Status of Fifty Patients Four and a Half to Seven Years after Mitral Commissurotomy

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The first 50 consecutive patients undergoing mitral commissurotomy approximately 4½ to 7 years ago have been subjected to a detailed analysis in an attempt to ascertain their present subjective and objective status. Operative mortality was 6 per cent and late mortality was 12 per cent. Forty-one patients (82 per cent) are living and have formed the basis for conclusions. After a comprehensive study of each living patient, including an appraisal of the patient's subjectively reported clinical state, as well as a correlation of the clinical findings, electrocardiographic tracings, teleroentgenograms, and catheterization data, we conclude that 29 patients (71 per cent of those living or 58 per cent of the original 50) are in better condition and living a more nearly normal life than they were prior to surgery.

MITRAL commissurotomy has now become a standard surgical procedure and in recent years a number of reports of the early results have appeared in the literature.1-8 This communication presents the clinical, operative, and laboratory findings of 50 consecutive patients in whom mitral commissurotomy was performed between January 1949 and March 1951 and who have been followed for 4½ to 7 years. More than average difficulty was encountered in obtaining all the information for this analysis because these patients live in many parts of the country. Nevertheless, over half of these patients have been examined personally (O.H.J. and R.P.G.), and detailed information including electrocardiograms and teleroentgenograms have been obtained from the patients and attending physicians in the remainder. All patients reported in this series have been operated upon by one surgeon (R.P.G.).

Case Material

Analysis of Patients

Fifty-one patients were subjected to mitral commissurotomy. One patient was re-evaluated 2 years postoperatively at which time she was asymptomatic without medication; however, at the present time her whereabouts is unknown, and she has not been included in the series. Of the remaining 50, 36 were women, and 14 were men. The average age at the time of surgery was 34 years, the youngest being 17 and the oldest being 47.

Status Prior to Admission. Twenty (40 per cent) patients presented a definite history of rheumatic infection, and each of the 50 patients complained of functional incapacity to some degree. There was a history of gross hemoptysis in 23 patients (46 per cent), and 27 patients (54 per cent) had suffered one or more episodes of congestive heart failure. Six (12 per cent) patients had episodes of arterial embolism from which a reasonable recovery had been made.

Admission Findings. When admitted to the hospital for evaluation for surgery, 13 (26 per cent) of the 50 patients were in chronic congestive heart failure and 19 (38 per cent) were in permanent atrial fibrillation.

Preoperative Classification of Patients. None of the patients was placed in class I according to the criteria of the New York Heart Association7 (table 1). Five patients (10 per cent) were

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placed in class II, another 36 (72 per cent) were placed in class III, and the remaining 9 (18 per cent) were placed in class IV. Each of these patients was subjected to the standard mitral commissurotomy as described in previous publications.4,9

Mortality. Three patients died within the first postoperative month and represent an operative mortality of 6 per cent. The first died from acute cardiac failure. Postmortem examination revealed a moderately calcified valve of very limited pliability; the previous mitral insufficiency had been increased by the surgery, and a moderately severe but previously undiagnosed aortic stenosis was noted. The second patient died 4 weeks after surgery, the postoperative course being steadily downhill. Postmortem examination revealed that the finger pressure commissurotomy had produced excessive mitral insufficiency, due to an inadvertent tear of the posterior mitral cusp along its lateral attachment. In addition, the superior one third of the left atrial lumen was completely obliterated by a lemon-sized thrombus. The third patient died 2 hours after surgery, apparently due to operative and anesthetic shock, for postmortem examination revealed that a satisfactory commissurotomy had been performed; the only other finding was minimal aortic valve disease.

Six additional patients died, 1 at 6 weeks, 1 at 7 months, 2 at 2½ years, and 2 at 3 years following commissurotomy. These patients had extensively calcified valves whose leaflets were thickened, fibroosed, and nonpliable. Three patients were in class IV and their deaths are attributable to irreversible cardiopulmonary, hepatic, and renal disease at the time of surgery. Three patients were in class III; in 1 of these a pre-existing mitral insufficiency was aggravated by surgery, and the patient went steadily downhill. The remaining 2 patients had inoperable valves that precluded successful commissurotomy.

Thus, there was an operative mortality of 6 per cent (3 patients) and a late mortality within the first 3 postoperative years of 12 per cent (6 patients). Forty-one patients are living at the present time, 4½ to 7 years after surgery, and the data on these patients comprise the remainder of this presentation.

Present Classification of 41 Living Patients. Table 1 shows the classifications. The 5 patients originally placed in class II have lived a relatively normal life since surgery. Two of these patients are asymptomatic and can be placed in class I, and the 3 others have been left in class II, since their fatigue level occasionally is lower than normal.

Thirty of the 36 patients originally placed in class III are living. Eleven of these are asymptomatic and are in class I. Eleven others have been placed in class II, and 7 remain in class III despite functional improvement. The remaining patient in this group has become more incapacitated and is now in class IV; he is the only patient with progressive incapacity after surgery.

Six of the 9 patients originally placed in class IV are living. One is completely asymptomatic and has been placed in class I, 4 are in class II, and 1 remains in class IV.

The Patient’s Classification of His Own Present Status. On close interrogation of the 41 living patients, with confirmation by their family physicians, 20 (40 per cent of the original 50 cases) consider themselves to be in excellent health. They deny symptoms during normal activity, although a few admit to some limitations on exertion beyond their normal routine. These patients engage in exercises such as golf, dancing, swimming, bicycle riding, and bowling. Eleven of these 20 patients take a normal diet and no medication, and 9 take digitalis sporadically in small dosage. Three of these patients were originally placed in class II, 13 in class III, and 4 in class IV.
Sixteen (32 per cent of the original 50 cases) consider themselves very definitely improved over their preoperative state. These patients think that they are living a relatively normal life within their own personal limitations. Thirteen take a daily maintenance dose of digitalis, 3 take no medication, a few remain on a low-salt diet, and 4 use an oral diuretic occasionally. Preoperatively 2 of these patients were placed in class II, 13 in class III, and 1 in class IV.

Five of the 41 living patients (10 per cent of the original 50) regard themselves as unimproved, although each experienced considerable improvement during the first 2 to 4 years postoperatively. Four of these patients were in class III and 1 in class IV prior to surgery.

In comparing our own and the patients' classification of the present status 29 of the 41 living patients (58 per cent of the 50 subjected to surgery) are improved according to us, and 36 (72 per cent of the original 50) are improved according to the patient.

Analysis of Murmurs

Twenty-five of the 41 living patients had "pure" mitral stenosis on the basis of auscultation. Seven of these patients now have no mitral diastolic murmur, and 3 of these 7 have no murmurs at all in any of the valve areas. Three others have a soft, blowing, mitral systolic murmur indicative of some insufficiency, and 1 has an additional soft diastolic murmur along the left sternal border suggestive of aortic insufficiency. Eighteen of the 25 still have a mitral diastolic murmur, and 10 of them have a new mitral systolic murmur.

Ten of the 41 living patients had a systolic component to their predominant mitral diastolic murmurs before operation. Six of them still have their diastolic and systolic murmurs, and 3 others have a systolic murmur only. One patient has no detectable murmurs at this time.

Four of the 41 living patients had a diastolic murmur along the left sternal border suggestive of aortic insufficiency in addition to their mitral diastolic murmurs. In the absence of other clinical signs the aortic insufficiency was thought to be dynamic. Each of these 4 patients still has these murmurs. Two of them have obtained excellent functional results, 1 is markedly improved, and the fourth remains unimproved.

One of the 41 living patients had systolic and diastolic mitral murmurs and an aortic diastolic murmur, and another patient had double murmurs at both areas; these murmurs are still present although the patients are improved functionally.

In conclusion, only 4 of these 41 living patients have no murmurs at the present time. Eleven have no mitral diastolic murmur, and 14 have mitral systolic murmurs of varying intensity that were not present preoperatively.

From a functional standpoint the 25 patients with diagnoses of "pure" mitral stenosis have had the best results. Fourteen are now excellent, 9 are improved, and 2 are unimproved. This improvement is better than in the 10 patients who had predominant mitral stenosis with an associated insufficiency. Of these 10, 4 obtained an excellent result, 4 were improved, and 2 were unimproved.

Electrocardiographic Changes

Rhythm. Twenty-nine patients had normal sinus rhythm at the time of surgery. Atrial fibrillation frequently appeared in this group during the early postoperative course, usually within the first 4 days. In 9 patients, fibrillation persisted despite intensive quinidine therapy during the hospital stay or on occasion thereafter. All of these patients, however, have remained improved or in excellent functional state to the present time.

Twelve patients had atrial fibrillation at the time of surgery, and it persisted. Of these 12, 5 are unimproved, and 7 are improved to excellent.

The P Wave. The P waves generally did not change in duration or configuration. Occasionally, high voltage of the P wave, usually noted in cases with marked pulmonary artery hypertension, was reduced in amplitude after an adequate mitral commissurotomy.

The QRS Complex. Ten patients had normal QRS complexes preoperatively. There were no changes after commissurotomy except for slight counterclockwise rotation around the longitudinal axis.

The remaining 31 patients had preoperative
electrocardiograms indicative of moderate to marked right ventricular hypertrophy. This pattern showed a variety of changes postoperatively. It receded in 11 and disappeared in 7. In 13 patients the pattern of right ventricular hypertrophy did not change, except for development of combined hypertrophy in 1. In this individual a dynamic mitral insufficiency is now present.

Roentgenographic Findings. It is frequently rather difficult to evaluate the observed changes in cardiac size because of the many postoperative variables such as pleural reaction, pericardial reaction and adhesions, changes in weight, and the variations in x-ray technic. Despite these difficulties the following statements can be made with confidence.

In 10 patients (24 per cent) the over-all heart size was smaller postoperatively as a result of diminution in size of the right ventricle, pulmonary artery, left atrium, and appendage. As would be expected, 9 of these patients have obtained an excellent result, and the tenth is considerably improved (fig. 1).
In 5 patients (13 per cent) the over-all size of the heart appeared larger, due mostly to an increased size in the left ventricle and perhaps the left atrium. Rather paradoxically perhaps, 4 of these patients consider themselves functionally improved, and 1 is unimproved (fig. 2).

In the largest group, 26 patients (63 per cent), any change in heart size is controversial. In our opinion the cardiac silhouettes remain unchanged (fig. 3).

The implication of these findings is most significant. In the years immediately preceding surgery all these patients showed progressive cardiac enlargement, and now 87 per cent have a cardiac silhouette either the same size or smaller. This is strong objective evidence of favorable clinical response to mitral commissurotomy.

Cardiac Catheterization Data (table 2). The preoperative studies were made 4½ to 7 years ago and are limited according to present standards. Nevertheless, all data are presented. Twenty-three of the 27 patients in whom data are available have obtained sig-

![Image](http://circ.ahajournals.org/)

**Fig. 2. J.K. Commissurotomy Nov. 23, 1949. A. Nov. 14, 1949. B. Mar. 9, 1954. Postoperative increase in the cardiac silhouette as noted in 5 patients (13 per cent).**
significant and sustained functional improvement. In all but 2 the reduced pressure within the pulmonary vascular bed and right ventricle has paralleled and objectively corroborated the clinical improvement. These 2 patients (no. 11, H.E., and no. 12, R.B.) are in excellent status now, but the pressure dropped slightly in one and rose in the other. Since the catheterizations in these patients were carried out only 1 month after surgery, perhaps the circulation had not yet readjusted to final levels.

In the 4 patients who remained unimproved after surgery, only 2 were catheterized during the postoperative period, but neither of these showed a significant pressure drop, again a good agreement with the observed clinical state.

Valvular Findings. In tight mitral stenosis,
with an orifice the size of a cigarette or less, the more pliable the valve, the better the result.

Twenty (49 per cent) patients had some degree of valvular calcification. Seventeen remained definitely improved, but only 6 can be considered excellent. Twenty-one patients (51 per cent) had no evidence of valvular calcification, and 18 remain considerably improved; however, 14 of the 18 are in excellent condition, and represent a decidedly better result than the group with calcification.

Three patients with densely fibrotic valves but no detectable calcium were essentially unimproved after surgery.

**Reactivation of the Rheumatic State.** Rheumatic activity is difficult to determine in patients who do not show the full-blown syndrome of rheumatic fever. However, one of us (O.H.J.) was the first to call attention to the possible reactivation of the rheumatic state following mitral commissurotomy and termed it "pleuropericarditis." 11 Eight (19.5 per cent) of these 41 living patients have had repeated postoperative episodes of cyclic fever, painful swollen joints, tachycardia, pulmonary and peripheral congestion, and thoracic or precordial pain, which certainly might be regarded as rheumatic activity. In only 3 of the 8 patients with postoperative rheumatic activity were there rheumatic changes in the biopsied left auricles. Thirteen other atrial appendages of these 41 living patients likewise showed rheumatic stigmata, but the patients showed no clinical evidence of rheumatic activity.

**Thromboembolic Data.** Despite the facts that the left atrium was traversed in each instance, that 7 were obliterated by thrombotic material, and that approximately half the valves contained calcium, only 1 embolus occurred during operation. A complete left hemiplegia resulted from which the patient has recovered except for
the finer motions of the left hand; clinically this patient has obtained an excellent result. In contrast, the over-all incidence of emboli in our first 500 consecutive mitral commissurotomies was 4.4 per cent, of which 2.6 per cent were cerebral and 1.8 per cent were peripheral. There have been no embolic episodes during the postcommisurotomy period.

Miscellaneous Postcomissurotomy Medical Events. Several patients have undergone unrelated surgery and other medical events without complication or deterioration of their cardiac status. Four patients had a total of 5 normal pregnancies and deliveries. Other events include 2 cholecystectomies; 2 appendectomies, 1 for a ruptured appendix; 1 hysterectomy, 1 myomectomy, and 3 curettings of the uterus; 1 hemorrhoidectomy; and 1 rather severe myocardial infarct with recovery.

SUMMARY

The first 50 consecutive patients who underwent mitral commissurotomy approximately 4 1/2 to 7 years ago have been subjected to a detailed analysis of their present subjective and objective status. None of these patients was in class I, 5 (10 per cent) were in class II, 36 (72 per cent) were in class III, and 9 (18 per cent) were in class IV. Operative mortality was 6 per cent (3 patients), and late mortality was 12 per cent (6 patients), occurring 6 weeks to 3 years postoperatively. Forty-one patients (82 per cent) are living and form the basis for the following.

We conclude that 29 patients (71 per cent of those living or 58 per cent of the original 50) are in better condition and living a more nearly normal life than they were prior to surgery.

According to the 41 living patients and their family physicians, 36 (88 per cent of those living, or 72 per cent of the original 50) are better than they were prior to surgery.

No definitive conclusion can be reached regarding the present clinical status of these patients on the basis of their murmurs alone. Four of the 41 living patients have no murmurs. Eleven do not have their original mitral diastolic murmur. Fourteen have a mitral systolic murmur of varying degrees that was not present preoperatively. Those patients with "pure" mitral stenosis obtain the best results from mitral commissurotomy.

Although the electrocardiographic changes following surgery do not regularly show conclusive evidence of improvement, a small group does show postoperative regression of right ventricular hypertrophy.

By fluoroscopic and telerontgenographic study, 10 (24 per cent) of the 41 living patients have a smaller cardiac silhouette, 26 (63 per cent) have a silhouette of the same size as preoperatively, and 5 (13 per cent) have a larger cardiac silhouette. In 87 per cent of these living patients the heart is the same size or smaller than prior to surgery, whereas in the years preceding surgery it grew progressively larger.

The available cardiac catheterization data parallel and corroborate the observed functional state of the patient.

Twenty patients (49 per cent) with valvular calcification have not been so greatly improved as 21 patients (51 per cent) without calcification.

Evidence of rheumatic activity was observed during the postoperative period in 8 patients (19.5 per cent).

Valvular restenosis has not been observed in the 41 living patients nor in those who died in the postoperative period.

Only 1 operative embolus was produced in 50 patients, and that patient has recovered almost completely. There have been no postoperative emboli, although the incidence prior to surgery was 12 per cent.

This analysis establishes that commissurotomy confers a genuine, often dramatic, and usually persistent benefit to the patient. It confirms the original hope that this procedure would become a valuable adjunct in the overall treatment of mitral stenosis.

SUMMARIO IN INTERLINGUA

Le prime 50 patientes consecutive subjicite a commissurotomia mitral a periodos de inter circa 4 1/2 e 7 annos retro esesse includite in le hic presentate delatale analyze de lor currente stato subjective e objective. Nulle de iste
Signos de activitate rheumatic eseva observate postoperatoriemente in 8 patientes (19.5 pro cento).

Re-stenosis valvular eseva observate in nulle del 41 superviventes e in nulle del patientes qui moriva post le operation.

Solmente un embolo operative eseva producute in le intege serie de 50 patientes. Le individuo in question ha recovrate quasi completamente. Nulle embolos ha occurrute postoperatoriemente, ben que le frequentia ante le operation amontava a 12 pro cento.

Le presente analyse prova que commissurotomia representa pro le patiente un beneficio genuin que es frequentemente frappante e generalmente persistente. Le analyse justifica le spero original que iste technica devenirea un adjuncto importante in le trattamento general de stenosis mitral.

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WILLIAM WITHERING

William Withering (1741–1799) a graduate of Edinburgh was the discoverer of the therapeutic virtues of digitalis. One of the ablest English clinicians, he published various clinical treatises including “An Account of the Scarlet Fever and Sore Throat or Scurlatina Anginosa, Particularly As It Appeared at Birmingham in the Year 1778.” A physician with broad interests, he determined the chemical composition of minerals and mineral waters, was a breeder of cattle and dogs, a climatologist, and engaged in playing the flute, bag pipes and harpsichord. During his medical student days, he disliked the study of botany, but having fallen in love with Helena Cooke, a young amateur painter of flowers, who subsequently became Mrs. Withering, his interest in plants and flowers grew apace. His five volume masterpiece “The English Linnaeus” established his fame as one of the greatest of medical botanists. His knowledge of botany and the pharmacological properties of various plants was, indeed, largely responsible for his great discovery. As Withering states on the second page of the Introduction in his great classic (“An Account of the Foxglove and Some of Its Medical Uses”—Birmingham 1785):

“In the year 1775, my opinion was asked concerning a family receipt for the cure of the dropsy. I was told that it had long been kept a secret by an old woman in Shropshire, who had sometimes made cures after the more regular practitioners had failed. I was informed also, that the effects produced were violent vomiting and purging; for the diuretic effects seemed to have been overlooked. This medicine was composed of twenty or more different herbs; but it was not very difficult for one conversant in these subjects, to perceive, that the active herb could be no other than the Foxglove.”

His last years were clouded with recurrent attacks of “consumption” and finally led to his death in 1799 when he was 58 years of age. A friend who visited him during his last days was responsible for the celebrated pun, uttered sadly and with warm affection, “The flower of English physicians is indeed ‘withering.’”—Ed.
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