Fifteen- to Twenty-Year Study of One Thousand Patients 
Undergoing Closed Mitral Valvuloplasty

By Laurence B. Ellis, M.D., Jang B. Singh, M.D., 
Dante D. Morales, M.D., and Dwight E. Harken, M.D.

SUMMARY
A study is reported of an annual follow-up over a 15- to 20-year period of the survivors of 
the first 1,000 patients undergoing closed mitral valvuloplasty for mitral stenosis. In addition 
to a report of the status of the patients at each year of follow-up, a detailed analysis has been made 
of the factors influencing results of surgery 15 years after operation. The most important factor 
adversely influencing long-term results is significant mitral valve calcification. This is true regard-
less of age, sex, preoperative status, concomitant mitral insufficiency or minor degrees of aortic 
valve disease. A beneficial effect of younger age (below 40 years at surgery) or lack of associated 
mitral insufficiency is apparent only in Group III patients with noncalcific valves, and in these two 
subgroups the results were 41 and 37 percent improved, respectively. These figures do not include 
the large number of patients who have again been improved following a second or even third 
operation. Late systemic embolization occurs infrequently after such surgery. (1.1% per patient 
year of follow-up). In patients without significant valvular calcification and without substantial 
mitral incompetence or significant associated valvular disease, closed mitral valvuloplasty is the 
operation of choice. The indications for closed versus open operation for mitral stenosis are dis-
cussed in detail.

Additional Indexing Words: 
Mitral valve calcification    Sex    Age 
Systemic embolization        Mitral insufficiency       Open heart surgery

THE RENAISSANCE of intracardiac heart 
surgery following World War II took place 
with successful development of closed operations 
for the correction of mitral stenosis (valvuloplasty). Although there was skepticism expressed at the 
outset by some as to the value of this procedure, the 
dramatic immediate relief and rehabilitation that 
most of the patients enjoyed precluded the 
employment of randomized studies or other appro-
priate evaluation techniques by which a comparison 
could be made between medically and surgically 
treated patients. From the outset it was apparent 
that both the immediate and long-term results 
would be importantly influenced by patient selec-
tion, the pre- and postoperative medical care, 
paterns of valve pathology, and indeed the quality 
of the surgical intervention itself.

It was apparent from the first that open heart 
surgery would one day become available for the 
attack on this diverse spectrum of pathologic 
processes. Dr. Gibbon (personal communication to 
DEH) urged a moratorium on surgical intervention 
until his cardiopulmonary bypass could render 
direct vision surgery available, an innovation which 
he felt to be on the verge of practical realization. 
Hufnagel,1 with his background of experience with 
plastics and prostheses for the amelioration of aortic 
insufficiency, foresaw wide application of valve 
replacement. With the confidence inspired by the 
substantial palliation accomplished by "finger frac-
ture" and valvulotome valvuloplasty in patients 
with pure mitral stenosis, we continued to carry out 
operations of this nature.2 At first, only patients who 
were in the terminal state of their disease (Group 
IV Harken-Ellis classification)3 were selected for 
operation. As the value of this procedure became

From the Harvard Medical Unit and Thorndike Memorial 
Laboratory of the Boston City Hospital, the Surgical Service 
of the Peter Bent Brigham Hospital, the Thoracic Surgical 
Service of the Mt. Auburn Hospital and the Departments of 
Medicine and Surgery of the Harvard Medical School.

Supported, in part, by Grants HL 5244 and HL 10539 
from the National Heart and Lung Institute, National 
Institutes of Health, and by a grant from the Medical Care 
and Education Foundation (Tri-State Regional Medical 
Program).

Address for reprints: Laurence B. Ellis, M.D., Heart 
Station, Boston City Hospital, 818 Harrison Avenue, Boston, 
Massachusetts 02118.

Received January 25, 1973; revision accepted for 
more evident, patients were then accepted who were deteriorating from increasing symptoms but not yet in refractory congestive failure (Group III). In these patients the surgical mortality fell to less than 1% in the second 500 patients operated upon. The Group IV mortality remained distressingly high (19%), due at least in part to the fact that these patients had associated irreversible changes in the lungs, liver, myocardium, and showed increasingly adverse valvular and thrombotic factors, but a majority of the survivors was significantly relieved.

Since 1949 a long-term follow-up study of patients with predominant mitral stenosis undergoing closed mitral valvuloplasty by one of us (DEH) and his immediate associates has been carried on. In 1968 the number of patients in this study had reached 1,878 and at this time new patients were no longer added; in January, 1971, follow-up of the patients in the study was terminated. In 1959 a report of the survivors of the first 1,000 patients in this series was made. Other reports of these and the additional patients have also been made during the past 22 years. The present study is concerned with the survivors of the first 1,000 patients who have been followed from 15 to 20 years since their surgery. This study is addressed to an analysis of the clinical results that may be expected in mitral valvuloplasty and to the major factors that determine good versus poor results. Such a review may clarify to a certain degree the place for closed, for open, and for replacement surgical procedures.

Methodology

The technique of conducting the follow-up has been described in previous reports. In essence, it consisted of an annual questionnaire designed to assess both the patient’s subjective status and his ability to carry on in society. The value and limitations of the questionnaire method of follow-up have been discussed previously by us. Whenever the questionnaires were unclear or revealed hospitalization, information was obtained from the patient’s physician or a hospital report, and in many instances from personal examination. Vigorous attempt has been made to locate delinquent patients, and the follow-up study has been relatively complete; 95% of the patients had been followed at the 15-year anniversary.

The preoperative status of the patients has been graded according to the classification published by us in 1952, which modifies the New York Heart Association classification to give a more dynamic view of the patients’ illness. Patients in Group I were asymptomatic. Group II patients had cardiac disability which produced moderate but static limitation in their activity, but who were able to carry on sedentary work. There were four patients without other disability in whom the indication for surgery was the occurrence of one or more systemic emboli. These patients were arbitrarily put in Group II. Group III was composed of those patients with progressive emboli, not yet in congestive failure, and who for the most part, were able to carry on some type of activity such as light housework. Group IV patients were cardiac invalids who were either in congestive heart failure or were kept out of it only by stringent therapeutic measures. Patients were classified in their postoperative period as "improved" if they had gone up one or more grades in the New York Heart Association classification as compared to their preoperative status. If only slightly improved, unchanged, or worse, they were classified as "unimproved." "Reoperated" patients were those undergoing a second cardiac operation, most commonly on the mitral valve. "Dead" patients in the postoperative study were those who had died since discharge from the hospital at the time of their original cardiac surgery. Patients classified as "operative deaths" were those who died at the time of surgery or during the hospital period immediately following surgery. These patients are not considered in this follow-up study.

The details of the preoperative status and operative mortality of the patients in the original group of 1,000 have been previously published. Since at that time (1959) it was not fully appreciated what an important role reoperations would assume in the later long-term analysis of results, 26 patients were included who had had a second cardiac operation; in 17 both the original and second operation were counted, and in one, three operations were counted separately. These 19 repeat operations, plus seven more in whom an original cardiac operation had been done elsewhere, have been dropped from the current series and the next 26 consecutive patients in our series have been added to replace them. The composition of this revised group of 1,000 patients is: Group II, 19; Group III, 716; Group IV, 265. Because of the few patients in Group II, they have been included in the series with the Group III patients, and in the future discussion these combined groups will be designated Group III. The operative mortality of Group III was 3.3%, and of Group IV, 24%.

Figure 1

Status of patients in Group III at each year of follow-up.
MITRAL VALVULOPLASTY FOLLOW-UP

Results

Annual Postoperative Status of Patients

Figures 1 and 2 indicate the annual status of the Group III and Group IV patients for each year of follow-up. The results are cumulative, that is, the status of each at each yearly anniversary is shown. Patients who died or were reoperated have been included in subsequent follow-ups to the final anniversary of their operations. As is to be expected, there has been a steady decrease in the number of patients that have remained improved with each year of follow-up. (The figures presented in this article with regard to improvement differ slightly from those presented before the American Heart Association in November 1971. In that presentation the patients who were "slightly improved" at any given period were included among the "improved" patients. In order to bring the present work in line with what we have previously published, patients "slightly improved" have been considered in the "unimproved" category.)

There is an approximately linear decrease in the percentage of patients who continue to be improved at each follow-up year in both Groups III and IV, and a converse increase in those undergoing reoperation or dying. The figures shown in later years are probably falsely skewed toward a high proportion of patients dying or being reoperated, since as already stated, patients known to have died or to have been reoperated were considered to be followed to the ultimate anniversaries of their operations, whereas "lost to follow-up" patients were always known to be alive at the last reports prior to their delinquency.

Late Results

Improved Patients

In order to assess the various factors that contributed to the deterioration of patients, a detailed study was made of all patients at the end of 15 years of follow-up. (Forty-two patients were included who had had their operations from 14 years, 8 months, to 15 years previously.) In 104 patients exact information as to the presence or amount of calcification of the mitral valve was unavailable and hence these patients are not considered in this analysis.

It is apparent that the most important factor related to the deterioration of patients has been the presence of significant mitral valve calcification as estimated by the surgeon at the time of operation (2 to 4+ in severity). Thirty-one percent of the patients who had trivial or no calcification at the time of surgery continued to be improved at the 15-year point, whereas only 6% of patients with significant calcification were improved. It will be shown that the poor late results in patients with calcified valves occurred in all subgroups, irrespective of preoperative status, age, sex, or presence of mitral insufficiency.

The percentage of patients with calcified valves in each subgroup is shown in Table 1.

| Table 1 |

Percentage of Patients with Calcified Mitral Valves (2-4+), According to Preoperative Disability, Sex, and Age

<table>
<thead>
<tr>
<th>Females</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>% calc</td>
</tr>
<tr>
<td>----</td>
<td>------</td>
</tr>
<tr>
<td>Total</td>
<td>458</td>
</tr>
<tr>
<td>&lt;40 yrs</td>
<td>298</td>
</tr>
<tr>
<td>Group III</td>
<td></td>
</tr>
<tr>
<td>&gt;40 yrs</td>
<td>160</td>
</tr>
<tr>
<td>Total</td>
<td>122</td>
</tr>
<tr>
<td>&lt;40 yrs</td>
<td>21</td>
</tr>
<tr>
<td>Group IV</td>
<td></td>
</tr>
<tr>
<td>&gt;40 yrs</td>
<td>101</td>
</tr>
</tbody>
</table>

Circulation, Volume XLVIII, August 1973
patients in Group IV had a much higher percentage of calcification than those in Group III; in males calcification occurred in the same percentage in both groups. Even more striking was the fourfold greater incidence of calcification in male patients as compared to females in Group III. The sex difference in Group IV also was significantly higher in males. Calcification tended to increase with age in females in Group III, but not in males, and in Group IV the differences were not significant.

Twenty-four percent of patients in Group III remained improved at the 15-year point, as compared to 11% of Group IV, a highly significant difference (fig. 3). If, however, these groups are divided into those with and without calcified valves and those with and without significant mitral insufficiency at the time of operation, it will be seen that the only significant difference between patients in Group III and Group IV were in patients without calcification. In Group III, 35% were improved at the fifteen-year point, and this subgroup made up 70% of the entire Group III. If patients had moderately to heavily calcified valves, it made little difference whether they had originally been in Group III or Group IV. Patients with noncalcified valves who did not have significant mitral insufficiency at the time of surgery did somewhat better than those with mitral insufficiency, but the differences were not statistically significant. In this analysis the greater degree of mitral insufficiency as estimated by the surgeon either before or after the valvuloplastic procedure was recorded.

It has been generally assumed that female patients have a better prognosis as far as improvement is concerned than do male patients, and this is true in Group III since 31% of female patients remained improved at 15 years whereas only 22% of males continued to be improved, a significant difference (fig. 4). In Group IV there was no sex difference. If the improvement of females and males are further compared with respect to the degree of calcification, only one subgroup, those in Group III with highly calcified valves, showed any significant sex difference in the number improved, and this was not very great. The most important reason, of course, why male patients in Group III do less well than females is related to the fact that 56% of male patients have moderately to heavily calcified valves as compared with only 14% of females, and Group III patients with noncalcified valves are predominantly female (89%).

A comparison of patients under and over 40 years of age at the time of operation shows that in Group III there was a significantly greater number of the younger patients who remained improved (fig. 5). There is no difference in the prognosis of patients in Group IV. When these patients are studied in

---

**Figure 3**

Status of patients at the 15 year follow-up point with respect to preoperative classification (Groups III and IV). These groups are each subdivided into subgroups with and without significant calcification (Calc 0–1+ and 2–4+), and further divided with respect to the presence or absence of significant mitral insufficiency (MI 0–1+ and 2–4+). The shaded bars represent the percentage of improved patients. The numbers within the bars represent the total number of patients in each subgroup. P values are shown between selected groups which are compared in regard to the percentage of improved patients.

**Figure 4**

Status of patients at the 15 year follow-up point in respect to sex (F = female, M = male). Group III patients are shown at left and Group IV at right. Each group is subdivided into those with and without significant calcification (Calc 0–1+ and 2–4+). The shaded bars represent the percentage of improved patients. The numbers within the bars represent the total number of patients in each subgroup. P values are shown between selected groups which are compared in regard to the percentage of improved patients.
regard to the presence or absence of calcification of the valve, the only subgroup showing a significant difference is that of Group III patients with noncalcified valves; 41% of those under 40 remaining improved at 15 years as compared to 26% of those over 40 at the time of surgery.

A further breakdown of the effect of mitral insufficiency in the subgroup of Group III patients without calcification shows that it is not of statistical significance. Ninety-eight of 237 patients (41%) under 40 without insufficiency were improved, compared to 6 of 19 with insufficiency (31%). The percentage of improved patients over 40, with and without insufficiency, was exactly the same (26%).

The presence of heavy calcification resulted in a bad prognosis for both older and younger people in Groups III and IV.

### Late Deaths

In 87% of the patients the cause of death was known (Table 2). In 87% in whom the cause of death was known, the death was due to or related to heart disease—congestive heart failure, sudden death, pulmonary or peripheral embolization. Undoubtedly in many of the cardiac deaths coronary artery disease or hypertension played a major role, since many of the patients were well along in years and their average age 15 years after surgery was 58 years. The trends and correlations observed at 15 years in regard to improvement are observed in reverse when late deaths are considered (Table 3). In both Groups III and IV, patients with calcified valves suffered a high death rate; mitral insufficiency alone or in conjunction with valvular calcification had surprisingly little effect on the outcome. The difference in age and sex was also largely explained by the number of patients with calcified valves.

### Reoperations

Table 4 shows the percentage of patients in the various subgroups undergoing reoperation, and reflects the obvious factors which led to a low percentage of sustained improvement. Furthermore there is reflected a tendency for younger patients to undergo reoperation. Since during much of this period of observation satisfactory surgery for mitral insufficiency did not exist, many patients who had evidence of such insufficiency either at the time of operation or later may have been denied reoperation for the correction of this incompetence, who today would be offered it.

### Late Systemic Embolization

We have previously discussed the problem of late systemic embolization. In the present group 102 episodes diagnosed as presumed systemic emboli occurred in 75 patients. This is 8% of the 913 patients surviving surgery. All 50 patients in whom acute cerebrovascular accidents were diagnosed were considered to have had emboli. In some of these episodes, however, intrinsic cerebrovascular disease or hypertension may well have been the cause since the average age of the entire group of patients was 58 years, 15 years after surgery. Peripheral and visceral embolizations are notably difficult to diagnose clinically. The present group therefore is only an approximation of the true number of emboli which have given significant clinical manifestations.

### Table 2

<table>
<thead>
<tr>
<th>Cause of Late Deaths</th>
<th>Group III</th>
<th>Group IV</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac</td>
<td>103</td>
<td>64</td>
<td>167</td>
</tr>
<tr>
<td>Sudden</td>
<td>20</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>Systemic embolus</td>
<td>9</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>Pulmonary embolus</td>
<td>5</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>Non Cardiac</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cancer</td>
<td>11</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>10</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Unknown</td>
<td>30</td>
<td>10</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>188</td>
<td>108</td>
<td>296</td>
</tr>
</tbody>
</table>

_Circulation, Volume XLVIII, August 1973_
Table 3
Percentage of Patients who Died from 1 to 15 Years After Surgery (Patients Undergoing Reoperation Omitted)

<table>
<thead>
<tr>
<th></th>
<th>Group III</th>
<th></th>
<th>Group IV</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total no. of patients</td>
<td></td>
<td>% Dead</td>
<td></td>
<td>% Dead</td>
</tr>
<tr>
<td>Mitral valve calc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1</td>
<td>313</td>
<td>32</td>
<td>73</td>
<td>62</td>
</tr>
<tr>
<td>2-4</td>
<td>69</td>
<td>67</td>
<td>48</td>
<td>94</td>
</tr>
<tr>
<td>Mitral insuff.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c 0-1 calc.</td>
<td>281</td>
<td>30</td>
<td>56</td>
<td>58</td>
</tr>
<tr>
<td>c 2-4 calc.</td>
<td>34</td>
<td>73</td>
<td>26</td>
<td>93</td>
</tr>
<tr>
<td>2-4+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c 0-1 calc.</td>
<td>31</td>
<td>45</td>
<td>17</td>
<td>76</td>
</tr>
<tr>
<td>c 2-4 calc.</td>
<td>35</td>
<td>57</td>
<td>22</td>
<td>95</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>304</td>
<td>36</td>
<td>88</td>
<td>73</td>
</tr>
<tr>
<td>Male</td>
<td>77</td>
<td>58</td>
<td>33</td>
<td>79</td>
</tr>
<tr>
<td>Age (at surgery)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;40 yrs</td>
<td>200</td>
<td>32</td>
<td>17</td>
<td>88</td>
</tr>
<tr>
<td>&gt;40 yrs</td>
<td>181</td>
<td>50</td>
<td>104</td>
<td>72</td>
</tr>
<tr>
<td>Total</td>
<td>381</td>
<td>40</td>
<td>121</td>
<td>75</td>
</tr>
</tbody>
</table>

Fifty-seven of the patients suffering emboli were in Group III at the time of surgery; and 18, in Group IV. About half of the Group III and 28% of the Group IV patients had improved at the time of their embolization. These 102 episodes occurred over a total period

<table>
<thead>
<tr>
<th></th>
<th>Group III</th>
<th></th>
<th>Group IV</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total no. of patients</td>
<td></td>
<td>% Reop</td>
<td></td>
<td>% Reop</td>
</tr>
<tr>
<td>Mitral valve calcification</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1</td>
<td>442</td>
<td>29</td>
<td>98</td>
<td>25</td>
</tr>
<tr>
<td>2-4</td>
<td>127</td>
<td>48</td>
<td>62</td>
<td>23</td>
</tr>
<tr>
<td>Mitral insufficiency</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c 0-1 calc.</td>
<td>400</td>
<td>30</td>
<td>77</td>
<td>28</td>
</tr>
<tr>
<td>c 2-4 calc.</td>
<td>68</td>
<td>60</td>
<td>37</td>
<td>30</td>
</tr>
<tr>
<td>2-4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c 0-1 calc.</td>
<td>42</td>
<td>26</td>
<td>21</td>
<td>20</td>
</tr>
<tr>
<td>c 2-4 calc.</td>
<td>59</td>
<td>41</td>
<td>25</td>
<td>12</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>458</td>
<td>34</td>
<td>122</td>
<td>28</td>
</tr>
<tr>
<td>Male</td>
<td>111</td>
<td>31</td>
<td>38</td>
<td>13</td>
</tr>
<tr>
<td>Age (at surgery)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;40 yrs</td>
<td>318</td>
<td>37</td>
<td>31</td>
<td>45</td>
</tr>
<tr>
<td>&gt;40 yrs</td>
<td>251</td>
<td>28</td>
<td>129</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>569</td>
<td>33</td>
<td>160</td>
<td>24</td>
</tr>
</tbody>
</table>
of 9,297 years of follow-up of living patients (i.e., dead and reoperated patients excluded), giving an incidence of embolization of 1.1% per patient year of follow-up. The occurrence of the emboli was fairly evenly spaced over the 20-year period, although it was a little higher (1.7%) in the first postoperative year.

Discussion

This report brings to a conclusion the follow-up study of a group of 1,000 patients who underwent mitral valvuloplasty for predominant mitral stenosis 15 to 20 years previously. To the best of our knowledge it is the longest reported follow-up study of a large group of patients with mitral stenosis operated on by the closed technique. Furthermore, all patients were operated by a single surgeon (DEH) and his immediate associates; a uniform operative technique was employed throughout, and all patients were evaluated and classified both preoperatively and postoperatively by a single, independent medical observer (LBE).

It is fortunate that the first real attack on valvular heart disease was on mitral stenosis, for the underlying cause for this particular lesion is a physical factor, i.e., the stenotic mitral barrier, which is directly responsible for the initial symptoms and the hemodynamic train of events leading to morphologic and physiologic deterioration. Hence it is not surprising that surgery for mitral stenosis produces dramatic and immediate relief to patients and the value of the procedure was soon established. The long-term results have confirmed its value, although the initial, perhaps unrealistic hope of some observers that the results would be permanent was, of course, not borne out. This is a palliative procedure, not a cure. The value and safety of closed mitral valvuloplasty have set standards yet to be matched by the multiple and complicated surgical procedures offered for many other valvular lesions. In addition, the comparatively uniform nature of the lesion attacked by this surgical procedure and the standardization of the operative technique have permitted long-term statistical studies, impossible with the great array of differing combinations of valvular lesions now being treated by a multiplicity of procedures and prostheses.

The present study confirms and extends the earlier results reported by us and others.4–7, 11–16 The one factor emerging which unequivocally and overwhelmingly influences long-term results is significant calcification of this mitral valve. This is consistently true regardless of age, sex, preoperative status, or the presence of minor degrees of mitral insufficiency or minor aortic valve disease.

The best results are evident in Group III patients with noncalcific valves, particularly in those under 40 years of age at the time of surgery. It is important to emphasize in these subgroups what a significantly large percentage of patients do well for so long. Moreover this analysis does not include the many patients who have had a second or even a third operation and are again improved. Valid comparisons with surgical procedures requiring prostheses are impossible but the extrapolation of comparatively short-term results now available would suggest that closed mitral valvuloplasty for noncalcific mitral stenosis may provide as much or more long-lasting relief for this condition than do more recently developed prosthetic procedures.17 Unlike operations utilizing prosthetic devices there are no late complications in patients undergoing closed valvuloplasty attributable to the operative procedure.

Only a minority of the patients in this study had hemodynamic studies before the original surgery or postoperatively, and then only if they developed symptoms that led to such intensive investigation. Cardiac catheterization and angiography have been valuable diagnostic tools in assessing the hemodynamics of mitral and other valvar lesions. It is regrettable that excessive dependence on hemodynamic and angiographic studies presumed to be “exact” have blunted the invaluable appraisal to be gained from careful clinical examination. In mitral stenosis more help is derived from clinical than from laboratory studies. Objective as the latter are, they afford but a momentary picture in time, subject to errors in technique and interpretation.

The results of the current study make clear that worthwhile and long-lasting results in mitral stenosis may be obtained by closed mitral valvuloplasty. In patients with noncalcific valves without substantial incompetence and without significant associated valvar disease, this operation remains the procedure of choice. Previous observations that peripheral embolization occurs uncommonly after closed mitral valvuloplasty are also confirmed.

The immediate and presumably the long-term results could clearly have been substantially improved if on each occasion of any dissatisfaction with the quality of the closed valvuloplasty, the surgeon had been able to proceed forthwith to open direct vision surgery. This is now possible. The capacity for evaluating the mobility, competence,
and completeness of correction in the closed, functioning heart is conspicuously better by closed technique than in an open, empty, flaccid heart. The equally real advantages of direct vision in some forms of elastic commissural and chordae fusion is recognized. The tragedies of open valvuloplasty by cardiopulmonary bypass in overcorrection, as well as persisting postsurgical neurologic and psychometric deficits have been real but difficult to assess.

All of these factors combine to define a realistic policy that offers the greatest opportunity for patient benefit. First, closed operations should not be performed unless there are facilities for immediate conversion to the open operation. Second, closed techniques should not be undertaken unless the surgeon is qualified to assess the quality and completeness of the valvuloplasty and is familiar with the gamut of digital, positional, and instrumental maneuvers to attain high quality correction. Open operation should not be undertaken without meticulous regard for and competence in avoiding the inherent hazards of neurologic and psychometric deficits. These latter factors have been too little regarded in reporting results in terms solely of operative mortality. It is to be hoped that these figures and this policy will offer a standard against which the long-term results of open valvuloplasty and valve replacement may now be evaluated.

References

4. Ellis LB, Harken DE, Black H: Clinical study of 1,000 consecutive cases of mitral stenosis two to nine years after mitral valvuloplasty. Circulation 19: 803, 1959
Fifteen-to Twenty-Year Study of One Thousand Patients Undergoing Closed Mitral Valvuloplasty

LAURENCE B. ELLIS, JANG B. SINGH, DANTE D. MORALES and DWIGHT E. HARKEN

_Circulation_. 1973;48:357-364
doi: 10.1161/01.CIR.48.2.357

_Circulation_ is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 1973 American Heart Association, Inc. All rights reserved.
Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circ.ahajournals.org/content/48/2/357