EMERGENCY SURGERY AFTER FAILED PERCUTANEOUS TRANSMITRAL COMMISSUROTOMY (PTMC) AT ARMED FORCES INSTITUTE OF CARDIOLOGY (AFIC)

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ABSTRACT

Background: Percutaneous transmitral commissurotomy (PTMC) is a preferred method of treatment of symptomatic mitral stenosis (MS). Major complications associated with this procedure are mortality, embolic stroke, significant mitral regurgitation (MR), iatrogenic atrial septal defect (ASD).

Objective: The aim of this study was to analyze the outcome of emergency after PTMC.

Design: A cross-sectional study.

Place and Duration of Study: Armed Forces Institute of Cardiology (AFIC) Rawalpindi from January 2005 to June 2009.

Patients and Methods: A cross-sectional study of 12 patients (2.3%) out of 523 who underwent PTMC and developed significant mitral regurgitation (MR) or cardiac tamponade (CT) was examined to analyze the outcome of emergency surgery. Transthoracic echocardiography (TTE) was used to select patients of MS with minimal calcification and transesophageal echocardiography (TEE) was used to rule out left atrial (LA) clot. Inuoe balloon was used in all cases for PTMC.

Results: Out of twelve who presented for surgery after failed PTMC, 9 (75%) had significant MR and 3 (25%) had CT. Majority of patients were female (83.3%) with mean age of 30.9 ± 5.12 years. In patients with MR, anterior mitral leaflet (AML) tear was found in 8 (66.7%) and posterior mitral leaflet tear in 1 (8.3%). LA clot was found in 1 (8.3%) patient who caused cerebral infarction. All patients underwent mitral valve replacement (MVR) with prosthetic valve on cardiopulmonary bypass (CPB). Two patients (16.7%) died; one because of cerebral infarction and one due to low cardiac output syndrome (LCOS).

Conclusion: With increasing experience of PTMC the magnitude of failure cases is decreasing as was seen in our case in which failed percentage was just 2.3%. Moreover, percentage of success of emergency surgery was good i.e. 83.3%. In case of failure a well coordinated effort between cardiologist and surgical team can prevent mortality significantly.

Keywords: Emergency surgery, Failed PTMC, Percutaneous Transmitral Commissurotomy (PTMC).

INTRODUCTION

Percutaneous transmitral commissurotomy (PTMC) is a preferred method of intervention in patients with symptomatic mitral stenosis (MS), and has been widely adopted all over the world. Dr Kanji Inoue first performed PTMC in 1982 using an ingeniously designed catheter[1]. Major complications related to the procedure are procedure related mortality 0–2.7%, embolic stroke 1–1.5%, significant mitral regurgitation 3.3% -10.5%, iatrogenic atrial septal defect – rare[2]. Kaul and colleagues, in a single center experience, have described 3650 cases of PTMC in 2000. The incidence of mitral regurgitation was 8.4% and 3.2% required mitral valve replacement (MVR). Perveen KV in 2005 described 1388 cases of PTMC. Thirty one cases (2.6%) of these required surgical intervention[3]. The objective of this study was to see the outcome of emergency surgery after failed PTMC.

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PATIENTS AND METHODS

This cross-sectional study was carried out at Armed Forces of Institute of Cardiology (AFIC) Rawalpindi from January 2005 to June 2009. Out of total 523 cases who underwent PTMC, 12

patients were selected to examine the results of emergency surgery. All other patients were excluded. Total sample size of 12 was selected by non-probability purposive sampling technique. Data were collected from patients medical records.

Selection of the patients was based on Transthoracic Echocardiographic (TTE) findings of minimally calcified mitral valve with mean valve area of 0.9 centimeter square (cm sq.) and free of subvalvular disease. Transesophageal Echocardiography (TEE) was used to rule out the left atrial clot. Inuoe Balloon (Toray Medical Company Ltd, Tokyo) was used for PTMC in all the cases. Heparin (5000 U) was administered intravenously in all the cases at the time of the procedure. Data was entered in SPSS Version 16.0 for analysis. Descriptive statistics such as frequencies and percentages for quantitative variables while mean and standard deviation (SD) for qualitative variables were calculated.

RESULTS

Out of 12 patients who presented for surgical intervention, 2 (16.7%) were males and 10 (83.3%) were females. Mean age of patients was 30.9 ± 5.12 years. Three patients (25%) had cardiac tamponade and 9 (75%) had acute severe mitral regurgitation (table 1). Out of those with severe MR, 6 had pulmonary edema. Those with cardiac tamponade all patients had hypotension, orthopnea and one was brought to operation room (OR) in cardiac arrest with external cardiac massage. Average intervention time for operation was 5.4 hours after complication in the catheterization laboratory (minimum time was 45 minutes). After relieving tamponade on sternotomy followed by pericardiotomy in 3 (25%) cases, right atrial (RA) perforations were found in 2 (16.6%) cases, left atrial (LA) roof perforation in 1 (8.3%) case. Theses perforations were closed using plegeted 4/0 prolene sutures. Out of 9 severe MR cases 8 (66.7%) patients had Anterior Mitral Leaflet (AML) tear with mid leaf area in 6 and paracommissural in 2 cases. Posterior mitral leaflet (PML) tear was found in the mid leaflet area in 1 (8.3%) case. Left atrial appendage (LAA) clot was found in 1 (8.3%) patient. This clot dislodged during manipulation and caused cerebral infarction in one patient. All cases underwent Mitral valve replacement (MVR) on cardiopulmonary bypass (CPB) with bicaval cannulation and cardioplegic arrest through left atrial approach with prosthetic mitral valve (St Jude's Standard Valve– 5 (41.7%), Carbomedics Orbis – 5 (41.7%) and Carbomedics Standard Valve – 2 (16.7%). Patient with pregnancy went into abortion one hour after shifting to ICU. One patient remained in low cardiac output syndrome and died on postoperative day 5 due to multiorgan failure. One patient with left parietal-occipital infarction could not be weaned from the ventilator and she died on postoperative day 7.

Table-1: Distribution of cases with complications after failed percutaneous transmitral commissurotomy (PTMC) (n =12).

Nature of complication	n (%)
Acute mitral regurgitation (MR)	*9 (75)
Cardiac temponade	**3 (25)

*including 8 cases of anterior mitral leaflet tear and 1 case of posterior mitral leaflet tear
**including 1 case of left atrial clot

Two (16.7%) patients died out of 12 patients who presented for intervention in emergency after failure of PTMC.

DISCUSSION

Development of severe mitral regurgitation (MR) is one of the most feared complications of PTMC. It may result in pulmonary edema and even death. This complication has been observed in 6% to 7.5% of patients who undergo Inoue balloon PTMC[4]. In our study 12 (2.3%) patients developed failed PTMC out of 523 patients which is much lower than reported in the literature. Various mechanisms—such as tearing of leaflets, rupture of papillary muscles[5] rupture of chordae tendineae, excessive splitting of the commissures, and mild leaflet prolapse[6] may account for the development of MR. In our series, only the leaflet

tearing caused acute, severe MR necessitating emergency surgery. The leaflet tearing leads to severe elevation of left atrial pressure, and in the presence of unrelieved MS, the clinical picture of pulmonary edema develops. Acute MR in the presence of moderate to severe pulmonary arterial hypertension leads to hemodynamic compromise[7]. Sudden elevation of right ventricular systolic pressure as a result of MR and hypotension could lead to right ventricular subendocardial is chemia, which may manifest as low cardiac out put in the postoperative period. On the basis of our study of cases of acute MR following PTMC, the following mechanism of leaflet tearing has been proposed. The balloon delivers sudden pressure to the fused leaflets, which split along the area of least resistance; that is, usually along the commissural fusion. Commissural and paracommissural fibrocalcific dystrophy represent sites of greater resistance that hinder commissural splitting, leading to delivery of the balloon pressure to the relatively thin AML and causing it to tear because the posterior mitral leaflet is fibrosed and rolled up most of the time[8]. In our study AML was involved in our 8 (66.7%) cases. Only 1 (8.33%) case had posterior leaflet tear.

Many reports describe management of mitral leaflet rupture with mitral valve replacement. Some groups have had success in mitral valve repair with complex repair techniques[9]. But repair is not possible most of the time in area endemic with rheumatic heart disease. In our study, the valve commissures were often severely fibrotic, with a thickened and fibrotic valve with subvalvular pathology and some paracommissural calcium deposition, making the valve unsuitable for repair.

The interatrial septal puncture is the critical step in performing the PTMC. In the presence of left or right atrial enlargement, the free wall enlarges while the interatrial septum is pushed relatively inferior. Therefore the likelihood of a high septal puncture is enhanced in the presence of an enlarged left or right atrium. In patients with MS, in whom the normal geometry is lost because of biatrial enlargement, septal puncture should be undertaken with extreme caution. Trans esophageal echocardiography (TEE) guided septal puncture can be helpful in this situation[10]. Transseptal puncture has been an important source of pericardial effusion (PE) and cardiac tamponade (CT) in procedures requiring LA access even in a primarily diagnostic catheterization setting. A review of 278 transseptal punctures revealed a 3.2% incidence of pericardial puncture with incipient or clinically significant tamponade[11]. In our study 3 (25%) patients developed hemopericardium with hemodynamic compromise. One patient had LA roof rupture and two patients had RA rupture. These patients were shifted immediately to the operating room for surgery. These patients underwent exploration through a median sternotomy. After the tear was controlled with plegeted 4/0 prolene sutures, MVR was undertaken on cardiopulmonary bypass (CPB). Open mitral valvotomy was not performed because of poor preoperative hemodynamics.

In our study, 10 (83.3%) patients survived after emergency surgery and only two (16.7%) died, which is a very good result.

Limitation Of Study

The major limitation of this study is its retrospective nature, spanning five years and involving a limited number of patients. During this period, factors such as a change in the technique of PTMC and selection of cases may have influenced the incidence of complications. Transesophageal echocardiography (TEE) use was restricted to ruling out left atrial clots. TEE was not used during the procedure due to which a recent clot in the left atrial appendage was missed which dislodged during emergency surgery. Valve morphology was primarily assessed by transthoracic echocardiography (TTE). This significant limitation may explain the discrepancies between operative and echocardiographic findings.

CONCLUSION

With increasing experience of PTMC, the frequency of acute MR or cardiac tamponade is not very high. Due to large number of cases for PTMC surgical back up is not provided routinely to these cases. However, whenever there is a failed PTMC, surgical treatment is provided on emergency basis. A well lubricated team work of cardiologist, anesthetist and cardiac surgeon can translate in minimal morbidity and mortality. Due to lubricated team at Armed Forces Institute of Cardiology, incidence of complications after PTCM was much lower (2.3%) as compared to reported in literature. Moreover, 83.3% patients survived after emergency surgery in failed cases of PTMC, which is a good success.

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