediate outcomes in patients of mitral stenosis with favorable mitral valve morphology.

KEY WORDS: Mitral stenosis, PTMC, BMV, Outcomes of PTMC.

INTRODUCTION

Mitral stenosis is commonly caused by rheumatic heart disease that affects about 15.6 million people worldwide, with approximately 282,000 new cases each year¹. Rheumatic fever is the most important cause of acquired valvular heart disease affecting children between the ages of 5 and 15 years and adults only in 20% cases². The incidence of recurrence with a subsequent infection may reach up to 50%³. The prevalence of rheumatic fever is as high as 21.9/1000 in the developing countries like Pakistan causing isolated mitral stenosis in 28% cases⁴.

Mitral stenosis is a progressive disease with a slow and stable course in the early years

followed by a progressive acceleration later in life. In some geographic areas, progression is rapid presumably owing to either a more severe rheumatic insult or repeated episodes of rheumatic carditis that results in symptoms in the late teens or early 20s⁵. Once significant symptoms develop, survival is 0% to 15% over the period of 10-years if left untreated⁶.

Percutaneous Transluminal Mitral Commissurotomy (PTMC) is the treatment of choice in patients with mitral stenosis having suitable valve morphology⁷. This can be performed in all age groups including during pregnancy⁸. The immediate results of PTMC are similar to those of open mitral commissurotomy. The mean mitral valve area usually doubles from

the baseline by 1.0 to 2.0 cm² with a 50% to 60% reduction in gradient across the mitral valve. Although the success rate of PTMC is seen in 80% to 95% of patients, yet failure of the procedure, mitral regurgitation, cardiac tamponade, thromboembolism and death are the established complications^{9,10}. Development of moderate to severe mitral regurgitation after PTMC may lead to mitral valve replacement within one month of the procedure in 2.8% cases.¹⁰ Operator skill and mitral valve morphology are the important factors in determining immediate post valvotomy outcomes and hemodynamics^{11,12}. The aim of our study was to determine the frequency of immediate outcomes of PTMC in our setup. This will help the physicians to consider ways and means of improving the results of PTMC.

METHODOLOGY

This was a descriptive cross sectional study from January 2008 to February 2012 conducted in the Department of Cardiology, Post graduate Medical Institute Govt. Lady Reading Hospital Peshawar where patients are also brought from Khyber Teaching Hospital and Hayat Abad Medical Complex Peshawar for cardiac intervention. This study included 577 patients using non probability purposive sampling technique. The study was approved by the Hospital Ethical Committee. An informed written consent was obtained.

Inclusion Criteria:

Patients of any age and gender with moderate to severe mitral stenosis with or without pre existing mild (grade +1) mitral regurgitation were included.

Exclusion Criteria:

1. Mitral regurgitation Grade +2, +3 or +4.
2. Severe mitral valve calcification.
3. Left atrial cavity or appendage thrombus.
4. Significant aortic valve or coronary artery disease.

Mitral stenosis was diagnosed on transthoracic echocardiography as mild when the mitral valve area was >1.5 cm², moderate when valve area was 1.0 cm² - 1.5 cm² and severe when valve

area was <1.0 cm². Quantification of mitral regurgitation (MR) was done via colour doppler with the mitral regurgitation jet to left atrial area ratio (Seller's criteria)¹¹ as below;

- MR jet-to-left atrial area ratio of <5 % was graded as 0 (No MR).
- MR jet-to-left atrial area ratio of 5% - 25% was graded as +1 (Mild MR),
- MR jet-to-left atrial area ratio of 26% -50% was graded as +2 (Mild-Moderate MR),
- MR jet-to-left atrial area ratio of 51%-75% was graded as +3 (Moderate-severe MR),
- MR jet-to-left atrial area ratio of 76% -100% was graded as +4 (Severe MR).

Transesophageal echocardiography (TOE) was performed in all patients 1 or 2 days before PTMC to exclude the presence of left atrial cavity thrombus and know the amount of mitral valve calcification. PTMC was done by senior interventionists with Inuoe balloon using height based stepwise technique on Axiom Artis (flat panel) Siemens machine. Post PTMC, transthoracic echocardiography was done within 24 hours to document mitral valve gradient, occurrence of severe MR. Cardiac tamponade, thromboembolism and in hospital death within 24 hours after PTMC were also recorded.

Immediate outcomes of PTMC were defined as failure of the procedure, severe mitral regurgitation, cardiac tamponade, thromboembolism and in-hospital death within 24 hours after PTMC.

Failure of PTMC was defined as failure to decrease transmitral valve pressure gradient by 50% of the baseline, or failure to cross the inter-atrial septum or mitral valve with the balloon.

Severe mitral regurgitation (MR) was defined as post procedure mitral regurgitation of grade $\geq$ +3 or +4 (Seller's criteria).

Cardiac tamponade was defined as post procedure tachycardia (pulse rate >90/min), hypotension (systolic BP <90 mmHg) and diastolic collapse of right atrium & right

ventricle along with pericardial effusion on echocardiography and elevated jugular venous pressure (>3 cm from the sternal angle).

Thromboembolism was defined as sudden new onset clinical or neurological/vascular deficit of an organ and radiological evidence of occurrence of thromboembolism.

In-hospital death was defined as death of the patient due to any cause within 24 hours after PTMC during the same hospital stay.

The statistical analysis was performed using the statistical software for social sciences (SPSS Ver. 10).

RESULTS

A total of 577 patients of moderate to severe mitral stenosis with or without pre existing mild (grade +1) mitral regurgitation were enrolled in the study. There were 220 (38.13%) males and 357 (61.87%) females. Females were 1.62 times more than males. The mean age of the patients was 31.96 ± 10.01 years. The age of the study population ranged between 18 years to 60 years and majority of the patients were between 25-35 years (Fig.1).

Out of these 577 PTMCs, failure of procedure (PTMC) was found in 38 (7%) patients whereas the procedure was successful in 539 (93%) patients. Severe mitral regurgitation occurred in 27 (5%) patients whereas 550 (95%) patients did not have any severe mitral regurgitation. Only 1 (0.17%) patient developed cardiac tamponade whereas 576 (98.83%) patients were found safe from developing cardiac tamponade. Thromboembolic events occurred in 3 (0.52%) patients while 574 (99.48%) patients were free of this complication. In-hospital death occurred in 5 (0.867%) patients whereas 572 (99.13%) patients survived after the procedure (Table 1).

FIGURE NO.1
AGE-WISE DISTRIBUTION OF PATIENTS

TABLE.1 IMMEDIATE OUTCOMES OF PTMC

Failure of PTMC ¹	7% (n=38)
Severe MR ²	5% (n=27)
Cardiac tamponade	0.17% (n=1)
Thromboembolism	0.52% (n=3)
In-hospital death	0.867% (n=5)

1. PTMC: Percutaneous Transluminal Mitral Commissurotomy

2. MR: Mitral Regurgitation

DISCUSSION

PTMC is established as the first line therapy in patients with favorable mitral valve morphology.⁹ However, failure of the procedure, development of severe mitral regurgitation, cardiac tamponade, thromboembolism and death associated with the procedure are still the main issues of concern.¹³

The mean age of our study population was 31.96 years which is similar to the results of study from Saudia by Fawzy et al¹⁴. This relatively younger age distribution was probably due to the

earlier and aggressive presentation of rheumatic heart disease in our set up⁵. Studies by Chmielak et al and Vahanian et al reported older age distribution ranging from 46-65 years (mean 56.7%)^{12,15}. This was probably because rheumatic heart disease presents late in the developed world.⁵

Failure of PTMC procedure is decreasing in frequency with the passage of time as physicians are achieving experience with the use of Inoue balloon. Failure rate is also low if fusion of mitral valve is only at commissures as found in 76% cases of mitral stenosis¹⁶. Frequency of failure of the procedure in our study was 7% which is comparable to the results of Ahmad et al from Lahore whose failure rate was 6.6% (at a Wilkin's echo score <8). However, failure rate in their study was quite high up to 37.5% in patients with a Wilkin's score >8¹⁷. Studies by Sulaiman et al from Oman and Lau et al from Singapore reported 4% failure rate which support the results of our study in terms of failure of the procedure^{18,19}. The lower failure rate in our study was probably due to the proper selection of patients with favorable mitral valve morphology, younger patient population and improved learning curve over time on part of our physicians.

Development of MR is due to stretching of the valve annulus, excess in commissural splitting, abnormal cusp coaptation and presence of the pre existing MR²⁰. After PTMC, Mild MR occurs in 50% of patients and does not affect the hemodynamic improvement²¹. But development of severe mitral regurgitation after PTMC is the most feared complication which occurred in 5% patients of our study. This result is comparable to the studies by Vahanian et al, Park et al and Essop et al who reported 3-5% of post PTMC severe MR^{15,22,23}. Older studies using trans-arterial balloon valvoplasty reported higher rates of development of MR as reported by Sancho et al to be 15%, but newer techniques and tranvenous approach has decreased the frequency of this dreadful complication^{21,22,23}. The frequency of severe MR was reported quite low

in some studies, as 3.4% reported by Lung et al and 0.0% reported by Lau et al^{19,24}. They attributed this good result to the cautionary balloon sizing and dilatation particularly in patients having pre-existing MR. As emergency surgery is rarely required to correct post PTMC severe MR, most of our patients who developed severe mitral regurgitation tolerated the complication very well, however these patients may eventually need surgery²⁵.

The occurrence of cardiac tamponade is another complication which needs quick management. Our patients developed cardiac tamponade in 0.17%, the least of all complications. The results are better in comparison to the international studies where it is reported to be 1-3% and it is related to transseptal puncture or perforation of the left ventricle apex by the guidewire or balloon²⁶. Cardiac perforation is directly related to the patient age and inversely related to the operator's experience²⁷.

Thromboembolism is another complication which is usually due to dislodgement of atrial thrombi or thrombi formed on the catheter or gas embolism after balloon rupture.²⁸ Thromboembolic events rate in our study was 0.52% mostly affecting the brain. The frequency of this complication is same as reported by Chmielak et al to be 0.4%, Ahmad et al to be 1% and 0.5-3% by Drobinski et al. Although post PTMC asymptomatic thromboembolism detected on MR-scan was reported to be up to 40.7% as reported by Rocha et al, but the real frequency of clinically evident thromboembolic events is similar to that of our study^{17,29,30}.

In hospital death after PTMC in our study was 0.867% showing it safe regarding this complication. Lung et al and Fawzy et al reported this frequency to be 0.4% and 0.0% respectively which is almost comparable to our results^{31,32}. One study from Oman by Sulaiman et al reported a little higher death rate, that is, 2.2% but improvement in the skill of performing PTMC has probably decreased this complication¹⁸.

CONCLUSION

Percutaneous transluminal mitral commissurotomy is a safe and effective procedure with good immediate outcomes in patients of mitral stenosis having favorable mitral valve morphology and mild pre-existing mitral regurgitation.

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