Mitral Commissurotomy in the Older Aged Patient
An Analysis of Twenty Patients Over the Age of Fifty

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An analysis of 20 consecutive cases of mitral stenosis (from a total of 400 cases) in patients between the ages of 50 and 61 treated by mitral commissurotomy from May 1951, to October 1952, is presented. The data suggests that the patient over 50 with symptomatic mitral stenosis can have a functionally satisfactory commissurotomy performed without undue operative risk and with essentially the same ultimate degree of improvement enjoyed by patients requiring treatment at an earlier age.

PREVIOUS communications on the surgical treatment for mitral stenosis have reviewed its historical development, surgical technics, the indications for and results of mitral commissurotomy.1-12 Mitral commissurotomy is briefly defined as the direct surgical approach through the left auricular appendage for the correction of mitral stenosis by separating the individual anatomic leaflets of the mitral valve. Incision of the angles or commissures of the stenosed mitral orifice frequently re-establishes function of the valve leaflets without producing significant mitral insufficiency. Hence, the purpose of the procedure is three-fold: (1) to enlarge the constricted orifice, (2) to restore motion to the valve leaflets, and (3) to prevent future arterial embolization by eliminating the source of the thrombus and/or by reducing stasis in the left auricle.

The purpose of this communication is to present the results in 20 patients between the ages of 50 and 61 (out of a total 400 consecutive cases) subjected to mitral commissurotomy. These patients have been followed for six months to two years. It will be shown that in selected patients over the age of 50 years intracardiac surgery can be performed without unusual morbidity or mortality, and significant improvement in functional capacity can be expected despite the chronologic age.

ANALYSIS OF CASES

Twenty patients whose ages ranged from 50 to 61 years were subjected to mitral commissurotomy between May 4, 1951, and Oct. 11, 1952. Eleven of these were female and nine were male. The oldest was a man aged 61, one patient was 57, one 55, three 54, five 53, four 52, two 51 and three were 50 years of age. All of these patients were markedly incapacitated; 17 were placed in the functional class III and three were placed in class IV.16
Status Prior to Admission (table 1)

A definite history of rheumatic fever and/or chorea was obtained in only eight of these patients; in these eight patients the initial infection occurred in childhood. It is interesting that in this small group symptoms appeared in the later decades of life rather than in childhood or youth which was the common finding in our total series of 400 patients who were operated upon. This long interval between the initial rheumatic infection and the occurrence of symptoms points out that a significant number of people having the murmur of mitral stenosis live a normal, productive life for many years and possibly in rare instances may live a normal life span. However, for those who do become incapacitated, even though they be in the geriatric age group, mitral valve surgery is indicated and should not be withheld merely because of age.

All of the patients had progressive cardio-pulmonary embarrassment. Slight activity produced severe dyspnea in each, and in three there were recurrent severe hemoptyses.

Eighteen had had one or more bouts of acute congestive heart failure, and three of these had been in chronic right heart failure for one to three years before they were operated upon. The latter three were considered desperate risks in view of the marked cardiomegaly, the poor response to a strict antifailure medical regime and persistent hepatomegaly of marked degree.

Systemic embolic episodes had occurred on one or more occasions in five patients. Four of these five patients had cerebral emboli in addition to emboli to the abdomen or legs. The only residual findings in these patients were incoordination of the finer movements of the fingers in three, and in one a right lateral homonymous hemianopsia. One other patient had had a suspected saddle embolus in May 1950, but vascular exploration failed to reveal the embolus. This patient had had severe, bilateral intermittent claudication since this episode. The longest time interval between the date of the first arterial embolism and commissurotomy was 17 years and occurred in a patient who had had a cerebral embolus in 1935 and a similar episode in 1936 and 1937, his only residual finding on admission being a right lateral homonymous hemianopsia. The shortest interval was two years in the patient with a possible saddle embolus. The other three patients had their vascular accidents from two to three and one-half years prior to commissurotomy. All of these five patients were in permanent auricular fibrillation on admission, and through the cooperation of the referring physicians it was established that auricular fibrillation in four had been present at the time of their vascular insults. Interestingly, four of these five patients had a thrombus in the left auricular appendage and/or the left auricle at operation, but in one the left heart chambers did not disclose a thrombus to the examining finger. At the present writing none of these five patients has had recurrences of their embolic episodes.

Admission Findings (table 2)

The preoperative valvular lesions diagnosed were “pure” mitral stenosis in 11 patients and there was a mitral stenosis and associated mitral insufficiency in nine. One patient had been diagnosed as having a possible aortic insufficiency in addition to the mitral valve lesion because of a grade II diastolic blowing murmur heard at the second and third left intercostal spaces at the parasternal line. This murmur disappeared after operation, indicating that the murmur was a functional pulmonic diastolic murmur so brilliantly described by Graham Steel17 in 1888. In a previous communication13 one of us (O.H.J.) pointed out that this murmur was present in 6 of the first 100 patients undergoing commissurotomy, and in all such instances, including the patient in this series, the main pulmonary arteries were found to be enormously dilated and tense during the operation. Mitral insufficiency
associated with mitral stenosis was considered dynamic if the left ventricle was enlarged and adynamic if this chamber was of normal size. The left ventricle was considered to be slightly enlarged in two of the nine patients with mitral stenosis and insufficiency. At operation, with the finger in the left auricle a systolic regurgitant jet was felt in all nine patients. This is not the usual finding in our larger series of cases, where a preoperative diagnosis of mitral insufficiency was not always confirmed by the operative demonstration of a systolic regurgitant jet at surgery. This is to be expected in view of the manipulation and possible arrhythmias occurring during intracardiac manipulation with consequent reduction in the force of ventricular systole.

In selection of cases for surgery the clinical recognition of a typical mitral stenosis usually presents no problem. However, in patients with coexisting mitral insufficiency and/or aortic valvular disease the diagnosis of mitral stenosis as the predominant lesion may be perplexing. In such cases, the greatest aid in our hands has been fluoroscopic and roentgenologic examination of cardiac chamber size. Radiologic estimation of right ventricular and left auricular enlargement seems reasonably accurate. Our most difficult problem has been estimating left ventricular enlargement in the presence of a markedly enlarged right ventricle. Posterior displacement and rotation of a normal left ventricle by an enlarged right ventricle are well known. In addition to the left ventricle being displaced posteriorly by the enlarged right ventricle, marked enlargement of the left auricle may form variable portions of the lower left cardiac border in the left anterior oblique projection. In 1 of our 20 patients the left auricle extended downward and intruded into the posterior inferior cardiac recess and simulated the obliteration of this space commonly seen in left ventricular enlargement. At operation this patient was found to have, in addition to the marked enlargement of the right ventricle, massive dilatation of the left auricle. Our most reliable single guide in assessing the size of the left ventricle has been the position of the cardiac “apex” in frontal projection which has been pointed out by Lehman and others. When this position of the cardiac apex is not definable and if the posterior inferior cardiac recess is obliterated, we are unable to predict the size of the left ventricle. In such instances we feel cardiac catheterization is indicated and helpful.

Preoperative right ventricular and left auricular enlargement was recorded as marked in four patients. In two of these the left ventricle was also thought to have been slightly enlarged. At operation these findings were corroborated and, in addition, an aneurysmal enlargement of the left auricle was found in one. The remaining 16 patients had moderate right ventricular and left auricular enlargement without associated enlargement of the left ventricle.

Calcification diagnosed before operation was confirmed at operation in 10 patients, and in an additional three patients calcification about the cicatricial mitral orifice not recognized preoperatively was found by the surgeon.

Three patients were in chronic congestive heart failure of one to three years’ duration. All three patients had marked cardiac chamber enlargement and auricular fibrillation.

Permanent auricular fibrillation was present in 12, all of whom had electrocardiographic evidence of right ventricular hypertrophy as did three patients with normal sinus rhythm. The electrocardiogram in four patients revealed a normal electrical axis without evidence of right ventricular enlargement. In one,

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**Table 2.—Findings on Admission**

<table>
<thead>
<tr>
<th>Description</th>
<th>Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Pure&quot; mitral stenosis</td>
<td>11</td>
</tr>
<tr>
<td>Mitral stenosis with associated insufficiency</td>
<td>9</td>
</tr>
<tr>
<td>a. Dynamic mitral insufficiency</td>
<td>7</td>
</tr>
<tr>
<td>b. Dynamic mitral insufficiency</td>
<td>2</td>
</tr>
<tr>
<td>Cardiac enlargement (x-ray)</td>
<td>20</td>
</tr>
<tr>
<td>a. Left auricle, moderate to marked</td>
<td>20</td>
</tr>
<tr>
<td>b. Right ventricle</td>
<td>16</td>
</tr>
<tr>
<td>c. Left ventricular enlargement, minimal</td>
<td>2</td>
</tr>
<tr>
<td>Auricular Fibrillation</td>
<td>12</td>
</tr>
<tr>
<td>Electrocardiogram</td>
<td></td>
</tr>
<tr>
<td>R.A.D.</td>
<td>15</td>
</tr>
<tr>
<td>N.A.D.</td>
<td>4</td>
</tr>
<tr>
<td>L.B.B.B.</td>
<td>1</td>
</tr>
<tr>
<td>Functional Classification</td>
<td></td>
</tr>
<tr>
<td>Class III</td>
<td>17</td>
</tr>
<tr>
<td>Class IV</td>
<td>3</td>
</tr>
</tbody>
</table>
auricular fibrillation with a complete left bundle branch block was present. In this latter case a successful commissurotomy was performed without any change postoperatively in the electrocardiographic pattern. It has been our experience that the presence of an abnormal left axis deviation or a combined strain pattern is probably a contraindication to mitral commissurotomy.

Operative Findings (fig. 1)

A thrombus was found at surgery in four of the five patients with a preoperative history of arterial embolic episodes. Five other patients also had thrombi, making a total of nine patients in whom a thrombus in the left auricular appendage and/or left auricle was found. In seven the clot appeared to be contained in the appendage and was removed by auricular appendectomy. In two the clot was also present in the auricle as well as the appendage. Strikingly, only one of these nine patients suffered an operative embolic insult.

The size of the valve orifice as estimated by the examining index finger was less than 1 cm. in diameter (diameter of a cigarette) in 17 instances and was slightly larger in three. The cusp margins were thickened and indurated and the valve leaflets themselves varied in consistancy from that of kid glove to that of heavy shoe leather. The chordae tendineae were foreshortened, thickened and matted together in all patients. In five these changes were so marked that the valvular diaphragm was rigid and completely fixed, all semblance of a functioning valve being lost; in the remaining 15 varying degrees of flexibility were present.

Calcification was present in varying amount in 13 of the 20 valves. In five it was excessive, infiltrating the valve leaflets and thereby constituting the major cause for complete fixation of the valve as mentioned above. In the remaining eight, the calcium varied from tiny, sand-like calcific beads along the cusp margin to complete encirclement of the valve orifice with extension into the valve leaflets. The most frequent site and position of maximum deposition of calcium was on the anterior valve leaflet at its medial aspect, that part nearest the left ventricular outflow tract.

Despite the advanced nature of the valvular pathology, in 12 it was possible to successfully and ideally separate the valve leaflets to a width of 3.0 to 4.0 cm. (sufficient to admit two fingers). In the remaining eight the opening was satisfactory from a functional standpoint, although the mitral vent in seven could only be enlarged to 2.5 cm. (one to one and one-half fingers) and opened to 1.5 to 2.0 cm. (one finger) in one other. In none of the cases was a clinically significant insufficiency produced, even in those who had minimal insufficiency prior to commissurotomy.

Results and Discussion (table 3)

I. Immediate Postoperative Status

It is realized that this small number of patients is of little statistical importance. However, it was unexpected to find so little difference in the postoperative complications...
and functional results from those found in the younger age group.

It was interesting to note that the eight patients in this geriatric group with normal sinus rhythm did not develop cardiac arrhythmias postoperatively, as compared with the reported incidence of 15 per cent occurring in our first 100 patients.11

Two patients awoke from anesthesia with evidence of having suffered a cerebrovascular accident; another had sudden severe left calf pain four hours after surgery. One of these patients developed a left hemiplegia. At present, 16 months after surgery, all faculties have returned to normal except that there is some loss of coordination of the finer movements of the fingers. Unfortunately, the other patient developed an incomplete motor aphasia with agraphia and inability to comprehend written and printed speech. Verbal speech comprehension was affected but slightly. Although his functional status has improved considerably, the aphasia remains. The third patient, who developed severe pain in the left calf, about four hours after surgery, had a preoperative history of frequent embolic episodes to the brain, viscera and extremities. An embolectomy in the right femoral artery had been attempted in 1948, and since that time she had had bilateral intermittent claudication. Pulses in the dorsalis pedi and popliteal arteries were not palpable before commissurotomy. She was placed on Dicumarol after the embolectomy and remained on this drug up to one week prior to surgery. A thrombus in the auricular appendage was removed and a successful commissurotomy performed. She moved all four extremities immediately postoperatively, and no indication of a vascular injury was apparent until four hours later, when sudden pain was noted in the left leg. A therapeutic caudal block was started without appreciable effect during the following 48 hours. The left leg remained cool, and marked mottling with subsequent demarcation just below the knee developed. An exploration of the left femoral artery revealed a good but not pulsatile flow of blood, and no embolus could be located from the aortic bifurcation to the popliteal artery. Finally a left midhigh amputation was done with an excellent recovery. Careful examination of the vascular tree of the amputated limb failed to reveal any embolus, and it was considered that the changes noted in all the vessels could be attributed to thromboangiitis obliterans.

II. Present Functional Status

It is stressed again that there was no increase in morbidity in these patients, the average postoperative hospital time being 15 days. With the exception of the one patient who had undergone amputation of the left leg, all of the patients were discharged from the hospital between 10 and 21 days after surgery. There has been no reactivation of rheumatic infection, and there has been no recurrence of hemoptyses or embolic phenomena.

The operative results in six patients are classified as being excellent, they having returned to a normal productive life compatible with their age group without obvious cardiac disability. These patients are carried on a maintenance dose of digitalis, and, even though they have progressively increased their activity, there has been no necessity for excessive salt restriction or the use of mercurial diuretics. Nine are felt to be objectively and subjectively improved as evidenced by their resumption of almost normal activity. These patients, in addition to the daily digitalis, have remained on a low sodium diet and on occasion mercurial diuretics have been used. Their progressive downhill course has been successfully terminated or reversed, some to gain a high level of efficiency and others to remain on an improved plateau.

Three of the 20 patients have not been essentially improved by the operation. One of these had a dynamic mitral insufficiency and marked right ventricular enlargement. The valve of another was fixed and heavily calcified so that adequate separation of the valve leaflets was impossible. The third should have had a satisfactory result, based on the condition of her valve and the presence of only moderate ventricular enlargement, but she refused to follow the instructions of her physician which has immeasurably delayed, perhaps permanently, a beneficial response.
The remaining two cases have died three months and eight months after commissurotomy. Before operation both had been in chronic congestive heart failure for over two years with marked hepatomegaly and marked cardiomegaly. In one, auricular fibrillation had been present for over four years, and in the other a normal sinus rhythm was present. It was striking that these two patients during the immediate postoperative state appeared to have improved. However, with increased physical activity, irreversible congestive heart failure resulted even though a technically satisfactory commissurotomy was performed.

If there is one outstanding prognostic factor, it is felt that cardiac size is the most decisive indicator of future surgical benefits. With a technically satisfactory commissurotomy, the greatest benefits result in those patients with only slight to moderate right ventricular enlargement. The least, or no improvement at all, is to be expected in patients with tremendous cardiac enlargement of the right ventricle and especially if this is associated with enlargement of the left ventricle and/or massive dilatation of the left auricle. Two of the four patients with marked right ventricular enlargement died in congestive heart failure and one other has been unimproved. The remaining patient has slowly and progressively improved his functional status. Generally, it is felt that marked right ventricular enlargement is a serious prognostic factor.

In such instances the myocardium is so severely damaged that there is a poor functional response even with adequate valvular surgery.

In the cases presented here, as well as in the total 400 patients, an unexpected finding has been the constancy of the size of the stenotic mitral valve inlet. Whether the symptoms be minimal or marked and of long duration, the orifice has rarely varied in diameter from 0.5 to 1.0 cm. or, in more easily appreciated terms, the head of a paper match to one cigarette.

We feel that there is a "critical point" of orificial contraction at which time symptoms appear, and thereafter little change in the diameter of the valvular opening takes place. This is in contrast to the progressive pathologic changes in the valve leaflets, chordae tendineae and papillary muscles, which roughly parallel the stage and duration of the disease. It appeals to us that if this is true, much of the success of the commissurotomy lies in recognizing when this "critical point of contraction" is reached. It is at this time, when progressive symptoms first develop, that the valve offers the best opportunity for maximal functional restoration.

**Summary**

Twenty patients over the age of 50 in whom mitral commissurotomy was performed have been presented in detail. Fifteen have benefited significantly from their surgery and therefore justified operative intervention. Morbidity and mortality are comparable with that seen in the younger age group, therefore such patients should not be denied surgery because of the factor of chronologic age alone.

**Addendum**

To date the total number of cases in this series has reached 35 with an operative mortality of 8.5 per cent (three deaths).

**Sumario Español**

Un análisis de 20 casos consecutivos de estenosis mitral (de un total de 400 casos) en pacientes entre las edades de 50 a 61 tratados con comisurotomía mitral desde Mayo, 1951, a Octubre, 1952, se presenta. Los datos sugieren que los pacientes sobre 50 con estenosis mitral sintomática pueden sufrir una comisurotomía con resultados funcionalmente satisfactorios sin riesgo excesivo operatorio y con esencialmente el mismo grado de mejoría gozado por pacientes que requieren la operación a una más temprana edad.

**References**


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