Status of Vision Following Surgical Treatment for Pituitary Chromophobe Adenoma

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The purpose of this paper is to evaluate the effect of surgical treatment alone on the impairment of visual fields produced by pituitary chromophobe adenoma.

Materials and Methods

We reviewed all of the cases of pituitary chromophobe adenoma treated only surgically during the period January 1950 through December 1958. Cases in which circumstances interfered with precise evaluation of preoperative or postoperative status of vision were eliminated. Thus, we excluded cases in which (1) adequate and satisfactory follow-up for a minimum of 2 years could not be obtained; (2) cases in which roentgen-ray therapy was administered postoperatively; (3) cases in which roentgen-ray therapy had been given within the year prior to operation; (4) cases in which the postoperative course was complicated to such a degree that we could not evaluate accurately the result of the initial operation (in other words, cases in which reoperation was carried out for massive postoperative clot, cases in which mental changes vitiated proper evaluation, and so forth); (5) cases in which cataract, glaucoma, or other nonrelated complications developed some time after the pituitary operation; (6) cases in which death resulted from other causes during the first 2 years after operation; (7) cases in which the tumor extended to involve other cranial nerves; and (8) cases in which the tumor penetrated into the 3rd ventricle or under the hypothalamus or into the lateral ventricle, necessitating other than the usual surgical procedure for pituitary adenoma. With these cases excluded, 71 cases were accepted as suitable for this study. In all of these patients, the operation had been done by standard transfrontal craniotomy.

Follow-up determination of visual fields was carried out at reexamination here in most instances. In a few cases, this information was obtained from the ophthalmologist in the patients' home community, and frequently he sent us charts of the visual fields.

The technic for evaluation of permanent impairment of vision reported by the American Medical Association Committee on Medical Rating of Physical Impairment\(^1\) was used. This technic is described in detail in the original publication and consists essentially of recording the corrected central visual

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acuity and degrees of peripheral vision for each eye along 8 radii. After combining this information, one obtains a value that indicates the per cent of impairment of vision. We have found that these percentages are reproducible to within 5 per cent and think that this is an accurate method of determining whether or not improvement followed surgical treatment.

For further analysis of the results in this series, the 71 cases were subdivided into 3 groups depending on the extent of preoperative loss of vision: Stage I, from 0 to 33 per cent (33 per cent loss corresponds quite well to a complete upper quadrant bitemporal hemianopsia or its equivalent); Stage II, from 34 to 65 per cent (65 per cent loss corresponds quite well to a complete bitemporal hemianopsia or its equivalent); and Stage III, from 66 to 100 per cent. Figs. 1, 2 and 3 illustrate field defects typical of the 3 categories.

Results

Of the entire group of 71 patients (Table 1), vision was improved after surgical treatment in 45 (63.5 per cent), vision remained the same in 11 (15.5 per cent), and vision was worse at last follow-up in 15 (21.1 per cent). Vision returned to normal in 14 (19.7 per cent).

It will be noted from Table 1 that less than half of the Stage I patients had improvement of vision following operation, while about three-fourths of those with Stage II and Stage III impairment improved. This disparity can be explained in part by the fact that 6 of the 27 Stage I patients had preoperative impairment of 5 per cent or less and consequently, since a change of more than 5 per cent was required for classification as a change in condition, in these patients a salubrious effect on vision would not alter the classification. In only 1 of these 6 patients was vision significantly worse at last follow-up examination. Thus, the percentage of patients shown as having had no change is larger in Stage I than in the other 2 stages. This also applies to the total percentage of patients improved. If one considers as improved the 5 Stage I patients whose preoperative impairment was less than 5 per cent (the factor of reproducibility) and whose impairment remained less than 5 per cent, the value for vision improved in Stage
I would be 62.9 per cent and, in the entire series, it would be 70.4 per cent.

In considering the patients whose vision was worse after operation, it should be pointed out that only the preoperative and the most recent determinations of visual fields were used for evaluation of results. The most recent determination was done several years after operation and, in some cases, the deterioration of vision was caused by recurrence of tumor rather than by injury to the optic apparatus or its blood supply at the time of operation. Of the 15 patients whose vision was worse at the time of last evaluation, vision was worse on the first postoperative check and remained so for the period of follow-up in 9 patients. In the other 6 patients, vision had improved after operation but deteriorated later during the follow-up period. Also, as shown in Figs. 4, 5, and 6, in about one-third of the cases in which vision was found to have become worse, the worsening was of relatively minor degree.

Fig. 7 gives a comparison of the impairment in vision in these 71 patients before and after operation. The median values indicated give one measure of the beneficial effect of surgical therapy. Other comparisons are made readily, such as: before operation,
FIG. 5. Change in vision after operation when preoperative impairment was Stage II. Open circle indicates preoperative status and vertical line indicates direction and extent of change.

FIG. 6. Change in vision after operation when preoperative impairment was Stage III. Open circle indicates preoperative status and vertical line indicates direction and extent of change. D indicates death of patient. R indicates evidence of recurrence of tumor.

FIG. 7. Cumulative distribution of percentage loss of vision before (solid circles) and after (open circles) operation in 71 patients.
15 per cent of the patients had a visual impairment of 10 per cent or less whereas, after operation, 37 per cent of the patients had a visual impairment of 10 per cent or less.

Table 2 shows, in increments of 10 per cent, the impairment in vision before and after operation for the 71 patients. The mean and median values before and after operation indicate the degree to which surgical treatment improved the vision. In Table 3 the results of surgical treatment are presented according to the preoperative status. For example, of the 27 patients who were in Stage I initially, 22 (81.5 per cent) remained in this stage while of the 21 patients in Stage III initially, 7 (33.3 per cent) remained in Stage III, 7 were in Stage II and 7 were in Stage I at the last follow-up; thus, 66.6 per cent of all Stage III patients were improved to Stage II or better by surgical treatment. Fig. 6 shows that 5 patients originally in Stage III had only minimal field defects when last evaluated 3½ to 10 years postoperatively.

Table 4 gives a distribution of the impairment of vision, in increments of 10 per cent, before and after operation. The values in italics represent cases in which there was no change in impairment. All values to the left of the italicized numbers indicate improvement in vision as a result of operation, and values to the right indicate additional impairment of vision after operation. It should be noted that the time factor is given only in Figs. 4, 5, and 6 and is not considered in Tables 2, 3, and 4.

**Discussion**

For the most part, reports dealing with changes in visual fields following treatment of pituitary tumors have evaluated results in rather vague language, such as satisfactory improvement, marked or moderate improvement, and so forth. Therefore it has been virtually impossible to develop a lucid or objective comparison of various forms of treatment. By employing several devices—the American Medical Association's scheme for evaluation of impairment of vision and the system of staging described above—we believe that we have been able to present our results in a more valuable and more useful form because they can be compared readily to results of other methods of treatment expressed in the same manner.

In a sense, the cases in this series have been selected in that those patients whose visual fields, for one reason or another, could not be evaluated properly after operation have been excluded. This was done so that evaluation of the results of the surgical treatment would be precise. Properly then, in this study, mortality and morbidity have not been considered. In a study more valid for deriving mortality data, we found an over-all mortality rate of 6.8 per cent. When
TABLE 4
Distribution of impairment of vision before and after operation

<table>
<thead>
<tr>
<th>Impairment (Per Cent)</th>
<th>No.</th>
<th>Before Treatment</th>
<th>After Treatment (No.)</th>
<th>Impairment (Per Cent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10</td>
<td>10</td>
<td>7</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10-19</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>20-29</td>
<td>7</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>30-39</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>40-49</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>50-59</td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>60-69</td>
<td>8</td>
<td>8</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>70-79</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>80-89</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>&gt;90</td>
<td>9</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>71</td>
<td>22</td>
<td>11</td>
<td>8</td>
</tr>
</tbody>
</table>

those cases in which the sella was excessively enlarged were excluded, the mortality rate decreased to 2.5 per cent.

Summary

In a series of 71 cases of pituitary chromophobe adenoma treated surgically (via transfrontal craniotomy), vision was improved postoperatively in 70.4 per cent, remained unchanged in 8.6 per cent, and became worse in 21.1 per cent. Vision returned to normal in 19.7 per cent. Vision improved by 67 per cent or more in 31.0 per cent of the cases and improved by 33 per cent or more in 50.6 per cent. Patients were followed for at least 2 years and, in some instances, for as long as 10½ years.

Reference