Significance of the Appearance of the Optic Disc for Predicting Visual Function Following Removal of Pituitary Adenomas

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Abstract

Deterioration of visual function occurred in 60% of 117 patients with pituitary adenoma. After transsphenoidal operation, both eyes regained normal visual acuity and visual fields in 28.2% of 64 patients, improvement was noted in 50%, no change was found in 15.6%, and a slight progression was observed in 6.2%.

In those cases with unimpaired optic disc before the operation, visual functions became normal in more than 50%. No full ophthalmological recovery was found when the pallor of the disc was severe.

In the authors' opinion, ophthalmological prognosis depends in the first place not on the visual acuity, but on the preoperative condition of the optic disc. Full ophthalmological recovery or improvement sufficient to resume working can be expected when the optic disc is normal or shows only temporal pallor, even when visual function is severely impaired.

Key words: transsphenoidal surgery, visual fields, optic disc, visual acuity

Introduction

Slowly growing pituitary adenomas sometimes produce merely local symptoms for years. Impairment of vision is frequently the presenting symptom1–4,12,15,18 and in many cases it is also the main indication of surgical intervention.4 Injury to the optic nerve often produces optic disc pallor of various degrees.1–3,7,18 Early diagnosis depends on the ophthalmologist in a significant proportion of cases. We here analyse the correlation of the preoperative ophthalmological symptoms with the postoperative improvement of visual acuity and visual fields.

Materials and Methods

During 1974 to 1979, transnasal-transseptal-transsphenoidal surgical removal of pituitary adenoma was performed on 117 patients in our institute. The average age of the patients with lesions of the visual pathway was 50 years and was 40 years in patients with other lesions. The 73 patients with visual pathway lesions included 37 males and 36 females, while in the ophthalmologically normal group (44 patients), 10 were males and 34 females.

Before surgery we examined the visual acuity, ocular movements, visual fields with various targets (Goldmann perimeter), and critical fusion frequency. The appearance of the optic disc was examined both in normal and red-free lights; any lesion found was graded by two independent observers. The recently developed quantitative methods for measuring pallor could not be used in this retrospective study.13 Ophthalmological examination was first repeated 7 to 10 days after operation, and later at 2 to 3 month intervals for 2 to 6 years.

Paresis of the eye muscles was found in seven patients (6%); two patients had unilateral total ophthalmoplegia, four oculomotor paresis, and one abducent paresis. Three patients with eye muscle paresis had no other symptoms, while the others also had visual field impairments. Visual field defects were found in 70 patients.
Only 64 could be followed, thus the analysis of the postoperative changes is based on 64 patients. Sixty-one\% of the ocular symptoms were associated with chromophobic adenomas.

The preoperative condition of the optic disc was evaluated in 119 eyes of 64 patients; two eyes could not be evaluated and in seven patients the lesions were only unilateral. Normal optic disc was seen in 44 eyes (37\%); in 35 eyes (30\%) pallor was only temporal and severe pallor involving the whole disc or atrophic disc was present in 40 eyes (33\%).

Results

1. Complete postoperative restoration of visual functions, i.e., normal visual acuity and visual fields in both eyes, was obtained in 28.2\% of our 64 patients. The ocular symptoms improved in 50.0\%, were unchanged in 15.6\%, and slightly progressed in 6.2\% of the patients. Thus, an improvement of function was observed postoperatively in 78.2\% of the patients.

Full recovery was seen frequently in patients with unilateral optic nerve lesion (three out of seven patients) and with bitemporal hemianopia not involving the center (eight out of 20 patients). In contrast, there was no full recovery in patients with bilateral optic nerve lesion associated with lesion of the chiasma, or in patients with lateral chiasmatic and tract lesions (Table 1).

In 44 eyes with normal optic disc, ocular symptoms returned to normal in 59.1\%, improved in 25.0\%, were unchanged in 13.6\%, and progressed in 2.3\%. In 35 eyes with temporal pallor of the disc, recovery occurred in 28.6\%, improvement in 62.8\%, and no change was found in 8.6\%. In contrast, none of the 40 eyes regained full visual acuity and normal visual fields when pallor or atrophy of the disc was severe before the operation; improvement of functions was found in 47.5\%, no change in 42.5\%, and progression in 10.0\% of the eyes (Table 2).

2. Changes after the operation were analysed as a function of the preoperative condition of the optic disc, visual acuity, and visual field defect type. In the eyes with normal optic disc (Fig. 1A) or temporal pallor (Fig. 1B), peripheral visual field defect was more common while loss of the center field with accompanying decrease in acuity was less frequent. Peripheral field defect was observed in 52 of the 79 eyes illustrated in Fig. 1A, B. Loss of the center field was still reversible because it improved considerably or disappeared altogether in

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Postoperative changes in visual functions depend on the preoperative condition of the optic disc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optic disc</td>
<td>Visual functions</td>
</tr>
<tr>
<td></td>
<td>Recovered</td>
</tr>
<tr>
<td>Normal temporal pallor</td>
<td>26</td>
</tr>
<tr>
<td>Severe pallor or atrophy</td>
<td>10</td>
</tr>
<tr>
<td>Sum</td>
<td>36</td>
</tr>
</tbody>
</table>

Table 1 Distribution and postoperative history of lesion in the visual pathways

<table>
<thead>
<tr>
<th>Type of lesion</th>
<th>No. of cases</th>
<th>Visual functions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recovered</td>
<td>Improved</td>
</tr>
<tr>
<td>Unilateral optic nerve</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Chiasma + bitemporal hemianopia</td>
<td>20</td>
<td>8</td>
</tr>
<tr>
<td>Chiasma + left optic nerve</td>
<td>23</td>
<td>6</td>
</tr>
<tr>
<td>Chiasma + right optic nerve</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Chiasma + both optic nerves</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Lateral chiasmatic</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Optic tract</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sum</td>
<td>64</td>
<td>18</td>
</tr>
<tr>
<td>Percentage</td>
<td>100</td>
<td>28.2</td>
</tr>
</tbody>
</table>
Fig. 1  Postoperative changes in visual acuity and field defects. Eyes with normal optic disc (A), with temporal pallor of the optic disc (B), severe pallor and atrophy (C), and all eyes together (D), were analysed separately. Preoperative visual acuity and field defect type are shown under the bars. ■: recovery, □: improvement with acuity better than 5/12, △: less than 5/12, □: no change, □: deterioration.
every eye except in two of the three without light sensation before operation.

It is important that the patient be able to read after the operation (visual acuity 5/12 or better). In all except two eyes without light perception before operation, every patient in this group could read after the operation. Six of the 12 eyes with acuity worse than 5/12 before the operation recovered with normal vision and visual fields; one of them had not even had light perception before operation (Fig. 1A). In the presence of temporal optic disc pallor, three of the eight eyes with acuity worse than 5/12 recovered with full functions, three became able to read, and in two improvement still did not enable reading (Fig. 1B).

In the eyes of severe pallor or atrophy of the disc, the loss of the centre field and the accompanying decrease in vision was common, and most of the visual field defects involved the center field (33 eyes) while seven were peripheral only. None of the eyes recovered full function in those with severe lesion to the optic nerve, and even improvement was of lesser degree: only six of the 32 eyes with acuity worse than 5/12 before the operation regained the ability to read, in eight improvement did not reach 5/12, while in 16 the condition did not change, and in two progression was noted after the operation.

Disregarding the condition of the optic disc, the postoperative changes in all eyes, subdivided according to preoperative functions, are summarized in Fig. 1D. The prognosis was good in those with scotoma type visual field defects. These occurred mainly in those with normal disc or with temporal disc pallor, and out of 16 eyes, 10 were completely cured and five improved considerably.

It should be noted that ocular functions may continue to improve for about a year and a half.

**Discussion**

A characteristic symptom of chromophobic adenoma is bitemporal hemianopia, occurrence in 44 to 96% of cases. Visual field defects were found in 60% of our 117 patients of pituitary adenomas, a rate which has been decreasing recently with the increase in the number of operations for microadenomas. Chiasmatic lesion occurred in 47% in our material and like Bakay we observed no full restoration in patients of bilateral central defect associated with bitemporal hemianopia, lateral chiasmatic, or tract lesions.

In our 64 patients recovery was full in 28.2%, while 50% of the patients improved, 15.6% remained unchanged, and only 6.2% showed slight progression. After Laws' 45 transphenoidal operations, ocular symptoms normalized in 16%, improved in 69%, and remained unchanged in 13%. Earlier authors performing transfrontal surgery also reported good results.

Our results suggest that a return of normal function may be expected only in the eyes where the optic disc is normal or there is only a temporal pallor. Even in the presence of a severe functional impairment, there is still hope that the functions may improve to such extent postoperatively that the patient will be capable of working again. That the severity of lesion to the optic nerve may be related to postoperative recovery has already been mentioned. According to Lundström et al., poor ocular function without anatomical change of the disc is a favourable prognostic sign. Prognosis is said to be good by Kluber et al. when preoperative visual acuity is better than 6/24, the optic nerve is intact, and the field defect involves less than two quadrants.

The opinion that it is the functions of the eye that have prognostic significance might have arisen because peripheral visual field defects with good acuity occur more frequently with normal optic disc, while the visual field defects involving also the center tend to appear more often when optic disc pallor is severe.

Scotomatous field defects appear more frequently with tumors of relatively rapid growth. We also found scotomatous field defects were a favorable prognostic sign since 62.5% of such eyes had fully normalized functions after the operation.

According to our retrospective analysis, the condition of the optic disc is the single most important factor in predicting the postoperative visual function. Therefore, it is important to make the evaluation as objective as possible. Although experienced ophthalmologists can reliably differentiate normal disc from temporal pallor and that from pallor involving the whole disc, scientific research would be better served by digital measurement of pallor-disc ratios.

**Conclusions**

The preoperative condition of the optic disc is of prognostic significance.

1. When the optic disc is normal, full recovery or improvement sufficient to resume working may be expected after the operation even when visual function is severely impaired.

2. When there is severe pallor or atrophy of the disc, central defect and loss of visual acuity are more common and are often irreversible.
References


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