Percutaneous Transmitral Balloon Commissurotomy [PTMC] Procedural success and immediate results at Ahmed Gasim Cardiac Center

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Abstract

Back ground

Balloon valvuloplasty for stenosed mitral and pulmonary valves has been practiced with good results for the last two years in Ahmed Gasim Cardiac Centre, Khartoum Sudan.

Objectives

The aim of this study is to audit percutaneous trans-mitral balloon commissurotomy [PTMC] in our current set up.

Methods

One hundred and eight patients underwent percutaneous transvenous mitral commissurotomy (PTMC) from April- 2004 to December-2005 in Ahmed Gasim cardiac center.

Results

67% percent of the patients were females. Age range was from 13years to 65years and the mean age was 27years. 27% were under 21 years of age and 12% had special problems.

The procedural success was achieved in 94.5% patients, in two patients we failed to dilate a tough septum, in other two the balloon got stuck to the septum and failed to cross the MV, while two patients had successful emergency MVR (due to inadvertent puncture of the RA and cardiac tamponade). There was no mortality related to the procedure, significant mitral regurgitation of > grade 2 didn't occur. No patient developed systemic embolization.

Optimal results were achieved in 91.6% patients and in 92% of the patients with special problems.

Hemodynamic data in the Cath. Lab showed left atrial mean (±SD) pressure dropped from 32 (±3.2) mmHg to 12 (±2.4) mmHg. LA-LV gradient dropped from an average of 25 to 5 mmHg. Echocardiographic assessment showed mean (±SD) mitral valve area increased from 0.86 (±0.19) cm2 to 1.9 (±0.5) cm2 ($p<0.001$) and PA pressure dropped from71 (± 23) to 40 (±12) mmHg ($p<0.01$).

Conclusion

We conclude that PTMC is a safe procedure with good success rate and optimal results even in patients with special problems like redo and previous CVA.

Introduction

Rheumatic fever (RF) is an important clinical entity in developing countries, where rheumatic heart disease (RHD) represents an important cause of cardiac morbidity. Recent reports has documented incidence of RF as high as 206/100.000 and RHD prevalence as high as 18.6/1000 though there are variations in the different geographical areas[1-6].

The mitral valve (MV) is the most frequently affected valve. It is solely affected in 25% and is affected with other valves in 40% of patients[7].

Inoue K and colleagues were the first to perform percutaneous trans-mitral commissurotomy (PTMC) in 1982. Since then PTMC became a standard procedure to help patients with MS favorable for it[8].

PTMC tends to delay the need for MV replacement for about ten years or more and some of these patients may be amenable for redo valvuloplasty[9, 10].

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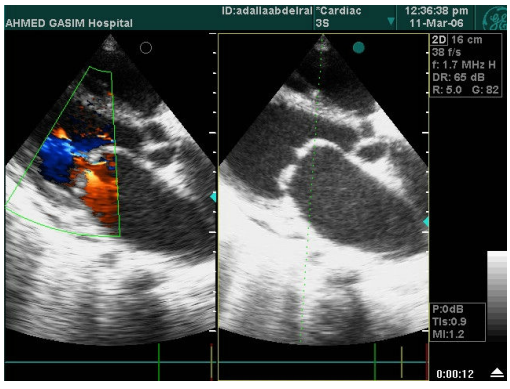
Currently there are two main techniques for PTMC; the balloon and the metallic commissurotomy.

Balloon commissurotomy has two major types, the double and the single balloon Inoue technique. The later has become the most popular world wide [11] (Fig 1).

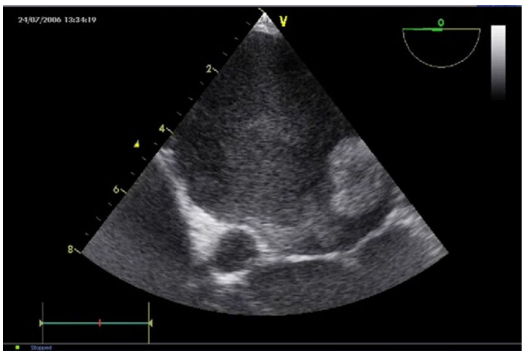
Figure 1: On the left: Colour Doppler flow across the stenosed MV. On the Right: 2D Echo demonstrating thickened leaflets of the MV with severe MS.



Balloon valvuloplasty is contraindicated when mitral stenosis is accompanied by a

significant mitral regurgitation (MR> grade 2), bilateral commissural calcification or when a thrombus which is mobile or situated in a high risk position (on the atrial septum, protruding into the left atrial (LA) cavity, or obstructing the mitral valve orifice) presents a high likelihood of systemic embolism. Relative contraindications include the presence of thrombus localized to the left atrial appendage and unilateral commissural calcification or the presence of another lesion which needs open heart surgery [12].

Figure2: Trans esophageal Echo demonstrating LA thrombus and spontaneous contrast which contraindicated PTMC in one of our patients



PTMC is most successful if the valve is pliable, the fusion is commissural and no much sub-valvular calcification or thickening is present (Fig 2) as assessed by Wilkins echocardiographic criteria i.e. score ≤ 8 (table 1). Trans esophageal echocardiography is needed to evaluate the morphology of the valve and to exclude the presence of left atrial thrombus [13, 14] (Fig 3).

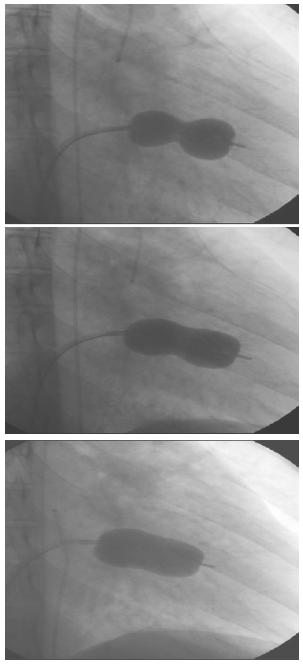


Figure 3: Mitral valve balloon valvuloplasty, (A) Initial inflation, (B) moderate dilation, (C) maximal dilatation.

The most crucial step in PTMC is the trans-septal puncture, which is best located in the fossa ovalis or the lower third of the inter-atrial septum for easy crossing of the MV by the balloon and the most serious complications are accidental puncture of the aorta or the atrial wall causing bleeding or tamponade. The valve dilatation may also lead to severe mitral regurgitation [15].

The successfulness of the procedure is measured in the Catheter Laboratory (Cath Lab) by the drop in the mean LA pressure and the drop in the trans- valvular pressure gradient. While it is evident by echocardiography if the mitral valve area (MVA) became > double the original area or it is increased by >1cm2 (7, 10).

PATIENTS AND METHODS

This is a cross sectional study, conducted at Ahmed Gasim Cath Lab, from April-2004 to December 2005

108 Patients with severe MS, who were suitable for PTMC (Most of them had Wilkins score <9) and made written consent for the procedure were enrolled. Patients with MR> grade2, LA thrombus of any type, bilateral commissural calcification or significant aortic valve (AV) disease were excluded. PTMC was done with the standard Inoue technique for all patients.

Detailed clinical data, pre-dilatation trans-thoracic and trans- esophageal echocardiography, a full procedural record and a post-dilatation Echo (within fourteen days) were accomplished for all patients.

The data was analyzed using Statistical Package for Social Sciences (SPSS). Significance testing of difference between proportions was conducted, with a value corresponding to $p < 0.05$ for significance.

RESULTS

108 patients were studied, 67% of them were females. The mean (±SD) age was 27(±9.8) ranged from 13 to 65 years. 27% of the patients were < 21 years of age.

All patients were symptomatic with NYHA Grade >11 and had severe MS (table 2).

Thirteen(12%) patients were regarded to have special problems (three had closed mitral valvotomy (CMV) before, three previous embolic CVA, two had giant LA, two calcified valves, a pregnant lady and two had associated tricuspid

Table 1: Echocardiographic Scoring System (Adapted from Wilkins criteria)

Morphology	Grade	score
Leaflet mobility	1-Highly mobile with restriction of the leaflet tips only	1
	2-Reduced mobility in mid-portion and base of leaflets	2
	3-Forward movement of valve leaflets in diastole mainly at the base	3
	4- No or minimal forward motion of the leaflets in diastole	4
Valve thickness	1- Near normal (4-5mm)	1
	2-Midleaflet thickening, marked thickening of the margins	2
	3-Thickening extends through entire leaflet(5-8mm)	3
	4-Marked thickening of all leaflet tissue(>8-10mm)	4
Sub-valvular thickening	1-Minimal thickening of chordial structures just below the valve	1
	2-Thickening of chordiae extending up to one third of length	2
	3-Thickening extending up to distal third of chordiae	3
	4-Extensive thickening and shortening of all chordiae extending down to the papillary muscle	4
Valve calcification	1-A single area of increased echo brightness	1
	2-Scattered areas of brightness confined to leaflet margins	2
	3-Brightness extending into the mid-portion of leaflets	3
	4-Extensive brightness through most of the leaflet tissue	4

Table 2: The MVA and the TR gradient Pre and Post Procedural

PARAMETER	PRE	POST	P Value
MVA[cm2] RANGE MEAN±SD	 0.5- 1.3 0.86±0.19	 1-3.4 1.9±0.5	 <0.001
TR [mmHg] RANGE MEAN ±SD	 41-140 71±23	 20-70 40±12	 <o.o1

stenosis (TS) and underwent combined procedure for both valves).

The procedure was successful in 102(94.5%) patients, in two patients we failed to dilate a tough septum, in spite of changing the puncture site. In two patients the balloon was stuck to the septum and failed to cross the MV [one of them was an emergency, with intractable pulmonary edema had three trans-septal puncture and repeated septal dilatation without success and died later in the CCU. The remaining two patients had successful emergency mitral valve replacement [MVR], due to inadvertent puncture of the RA and cardiac tamponade.

Optimal results were achieved in 91.6% of patients. Three patients had their valves stretched but without opening the commissures despite 3 to 4 balloon inflations for each patient including a redo patient. All patients with special problems showed optimal results except this redo patient.

Hemodynamic data in the Cath Lab showed a drop of the left atrial mean pressure (LAMP) from an average of 32 to 12 mmHg and a drop of the LA-LV gradient from an average of 25 to 5 mmHg. LV angiogram, post dilatation, showed no significant MR. No patient developed systemic embolization and there was no immediate mortality.

Echocardiographic assessment post procedural showed significant increase in mitral valve area and significant drop in pulmonary artery [PA] pressure and confirmed the LV angiographic results of no significant MR [tab 2].

DISSCUSSION

The age and sex distribution of our patients was not different from the data from developing countries [16, 17].

Our procedural success rate was similar to that reported by Nobuyoshi and colleges from Jaban, who studied 102 patients with a success rate in 92% and comparable to Arora and colleges from New Delhi who studied 4,838 patients with a success rate of (99.8%). Also, our results are in keeping with those of Paul and his team at Texas who had 87% success rate in their 45 patients. This data reflects procedural success rate in relation to the load of work and hence the experience of the centre [16-18].

The procedural complications in our series were not so different from those obtained by Arora [17].

We achieved optimal results in 91.6% of our patients which were comparable to that achieved by Arora and colleges, Nobuyoshi from Jaban, Yonga from Nairobi and Luiz from Brazil but they are different from Texas group who achieved optimal results in 71% of their study group. Of special note was the results of our patients who had special problems or difficult cases which showed optimal results in 92% of them [16-20].

CONCLUSION

This study demonstrated that PTMC in our current set up is a safe procedure with a good success rate and optimal results which may save or delay the need for valve replacement even in patients with special problems (like previous CVA and re stenosis following CMV).

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