PROGNOSTIC FACTORS OF CLOSED MITRAL VALVOTOMY IN CHILDREN AND ADOLESCENTS: A QUARTER OF CENTURY EXPERIENCE

By

Ahmed Kadry Abdalla, M.D.

From

Department of Cardio-Thoracic Surgery,
Faculty of Medicine, Mansoura University.

ABSTRACT

Closed mitral valvotomy was performed in 153 patients with rheumatic mitral stenosis over a 25-year period ending in December 1999. There were 65 (42.5%) males and 88 (57.5%) females with an age range from 8 to 19 years (mean 14.8 ± 2.7). The most common presentation of the patients includes exertional dyspnea, palpitation, cough, chest pain, congestive heart failure and hemoptysis. According to New York Heart Association (NYHA) functional class 13 patients (8.5%) were in class II, 112 (73.2%) in class III, and 28 (18.3%) in class IV. Preoperative echocardiography was done for 133 patients (86.9%). All of them had echocardiographic score < 8 with mitral valve area ranged from 0.6 to 1.1 cm2 with a mean value of 0.761 ± 0.21 cm2. Three patients (2%) died in the early postoperative period. Ten patients (6.5%) developed postoperative complications. Postoperatively, the mean valve area achieved was 2.67 ± 0.38 cm2. Of the 150 patients who survived the operation, 28 patients were excluded from the last follow-up, 9 (6%) required reoperation, 8 (5.2%) died late postoperatively, and 11 (7.2%) lost the follow-up. The most recent follow-up data were available for 122 patients (79.7%). In a recent follow-up, conducted after a mean of 10.3 ± 5.8 years (range: 1-24 years), the mean valve area measured by echo-Doppler in this patient group was 2.12 ± 0.41 cm2 (range: 1.4-2.9 cm2). Nine patients subsequently underwent reoperation for the mitral valve; 6 closed revalvotomy, and 3 valve replacement. The late mortality rate was 5.2%. Most of the patients (97.7%) were in NYHA functional

class I or II. At 20 years, the overall cumulative proportion survival was 85%. The factors preoperative NYHA (New York Heart Association) functional class, the pliability of the valve (echocardiographic scoring), and requirement for reoperation showed a tendency to influence the survival significantly. The presence of preoperative mild mitral regurgitation, pulmonary hypertension and atrial fibrillation did not alter survival significantly. Age and sex were not associated with adverse prognosis. We conclude that closed mitral valvotomy offers good long-term result for patients with pliable mitral stenosis, particularly in areas where there is a high incidence of rheumatic heart disease and a large number of young patients have mobile mitral stenosis.

INTRODUCTION

Although rheumatic fever was thought to be nearly eradicated from developed countries, it continues to be challenge because of its high prevalence in the developing world. Unfortunately, the notion that rheumatic fever is a disease of the poor and the underprivileged is still true at the beginning of the new millennium (1). Worldwide estimates of chronic rheumatic heart disease in school age children and young adults range from 4.9 to 30 million (2). Hospital statistics from most developing nations reveal that about 10-35% of all cardiac admissions are for patients with rheumatic fever or chronic rheumatic heart disease (2).

The mitral valve is the most commonly involved single valve, and the involvement of the other valves is usually in association with that of the mitral valve. The isolated involvement of the aortic valve is less common, and the tricuspid valve much less, although in involvement of the mitral and aortic valves, the aortic valve disease may be far more advanced than that of the mitral valve at the time the patient comes for treatment (3).

In our population there is a significant incidence of rheumatic heart disease, and we still see a large number of young patients with rheumatic mitral stenosis. Closed mitral valvotomy is one of the simplest and oldest of all cardiac operations (4,5), and its clinical efficacy has been well assessed during the last decades (6,7). In our hospital, closed mitral valvotomy has remained a popular operation and an attractive alternative to open valvotomy or mitral valve replacement. To

determine the success of this policy we reviewed the results in 153 of children and adolescent patients with tight mitral stenosis who underwent closed mitral valvotomy between January, 1975 and December, 1999. We were particularly interested in symptomatic improvement, the requirement for further mitral valve procedures, as well as the survival analysis of these patients.

PATIENTS AND METHODS

Six hundred twenty one patients with rheumatic mitral stenosis underwent closed mitral valvotomy in the Department of Cardio-thoracic Surgery at Mansoura University Hospital during the 25-year period ending December 1999. One hundred fifty-three of them (24.6 %) were under 19 years of age. Their case records were reviewed from the standpoint of clinical profile, method of treatment and eventual outcome.

Exercise tolerance of each patient was classified according to the New York Heart Association (NYHA) classification. Twelve patients (7.8%) were in class II, 112 (73.2%) in class III, and 29 (19%) in class IV.

Once the diagnosis is suspected from the history and clinical examination, it is confirmed by chest x-rays in all patients and echcardiography in 133 patients. The mitral valve was scored on the transthoracic echocardiographic images as described by Wilkins and colleagues and Abascal and associates (8). This involves assessment of the mitral valve for: (a) leaflet mobility, (b) leaflet thickening, (c) subvalvular thickening, and (d) calcification. Each abnormality has a possible score of 0 to 4, and higher scores represented more abnormal structure. Summing the individual scores resulted in a total echocardiographic score. According to this system, a score of 0 would be a totally normal valve, while a score of 16 would represent an immobile valve with considerable thickening of the leaflets and subvalvular apparatus and severe superimposed calcification.

Our criteria for selection of patients were a pliable mitral valve appratus with mobile leaflets and minimal or no subvalvular disease, absence of massive calcification of leaflets or annulus, absence of dence fibrosis, absence of left atrial clot, absence of significant mitral regurgitation, and absence of any associated

significant cardiac lesion.

The patient was anaesthetized, intubated, and positioned in the semi-lateral position with the left side up. The chest was entered through the fifth intercostal space through lateral to antero-lateral thoracotomy. The pericardium was opened anterior to the pherenic nerve. It was our practice to place two concentric purse-string 2/0 silk sutures on the left auricular appendage, then to make a stabe incision at their centre to introduce either the index or the little finger intraatrially to explore and assess the mitral valve. A pretaken transverse mattress 2/0 silk suture was to be done at the apex and a ventriculotomy stab was to be done at its centre, through which the Tubbís dilator was to be introduced guided by the intraatrial finger to locate it at the mitral valve, then dilatation was performed. Dilatation was usually performed on two or three steps with gradual increase of the width of the Tubbís dilator till we get a good valve area, taking utmost care not to cause mitral incompetence, as judjed by the intraatrial finger. Both ventriculotomy and atriotomy stab incisions were closed by the pretaken sutures. In earlier cases valves were explored forvthe possibility of digital fracture before resort to mechanical dilatation was made. Digital dilatation was done in 18 (14.2%) patients while Tubbís dilator was used in 109 (85.8%) patients.

The results of each valvotomy were analyzed from the date of operation to outcome, where outcome was one of the following: 1) death of the patient (all causes of death including death not related to cardiac causes), 2) reoperation in the form of mitral valve replacement or repeated valvotomy, 3) survival to the time of analysis, and 4) lost to follow up. For studying the variables affecting long-term success of the valvotomy, outcome 1 and 2 are combined and regarded as failures, and outcome 3 and 4 are right sensored.

Statistical analysis of data was performed using the log rank chi-square method. The survival model was used to calculate the influence of several preoperative factors on the length of the survival period. The calculations were made using the Stastical Package for the Social Sciences (SPSS). The following factors were analysed: (1 age, 2 sex, 3) preoperative NYHA Functional Class, 4) preoperative mitral regurgitation, 5) preop-

erative echocardiographic assessement of the valve (echo score), 6) preoperative pulmonary hypertension, 7) preoperative atrial fibrillation, and 8) requirement of reoperation.

RESULTS

A total of 153 children and adolescents underwent closed mitral valvotomy for tight mitral stenosis over 25 years period ending in December 1999, in the Departement of Cardio-Thoracic Surgery at Mansoura University Hospitals. Eighty-eight of the patients (57.5%) were females and 65 (42.5 %) males. Their ages ranged from 8 to 19 years with a mean age of 14.8 years. The majority of cases (54.9%) were between 15 and 19 years of age. The youngest was an 8 year old girl. Age and sex distributions are shown in Table 1.

All patients had exertional dyspnoea. The other important symptoms in descending order of frequency were palpitations, cough, and chest pain. The high incidence of congestive heart failure (39.4%) in such young patients was a significant factor in precipitating surgical intervention (Table 2). Past history of rheumatic fever was present in 99 patients (64.7%).

At the time of operation erythrocyte sedementation rate was normal in all patients, C-reactive protine and antistreptolysin titre were done in 95 patients (62.1%) and were normal, indicating the absence of rheumatic activity. The electrocardiograms showed right ventricular hypertrophy, right axis deviation, and P-mitral in 121 patients (79.1%). Atrial fibrillation was present in 8 patients (5.2%). In 24 patients (15.7%), the electrocardiogram was normal, in spite of evidence of tight mitral stenosis at operation. The chest X-ray demonstrated left atrial enlargement in 117 (76.5%) and pulmonary venous congestion of varying degree in all patients. Echocardiography was performed in 107 (69.9%) patients. Mitral valve area was ranging from 0.6 to 1.1 cm2 with a mean value of 0.761 ± 0.21 cm2. Calcification of the mitral valve leaflets was minimal in 18 (11.8%) patients. Calcification of subvalvular appratus was minimal in 12 (7.8%) patients. Echocardiographic score of the mitral valve was ranging between 3 and 10 with 91 patients had score < 6 and 16 had score > 6. Associated mild mitral regurgitation was found in 11 patients (7.2%), functional tricuspid regurgitation in 11 (7.2%) patients, and mild aortic stenosis in 5 (3.3%) patients.

In our series there were three operation-related deaths occurred during the first 10 years of this study giving an operative mortality of 2%. Two patients had significant pulmonary hypertension, and advanced NYHA functional class, and atrial fibrillation in one of them. They died of persistent low-output state and intractable arrhythmia after surgery. Embolic hemiplegia developed on table in one case with atrial fibrillation and extensive left atrial thrombus inspite of meticulous precautions. The patient died 7 days later.

Ten patients (6.5%) developed postoperative complications. One developed constrictive pericarditis which was successfully treated by pericardiectomy 2 months after mitral valvotomy, five patients developed mild to moderate mitral regurgitation one of them required mitral valve replacement 4 months later, and four patients developed postoperative arrhythmias which controlled by medications.

Nine patients needed subsequent surgical procedures for the mitral valve from 4 monthes to 19.2 years (mean 5.9 years) after the initial procedure. Repeated closed mitral valvotomy was performed in six patients after 3.3, 5.5, 8.8, 12.6, 15.4, 19.2 years, and these cases were discussed in detail in our previous work (9). Mitral valve replacement was performed in one patient after 4 months, two patients required aortic and mitral valve replacement 4.9 and 9.8 years after the first operation.

There were eight (5.2%) late deaths 3.4 to 21 years after operation. The actuarial survival curve for the whole group (Fig 1) shows a cumulative proportion of 85 % surviving at 20 years.

Factors Affecting Long-Term Survival:

The results of the actuarial analysis of various subgroups are summarized in Table 3.

AGE AND SEX : There was no significant difference in long-term survival between male and female patients ($x^2=0.25$, $p=0.62$). Age at the time of operation was also not significant.

PREOPERATIVE NYHA FUNCTIONAL CLASS : Preoperatively, the distribution of the patients by NYHA Functional Class was as follows: Class II, 12 patients (7.8%); Class III,

112 (73.2%); and Class IV, 29 patients (19%). Postoperatively, 94 patients were in Class I, 25 in Class II, 3 in Class III, and none in Class IV. The change from preoperative to postoperative functional class in the 122 survivors at the last follow-up is illustrated in Figure 2. Preoperative assessment of NYHA Functional Class was significant in an ordered fashion. Figure 3 illustrates the effect of functional class on survival after valvotomy: there are poor long-term results in patients with NYHA Functional Class VI.

PREOPERATIVE MITRAL REGURGITATION: As assessed by preoperative echocardiography and/or intraoperative assessment by palpation before dilatation, 136 patients had no mitral regurgitation and 17 (11.1%) had mild regurgitation. Preoperative mitral regurgitation was not a predictor of the length of survival with successful operation (Table 3).

ECHOCARDIOGRAPHIC ASSESSMENT OF MOBILITY AND CALCIFICATION (ECHO SCORE): Figure 5 illustrates the effect of the echocardiographic assessment of the valveís suitability for valvotomy according to the scoring system on survival. The outcome after valvotomy on valves with score of < 6 is compared with the outcome in valves with score > 6. The factor of mobility or calcification is clearly significant. Projected survival of those with ideal valves is 85% at 20 years as opposed to 48% of those valves were less mobile. It appears from the survival curve (Fig 4) that an unusually large number of failures occur between 10 and 20 years after operation.

PREOPERATIVE PULMONARY HYERTENSION : Seventeen (13.4%) patients were assessed clinically and by echocaediography to have significant pulmonary hypertension prior to valvotomy. It appears from survival curve (Fig 5) that an unusually large number of failures occur between 5 and 7 years after operation in patients with pulmonary hypertension. However this difference did not put preoperative pulmonary hypertension as a significant predictor of success after valvotomy ($X2 = 1.82$, $p = 0.1779$).

ATRIAL FIBRILLATION: Eight patients (5.2%) were in atrial fibrillation at the time of operation. Although, two of the three hospital mortalities were in atrial fibrillation, however the log-rank test shows that the rhythm was

not a significant independent predictor of success after valvotomy (X2 = 1.85, P = 0.1736).

REOPERATION: Nine patients (7%) had an additional procedure involving the mitral valve during follow-up. Six patients required closed mitral revalvotomy and three required mitral valve replacement. Figure 6 shows the survival curves for patients who required reoperation and those who did not require reoperation. The cumulative proportion surviving at 20 years is 38% for the first group and 92% for the second group.

Table (1): Age and sex distribution.

Age (years)	Male	Female	Total
<10	1	3	4 (2.6%)
10-14	27	38	65 (42.5%)
15-19	37	47	84 (54.9%)
Total	65 (42.5%)	88 (57.5%)	153 (100%)

Table (2): Frequency of Symptoms.

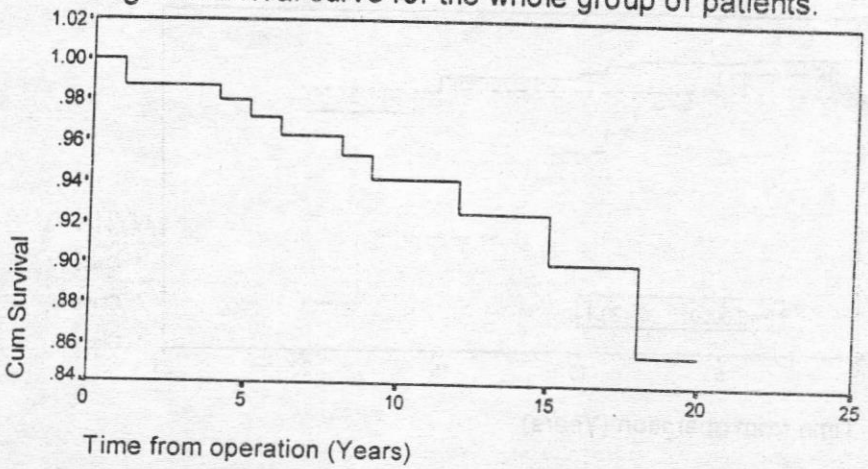
Symptom	Number of Patients
Exertional dyspnoea	153 (100 %)
Palpitations	125 (81.7%)
Cough	112 (73.2%)
Chest pain	52 (34%)
Congestive heart failure	26 (17%)
Hemoptysis	15 (9.8%)

Table (3). Summary of Logrank statistics.

Variable	Logrank X2	P value
Age groups (<15 & ≥ 15)	1.6	0.20
Sex	1.29	0.25
Mitral regurge	0.02	0.88
Pulmonary hypertension	1.82	0.17
Atrial fibrillation	1.85	0.17
NYHA functional class	20.10	0.00001
Echo score (≤ 6 & > 6)	6.42	0.01
Reoperation	4.89	0.02

NYHA: New York Heart Association.
P < 0.05 considered significant.

Fig 1. Survival curve for the whole group of patients.



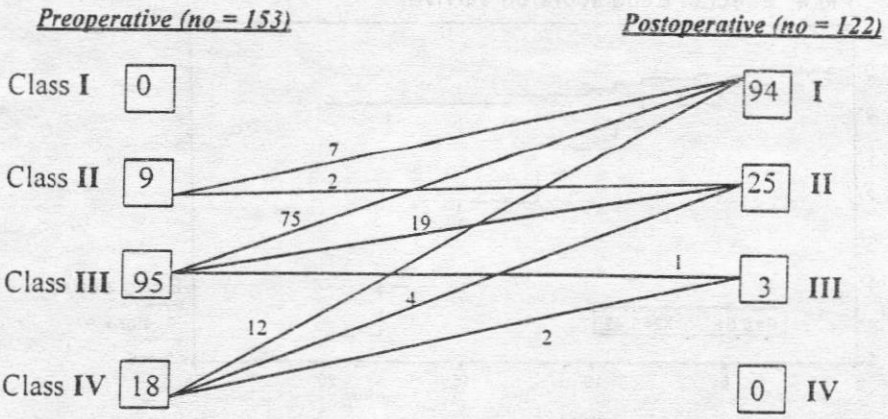


Figure (2): *Pre- and postoperative functional class in 122 patients.*

Fig 3. Outcome of three groups of patients classified by preoperative NYHA functional class.

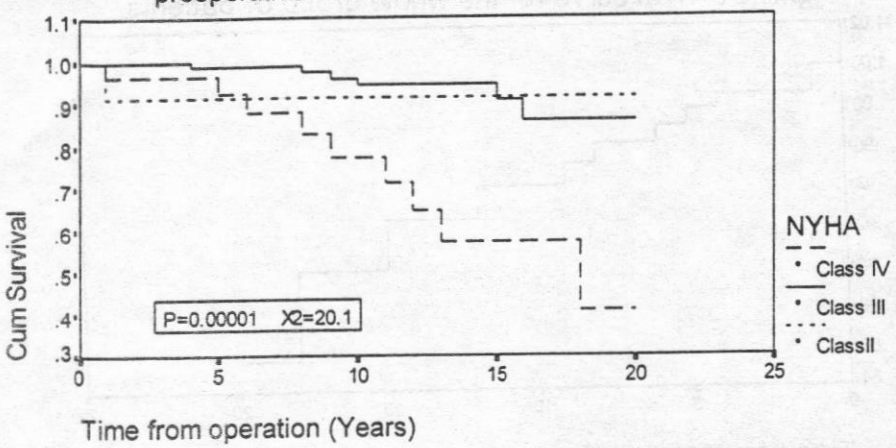


Fig 4. Effect of Echo score on survival.

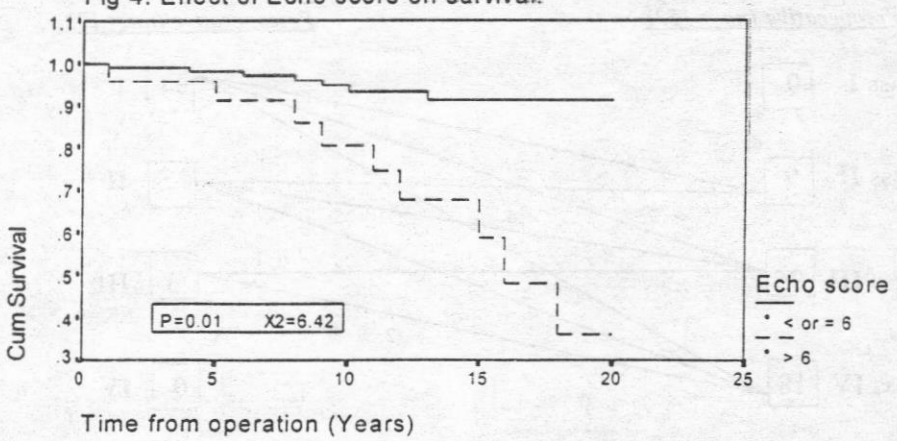


Fig 5. Effect of pulmonary hypertension on survival.

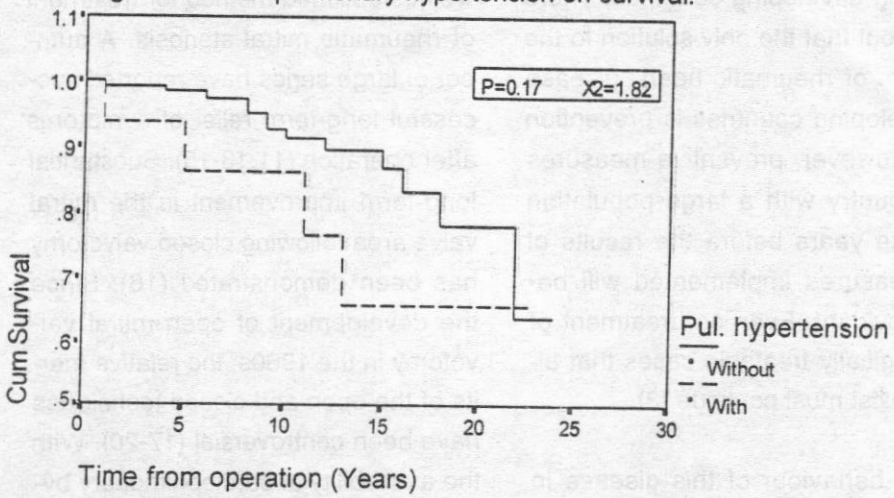
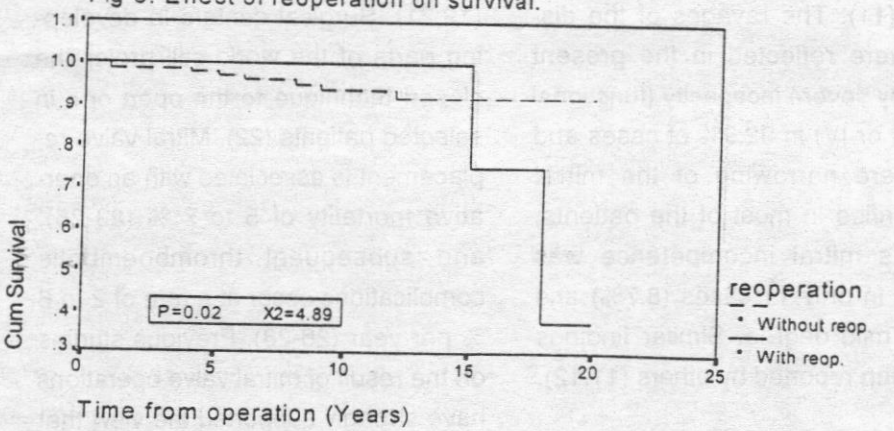


Fig 6. Effect of reoperation on survival.



DISCUSSION

Rheumatic mitral stenosis remains the most common valvular heart lesion in developing countries. There is no dout that the only solution to the problem of rheumatic heart disease in developing countries is prevention (10). However, preventive measures in a country with a large population will take years before the results of the measures implemented will become evident. Even so, treatment of the surgically treatable cases that already exist must continue (3).

The behaviour of this disease in childhood and adolescence is characterized by its rapid progress, gross damage to the myocardium and severe degree of haemodynamic disturbance (11). The ravages of the disease were reflected in the present series by severe incapacity (functional class III or IV) in 92.9% of cases and by severe narrowing of the mitral valve orifice in most of the patients, whereas mitral incompetence was present in only 11 cases (8.7%) and was of mild degree. Similar findings have been reported by others (11,12).

In patients with pure mitral stenosis, there are four modalities of treatment: closed valvotomy, open valvotomy, mitral valve replacement, and percutaneous balloon valvotomy. Closed mitral valvotomy (CMV) is a well-established method for treatment of rheumatic mitral stenosis. A number of large series have reported successful long-term relief of symptoms after operation (11,13-15). Substantial long-term improvement in the mitral valve area following closed valvotomy has been demonstrated (16). Since the development of open mitral valvotomy in the 1960s, the relative merits of the open and closed techniques have been controversial (17-20). With the availability of cardiopulmonary bypass, the technique of open mitral commissurotomy has nearly replaced the closed technique in most surgical centers in developed countries (19,21). Surgical centers in developing parts of the world still prefer the closed technique to the open one in selected patients (22). Mitral valve replacement is associated with an operative mortality of 5 to 7 % (23-25), and subsequent thromboembolic complications occur at a rate of 2 to 6 % per year (26-28). Previous studies on the result of mitral valve operations have strongly supported the view that conservation of the mitral valve, if feasible, is preferable to valve replacement (29,30). The introduction of per-

cutaneous balloon mitral valvotomy (BMV) by Inoue and colleagues in 1984 (31) was an important new option for the treatment of patients with mitral stenosis. Since then most of the studies comparing the results of CMV and BMV, found comparable hemodynamic improvement with the two procedures (32-35). Although one of the advantages of BMV, is elimination of drawbacks of thoracotomy, but it is not without complications. As reported in a North American multicenter study, complications of BMV include death in 0.5%, embolism in 2.0%, and perforation in 1.5% and a rate of restenosis of approximately 20% at 6 months (36).

There is no doubt that conservative surgery is the preferable treatment for valvular lesions in children (37). Closed mitral valvotomy could be the procedure of choice even for affluent patients in affluent centers, as long as the criteria for suitability are satisfied and surgeons are trained to perform the operation (38). Granted open mitral valvotomy is a better operation because relief of valvular and subvalvular obstructive elements can be dealt with much better under vision (39,40). However in the hand of skilled surgeons, closed valvotomy rivals in results open valvotomy (41). In addition to that the risk of cardiopulmonary bypass used in open commissurotomy is not negligible (42). Another important issue is the cost-effectiveness of the procedure when it is considered for large number of patients. To cite an example, the cost of the disposables and the drugs for one closed mitral valvotomy is 25 times less than that for an open procedure. On-table extubation, early ambulation, and short inpatient stay further reduce the cost (43).

In our hospital, closed mitral valvotomy has remained a popular operation and an attractive alternative to open valvotomy or mitral valve replacement. What is still more disconcerting and intriguing is the involvement of the mitral valve at a very young age, and the youngest patient in whome closed mitral commissurotomy was done in the present series was 8 years old girl. Her mitral valve orifice was approximately 0.6 cm2 as judged at operation. About 24.6% of all patients who required closed mitral valvotomy were children and adolescents.

The safety of closed mitral valvotomy is confirmed by the fact that only 2

(1.6%) deaths in this series can be directly attributed to the type of operation. Several previous studies have also shown low and improving mortality associated with closed mitral valvotomy (13,17,18,20,44).

Long term follow-up in our series revealed that a good percentage (77%) of patients are in excellent condition after operation (in class I). Moreover the quality of life has improved. Our findings are similar to those by other authors throughout the world (11,20,42,44,45).

The 20-year cumulative proportional survival was 85%. Some of these patients had required repeat valvotomy or had undergone valve replacement by 20 years. However, at 20 years the cumulative proportional survival with and without reoperation is 38% and 92% respectively (see Fig.1 & Fig.6). These results are similar to those reported by others (13,44), who confirm that closed mitral valvotomy provides long-lasting relief of symptoms in a large number of patients. In addition, the procedure provides effective palliation and delays valve replacement for many years in other patients. These results are as good as those reported for series of open mitral valvotomy (46,47), but the claim that open mitral valvotomy is curative rather than palliative (39) is not established and actuarial techniques applied to the follow-up of patients after open valvotomy (46) indicate that, as with the closed procedure, increasing numbers of patients will come to reoperation as each year passes.

Factors that might contribute to the outcome of closed mitral valvotomy and affect long-term results have been evaluated in this study. Preoperative NYHA Functional Class is a highly significant predictor of survival with successful operation in our cases as well as in others (44). On the contrary Molajo et al, reported that the preoperative functional class has no effect on survival (20), the finding which might be atributed to the short term follow-up period in that study compared to our long term follow-up in this study.

We used the echocardiographic score of the mitral valve as a clinical assessment of the suitability of the valves for valvotomy. This factor was also significant predictor of long-term survival in our patients. Patients with lower echo score had a better survival

than others who had higher score. Clinical assessment of the valve was also assessed by others (20,44) who reach the same conclusion as ours.

Though preoperative pulmonary hypertension did not have a significant effect on the long-term result of closed mitral valvotomy in our patients as well as others (20,44,45,48), it was found to be effective in other series (49). Pulmonary hypertension may reflect the severity or duration or both of mitral valve disease, however the presence of pulmonary hypertension should not be considered a contraindication to the operation (50).

Preoperative mitral regurgitation was shown to be insignificant predictor of the long-term result. Others reported that preoperative mitral regurgitation had a significant effect on long-term survival (20,44). This can be related to the meticulous selection of our patients to have isolated mitral stenosis and if there was any mitral regurge it must be trivial.

Atrial fibrillation has been reported to affect operative mortality adversely in our series of patients as well as in others (51). Two operative deaths (66.6%) in our study had atrial fibrillation preoperatively. This was not apparent in other studies (44). The presence of atrial fibrillation preoperatively did not appear to affect the long-term result in our patients. The possible explanation is the small number of patients who had preoperative atrial fibrillation in our series (only 8 patients i.e 5.2%), however the same result was proved by others who had a large number of patients (21%) with preoperative atrial fibrillation (44).

We conclude that closed mitral valvotomy is still a useful operation in the our country. Closed mitral valvotomy offers good long-term result for patients with pliable mitral stenosis, particularly in areas where there is a high incidence of rheumatic heart disease and a large number of young patients have mobile mitral stenosis. Preoperative predictors of a poor long-term result for patients with mitral stenosis are advanced NYHA Functional Class, and nonpliability and calcification of the valve (high echo score). The need of reoperation for the mitral valve was found to affect the long-term survival negatively. Age, sex, pulmonary hypertension, mitral regurgitation and atrial fibrillation have no effect on the long-term result of closed mitral valvotomy in

children and adolescents.

REFERENCES

1- **Soler-Soler J, Galve E (2000) :** Valve disease: Worldwide perspective of valve disease. Heart ; 83: 721-725.

2- **World Health Organization. (1988) :** Rheumatic fever and rheumatic heart disease. WHO Technical Report Series no. 764. Geneva: WHO.

3- **Kalke B.R., Desai J.M., Magotra R. (1989) :** Mitral valve surgery in children. J Thorac Cardiovasc Surg; 98: 994-498.

4- **Souter PW (1925) :** The surgical treatment of mitral stenosis. Br Med J; 2: 603-606.

5- **Bailey CP (1949) :** The treatment of mitral stenosis (mitral commissurotomy). Chest; 15: 377-384.

6- **Ellis LB, Singh JB, Morales DD, Harken DE (1973) :** Fifteen to twenty year study of one thousand patients undergoing closed mitral valvuloplasty. Circulation; 48: 357-364.

7- **Bross W, Bross T, Koczorowski S, et al (1972) :** Surgical treatment of mitral stenosis: Some problems encountered in 1220 operations. J Cardiovasc Surg; 13: 518-522.

8- **Wilkins GT, Weyman AE, Abascal VM, et al (1988) :** Percutaneous balloon dilatation of the mitral valve: An analysis of echocardiographic variabies related to outcome and the mechanism of dilatation. Br Heart J; 60: 299-308.

9- **Abdalla A.K., Mowafy A.A., Fouda M.A., El-Saied M.M., Abu-Elela S., Abdalla F.Z. (1993) :** Second closed mitral valvotomy for recurrent mitral stenosis. Eg J Chest Dis Tuberculosis; 41,2 (Suppl.): 191-199.

10- **Agarwal B.L. (1981) :** Rheumatic heart disease unabated in developing countries. Lan-

cet; 2: 910-911.

11- John S., Krishnaswami S., Jairaj P.S., Cherian G., Muralidharan S., Sukumar I.P. (1975) : The profile and surgical management of mitral stenosis in young patients. J Thorac Cardiovasc Surg; 69: 631-642.

12- Beg M.H., Reyazuddin (1989) : Mitral stenosis in childhood and adolescence - a study of 45 cases and their surgical management. Ann Trop Pediatr; 9: 98-101.

13- Ellis L.B., Singh J.B., Morales D.D., Harken D.E. (1973) : Fifteen-to-twenty-year study of one thousand patients undergoing closed mitral valvuloplasty. Circulation; 48: 357-364.

14- Fraser K., Tumer M.A., Sugden B.A. (1976) : closed mitral valvotomy. Br Med J; 2: 352-353.

15- El-Ashkar M.F., Gaafar H., Abou Senna G., Balbaa A., El-Mallah S. (1986) : Thirty years experience of closed mitral commissurotomy at Kasr El Ani Hospital. Eg J Chest Dis Tuberculosis; 31: 217-221.

16- Heger J.J., Wann L.S., Weyman A.E., Dillon J.C., Feigenbaum H. (1979) : Long-term changes in mitral valve area after successful mitral commissurotomy. Circulation; 59: 443-448.

17- Ellis L.B., Harken D.E. (1964) : Closed valvuloplasty for mitral stenosis: A twelve-year follow-up study of 1571 patients. N Engl J Med; 270: 643-648.

18- Turina M., Messner B.J., Senning A. (1972) : Closed mitral commissurotomy: Operative results and late follow-up in 137 patients. Surgery; 72: 812-820.

19- Finnegan J.O., Gray D.C., MacVaugh H., Joyner C.R., Johnson J. (1974) : The open approach to mitral commissurotomy. J Thorac Cardiovasc Surg; 67: 75-82.

20- Molajo A.O., Bennett D.H., Bray C.L. et al. (1988) : Actuarial analysis of late results after closed mitral valvotomy. Ann Thorac Surg; 45: 364-369.

21- Nichols HT Balco G, Morse DP, Adam A, Ballzar N (1962) : Open mitral commissurotomy: Experience with 200 consecutive cases. JAMA; 19: 268-270.

22- Cheng T (1989) : Closed mitral commissurotomy is not obsolete in developed countries. Am J Cardiol; 63: 764.

23- Chaffin J.S., Daggett W.M. (1979) : Mitral valve replacement: A nine-year follow-up of risks and survivals. Ann Thorac Surg; 27: 312-319.

24- Lepley D.Jr, Flemma R.J., Mullen D.C., Molt M., Anderson A.J., Weirauch E. (1980) : Long-term follow-up of the Bjork-Shiley Prosthetic valve used in the mitral position. Ann Thorac Surg; 30 : 164.

25- Magovern J.A., Pennock J.L., Campbell D.B., Pierce W.S., Waldhausen J.A (1985) : Risks of mitral valve replacement and mitral valve replacement with coronary artery bypass. Ann Thorac Surg; 39: 346-352.

26- Macmanus Q., Grunkemier G.L., Lambert L.E., Starr A. (1978) : Noncloth-covered caged ball protheses: The second decade. J Thorac Cardiovasc Surg; 76: 788-794.

27- Bjork V.O., Henze A. (1979) : Ten yearsí experience with the Bjork-Shiley tilting disk valve. J Thorac Cardiovasc Surg; 78: 331-342.

28- Oyer P.E., Stinson E.B., Reitz B.A., Miller D.C., Rossiter S.J., Shumway N E. (1979) : Long-term evaluation of the porcine xenograft bioprothesis. J Thorac Cardiovasc Surg; 78: 343.

29- Sutton M.St J, Rondaut R, Oldershaw P, Bricaud H (1981) : Echocardiographic

assessment of left ventricular filling characteristics after mitral valve replacement with the St. Jude Medical prosthesis. Br Heart J; 45: 365-368.

30- **Eguaras M.G., Montero A., Morriones I., et al. (1987) :** Conservative operation for mitral stenosis with densely fibrosed or partially calcified valves: An eight-year evaluation. J Thorac Cardiovasc Surg; 93: 898-903.

31- **Inoue K, Owaki T, Nakamura T, et al (1984) :** Clinical applications of transvenous mitral commissurotomy by a new balloon catheter. J Thorac Cardiovasc Surg; 87 : 394-402.

32- **Bernard Y, Bassand JP, Schiele F, et al (1992) :** Percutaneous mitral valvotomy in non-optimal candidates. Eur Heart J; 12 (suppl B): 90-94.

33- **Shrivastava S, Mathur A, Dev V, Saxena A, Venugopal P, Kumar AS (1992) :** Comparison of immediate hemodynamic response to closed mitral commissurotomy, single-balloon, and double-balloon mitral valvuloplasty in rheumatic mitral stenosis. J Thorac Cardiovasc Surg; 104: 1264-1267.

34- **Farhat M B, Ayan M, Maatouk F, et al (1998) :** Percutaneous balloon versus surgical closed and open mitral commissurotomy: Seven-year follow-up results of a randomized trial. Circulation; 97: 245-250.

35- **Arora R, Nair M, Kalra GS, Nigam M, Khalilullah M (1993) :** Immediate and long-term results of balloon and surgical closed mitral valvotomy: A randomized comparative study. Am Heart J; 125: 1091-1094.

36- **Herrmann HC, Ramaswamy K, Isner JM, et al (1992) :** Factors influencing immediate results, complications, and short-term follow-up status after Inoue balloon mitral valvotomy: A North American multicenter study.

Am Heart J; 124: 160-166.

37- **El Makhlouf A., Friedli B., Oberhansli I., Rouge J.C., Faidutti B. (1997) :** Prothetic heart valve replacement in children: Results and follow-up of 273 patients. J Thorac Cardiovasc Surg; 93: 80-85.

38- **Victor S., Nayak V.M. (1995) :** Closed mitral valvotomy: TEE probe or tactile control. Ann Thorac Surg ; 59: 1622-1623.

39- **Spencer F.K. (1978) :** A plea for early open mitral commissurotomy. Am Heart J; 95: 668-670.

40- **Kay P.H., Belcher P., Dawkins K., Lennox S.C. (1983) :** Open mitral valvotomy: 14 yearsí experience. Br Heart J; 50: 4-7.

41- **Shafie M.Z., Hayat N., and Majid O.A (1985) :** Fate of tricuspid regurgitation after closed valvotomy for mitral stenosis. Chest; 88: 870-873.

42- **Khan S.R., Ahmed N.U. (1991) :** Report on the surgical experience with 1500 closed mitral commissurotomy at the national institute of cardiovascular diseases in Bangladesh. Saudi Heart J; 2: 41-44.

43- **Bedi H.S., Sharma V.K., Kohli V., Kasliwal R.R., Trehan N.: Closed mitral valvotomy (1994) :** No more blind procedure. Ann Thorac Surg; 58: 603-604.

44- **Commerford P.J., Hastie T., Beck W. (1982) :** Closed mitral valvotomy: Actuarial analysis of results in 654 patients over 12 years and analysis of preoperative predictors of long-term survival. Ann Thorac Surg; 33: 473-479.

45- **Grantham R.N., Daggett W.M., Cosimi A.B., et al. (1974) :** Transventricular mitral valvulotomy: Analysis of factors s influencing operative and late results. Circulation; 50 (Suppl 2): 200-207.

46- **Housman L.B., Bonchek L., Lambert L., Grunkemeier G., Starr A. (1977) :** Prognosis of patients after open mitral commissurotomy: Actuarial analysis of late results in 100 patients. J Thorac Cardiovasc Surg ; 73: 742-745.

47- **Montoya A., Mulet J., Pifarre R., Moran J.M., Sullivan H.J. (1979) :** The advantages of open mitral commissurotomy for mitral stenosis. Chest; 75: 131-135.

48- **Emmanuel R. (1963) :** Valvotomy in mitral stenosis with extreme pulmonary vascular resistence. Br Heart J; 25: 119-122.

49- **Kirklin J.W., Barratt-Boyes B.G. (1993) :** Mitral valve disease with or without tricuspid valve disease. In cardiac surgery. Churchill Livingstone, New York, Edinburgh, London, Melboume, Tokyo, pp 425-489.

50- **Braunwald E., Braunwald N.S., Ross J., Morrow A.G. (1965) :** Effects of mitral valve replacement on the pulmonary vascular dynamics of patients with pulmonary hypertension. N Engl J Med; 273: 509-512.

51- **Ellis L.B., Benson H., Harken D.E. (1968) :** The effects of age and other factors on the early and late results following closed mitral valvuloplasty. Am Heart J; 75:743-751.

العوامل المؤثرة فى عملية التوسيع المغلق للصمام الميترالى للمرضى فى مرحلة الطفولة والمراهقة خبره ربع قرن فى هذا المجال

د. أحمد قدرى عبد الله

قسم جراحة القلب والصدر بكلية الطب - جامعة المنصورة

أجريت عملية التوسيع المغلق للصمام الميترالى فى سلسلة متتابعه من ١٥٣ مريضاً مصابون بضيق شديد بالصمام الميترالى من تتراوح أعمارهم مابين ٨ر١٩ عاماً وذلك خلال فترة ٢٥ عاما تنتهى فى ديسمبر ١٩٩٩ بقسم جراحة القلب والصدر بكلية الطب جامعة المنصورة ثمانية وثمانون مريضاً (٥ر٥٧٪) كانو من الاناث و ٦٥ (٥ر٤٢٪) كانو ذكوراً كانت أهم الأعراض المصاحبه للمرض هى ضيق التنفس مع المجهود وخفقات القلب والكحة والام الصدر وهبوط القلب ونفث الدم. وكان معظم المرضى من الفئه الثالثه والرابعه حسب التصنيف الوظيفى لجمعية القلب الأمريكيه. تمت دراسة ١٣٣ مريض قبل إجراء الجراحه وبواسطة الموجات الصوتيه للقلب التى أظهرت أن فتحة الصمام الميترالى تتراوح بين ٦رسم٢ و ١ر١ سم٢ (متوسط ٧٦ر سم٢).

توفى ثلاثه مرضى (٢٪) بعد إجراء الجراحه وقبل مغادرة المستشفى كما أصيب عشرة مرضى (٥ر٦٪) بمضاعفات تم علاجها. وكان متوسط إتساع الصمام الميترالى بعد الجراحه ٦٧ر٢ سم٢ .

وقد تمت متابعه المرضى لفتره تراوحت بين عام واحد و ٢٤ عاما بمتوسط ٣ر١٠ عام. وقد ضمت أخر متابعه ١٢٢ مريضاً بعد إستبعاد ٣ وفيات بعد الجراحة مباشره و ٨ وفيات خلال المتابعه و ٩ حالات تطلبت إجراء جراحات أخرى بالصمام الميترالى و ١١ مريض فقدو الحفاظ على استمرارية المتابعه. وكان إتساع الصمام الميترالى عند اخر متابعه ١٢ر٢ سم٢. وكان معظم المرضى (٧ر٠٧٩٪) فى الدرجه الأولى والثانيه حسب التقييم الوظيفى لجمعية القلب الأمريكيه.

وقد وجد أن العوامل الموجوده فى المرضى قبل الجراحه والتى تؤثر فى البقاء على قيد الحياه بعد الجراحه هى الدرجة الوظيفيه حسب التصنيف الوظيفى لجمعيه القلب الأمريكيه ودرجه تقييم الصمام بالموجات الصوتيه وإحتياج المريض لأى تدخل جراحى أخر بالصمام الميترالى. أما العوامل التى تؤثر

بدرجه ذات قيمه فهى وجود إرتجاع بسيط بالصمام المبترالى وإرتفاع الضغط الرئوى وتذبذب الأذين والعمر والجنس .

ويستخلص من هذا البحث أن العمليه الجراحيه للتوسيع المغلق للصمام المبترالى مازالت مفيده فى بلادنا وأنها تؤدى إلى نتائج طيبه فى الحالات المختاره جيداً وخاصة وأن الاصابه بالحمى الروماتيزميه ومضاعفاتها مازالت منتشره بين الأطفال والمراهقين. وللحصول على نتائة جيده للعمليه يجب مراعاه العوامل السابق ذكرها والتى تؤثر على البقاء على قيد الحياه بعد الجراحه