

An Evaluation of Mitral Valvotomy

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MITRAL VALVOTOMY is now a standard procedure and in recent years many series of cases have been reported. The results of 121 cases from this hospital have been recorded (Pantridge et al., 1953). 454 patients with mitral stenosis, all of whom were assessed by one of us (J. F. P.), have now had mitral valvotomy. The results of the initial 400 operations have been subjected to critical analysis are presented here. The operations were performed by Mr. T. B. Smiley, Mr. J. A. W. Bingham and Mr. H. M. Stevenson.

Of the patients 305 (78.2 per cent.) were female and 85 (21.8 per cent.) male. (Table 1). A few patients had more than one operation. The figures relate to all operations and include those where no effective commissurotomy was possible.

TABLE 1.

AGE AND SEX DISTRIBUTION.

AGE				FEMALE		MALE
10-19	-	-	-	10	...	4
20-29	-	-	-	73	...	23
30-39	-	-	-	127	...	30
40-49	-	-	-	84	...	23
50-59	-	-	-	11	...	5
TOTALS	-	-	-	305	...	85

The average age at operation was 35.4 years. The oldest patient was aged 58 and the youngest 13. Only 40 per cent. of patients referred by their practitioners or by other specialists for consideration of mitral valvotomy proved suitable for operation.

ASSESSMENT OF DISABILITY.

In the clinical history special attention was paid to the following:—history of rheumatic activity; exercise tolerance; orthopnœa; hæmoptysis; “winter bronchitis”; arrhythmias; embolic episodes; history of congestive failure; the effect of pregnancies.

For the purpose of this study the patients were graded according to the severity of their symptoms:—grade 0, no disability; grades 1, 2 and 3, slight, moderate and severe disability; grade 4, complete incapacity from congestive

heart failure or intractable pulmonary congestion and oedema. Such a classification, based mainly on subjective complaints, has its limitations. Patients vary widely in their reaction to cardiac disease; in some grave disability is borne with stoicism, while in others the symptoms are disproportionately great due to a superadded neurosis. Where our assessment of disability, based on objective clinical, laboratory and operative findings and on an appraisal of the patient's attitude to his disease, conflicted with the severity of subjective complaints, we did not hesitate to alter pre-operative or post-operative grading accordingly.

Difficulties existed in grading patients whose presenting symptoms were partly caused by chronic respiratory disease, or whose limitation of activity was partly due to the residual effects of embolic episodes, and also in grading those patients who developed rapid though reversible deterioration, e.g., pulmonary oedema during pregnancy and cardiac failure from the onset of atrial fibrillation. In the latter instance the patient was graded according to his status following control of the arrhythmia.

In addition to physical examination, full laboratory investigation was performed in all cases, including electrocardiography, fluoroscopy, a P.A. chest film, E.S.R., and leukocyte count. In the early stages cardiac catheterisation was frequently required, and was performed in 71.3 per cent. of cases from 1950 to 1953. Increasing experience has led to a substantial decrease in the number of cases requiring catheter studies and since 1954 the figure is 24.7 per cent. Cardiac catheterisation is still necessary for the assessment of those patients whose symptoms appear disproportionate to the clinical and laboratory signs of severity and in evaluating the importance of associated respiratory disease (asthma, emphysema, pulmonary fibrosis) in the production of dyspnoea.

The majority of cases in this series were pre-operatively grade III or IV. None were better than grade II. There was no deliberate selection of good risk cases. When the stenosis was thought to be tight, valvotomy was advocated despite the risk involved. Indeed in a few cases the patient was virtually moribund at the time of operation.

Those patients with signs of pure mitral stenosis but without sufficient incapacity to warrant valvotomy have been reviewed at regular intervals in an endeavour to select the optimum time for surgery. There is much to be gained by adopting conservative measures in such cases. In some, especially in the older age groups, the disease is slowly progressive or static and it may be possible to postpone operating indefinitely. Further, as experience increases, the technique of mitral valvotomy is improving and the mortality, already at a low level, declining.

INITIAL RESULTS OF VALVOTOMY.

Criteria have been used similar to those of Baker, Brock and Campbell (1955). An improvement of 3 grades or more was regarded as excellent; 2 grades, good; 1 grade, improved. The remainder either were not improved (0 grade), some being worse, or died at operation or in the early post-operative period (-1 grade). It is difficult to exclude psychological factors in determining the amount of benefit from operation. Attention was therefore also paid to objective changes, including

alterations in electrocardiographic and radiographic appearances, and to improvement in pulmonary vascular pressures determined by post-operative cardiac catheterisation. In some cases the occurrence of persistent post-operative fibrillation or of post-operative embolism unfavourably influenced the grading.

The initial assessment was made 6 months after operation (Table 2).

TABLE 2.
INITIAL ASSESSMENT OF RESULTS.
(390 patients).

Grade of improvement	Number of patients	Percentage of total
(3) Excellent	110	28.2
(2) Good	128	32.8
(1) Improved	75	19.2
(0) No Improvement	67	17.2
(-1) Died (a) at operation	3	0.8
(b) immediate post-operative phase	7	1.8
	10	2.6

Average grade of improvement for entire group=1.67.

It is seen that at this time the result was good or excellent in 61 per cent. and some improvement was obtained in 80 per cent. The average improvement was by 1.67 grades. Since criteria for selection of cases and for assessing improvement vary in different centres, and since the period after operation at which the results are analysed also varies widely, no direct comparison can be made with other series. However, our figures are very similar to those of other large series, e.g., Janton, Glover and O'Neill (1952)—78 per cent. improved; Wood (1954)—85 per cent. improved; Kirklín and Ellis (1955)—78 per cent. improved.

The operative mortality has been low. Five deaths occurred at the first 50 operations. Since then there have been 5 deaths at 350 operations (1.4 per cent.). Between June 1952 and August 1954, 155 operations were performed without a death. The mortality for the entire series was 2.5 per cent. of 400 operations or 2.6 per cent. of 390 patients. The 10 deaths were due to, cerebral embolism (3); cardiac arrest at operation (2); severe hæmorrhage at operation (2); post-operative hypotension, bilateral adrenal hæmorrhage (2); hæmorrhage following post-operative iliac embolectomy (1).

The more important factors influencing the initial results were the technical success of the valvotomy, calcification of the mitral valve, and associated mitral incompetence. Other factors included embolism, cardiac arrhythmias, pre-operative congestive heart failure, complicating tricuspid lesions, pregnancy, and the age of the patient.

Technical Success of the Valvotomy.

The surgeon's estimate of technical success at valvotomy is a reliable guide to the patient's subsequent clinical state. This is clear from Table 3, relating to

234 operations, in which the degree of splitting of the commissures is related to the patient's grade of improvement. Good or excellent results were obtained in 91 per cent. of cases when full splitting of both commissures was possible, but in only 1 of 33 cases where little or no split was achieved.

TABLE 3.
INITIAL RESULTS IN RELATION TO THE EXTENT OF VALVOTOMY.

Grade of improvement	EXTENT OF VALVOTOMY				Total
	Poor or none	Fair	Good	Full	
Excellent	0	4	19	47	70
Good	1	24	26	22	73
Improved	6	22	7	5	40
No Improvement	26	18	5	2	51
TOTAL	33	68	57	76	234

Calcification of the Mitral Valve.

Moderate or gross calcification was noted at operation in 68 patients (17.4 per cent). In about the same number minor degrees of calcification were detected, insufficient to cause any additional functional disturbance or operative hazard; these cases are not considered here. The site of the deposit varied. In some cases there was diffuse calcification of one or both cusps; in others a mass of calcium occupied one or both commissures; occasionally calcification extended to involve the posterior wall of the left atrium. Twenty-nine patients with calcified valves had loud mitral systolic murmurs, and incompetence was found at operation in 16 (53.1 per cent.). In contrast, only 2 of 14 (14.3 per cent.) with soft localised systolic murmurs, and 2 of 25 (8.0 per cent.) with no systolic murmur, had significant incompetence. The high overall incidence of incompetence (29.4 per cent.) appears to be due to the calcified valve's lack of mobility. An opening snap was heard in only 31.3 per cent. of patients with calcified valves, compared with 70 per cent. in the entire series. The average age of men with calcified valves was 38.7 and of women 33.3 years. Calcification was twice as common in men as in women.

In 8 cases with extensive calcification in both commissures no valvotomy was possible; forcible splitting was avoided owing to the dangers of causing mitral incompetence and releasing calcific emboli. A limited valvotomy was performed in 33 cases in most of which calcification involved one commissure only, and a more complete operation was possible in the remaining 27. The results, assessed six months after valvotomy were, excellent, 14 (20.5 per cent.); good, 16 (23.5 per cent.); improved, 20 (29.5 per cent.); no improvement, 16 (23.5 per cent.); deaths, 2 (3.0 per cent.). The average grade of improvement was 1.35. Neither of the 2 deaths was directly attributable to the presence of calcium. Post-operative embolism occurred in 2 patients; in one of these, a young man with sinus rhythm and an auricle free from clot, calcium embolism was suspected.

While the presence of gross calcification is usually an unfavourable sign, the following case indicates that it is not invariably so.

A man aged 38 suffered from increasing dyspnoea for fifteen years. He had had several episodes of complete heart block. On admission he was totally incapacitated from pulmonary congestion. Electrocardiography showed second degree A.V. block and fluoroscopy showed gross calcification of the mitral valve. Mitral valvotomy was performed by Mr. Bingham in January, 1955, a good split being obtained despite massive calcium deposits in both cusps of the valve. No mitral reflux was detected following splitting of the commissures. During operation numerous rhythm disturbances occurred including complete heart block. Transient right ventricular defeat occurred after operation. However, the patient is now asymptomatic and A.V. conduction is normal.

Mitral Incompetence.

This was suspected when the following signs were present; a loud mitral systolic murmur conducted to the axilla, a soft first sound, the third heart sound of rapid ventricular filling, and an enlarged left ventricle. Localised systolic murmurs of grade 1 or 2 intensity were probably as common in patents with pure stenosis as in those with minor degrees of incompetence. In individual cases, it may be difficult to decide whether significant incompetence is present, and every large series contains some cases where at operation an unsuspected degree was found.

In the present series a regurgitant jet was found by the surgeon in 49 cases; 20 of these (40.8 per cent.) had associated calcification. The incompetence was minimal in 30; it was increased by the valvotomy in only 3 of these, and the average grade of improvement (1.47) was only slightly inferior to that of the whole series. Moderate incompetence was found in 13; there were 2 operative deaths, in several cases the incompetence was increased, and only 5 patients were improved. Unexpected gross incompetence was found in 6 (1.5 per cent.) and none of these were improved.

The effects of incompetence produced at operation are discussed later.

Embolism.

The incidence of post-operative pulmonary embolism is difficult to determine since other common pulmonary complications such as pneumonia, small effusions and post-operative collapse may have similar clinical and radiographic features. In our experience, however, pulmonary infarcts, whether due to embolism or venous thrombosis were much more common in patients with fibrillation. The remainder of this section relates to systemic embolism, regarding which more precise details are available.

There was a clear-cut history of pre-operative systemic embolism in 20 patients (5.1 per cent. of the series). The site was cerebral in 16, iliofemoral in 6, and abdominal in 3, several of the patients having had multiple episodes. Embolism was more frequent in patients with fibrillation (7.8 per cent.) than with those in sinus rhythm (3.7 per cent.).

Systemic emboli were less common at operation and immediately afterwards than in some other reported series, occurring in only 17 patients (4.4 per cent.). It is of interest that none of the 20 patients with definite pre-operative emboli had a recurrence at or following operation. This may be partly due to the great care with which the atrium was flushed free of clot before splitting of the valve was undertaken. Our experience in this respect parallels that of Goodwin et al. (1955), who concluded that "there is certainly no reason to think that the risk of embolism during valvotomy is increased if the patient has previously suffered from embolic phenomena." On the other hand, Bailey and Bolton (1956) noted post-operative emboli in 6 of 37 patients with a history of both cerebral and peripheral emboli and state that a patient with a history of arterial emboli prior to surgery is a somewhat greater surgical risk than one with no such history. The post-operative emboli were more liable to occur in patients with fibrillation (10 cases) than in those with sinus rhythm (7 cases); in 2 of the former the embolism was related in time to the onset of paroxysmal fibrillation. Cerebral embolism occurred 10 times, with 3 deaths, iliofemoral 5 times and abdominal twice. Iliofemoral embolectomy was performed on 4 occasions with 3 successes and 1 death (retroperitoneal hæmorrhage from the suture line); the fifth case died from a simultaneous cerebral embolus.

Cardiac Arrhythmia.

Ninety-nine patients (25 per cent.) showed pre-operative atrial fibrillation. The incidence of pre-operative arrhythmia was higher in the older age groups (Table 4). It was also noted that the larger the left atrium the higher the incidence of atrial fibrillation (Table 5).

Valvotomy caused auricular fibrillation in 50 patients previously in sinus rhythm. Nine of these 50 patients spontaneously reverted to sinus rhythm within a few hours or days. Reversion with quinidine was obtained in 26. Thus 15 patients

TABLE 4.
INCIDENCE OF FIBRILLATION IN THE AGE GROUPS.

AGE GROUP	PER CENT. WITH FIBRILLATION
10-19	14.3
20-29	10.5
30-39	21.5
40-49	44.0
50-59	81.3

TABLE 5.
RELATIONSHIP OF LEFT ATRIAL SIZE TO THE INCIDENCE OF FIBRILLATION.

L.A. SIZE	PER CENT. WITH FIBRILLATION
+	9.5
++	15.5
+++	41.5
++++	85.5

developed permanent fibrillation as a result of mitral valvotomy. No patient with established atrial fibrillation regained sinus rhythm after valvotomy, and no attempt was made to achieve this.

Congestive Heart Failure.

Forty-two patients had an indubitable history of one or more episodes of congestive heart failure in the past, or were actually in congestive failure when admitted for operation. The dominant rhythm was fibrillation in thirty-nine. The occasional spectacular result, exemplified by the following case indicates that operation may be worthwhile, even in patients with intractable congestive cardiac failure.

A woman aged 43 years became increasingly breathless over a period of two years; for six months she had been totally incapacitated with congestive heart failure. On admission to hospital she was dyspnoëic and cyanosed, the jugular venous pressure raised 10 cm., the liver tender and enlarged, the ankles swollen, and the lung fields moist. The signs of failure were unaffected by a rigid medical regime. Catheterisation showed a mean pulmonary artery pressure of 65 mm. Hg. At operation the mitral orifice was extremely small and slit-like, with some calcification; a satisfactory finger fracture valvotomy was achieved. All signs of cardiac failure disappeared after operation. The mean pulmonary artery pressure fell to 27 mm. Hg. Five years later she works in a shop, does all her housework, and has no dyspnoëa on ordinary exertion.

Complicating Tricuspid Lesions.

Tricuspid insufficiency was detected by Bailey and Bolton (1956) in 17 per cent. of cases during routine exploration of the tricuspid valve at mitral valvotomy. In many cases the condition is in part functional incompetence and improvement can be anticipated following mitral valvotomy. Tricuspid stenosis is a more important lesion, since it is amenable to surgical correction. The diagnosis may be missed since some of the signs are masked by those of the invariably associated mitral lesion. Tricuspid stenosis was found as a complication in three cases (Pantridge and Marshall, 1957) and two have had tricuspid valvotomy with considerable benefit.

Pregnancy.

It has been stated that the risk of mitral valvotomy is greater during pregnancy (Burwell and Metcalfe, 1954). However, eighteen cases in this series were operated on during pregnancy (Marshall and Pantridge, 1957). In each case the operation was performed either as an emergency measure or following failure of strict medical therapy. There was no maternal death and only one fœtus was lost from premature labour two days after valvotomy.

The age of the patient.

Operation was delayed when possible in patients under 20 years of age because of the likelihood of subsequent attacks of rheumatic activity with possible re-stenosis of the mitral valve. However, operation has been performed in fourteen such patients because of severe pulmonary congestion. The youngest patient was

aged 13. Although there was evidence of florid rheumatic activity in seven of twelve biopsies, rheumatic manifestations occurred post-operatively in only one case. The initial results in this group have been very gratifying, immediate improvement being excellent or good in all. One patient, however, deteriorated nine months after operation and died two years later; at autopsy there was active rheumatic carditis and re-stenosis of the mitral valve. The long-term outlook in the remaining cases is uncertain, since seven of the operations were performed in the last year and the longest follow-up is 2½ years; however, the improvement has been maintained to date in all thirteen.

It has often been stated that valvotomy is rarely, if ever, indicated in elderly patients. The reasons given are that the anatomical lesions are of longer standing and more complex than in younger patients, the operative risk is greater, valvotomy is more likely to be inadequate, and that the elderly can tolerate a considerable reduction in their activities. Nevertheless recent published experience favours operation for otherwise suitable cases, irrespective of age. d'Allaines, Dubost and Blondeau (1955) operated on 14 cases over 50 years, with 2 deaths, and concluded that neither the morbidity nor the mortality was high enough to constitute an argument against valvotomy. In our series 16 patients were aged between 50 and 58. The results were good or excellent in 8, 4 were improved, 3 showed no improvement, and 1 died from cerebral embolism, the average grade of improvement was 1.38. Although the results are less good than those of the whole series they are satisfactory enough to indicate that valvotomy may be considered in patients who have reached the sixth decade.

LONG TERM RESULTS OF MITRAL VALVOTOMY.

Mitral valvotomy is still a relatively new procedure. Thus, although the immediate results of operation are well documented, little is known of the long-term effects. Of 131 of our patients operated on three or more years ago, 11 have been lost from follow-up, in most cases because of emigration. The post-operative assessment at six months, one year, two years, and three years for the remaining 120 patients is shown in Table 6.

TABLE 6.
THREE-YEAR FOLLOW-UP OF 120 CASES.

GRADE	NUMBER AND PER CENT. OF CASES IN EACH GRADE							
	6 months		1 year		2 years		3 years	
	No.	%	No.	%	No.	%	No.	%
Excellent	- 37	(31)	... 37	(31)	... 36	(30)	... 35	(29)
Good (+2)	- 31	(26)	... 29	(24)	... 25	(21)	... 24	(20)
Improved (+1)	- 23	(19)	... 22	(18)	... 17	(14)	... 14	(12)
No improvement (0)	22	(18)	... 23	(19)	... 30	(25)	... 35	(29)
Dead (-1)	- 7*	(6)	... 9	(8)	... 12	(10)	... 12	(10)
Average grade of improvement	- 1.58	...	1.52	...	1.36	...	1.29	

*Five were operative deaths; the others died two and four months after operation.

The average grade of improvement of these 120 at the initial assessment (1.58) was slightly inferior to the figure for the whole series; the difference is explained by the higher incidence of operative deaths (5) among the early cases. The remaining cases of the group can therefore be regarded as a representative sample of the whole series.

Between six and twelve months after operation one patient with a good result died suddenly from cerebral embolism and another who was not improved by operation died in congestive heart failure. One patient with a good result and one regarded as improved reverted to their pre-operative state. At the end of one year the average grade of improvement was 1.52.

The table indicates that a significant number of patients deteriorated during the second and third years after operation. Study of individual cases has shown that several factors are responsible for such deterioration. In our experience the more important of these are the development of free aortic incompetence, the production of traumatic incompetence at valvotomy, and myocardial failure. Other factors which may influence the long term as well as the immediate results include active infection and re-stenosis of the mitral valve, change of rhythm, systemic embolism and associated medical conditions.

Aortic Incompetence.

Advanced degrees of aortic incompetence contraindicate mitral valvotomy. Minor degrees of this lesion are difficult to detect in the presence of tight mitral stenosis with high pulmonary vascular resistance, since the early diastolic murmur may be confused with the Graham-Steel murmur of pulmonary incompetence. If mitral stenosis is mandatory on other grounds, a degree of aortic valvular involvement insufficient to alter the pulse pressure is not usually regarded as a contraindication to operation.

Successful mitral valvotomy leads to improved left ventricular filling and therefore to increase in left ventricular stroke volume. An aortic lesion considered insignificant before operation may therefore become highly significant following mitral commissurotomy.

In this series no case complicated by more than minimal aortic incompetence was submitted to mitral valvotomy. Twenty-one patients, however, had basal murmurs indicative of mild aortic valve involvement; in three there was a relatively localised systolic murmur, in six a blowing early diastolic murmur audible in the aortic area and conducted down the left border of the sternum, and in twelve a double aortic murmur. After mitral valvotomy the murmurs were more conspicuous and a double murmur was heard where previously it had been confined either to systole or to diastole. In addition, aortic diastolic murmurs were detected in a further eight patients in whom no basal murmur was heard pre-operatively, making a total of twenty-nine patients with complicating aortic valvular involvement. The results in this group at the first assessment were comparable with those of the whole series. Fifty-two per cent. were good or excellent, a further thirty-four per cent. improved, and fourteen per cent. unaltered; there were no deaths. The average grade of improvement was 1.55.

A most important finding, however, is that patients with complicating aortic lesions who have been followed up for two or more years have in many cases lost much of their initial symptomatic improvement. In some there have been enlargement of the left ventricle and development of more obvious peripheral signs of free aortic incompetence. In Table 7 the initial results are compared with those two to six years (average 3.5 years) after operation in a group of sixteen patients.

TABLE 7.
INITIAL AND LONG TERM RESULTS IN CASES WITH COMPLICATING AORTIC INCOMPETENCE.

	Excellent	Good	Improved	Not improved	Dead
Initial result	4	5	5	2	0
Result after 2-6 years	2	3	6	4	1

It will be seen that during this period the average grade of improvement fell from 1.81 to 1.06, a much greater rate of deterioration than in the series as a whole. It is, of course, possible that in some of the patients other factors, difficult to evaluate, such as rheumatic myocardial damage, may have played a contributory part in the deterioration.

Traumatic Mitral Incompetence.

The development of undoubted traumatic incompetence at valvotomy was noted by the surgeon in eleven patients who previously had no regurgitant jet. The initial result in this small group was only fair (average improvement 1.18 grades). Six of these patients have been observed for three years or more after valvotomy. Of the four who initially benefited from operation three subsequently deteriorated. Two of the five patients followed up for less than three years have also fallen by one grade each.

We therefore regard incompetence produced at operation as a very unfavourable prognostic sign. Our experience is in marked contrast with that of Belcher (1956) who states that the creation of incompetence at operation has little influence on the results of valvotomy.

Active Infection and Re-stenosis of the Mitral Valve.

Although bacterial endocarditis and florid rheumatic activity are easily recognised and demand postponement of mitral valvotomy, it is difficult to exclude the

TABLE 8.
RELATIONSHIP BETWEEN THE E.S.R. AND THE PRESENCE OF ACTIVE RHEUMATIC LESIONS IN THE LEFT AURICULAR BIOPSY.

E.S.R. (Westergran)	No of Patients	Rheumatic Activity	
		Present	Absent
0-14	190	23%	77%
15-29	20	35%	65%
30 +	10	30%	70%
TOTAL	220	24.3%	75.7%

presence of low-grade rheumatism. The E.S.R. is a poor index of rheumatic activity as judged by the left auricular biopsy (Table 8) and the leukocyte count, anti-streptolysin titre and electrocardiogram are no more helpful.

The proportion of patients with rheumatic activity in the biopsy falls gradually with increasing age, but in this series differences are relatively slight (Table 9).

TABLE 9.

RELATIONSHIP BETWEEN AGE AND THE PRESENCE OF ACTIVE RHEUMATIC LESIONS IN THE LEFT AURICULAR BIOPSY.

Age	No. of Patients	Rheumatic Activity	
		Present	Absent
10-29	62	37%	63%
30-39	93	26%	74%
40-59	65	23%	77%

This contrasts with the findings of McNeely, Ellis and Harken (1953); 89 per cent. with activity at 20 to 25 years, and 14 per cent. at 45 to 50 years. Histological evidence of rheumatic activity is, however, much less common in cases with fibrillation (8 per cent.) than with those in sinus rhythm (34 per cent.).

McKeown (1953) who studied ninety-two cases of rheumatic heart disease coming to autopsy, found that all cases with active lesions in the auricle had also rheumatic activity in the left ventricle. It is therefore surprising that the presence of such smouldering activity does not appear to influence the results of mitral valvotomy. Post-operative febrile reactions with arthralgia and myalgia ("post-commissurotomy syndrome") were no more common than in patients with normal biopsies. Further, analysis of the patients who deteriorated between the first and third years after valvotomy does not suggest that this deterioration is more likely to occur in those with histological evidence of rheumatic activity (Table 10). Of the group of 120 patients, followed for 3 years, 91 were graded as excellent, good or improved at the end of 6 months (Table 6). Left auricular biopsies were available for 60 of these. Of the 15 patients who deteriorated only 4 (26.7 per cent.) had histological evidence of rheumatic activity. On the other hand 13 of 45 patients (28.9 per cent.) with fully maintained improvement had rheumatic activity. These figures show that the auricular biopsy is of little value as a prognostic index.

TABLE 10.

RELATION BETWEEN LONG-TERM IMPROVEMENT AND THE PRESENCE OF RHEUMATIC ACTIVITY.

	Rheumatic Activity in Biopsy	
	Present	Absent
Maintained initial improvement	13	32
Deteriorated	4	11

Re-stenosis has occurred in at least three patients in the series, at periods between one and four years after operation. It is of interest that in all three the auricular biopsy taken at the first operation showed no evidence of rheumatic activity.

Associated Medical Disorders.

Several patients have deteriorated despite technically satisfactory operations, due to progressive chronic respiratory disorders. Others have gained weight excessively and developed restriction of activity from obesity.

An attempt was made (Table 11) to evaluate the relative importance of the factors which may lead to deterioration after initial success in the group of patients followed up for three years. In some patients two or more factors were responsible. It is of interest that only two patients regarded initially as excellent results deteriorated during the three year follow-up period.

TABLE 11.
FACTORS CONTRIBUTING TO THE DETERIORATION OF 18 PATIENTS BETWEEN
1 AND 3 YEARS AFTER MITRAL VALVOTOMY.

Factor	No. of Cases
Aortic incompetence	6
Mitral incompetence (traumatic)	3
Re-stenosis of mitral valve (confirmed at operation)	3
Onset of atrial fibrillation	3
Congestive failure (probably myocardial origin)	3 (1 death)
Bronchitis and emphysema	2
Obesity	1
Cerebral embolism	1 death
Unknown	1 death

SUBSEQUENT FOLLOW-UP.

Thirty-nine patients have been followed up for a fourth year. Of these, 12 of 13 remained in the excellent grade and 1 fell to good, 3 of 10 good results fell to improved, and 1 of 4 improved patients reverted to the condition present before operation. There were no deaths.

During the fifth year, 2 patients dropped one grade each, the remaining 14 maintained their status (5 excellent, 2 good, 2 improved and 5 with no improvement).

From our experience it is clear that some guidance as to prognosis may be obtained from the initial post-operative results. When the operation is technically successful and the patient's condition restored to normal or approaching normal, deterioration is unlikely to occur for at least 5 years. Thus 87 per cent. of these patients classified as good or excellent 6 months after operation retained these grades at the end of 3 years. When, however, the result at 6 months was improved, only 42 per cent. were still improved 3 years later.

SUMMARY AND CONCLUSION.

The results of four hundred operations for mitral stenosis have been reviewed. Particular attention has been directed to factors influencing the result.

As might be expected the immediate and late results were greatly influenced by the technical success of the operation. When the immediate result was regarded as good or excellent few cases subsequently deteriorated. Deterioration was, however, frequent in those cases classified as "improved" at the initial post-operative assessment.

Associated aortic valvular lesions and mitral incompetence, particularly traumatic mitral incompetence were important factors resulting in failure to maintain initial benefit. Evidence of rheumatic activity in the auricular biopsy did not significantly affect either the immediate or long-term result.

We are indebted to Dr. R. J. Weir for his help in the post-operative care and post-operative assessment of many of the earlier cases.

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