



Closed Mitral Valvotomy in Present Era

Authors

Dr Ishtyak Ahmed Mir¹, Dr Noor Ali², Dr Arvind Kohli³, Dr Vivek Gandhotra⁴

¹Assistant Professor, ²Professor, ^{3,4}Lecturer

Department of Cardiovascular and Thoracic Surgery Government Medical College Jammu

Corresponding Author

Dr Ishtyak Ahmed Mir

Umar Colony, Back Side of Forest Nursery,
Sidhra- Jammu, J&K State, India, Pin180019,

Email: ishtyak_mir@rediffmail.com

ABSTRACT

Background: *Rheumatic heart disease is the most common cause of mitral valve stenosis. About 20 million people are believed to be affected with rheumatic heart fever in underdeveloped countries, and 40% of these patients have only mitral valve disease. The characteristic features of mitral stenosis are leaflet / chordal thickening and retraction. All current operations for the condition are palliative.*

Aims of the study: *To know the results of closed mitral valvotomy in patients undergoing surgery for mitral valve stenosis.*

Material and Methods: *The study was conducted on all the patients who underwent closed mitral valvotomy.*

Results: *97 patients, mostly in 3rd decade of life, irrespective of age, sex, surgical results were included in the study. Majority, 60.82% were in New York Heart Association Functional class III, 55.67% were fibrillating. Closed mitral valvotomy was done in 90 (90.78%) of patients.*

Conclusion: *In pure mitral stenosis, closed mitral valvotomy gives good results, and is still relevant even in current minimally invasive era.*

Keywords: *Mitral valve, Mitral stenosis, Closed mitral valvotomy.*

INTRODUCTION

The mitral valve in essence a funnel shaped structure with the apex within the left ventricle is the valve most frequently damaged by rheumatic carditis, though about one half of patients with mitral stenosis (MS) do not give a classic history of acute rheumatic fever or chorea. The other rare causes of mitral stenosis include congenital mitral stenosis, mitral annular calcification, rheumatoid arthritis and infective endocarditis. It takes decades from the onset of rheumatic carditis until

the onset of cardiac symptoms due to MS. ¹ The cross sectional area of normal mitral valve is 4 cm² and there is no detectable pressure gradient across the normal mitral valve even with increased flow. Patients with MS may present with dyspnea, orthopnea, paroxysmal nocturnal dyspnea, pulmonary edema, hemoptysis and winter bronchitis. Patients with MS develop pulmonary vascular disease, which may be due to pulmonary vasoconstriction, increase in pulmonary vein pressure of lower lobes, obliteration of pulmonary

capillary bed by alveolar fibrosis.²⁻³ The sequel of pulmonary hypertension besides other may be hoarseness. The complications caused by MS are atrial fibrillation, systemic embolization, infective endocarditis, right ventricular failure and its further sequel. Physical findings in such patients may be apical diastolic thrill, loud S1, opening snap, and diastolic rumble. Diagnostic procedures besides clinical examination and electrocardiogram are skiagram chest, which may reveal left atrial enlargement, calcification of mitral valve, Kerley B lines, enlarged pulmonary artery and right ventricle. Transthoracic echocardiography which has a sensitivity of around 70% is the investigation of choice, but transesophageal echocardiography which has a sensitivity of 100% is ideal for deciding the approach to surgical intervention, cardiac catheterization may be needed in elderly and those with risk factors for ischemic heart disease, besides thyroid functions are routinely done in all such patients. The principal symptoms of MS are due to pulmonary venous hypertension, which is closely related to the degree of mitral valve obstruction. The first surgical attempt at relieving mitral valve obstruction was made in 1920, and in 1925 mitral valve was first successfully approached through incision in left atrial appendage,⁴⁻⁵ finger dilatation of the MS was reported in 1949.⁶ In the subsequent years closed mitral commissurotomy was routinely performed by using a valvulotome (tubbs dilator) introduced through left ventricle. Percutaneous balloon and open mitral commissurotomy are the commonly performed procedures for MS, however, closed mitral valvotomy (CMV) is also an acceptable procedure in some centers.

MATERIAL AND METHODS

The study was conducted in the department of cardiovascular and thoracic surgery. All the patients who underwent closed mitral valvotomy (CMV) irrespective of age, sex, operative findings and surgical outcome are included in the study. Case record of all the patients was confirmed from

the admission files. All had transthoracic echocardiography (TTE) done, of the first 46 patients, only those with features of spontaneous echogenic contrast in left atrium on transthoracic echocardiography were subjected to transesophageal echocardiography (TEE), but in last fifty one patients and thereafter TEE is done routinely in all such patients before CMV. Heart was approached by left anterior thoracotomy, preferably over the interspace through which the impulse of the apex of the left ventricle can be palpated, pericardiotomy was done anterior to phrenic nerve, pericardial stay sutures were given, purse-string suture is placed just off, and usually just lateral and superior to, the left ventricular apex, the purse-string is threaded in to a atraumatic snigger, left ventriculotomy followed by dilatation of ventriculotomy was done. Purse-string is also placed around left atrial appendage. left atriotomy was done, some blood is allowed to gush out of the left atrium, right index finger is negotiated through appendage in to left atrium and passed directly to the mitral valve. After the valve is evaluated, pressure is applied with the exploring finger against the anterolateral commissure, heart was lifted by right middle, ring and little finger, tubbs dilator was negotiated through left ventriculotomy by left hand, and mitral commissurotomy was done. Peri, intra and post operative problems were noted, post operative patients were observed in cardiac intensive care unit. Morbidity and mortality was recorded and survivors were followed in outpatient department after discharge.

RESULTS

97 patients were included in the study, mostly in 3rd decade of life, Table-1, female outnumbering males, Table-2. In male patients the youngest was a thirteen years old boy and the eldest a fifty years old male, in case of females the youngest was sixteen year old and the eldest 65 years old. 59 (60.82%) patients were in New York Heart Association (NYHA) functional class III, 55.67% were fibrillating and an equal number had one to

multiple hospitalizations for MS related events in the past. Breathlessness was the most common symptom, Table-3, and diastolic murmur the common clinical sign, Table-4. TTE was done in all and all had features of MS, TEE was done in 54 patients, and coronary angiography was done in 9 patients only. Four patients each had previously undergone embolectomy and CMV, before CMV / redo CMV was done. CMV was done in 90 patients, Table- 5. In four patients the procedure had to be abandoned because of left atrial clot in two, juxtaposition of left atrium in one, and in one who had undergone CMV sometimes back left atrium could not be localized. Two patients developed mitral regurgitation and needed mitral valve replacement, three patients developed refractory arrhythmias and two died in

immediate post operative period. Immediate complications noted were excessive drainage in three, arrhythmia in three, re-exploration on the day of surgery was needed in three patients. 80% had improved functional class, and an equal number were symptomatically better at an average follow up of two years. 16% of the survivors had no improvement in functional class, symptomatology, did not improve, majority of these were lost to follow up, had either gone to other centers or had died. 54 patients were in functional class II, 40 had uneventful follow up of more than five years, two have been re-operated, four died in post operative period and the longest follow up of a patient not operated during this period has been of more than 12 years.

Table-1 Age distribution of the patients

Age in years	Number of patients	Percentage
11-20	08	8.24
21-30	43	44.32
31-40	29	29.89
41-50	12	12.37
51-60	04	4.12
61-70	01	1.03

Table-2 Sex distribution of the patients

Sex of the patients	Number of patients	Percentage
Females	75	73.31
Males	22	22.68

The youngest was a thirteen years old boy and the eldest a fifty years old male, In case of females the youngest was sixteen year old and the eldest 65 years old.

Table-3 Clinical presentation of patients with MS*

Symptomatology	Number of patients	Percentage
Breathlessness	76	78.35
Palpitations	73	75.25
Easy fatigability	66	68.04
Edema	49	50.51
Decreased urine out put	37	38.14
Weakness of a limb	08	8.24

*More than one symptom was present in a patient

Table-4 Clinical Signs in patients with MS

Clinical sign	Number of patients	Percentage
Diastolic murmur	89	91.75
Anemia	76	78.35
NYHA functional class-III	59	60.82
Atrial fibrillation	54	55.67
Hepatomegaly	43	44.32
Pedal edema	34	35.05
Loud first heart sound	32	32.98

Table-5 Surgical procedures done

Surgical procedure	Number of patients	Percentage
CMV	90	92.78
Abandoned	04	4.12
Redo CMV	03	3.09
Re exploration	03	3.09

COMMENTS

Rheumatic fever is the most common cause of MS, and for unknown reasons females are effected more than the male patients. Although the rheumatic inflammatory process is a pancarditis involving the endocardium, myocardium, and pericardium, permanent injury is almost always limited to the cardiac valve. Rheumatic valvulitis produces at least three distinct pathologic changes, with the degree varying widely among patients : fusion of the valve leaflets along the commissures; fibrosis of the leaflets with stiffening, retraction, and ultimate calcification; and fusion and shortening of the chordae tendineae. 42.32% of MS patients presented in third decade, late presentation is well known, more extensive changes are usually seen in patients with recurrent attacks of rheumatic fever, symptoms may not appear for 10 to 15 years, but gross valvular destruction and calcification may appear as early as 10 to 12 years of age in some developing countries. Significant hemodynamic changes only appear when the cross-sectional area of the valve is reduced to 2 to 2.5cm² patient may be symptomatic at extreme exertion (NYHA) class I, with cross-sectional area of 1 to 2 cm² symptoms appear with lesser degree of exertion (NYHA) class II, a patient with valve area of less than 1 cm² is symptomatic at rest (NYHA) class III, and

patients with opening as small as 0.5 cm² is said to be of smallest size compatible with life.

Although the attack rate for rheumatic fever is roughly equal among genders, MS is 2 to 3 times more common in women, and similar observations have been made in the present study, it takes approximately 5 to 10 years for most patients to progress from mild disability (functional class II) to severe disability (functional class III and IV), and the progression is more in tropical and subtropical areas.⁷ Elevated C-reactive proteins levels, indicative of ongoing generalized inflammation, are found in many patients before valvotomy, which supports an inflammatory origin of MS.⁸ Symptomatology in the present series is in accordance to other reports,⁷ although many patients may remain asymptomatic despite very high left atrial pressure, lymphatic hyperfunction in such patients may help prevent pulmonary congestion and its attendant symptoms.⁹ Atrial fibrillation, advanced NYHA functional class in patients with MS are well known. Echocardiographic characteristics of mitral valve were evaluated as per echocardiographic scoring system devised by Wilkins and associates,¹⁰ and similar scoring system has been adopted by others also.¹¹ In general all patients with a mitral valve area of 1.5 cm² should be operated upon even though they are asymptomatic,¹² but patients who have mitral

valve area of 1.1 cm^2 , and have no history of systemic embolization, or had failed percutaneous balloon mitral valvuloplasty are considered candidates for mitral commissurotomy.¹¹ In a reported series of 1000 patients closed mitral valvuloplasty has been considered the operation of choice in patients with pure mitral stenosis,¹³ tactile impression is paramount in this procedure, not only for performance of commissurotomy but for evaluating valvular anatomy before and after the operation,¹⁴ and there have been occasions when nothing better could be done with the heart open than with it closed.¹⁵ However, for a successful closed mitral procedure, it is a must that the mitral valve is pliable, should neither be calcified nor distorted, and to get exact anatomical details of the mitral valve, TEE is the investigation of choice before operation, it has a sensitivity of 100%,¹⁶ much higher than that of TTE.¹⁷ The risk of early operation is very small, early commissurotomy combined with obliteration of atrial appendage, also provides marked protection from arterial embolism.¹⁸ Balloon valvuloplasty and CMV are not considered superior to open mitral commissurotomy, in that in both these techniques chances of clot dislodgement and embolism exist, also balloon valvotomy does nothing to prevent future embolization from fibrillating left atrial appendage, besides significant restenosis will occur within 5 years in a large number of patients. The supporters of open commissurotomy have observed that, restenosis of a mitral valve after an extensive commissurotomy that eliminates the end-diastolic gradient is almost unknown. Mitral valvotomy by transventricular dilator used in the present study is in accordance to other studies.¹⁹ Primary closed valvotomy using the mitral valve dilator is an acceptable and safe means of relieving a stenosed valve,^{13, 20} even redo CMV has been done with a mortality of around 10.4%.²¹ The study differs from the commissurotomy done using the tubbs dilator with out opening of left atrium, but under transesophageal echocardiography 2D and 4D views,^{11, 22} we also differ from

the observation that thrombus can not be dislodged in this procedure, definitely TEE is an excellent tool, but what the finger can feel can not be accomplished with a mechanical dilator. CMV should be the procedure of choice for MS in patients with non calcified pliable valves, the results and cost of this operation comparing favorably with those of open heart procedures.²⁰ It is a fact that if left atrial clot is found, or valve is heavily calcified, and the facilities for cardiopulmonary bypass are not available, the procedure should be abandoned, the procedure in 4.12% was abandoned because of left atrial clot in two, left atrium could not be located in a redo patient, and juxtaposition of left atrium in one, the last two problems are rarely described in literature. Arrhythmias during cardiac manipulation are well known,¹¹ but two of the patients dying of arrhythmias in the present series is very high, these patients were very sick and the heart could not tolerate even the minimal fiddling. Mitral regurgitation after CMV is well documented and two patients needed valve replacement, in that the results are not in similarity to the observation where the procedure was abandoned as soon as regurgitation was noticed even at valve dilatation of 1.8 cm^2 ,¹⁰ but they were operating under TEE guidance. Though the operative mortality has to be around 1%, our figures of 4.12% are in similarity to others.²⁰⁻²¹ The possible reasons could be, patients wasting time with quacks, local paramedics, inaccessibility to proper health care, advanced disease, and poor cardiac reserve at the time of surgery.

CONCLUSION

CMV though obsolete in developed nations and advanced cardiac centers, should always be done in patients who have only pure mitral stenosis, non calcified pliable valve, expert hands, and in such patients in such centers, where facilities for cardiopulmonary bypass are not available, or the patients refuse going to higher centers because of one or the other reason.

LIMITATIONS

All the patients did not have preoperative transesophageal echocardiography, which could have delineated the valve anatomy better, this facility was not available during intra-operative period also, where some problems could have been avoided. Strict post operative follow up, and follow up echocardiography was not done in all.

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