IMMEDIATE OUTCOME AND SAFETY OF REDO PTMC

Khurshid Ali, Sajjad Ahmad*, Ariz Samin*, Samra Yasmin*, Zameer Ul Asar, Muhammad Amad Abbasi*, Hajra Bibi***, Filza Tariq*, Javeria Kamran*, Naseer Ahmed Samore***

Peshawar Institute of Medical Science, Peshawar Pakistan, *Punjab Institute of Cardiology, Lahore Pakistan, **Armed Forced Institute of Cardiology/National Institute of Heart Diseases/National University of Medical Science (NUMS) Rawalpindi Pakistan, ***Women Medical and Dental College, Abbottabad Pakistan

ABSTRACT

Objective: To assess and compare the immediate procedural success of percutaneous transvenous mitral commissurotomy and safety in those patients who had undergone a prior percutaneous transvenous mitral commissurotomy.
Study Design: Single-center, retrospective study.
Place and Duration of Study: Angiography department, Punjab Institute of Cardiology, Lahore, from Jan 2019 to Jun 2020.
Methodology: Medical records of all those patients who underwent redo percutaneous transvenous mitral commissurotomy (PTMC) were included. Mitral valve area (MVA), left atrial (LA) pressure, pulmonary artery systolic pressure (PASP), and mitral regurgitation (MR) were compared before and after procedure.
Results: There were 39 patients 22 (56%) males and 17 (44%) females with a mean age 37.15 ± 2.63 enrolled age range between 25-45 years. The difference in left atrial pressure, mitral valve area and pulmonary artery systolic pressure between pre and post redo percutaneous transvenous mitral commissurotomy was statistically significant (p-value=0.001).
Conclusion: Redo percutaneous transvenous mitral commissurotomy is a feasible and safe procedure in significant mitral restenosis. The results are optimal with acceptable morbidity and mortality.

Keywords: Mitral stenosis, Percutaneous transvenous mitral commissurotomy, Rheumatic heart disease, Re-do percutaneous transvenous mitral commissurotomy, Mitral regurgitation.

INTRODUCTION

Rheumatic heart disease (RHD) is a critical health condition which is a cause of cardiovascular death and disability in young adults and children. Currently, an estimate of 33.4 million patients are surviving with RHD, 305,000 deaths due to RHD have been reported in 2015 and >1 million premature deaths occur annually. In Pakistan although sufficient data is not available to determine its exact prevalence nation-wide however research carried out in 2014 showed prevalence of RHD in Pakistan is 22/1000 as compared to local studies done in India (5.4/1000) and Bangladesh[1].

RHD Action, a civil society movement was started in 2015 to increase awareness and support for the early diagnosis and treatment of Rheumatic Heart Disease[2]. Recently, a resolution was adopted by the World Health Assembly to reinvigorate global and national interest in the development of preventative and management strategies for Acute renal failure and Rheumatic Heart Disease (RHD)[3].

Still in developing countries which have low socioeconomic status, mitral stenosis (MS) is observed in adolescents and children, where rheumatic fever is endemic even now[4]. It occurs as juvenile mitral stenosis (JMS) in 25% of the people >20 years of age. The only treatment modality available was surgical close or open commissurotomy until the mid-1980s. In addition to acute and chronic complications of mitral valve surgery in children and adolescents, there exists another drawback of need of reintervention after 10-15 years[5].

Percutaneous mitral balloon valvotomy has widely been selected as a treatment modality for the symptomatic severe mitral stenosis (MS) patients and is also preferred in asymptomatic patients of mitral stenosis with greater and significant hemodynamic changes[6]. The PTMC principle is based on the expansion of fluid-filled balloon, upon expansion equal pressure is exerted on MV which leads to separation along the plane of least resistance that are commissures that would eventually result in increased MVA pressure and decreased LA pressure.

In the early 1980s, percutaneous transvenous mitral commissurotomy was established. It was started as a double-balloon technique and evolved throughout the course of time to now widely used single hourglass-shaped balloon inoue-balloon catheter. The technique provides comparable results with surgical mitral commissurotomy[7]. It is fluoroscopic guided procedure performed via a femoral vein and trans-septal puncture. In the western world, with the reducing number of cases, the procedure is performed now with the aid of general anesthetic which helps in trans-septal access the mitral valve assessment throughout the

Correspondence: Dr Ariz Samin, Cardiology Department Pak International Medical College Peshawar- Pakistan

procedure[8].

Even though the mitral valve area (MVA) is increased by the PTMC procedure, still in some patients, optimal MVA is not obtained through the procedure, which indicates the necessity of clinical evaluation prior to the selection of patient for the specified procedure[9]. Moreover, the procedure is limited also by other PTMC associated complications, such as embolic stroke, cardiac perforation, and mitral regurgitation. Occasionally, the mitral restenosis and mitral regurgitation warrant emergency mitral valve replacement or a redo of PTMC i.e., repeat PTMC for the second time[10].

The Wilkins score is the echocardiographic scoring that is widely utilized to evaluate the suitability of morphology of mitral valve for PTMC[11]. The Wilkins score is used to assess the thinking of mitral leaflet, calcification, mobility, and degree of sub valvular thickening. Various studies based on immediate, short-termed, and long-termed follow up indicate that patients scoring 8 or less present better outcome compared to the patients with score >8[12].

Although mitral valve replacement (MVR) is performed in some patients with mitral restenosis, it is unknown whether repeat PTMC is beneficial for them or not. Only a few studies have assessed the outcomes of redo PTMC that proclaim favorable results in particular patients possessing suitable morphology of the valve[13,15]. The study aims to assess the immediate outcomes of Redo PTMC (second PTMC) in patients symptomatic with recurrent mitral valve stenosis (history with previously undergone PTMC).

METHODOLOGY

The study was conducted in angiography department, Punjab Institute of Cardiology Lahore Pakistan. This retrospective data were collected from hospital records for patients who under went redo PTMC from January 2019 to June 2020.

Medical records of all those patients who underwent redo percutaneous transvenous mitral commissurotomy (PTMC) were included. Mitral valve area (MVA), left atrial (LA) pressure, pulmonary artery systolic pressure (PASP), and mitral regurgitation (MR) were compared before and after procedure.

RESULTS

Table-I demonstrated the baseline and clinical parameters of the two groups. The average age of patients was 37.15 ± 2.63 years. There were 22 (56%) males, and 17 (44%) female patients were enrolled. Both groups were matched well demographic and echocardiographic characteristics (table-I).

Results indicated that the mean LA pressure, MV Area, and PA pressure between pre- and post-redo PTMC was statistically significant as *p*-value=0.001 (table-II).

Table-I: Baseline characteristics of the patients.

Characteristic		Research Group (n=39)
Age (years)		37.15 ± 2.63 (Age range 25-45)
Male		22 (56%)
Female		17 (44%)
Height (cm)		144.5 ± 0.18
Weight (kg)		65.51 ± 0.04
Sinus Rhythm		13 (33.33%)
Atrial Fibrillation		26 (66.67%)
Pre PTMC MR	No	26 (66.67%)
	Mild	13 (33.33%)
Post PTMC MR	No	20 (51.30%)
	Mild	8 (20.50%)
	Moderate	6 (15.40%)
	Severe	5 (12.80%)

Table-II: Comparison of la pressure and mva between first and second PTMC.

LA Pressure	Pre (Mean ± SD)	Post (Mean ± SD)	*p*-value
First PTMC	32.67 ± 6.59	15.64 ± 4.39	<0.001*
Redo PTMC	32.79 ±7.05	18.90 ± 4.59	
MV Area			
First PTMC	0.82 ± 0.20	1.45 ± 0.25	<0.001*
Redo PTMC	0.89 ± 0.17	1.51 ± 0.24	
PASP			
First PTMC	51.34 ± 14.22	32.15 ± 19.99	<0.001*
Redo PTMC	63.07 ± 18.66	41.23 ± 11.16	

**Significant*

Table-III: Comparison of commissure between first and second PTMC.

	Commissure					
PTMC	**n**	**Both Splitted**	**Splitted/ Stretched**	**Both Stretched**	**MVR**	***p*-value**
First PTMC	39 (%)	29 (74.4%)	5 (12.8%)	5 (12.8%)	-	0.379
Redo PTMC	39 (%)	24 (61.5%)	9 (23.1%)	5 (12.8%)	1 (2.6%)	

DISCUSSION

PTMC is a nonsurgical commissurotomy in patients with hemodynamically significant mitral stenosis (MS). According to AHA guideline PTMC is class-I

recommendation in symptomatic patients with severe MS. The purpose of this study is the assessment of immediate outcome and safety of redo PTMC, impact on mitral valve area (MVA), hemodynamic and clinical parameters. Our results demonstrate that redo PTMC is safe and effective procedure in those who have previous history of PTMC and with moderate to severe symptomatic rheumatic mitral restenosis. In current study males are predominantl. Immediate results in young patients better than adult due to more feasible anatomy.

The age and sex distribution of our patients was not different from the data from developing countries. The current study is single-center based, retrospective, open label study of 39 patients in study, the mean age 37.15 ± 2.63, male patients were 22 (56%) and 17 (44%) were females enrolled. The mean age of patients of research conducted by Sharma *et al*[8] was 33.57 ± 9.125 years and another similar study done by Iung *et al*, revealed their results, they found mean age of patient was 39 ± 1.1 years but different from Pathan *et al* their participant's age was 58 ± 1.3 years. Majority of patients with prior Percutaneous transvenous mitral commissurotomy were male 22 (56%) which was comparable with result of Pathan *et al*, which show that majority of patients were females as 75%. In this study patients with prior PTMC have Atrial Fibrillation which was 26% compared with 50% in two studies conducted by Iung *et al*, and Pathan *et al*, and varied proportion of AF population, 25% compared with 61% in Pathan *et al*[16], and 11% in Iung *et al*[15].

In this study, the LA pressure showed that there was statistically significant deference observed as *p*-value as <0.001 and illustrated decreased from 32.79 ± 7.05 to 18.90 ± 4.59 mmHg. The current study showed the MVA was significantly increased, in total 80% to 95% patients mightgo through asafeand successful procedure, which is demonstrated as MVA >1.5cm^2, absence of complications like cardiac tamponade, mitral regurgitation or requirement of emergency surgical procedure and in hospital death. The mean right ventricular systolic pressure dropped from 67.07 ± 18.66 to 41.23 ± 11.16 mmHg.

Another study which isconducted by Shrestha *et al*, in patients of all age groups, success rate of the procedure was 84% in their center. In this study successful PTMC was defined as, mean left atrial pressure decrease by <50% as compared to the baseline, MVA increase by >50% as compared to the baseline and final absolute MVA of >1.5cm^2 and in the absence of more than moderate mitral regurgitation.

Sriram *et al*, revealed their study results. They found that PTMC patients that the MVA, pulmonary artery systolic pressures (PASP) and mean transmitral gradient to be statistically significant different (*p*-value <0.05) in pre and post redo PTMC[18].

All patients of either gender having the previous history of PTMC, symptomatic moderate to severe mitral restenosis with mitral valve area <1.5cm^2 who are undergoing redo PTMC with Wilkins score <9 were included in this study.

Patients with mild mitral stenosis (MVA>1.5 cm^2), with grade II mitral regurgitation, presence of left atrial or left atrial appendage thrombus, massive/bi-commissural calcification, more than mild MR were excluded. Also, the patients with Severe concomitant aortic valve disease or organic tricuspid stenosis, severe concomitant atherosclerotic coronary artery disease requiring bypass surgery, and previous history of open/ closed commissurotomy were excluded.

The individuals included in the study were evaluated for major complaints like breathlessness and fatigability and a history of present illness was recorded. Relevant past history, personal history, and treatment history were taken. General examination was done and anthropometric recordings like height, weight, BMI, body surface area were recorded[19]. Vitals of the patient were noted. Cardiovascular examination was followed by other systems examination. Blood samples of the patient were collected, and hemoglobin, blood urea, and serum creatinine analysis were done. ECG of the patient was done. Echocardiographic examination was done to assess MV area (cm^2), morphology, intravalvular disease, Wilkins score, presence or absence mitral regurgitation, and mean gradient (mmHg) and detection of clot in the left atrium or left atrial appendage[20].

All hemodynamic measurements were repeated right after the completion of the procedure. The left atrial and left ventricular pressure is also measures immediately after the procedure by echocardiographic examination. Immediately after redo PTMC, mean gradient, pulmonary artery systolic pressure (PASP) and mitral valve area (MVA) of the patients were recorded.

CONCLUSION

PTMC is feasiblein patients with mitral restenosis. It isa safe procedure and is effective with optimal results and satisfactory success rate with acceptable morbidity and mortality. Redo PTMC can be employed

as palliative treatment modality in patients who are at greater morbidity and mortality risk when treated with MVR because of the present significant co morbid conditions.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

REFERENCES

1. Watkins DA, Johnson CO, Colquhoun SM, Karthikeyan G, Beaton A, Bukhman G, et al. Global, regional, and national burden of rheumatic heart disease, 1990–2015. New Eng J Med 2017; 377(8): 713-722.
2. Watkins DA, Beaton AZ, Carapetis JR, Karthikeyan G, Mayosi BM, Wyber R, et al. Rheumatic heart disease worldwide: JACC scientific expert panel. J Am Coll Cardiol 2018; 72(12): 1397-1416.
3. Engelman D, Wheaton GR, Mataika RL, Kado JH, Colquhoun SM, Remenyi B, et al. Screening-detected rheumatic heart disease can progress to severe disease. Heart Asia. 2016; 8(2): 67-73.
4. Lilyasari O, Prakoso R, Kurniawati Y, Roebiono PS, Rahajoe AU, Sakidjan I, et al. Clinical Profile and Management of Rheumatic Heart Disease in Children and Young Adults at Tertiary Cardiac Center in Indonesia. Front Surg 2020; 7(1): 47-55.
5. Shrestha M, Adhikari CM, Shakya U, Khanal A, Shrestha S, Rajbhandar R. Percutaneous transluminal mitral commissurotomy in nepalese children with rheumatic mitral stenosis. Nepal Heart J 2013; 10(1): 23-26.
6. Yonga GO. Percutaneous transvenous mitral com-missurotomy in juvenile mitral stenosis. East African Med J 2003; 80(4): 172-74.
7. Arora R, Kalra GS, Singh S, Mukhopadhyay S, Kumar A, Mohan JC, et al. Percutaneous transvenous mitral commissurotomy: immediate and long term follow up results. Catheter Cardio Vascul Interv 2002; 55(4): 450-456.
8. Sharma KH, Jain S, Shukla A, Bohora S, Roy B, Gandhi GD, et al. Patient profile and results of percutaneous transvenous mitral commissurotomy in mitral restenosis following prior percutaneous transvenous mitral commissurotomyvs surgical Ncommissurotomy. Ind Heart J 2014; 66(2): 164-168.
9. Drighil A, Ghellab D, Mathewson JW, Ouarga L, Alalou H, Azzouzi L. Immediate impact of successful percutaneous mitral valve commissurotomy on echocardiographic measures of right ventricular contractility. J Am Soci Echocard 2012; 25(11): 1245-1250.
10. Rahman F, Akhter N, Anam K, Rashid MA, Uddin MJ, Ahmed CM, et al. Balloon mitral valvuloplasty: immediate and short term haemodynamic and clinical outcome. Mymensingh Med J 2010; 19(2): 199-207.
11. Wilkins G, Weyman AE, Abascal V, Block P, Palacios I. Percutaneous balloon dilatation of the mitral valve: an analysis of echocardiographic variables related to outcome and the mechanism of dilatation. Br Heart J 1988; 60(4): 299-308.
12. Babu DS, Ranganayakulu KP, Rajasekhar D, Vanajakshamma V, Kumar TP. Assessment of mitral valve commissural morphology by transoesophageal echocardiography predicts outcome after balloon mitral valvotomy. Ind Heart J 2013; 65(3): 269-75.
13. Rifaie O, Ismail M, Helmy M, El-Bialy M, Nammas W. Redo percutaneous mitral valvuloplasty for mitral restenosis: a comparison with first procedure for de novo mitral stenosis. Kardiol Polska 2011; 69(2): 125-31.
14. Kothari SS, Ramakrishnan S, Juneja R, Yadav R. Percutaneous transvenous mitral commissurotomy in patients with severe mitral stenosis and acute rheumatic fever. Pediat Cardiol 2016; 27(3): 347-50.
15. Iung B, Garbarz E, Michaud P. Immediate and midterm results of percutaneous mitral commissurotomy for restenosis following earlier percutaneous mitral commissurotomy. Eur Heart J 2015; 16(1): 83-89.
16. Pathan AZ, Mahdi NA, Leon MN, Simosa H, Block PC, Harrell L, et al. Is redo percutaneous mitral balloon valvuloplasty indicated in patient with post PMV mitral restenosis. J Am Coll Cardiol 1999; 34(1): 49-54.
17. Shrestha N, Bhatta YKD, Maske A, Malla R, Rajbhandari R, Kansakar S, et al. Immediate Outcome of Percutaneous Balloon Mitral Valvotomy in Shahid Gangalal National Heart Centre, Bansbari, Kathmandu, Nepal. Nepal Heart J 2015; 12(1): 11-14.
18. Sriram SN, Venkata BJ, Sadagopan T, Ramamurthy MT. Immediate, intermediate and long term clinical outcomes of percutaneous transvenous mitral commissurotomy. IJC Heart Vascul 2015; 6(1): 66-70.
19. Lal A, Faruqui A, Aziz K. Percutaneous balloon pulmonary valvuloplasty. Pak Heart J 2012; 20(4): 1-5.
20. Zaman KS, Saghir T, Jan D, Masood T, Tasneem H, Faruqui A, et al. Percutaneous metallic mitral commissurotomy at NICVD. Pak Heart J 2012; 34(1): 1-4.