

SHORT TERM CLINICAL OUTCOMES AFTER PERCUTANEOUS MITRAL COMMISSUROTOMY FOR MITRAL STENOSIS

Muhammad Abdur Rauf¹, Noman Khan², Nida Mehmood³,
Adnan Memood Gul⁴, Mohammad Hafizullah⁵

^{1,3}Department of Cardiology, Hayatabad Medical Complex, Peshawar - Pakistan

²Department of Cardiology KDA Hospital, Kohat- Pakistan

^{4,5}Department of Cardiology, Lady Reading Hospital, Peshawar - Pakistan

Address for Correspondence:

Muhammad Abdur Rauf,
Department of Cardiology, Hayatabad Medical Complex, Peshawar - Pakistan

Emails: dr.raufkhan@yahoo.com

Date Received: May 02, 2017

Date Revised: June 10, 2017

Date Accepted: June 19, 2017

Contribution

MAR conceived the idea, planned the study and drafted the manuscript. NM collected data. NK did statistical analysis. MAR, AMG, MHU drafted the manuscript and critically reviewed manuscript. All authors contributed significantly to the submitted manuscript.

All authors declare no conflict of interest.

This article may be cited as: Rauf MA, Khan N, Mehmood N, Gul AM, Hafizullah M. Short term clinical outcomes after percutaneous mitral commissurotomy for mitral stenosis. Pak Heart J 2017; 50 (03): 139-44

ABSTRACT

Objective: To determine the frequency of short term clinical outcomes of percutaneous transvenous mitral commissurotomy for mitral stenosis among patients having wilkin score of ≤ 12 .

Methodology: This study was conducted at Lady Reading Hospital, Peshawar from January to October, 2014. It was a cross sectional descriptive study and sampling method was consecutive. Patients having mitral stenosis were included and followed for 3 months after PTMC. Patient were selected from cardiology outpatient department and subjected to echo-cardiography to know the exact Wilkin's score.

Results: Out of total 175 patients 56 (32%) were males. The mean age of the patients was 22.69 ± 7.93 years. Mean BMI of patients was 21.07 ± 3.95 . Mean Wilkin's score was 6.69 ± 1.99 ranging from 3-11. Improvement in mitral valve area, pulmonary artery pressure, mitral valve gradient and left atrial volume were found in 148 (84.6%), 170 (97.1%), 175 (100%) and 170 (97.1%) respectively. While worsening in mitral regurgitation was 47 (26.9%).

Conclusion: PTMC is a safe and effective procedure with good short-term outcomes like improvement in mitral valve area, pulmonary artery pressure, mitral valve gradient and left atrial volume and not worsening mitral regurgitations in patients of mitral stenosis having Wilkin's score ≤ 12 .

Key Words: Mitral stenosis, PTMC, Wilkin's Score.

INTRODUCTION

Rheumatic heart disease occurs in 30 to 45% patients with rheumatic fever. The prevalence is high in the school age children especially in the developing countries like Pakistan (21.9/1000), causing mixed mitral valve disease like mitral stenosis and regurgitation both in 30% cases and isolated mitral stenosis in 28% cases.¹

Like other third world countries in Pakistan rheumatic heart disease remains endemic. The prevalence of RHD in Pakistan was found to be 22/1000 in inner Lahore and 5.7/1000 in rural Pakistan in recent studies.²

Percutaneous transvenous mitral commissurotomy (PTMC) has been used as an alternative to surgical mitral commissurotomy in patients with symptomatic mitral stenosis (MS) since 1984. PTMC produces significant change in mitral valve morphology; success (MVA \geq 1.5 cm² and MR \leq 2/4) is achieved in (82%) patients and improvement in leaflets mobility.³

Although significant mitral regurgitation (MR) after (PTMC) a serious complication of the procedure is expected to be stationary or decrease during follow-up, grade 3-4 mitral regurgitation are observed in (33.3%) patients.⁴ The morphological features of the mitral valve were categorized as described by Wilkin, and the total echocardiographic score was obtained by adding the scores for leaflet mobility, thickness, calcification, and subvalvular lesions, every category got from 0-4 score having maximum 16 score when combined. Unsuccessful PTMC group was characterized by higher Wilkin's score, larger left atrium, smaller pre-PMV MVA, and higher prevalence of atrial fibrillation than the successful PTMC group.⁵

PTMC can be performed successfully in patients having a low (\leq 8) or higher (9-11) echo score, with satisfactory hemodynamic and symptomatic improvements.⁶ Improvement in pulmonary artery systolic pressure from 34 ± 12 to 26 ± 10 having Wilkin's score $<$ 8 and from 40 ± 14 to 33 ± 12 having score $>$ 8 post PTMC.⁷

Thus it seems reasonable to recommend PTMC for patients with Echo-Sc $<$ 8, especially if they have other favorable characteristics (age $<$ 25 years, $<$ 2+ MR, and no previous mitral surgery). The question remains as to which procedure, MVR or PTMC, is more suitable for patients with Echo-Sc $>$ 8. A successful PTMC result is obtained in 54% of these patients, and only 33% of them were free of combined events at follow-up. Because a good immediate outcome was achieved in 61% of patients with Echo-Sc between 9 and 11 and 39% were free of combined events at 5-year follow-up, PTMC might be considered the first choice in these patients if they are free of other risk variables. Conversely, patients with Echo-Sc \geq 12 should be referred for MVR, because only 36% had successful PTMC and 10%

were free of events at followup.⁷

The aim of study was to determine the short term outcomes of percutaneous transvenous mitral commissurotomy (PTMC) in mitral stenosis patients having Wilkin's score of \leq 12. The idea behind doing this study developed in our mind while carefully doing the literature search and we found that most the published data is on wilkin score of less than 9 though at most places there are recommendations that PTMC can be performed even at wilkin score of \leq 12.

METHODOLOGY

It was a cross-sectional study conducted at Cardiology Unit Govt. Lady Reading Hospital Peshawar. Duration of study was nine months and twenty days Mitral stenosis patients with or without preexisting mild mitral regurgitation admitted in Cardiology Unit, Lady Reading Hospital Peshawar were included in the study. Sample size was calculated using 33.3%⁸ proportion of mitral valve regurgitation after PTMC for MS, with 95% confidence level and 6% margin of error under WHO software for sample size determination. Sampling technique was non probability consecutive sampling. Patients of all ages and both genders with isolated Mitral stenosis or with \leq grade II mitral regurgitation, with Wilkin's score \leq 12 and giving an informed consent to the procedure, were included in the study. All patients were subjected to detailed history, followed by complete routine examination and baseline investigations including ECG (Cardiofax) and echocardiography (Siemens' Acuson CV-70) was done. Patients of mitral stenosis were diagnosed on transthoracic echocardiographic assessment using Acuson CV 70 Siemens on Planimetry and colour doppler methods. Mitral stenosis was graded as mild when the mitral valve area was more than 1.5 cm², moderate when mitral valve area was 1.0 cm² to 1.5 cm² and severe when mitral valve area was $<$ 1.0 cm². An assessment was made to know the grade of mitral regurgitation using transthoracic echocardiography machine before PTMC. Quantification of mitral regurgitation (MR) was done via colour doppler with the mitral regurgitation jet to left atrial area ratio (Seller's criteria).¹⁷ The collected data were stored and analyzed in SPSS version 10 for windows. Mean \pm SD were calculated for numerical variables like age, BMI. Frequencies and percentages will be calculated for categorical variables like gender and short term clinical outcomes (improvement in mitral valve area, improvement in pulmonary artery pressure and severe of mitral regurgitation). Pre and post PTMC mitral valve area and pulmonary artery pressure were compared by applying paired sample T test and p value of 0.05 were taken as significant. Three months clinical outcome will be stratified among age, gender and baseline wilkin score to see the effect modifications. Mitral Valve Area measured more than double the original area post PTMC by direct planimetry at the parasternal short-axis view on color Doppler

echocardiography was considered improvement in mitral valve area. Decrease in pulmonary artery systolic pressure > 7mm Hg from baseline after PTMC were taken as improvement, estimated by continuous wave Doppler echocardiography using the modified Bernoulli equation [4x (peak tricuspid regurgitant jet velocity) ²] with 10 mmHg added for the estimated right atrial pressure. Procedure mitral regurgitation of grade ≥ +3 or +4 quantified by color doppler transthoracic echocardiography Acuson CV 70 Siemens using MR jet to left atrial (LA) area ratio via Seller's criteria.

RESULTS

Total of 207 patients of moderate to severe mitral stenosis with isolated Mitral stenosis or with less than grade II mitral regurgitation, with Wilkin's score ≤ 12 were enrolled in the study. Patients who lost to follow up were 32(Figure 1). At

end of the study we followed 175 patients for three months. There were 56 (32%) males and 119 (68%) females. The mean age of the patients was 22.69±7.93 years. The age of the study population ranged between 12 years to 43 years and majority of the patients were between 15-25 years. Mean BMI of patients was 21.07±3.95 kg/m². Mean Wilkin's score was 6.69±1.99 ranging from 3-11 (Table 1).

Patients having no, mild or moderate mitral regurgitation were 78 (44.6%), 78 (44.6%) and 19 (10.9%) respectively. Improvement in mitral valve area, pulmonary artery pressure, mitral valve gradient and left atrial volume were found in 161 (92%), 170 (97.1%), 175(100%) and 170 (97.1%) respectively (Table 2). While worsening in mitral regurgitation was present in 21(12%).

Mitral valve area , pulmonary artery pressure, mitral valve gradient and left atrial volume were studied before and after PTMC and shown in (Table 3).

Figure 1: Patients Enrolled in Study (n=207)

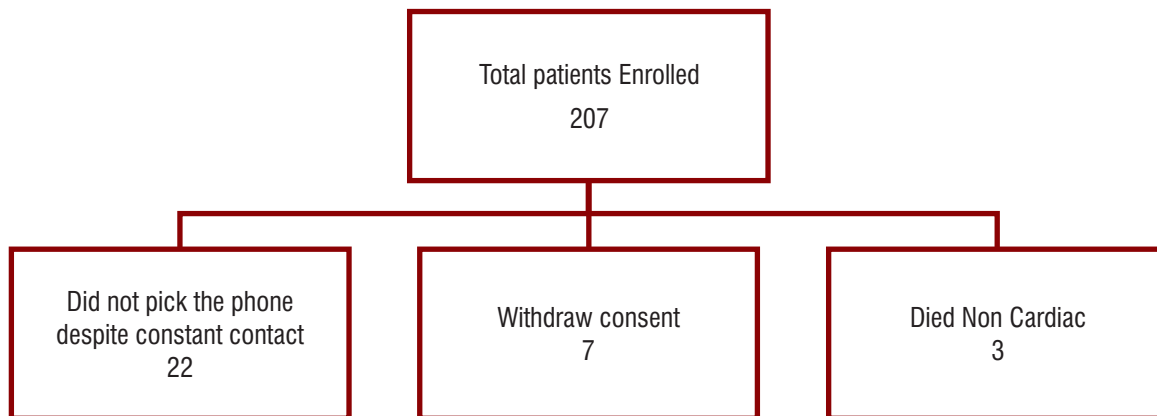


Table 1: Wilkin's score

	WilkinScore	Mobility	Subvalular Thickning	Thickning	Calcification
Mean	6.6914	1.7029	1.5143	1.7200	1.7543
n	175	175	175	175	175
Std. Deviation	1.99617	.63675	.78680	.45029	.75974

Table 2: Short Term Outcomes of PTMC in study population n=207

Outcomes of PTMC	Yes	No
Improvement in Mitral Valve Area	92% (n=161)	8% (n=14)
Improvement in Pulmonary Artery Pressure	97.1% (n=170)	2.9% (n=5)
Improvement in Mitral Valve Gradient	100% (n=175)	(n=0)
Improvement in Left Atrial Volume	97.1% (n=170)	2.9% (n=5)
Worsening of Mitral Regurgitation	12% (n=21)	88% (n=154)

Table 3: Echocardiographic Findings Pre and Post PTMC in study population n=207

Outcomes of PTMC	Pre PTMC (Mean±SD)	Post PTMC (Mean±SD)	p-Value
Mitral Valve Area	0.88±0.08	1.82±0.26	<0.001
Pulmonary Artery Pressure	53.47±11.87	35.48±8.78	<0.001
Mitral Valve Gradient	15.56±1.82	6.67±1.59	<0.001
Left Atrial Volume	64.97±4.50	43.60±5.51	<0.001

DISCUSSION

PTMC has revolutionized the treatment of patients with symptomatic mitral stenosis and is established as the first line therapy in patients with favorable mitral valve morphology. Patients selection is fundamental in predicting the immediate and short term results of PTMC. Immediate, short and intermediate follow-up studies have shown that patients with low echocardiography Wilkin's score have superior results and significantly greater survival.

The mean age of my study population was 22.69 years which is similar to the results of Gul et al, and Ahmad et al.⁸ This relatively younger age distribution was probably due to the earlier and aggressive presentation of rheumatic heart disease in our set up.¹ Other studies reported older age distribution like Chmielak et al⁹ and Vahanian et al.¹⁰ They documented the age range from 46-65 years with mean age of 56.7%. The older age distribution in these studies was because of the late presentation of the rheumatic heart disease in the developed world.¹

The most important short term outcome is improvement in mitral valve area which was reported 92% from mean± SD 0.88±0.08 cm² to 1.82±0.26 cm² with a significant p value. Which suggest that patients with MS post PTMC have quite significant improvement in mitral valve area, finding in accordance with national and international studies Al Khalifa et al, Drighil et al and Gul et al.¹¹⁻¹³ The reason for that was high number and frequent PTMC done in our Centre by highly experienced and professional interventionist.

Failure of PTMC procedure is decreasing in frequency with the passage of time as physicians are achieving experience with the use of Inoue balloon. A lower failure rate of PTMC is also seen with the commissural fusion of mitral valve which is found in as high as 76% cases of mitral stenosis.¹ Frequency of failure of the procedure in my study was 8%. This is comparable to the failure rates reported in the study conducted by Ahmad et al from Lahore whose failure rate was 6.6% in patients with favorable mitral valve morphology (Wilkin's echo score <8), although the failure rate in their study was 37.5% in patients with severe disease of mitral valve (Wilkin's score >8).⁸ The lower failure rate in my study was probably due to the younger age of our patients, proper selection of patients with favorable mitral valve morphology

and improved learning curve over time on part of our physicians.

The effect of successful PTMC on global RV systolic and diastolic functions in patients with rheumatic MS has not been well-defined. It has been reported that pulmonary PA pressure normalizes within six months, but may stay elevated for more than two years in some patients.¹⁴ Improvement in PA pressure is an important predictor of successful PTMC in mitral stenosis patients. In my study the improvement in PA pressure was clearly significant 97%, findings were in accordance with Gul et al, Drighil et al and Ekinic et al.^{12,13,15} Ekinic et al have also studied patients having high echocardiographic score. But our results were quite better than Ahmad et al.⁸ The reason for that is younger age and suitable patients' selection for PTMC.

Another important parameter of successful PTMC is improvement in MVG, reported 100% in my study from mean±SD 15.5±1.82 to 6.67±1.59 post PTMC, which is in accordance with Ekinic et al, Gul et al and Ahmad et al irrespective of the Wilkin's score.^{8,13,15}

The most feared complication of PTMC is the development of severe mitral regurgitation. The frequency of development of severe mitral regurgitation in my study was 9%. This result is quite favorable and comparable to the national studies like Mahmood et al and Ahmed et al.^{8,16} Vahanian et al, Park et al and Essop et al, who reported 7-13% of post PTMC severe MR. Discreet increases in MR magnitude is due to stretching of the valve annulus, excesses in commissural splitting, abnormal cusp coaptation (up to 40% cases) and presence of preexisting MR.^{10,17,18} 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.^{15,16,19} The frequency of severe MR was reported quite low in some studies, as 3.4% reported by Gul et al, lung et al and 0.0% reported by Lau et al.^{13,20,21} 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 eventually need surgery and need strict follow up especially

if it is secondary to noncommissural tearing of the mitral leaflets.^{19,22}

CONCLUSION

Percutaneous transvenous mitral commissurotomy for mitral stenosis among patients having wilkin score of ≤ 12 is considered safe and effective as there is significant improvement in mitral valve area, pulmonary artery pressure and mitral valve gradient and lower frequency of worsening mitral regurgitation.

REFERENCES

- Sadiq M, Islam K, Abid R, Latif F, Rehman AU, Waheed A, et al. Prevalence of rheumatic heart disease in school children of urban Lahore. *Heart* 2009; 95:353-7.
- Aurakzai HA, Hameed S, Shahbaz A, Gohar S, Qureshi M, Khan H, et al. Echocardiographic profile of rheumatic heart disease At a tertiary cardiac centre. *J Ayub Med Coll Abbottabad* 2009; 21 (3):122-6.
- Ghaffari S, Sohrabi B, Aslanabadi N, Sedgi Mogadam AR, Sepehrvand A, Pourafkari L, et al. Percutaneous transvenous mitral commissurotomy: with or without heparin? A randomised double blind study. *Kardiologia Polska* 2011; 69(5): 445–50.
- Korkmaz S, Aksu T, Sasmaz H, Colak A, YilmazMB, Guray Y, et al. Perkütan mitral balon valvüloplastinin k sa dönem sonuçlar : Acute results of percutaneous mitral balloon valvuloplasty. *Türk Kardiyol Dern Arş - Arch Turk Soc Cardiol* 2011; 39(2):137-42.
- Song JK, Song JM, Kang DH, Yun SC, Park DW, Lee SW, et al. Restenosis and adverse clinical events after successful percutaneous mitral valvuloplasty: immediate post-procedural mitral valve area as an important prognosticator. *European Heart Journal* 2009; 30: 1254–62.
- Ekinci M, Duygu H, Acet H, Ertaş F, Çak r C, Berilgen R, et al. The efficiency and safety of balloon valvuloplasty in patients with mitral stenosis and a high echo score: mid- and short-term clinical and echocardiographic results. *Kardiyol Dern Arş - Arch Turk Soc Cardiol* 2009; 37(8):531-37.
- Ahmad A, AbidAR, Imran S, MallickNH. Percutaneous transvenous mitral commissurotomy; outcome of in patients of mitral stenosis. *Professional Med J Dec* 2007; 14(4): 602-09.
- Ahmad A, Imran S, Mallick NH. Percutaneous transvenous mitral commissurotomy; outcome of in patients of mitral stenosis. *Professional Med J* 2007;14:602-9.
- Chmielak Z, Kruk M, Demkow M, Kłopotowski M, Konka M, Rużyłko W. Long-term follow-up of patients with percutaneous mitral commissurotomy. *Kardiol Pol* 2008;66:525-30.
- Vahanian A, Baumgartner H, Bax J, Butchart E, Dion R, Filippatos G, et al. Guidelines on the management of valvular heart disease: the task force on the management of valvular heart disease of the European Society of Cardiology. *Eur Heart J* 2007;28:230-68.
- Alkhalifa MS, Elhassan HHM, Suliman FA, Ali IA, Elsadig TE, Gasim MK. Percutaneous Transmitral Balloon Commissurotomy [PTMC] Procedural success and immediate results at Ahmed Gasim Cardiac Center. *Sudan JMS* 2006; 1(02):115-20.
- Drighil A, Bennis A, Mathewson JW, Lancelotti P, Rocha P. Immediate impact of successful percutaneous mitral valve commissurotomy on right ventricular function. *European Journal of Echocardiography*.2008;9: 536–41.
- Gul AM, Hafizullah M, Rehman H, Fahim M, Khan SB. Efficacy and safety of percutaneous transvenous mitral commissurotomy (PTMC) performed through patent foramen ovale (PFO). *Pak Heart J* 2012;45(01):39-42.
- Shulman ST, Tanz RR. Group A streptococcal pharyngitis and immune-mediated complications: from diagnosis to management. *Expert Rev Anti Infect Ther* 2010;8:137-50.
- Ekinci M, Duygu H, Acet H, Ertaş F, Çak r C, Berilgen R, et al. The efficiency and safety of balloon valvuloplasty in patients with mitral stenosis and a high echo score: mid- and short-term clinical and echocardiographic results. *Kardiyol Dern Arş - Arch Turk Soc Cardiol* 2009; 37(8):531-537.
- Hassan M, Hussain C, Gul AM, Jan H, Hafizullah M. Frequency of left atrial and appendage clot in patients with severe mitral stenosis. *J Ayub Med Coll Abbottabad* 2010; 22:40-2.
- Park SJ, Kim JJ, Park SW, Song JK, Doo YC, Lee SJ et al. Immediate and one-year results of percutaneous mitral balloon valvuloplasty using Inoue and double balloon techniques. *Am J Cardiol* 1994;71:938-43.
- Essop MR, Wisenbaugh T, Skoularigis J, Middlemost S, Sareli P. Mitral regurgitation following mitral balloon valvotomy: different mechanism for severe versus mild to moderate lesions. *Circulation* 1991;84:1669-79.
- Sancho M, Medina A, Suarez de Lezo J, Hernandez E, Pan M, Coello I et al. Factors influencing progression of mitral regurgitation after transarterial balloon valvoplasty for mitral stenosis. *Am J Cardiol*

- 1990;66:737-40
20. lung B, Cormier B, Berdah P, Michaud P, Fondard O, Helou S et al. What are the mechanisms of severe mitral regurgitation following percutaneous mitral commissurotomy, and are they related to patient or procedure characteristics? *Circulation* 1997;96(8 Suppl.1):I-203
 21. Lau KW, Gao W, Ding ZP, Hung JS. Immediate and long term results of percutaneous Inoue balloon mitral commissurotomy with use of a simple height-derived balloon sizing method for the stepwise dilatation technique. *Mayo Clin Proc* 1996;71:556-63
 22. Guérios EE, Bueno R, Nercolini D, Tarastchuk J, Andrade P, Pacheco A et al. Mitral stenosis and percutaneous mitral valvuloplasty. *J Invasive Cardiol*. 2005;17:382-6.