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Retrospective study to investigate the long-term sustainability of amblyopia treatment

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Abstract

Aim: **To determine whether the level of visual acuity achieved after occlusion for amblyopia was maintained for at least 5 years after cessation of treatment.**
Methods: **Patients whose amblyopia had been successfully treated and in whom at least 5 years had elapsed since treatment were recalled for assessment of their present level of visual acuity. The types of occlusion used, duration of treatment and the treatment regimes were recorded. The patient's comments with regard to their hospital visits were assessed using a questionnaire.**
Results: **Four hundred patients met the inclusion criteria and were recalled for assessment. Seventy-six patients attended the recall appointment. Two cases were excluded from data analysis due to complications with repeated episodes of occlusion treatment, leaving 74 cases for analysis. Sixty-four patients had maintained their level of visual acuity and 10 showed a reduction in their acuity. The average vision reduction was 2.6 Snellen lines. The reduction ranged from 1 to 4 lines for 7 patients with strabismus, 3 lines for 2 cases of anisometropia and 5 lines for 1 patient who had developed keratoconus.**
Conclusion: **Occlusion treatment can be beneficial and the improvement in visual acuity is more likely to be maintained than to regress.**

Key words: Amblyopia, Maintained, Occlusion, Regressed, Visual acuity

Introduction

The benefits of occlusion treatment in amblyopia remain in question and there is a lack of research into the incidence and extent of the regression of amblyopia following occlusion treatment. Gregerson and Rindziunski[1] reviewed 53 patients 10 years after cessation of treatment and found 75% had regressed acuity with an average vision reduction of 2.4 Snellen lines. Sparrow and Flynn[2] reviewed 30 amblyopic patients for an average of 5.4 years. Of the 17 patients whose acuity improved with treatment, 5 (29%) regressed by 1–2 lines. Ching *et al.*[3] reported a regression of acuity in 6 of 73 (8%) patients at 10 years of age and in 5 of 23 (22%) patients at 14 years of age; the average reduction was less than 1 Snellen line. The Paediatric Eye Disease Investigators Group (PEDIG) evaluated 145 cases and reported that 25% of the patients experienced a regression of amblyopia within the first year of ceasing treatment, but found that the risk of regression was less if treatment was not stopped abruptly.

The National Screening Committee[5] has commented on the need for evidence on the long-term stability of visual acuity after amblyopia treatment. The aim of this study was to determine whether the level of visual acuity achieved following occlusion was maintained for at least 5 years after cessation of treatment.

Methods

The case notes of patients who had attended over the last 30 years were reviewed. Criteria for inclusion in the study were that: occlusion therapy had been prescribed for amblyopia, a minimum of 2 Snellen lines improvement in visual acuity had been obtained with the treatment, and treatment had ceased a minimum of 5 years ago. Patients with multiple periods of occlusion treatment were excluded.

Each patient who met the inclusion criteria was sent an information sheet explaining the purpose of the study, a consent form and a pre-paid reply envelope. Patients who returned the consent form were sent an appointment to have their visual acuity assessed. Consent was obtained to inform the patient's general practitioner that the patient had attended the appointment.

At the appointment the patients were given a short questionnaire regarding their experience of childhood occlusion (Table 1). To enable comparability of results, re-test visions were measured using a Snellen chart at 6 metres and a Moorfields Bar Reading Book at 33 cm. If there was concern about the level of acuity recorded at the assessment the patient was referred either to their optician or to an ophthalmic consultant for refraction and a fundus/media check.

Factors considered in the data analysis were treatment regimes, the type of occlusion prescribed, duration of treatment and the patient's perspective of treatment

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Table 1. Patient questionnaire

1. Do you remember visiting the department as a child?
2. Did you enjoy coming to the hospital? Why?
3. Did you object to your patch treatment? Why?
4. What effect, if any, did wearing a patch have on you?
5. If as a child you experienced negative emotions wearing your patch, did this continue into adulthood?
6. If yes, in what way?

received. Patients were categorised into the following groups: strabismic amblyopia, strabismic anisometropic amblyopia and anisometropic amblyopia. The acuity data were considered as the initial number of lines of improvement in visual acuity with occlusion treatment ($\leqslant 4$ lines or >4 lines) and any regression in the visual acuity from the previous best acuity recorded. A loss of 1 Snellen line or more was recorded as regression.

Results

Four thousand departmental case notes were reviewed and 400 cases met the inclusion criteria. The average time from the end of treatment to recall was 13.34 years (range 5–29 years).

Seventy-six patients attended for re-test. Two cases were excluded from the data analysis due to complications with repeated episodes of occlusion treatment. Of the remaining 74 patients, 42 were male and 32 were female. The average age was 19.05 years (range 10–32 years).

The mean age at the start of treatment was 51.31 months (range 4–95 months, SD ±18.92). The type of amblyopia and the improvement in the acuity achieved with occlusion treatment are detailed in Table 2.

Part-time occlusion, total to form and light, prescribed for a limited period each day was the preferred treatment for 69 patients. Transpore, giving total occlusion to form but not light, was used for 2 patients. A combination of atropine and total occlusion was prescribed for 3 patients. The average period of daily occlusion was 60 minutes (range 15–300 minutes, SD ±63.84).

The average duration of occlusion was 17.32 months (range 1–54 months, SD ±9.49). Twenty-six patients had required one additional period of occlusion, which ranged from 3 to 46 months with an average of 12 months (SD ±10.43). Six patients required two additional periods of occlusion ranging from 1 to 9 months with an average of 4.66 months (SD ±2.94).

The case notes stated that all patients had been prescribed maintenance occlusion achieved by reducing the frequency of wear, or the duration of daily wear, over a period of time before ceasing the occlusion. Compliance with occlusion was judged by comments in the patient's case notes and was either good ($n = 59$), fair ($n = 14$) or poor ($n = 1$).

Sixty-four patients had maintained their previous best recorded visual acuity in the amblyopic eye. Ten patients had not maintained the previous best recorded visual acuity and the difference in acuity was significant (χ^2 (1) = 37.45; $p < 0.005$). There was no significant difference between the age at which occlusion was started and whether acuity was maintained (Mann–Whitney test, $p = 0.92$). There was no significant difference between the male and female patients who had maintained their acuity (Mann–Whitney test, $p = 0.65$).

The case notes of the 10 patients whose vision was not maintained were re-examined (Table 3). The average vision loss was 2.6 Snellen lines (SD ±1.78). Acuity for case 1 had reduced from 6/12 to 6/90 and the patient was subsequently diagnosed with keratoconus. Seven patients (cases 2 to 8) had strabismic amblyopia, which had regressed by 1 line or more. Two patients with anisometropia (cases 9 and 10) had acuity that had regressed by 3 lines. Both had discarded their glasses; acuity improved with a pinhole, but not to the previous best recorded level.

Table 2. The categories of patients by amblyopia type

Type of amblyopia	Lines of improvement	No. of patients	Male	Female
Strabismic	>4 lines	32	20	12
	⩽4 lines	20	12	8
Strabismic/anisometropic	>4 lines	3	3	0
	⩽4 lines	1	1	0
Anisometropic	>4 lines	7	2	5
	⩽4 lines	11	4	7

Table 3. Results for cases 1–10

Case no.	Type of amblyopia	Sex	Initial VA	Final VA	Retest VA	Regression	Comments
1	Anisometropic	M	6/36	6/12	6/90	>4	Pathology
2	Strabismic	F	1/60	6/36-1	6/60	1	
3	Strabismic	F	6/24	6/9-3	6/18-1	2	
4	Strabismic	F	6/60	6/9	6/18	2	
5	Strabismic	M	2/60	6/24-1	6/36-1	1	
6	Strabismic	M	2/60	6/12-2	6/60	4	
7	Strabismic	M	4/60	6/12	6/60-	4	
8	Strabismic	M	6/60+1	6/12-2	6/18-1	1	
9	Anisometropic	F	6/36+1	69	6/24	3	Discarded glasses
10	Anisometropic	M	6/24	6/9-1	6/24	3	Discarded glasses

Fifty-six questionnaires were completed. One patient reported negative emotions with regard to wearing the occlusion, which had continued into adulthood. Forty-one patients remembered coming to the hospital and recalled it as a pleasant experience. Reasons for this included having time off school, playing with the toys in the waiting room, and liking the orthoptist and the tests, especially the synoptophore. Patients also remembered rewards such as stickers and a parental treat for being good. Those who disliked coming to hospital mentioned the eye drops. Twelve patients remembered objecting to their patch treatment, because they could not see and were teased or embarrassed.

Discussion

Sixty-four of 74 patients evaluated more than 5 years after the cessation of occlusion therapy for amblyopia had maintained the improvement in their visual acuity. Ten patients (14%) did not maintain the level of acuity achieved with occlusion. This incidence of regression is less than previous reports of 75% by Gregerson and Rindziunski[1], 29% by Sparrow and Flynn[2] and 25% by PEDIG.[4]

Of the patients who had regressed acuity, with the exception of the case of keratoconus, the level of vision at re-test had not regressed to the pre-occlusion level. The average vision loss was 2.6 Snellen lines. These data are in agreement with Gregerson and Rindziunski[1] and Sparrow and Flynn,[2] who reported a regression of 2.4 lines and 1–2 lines, respectively.

Seven of the patients who regressed had strabismic amblyopia, and 6 of these had an initial pre-treatment acuity of less than 6/60. Whilst a low starting vision was not statistically significant the statistical power of the study to detect any such association is low and the lack of significance may reflect this rather than no true difference being present. The 2 patients with anisometropia whose acuity regressed may have maintained their previous best acuity if they had not discarded their glasses. Some improvement in acuity is likely if glasses wear was recommenced given the result with the pinhole.

Four hundred cases met the study inclusion criteria but only 19% attended for re-test. It is possible that those who did not attend may differ systematically from those who did attend, and this is an important consideration when interpreting the data.

Part-time occlusion with detailed close work was the prescribed treatment during the time period evaluated. In the authors' experience this regime is accepted by parents and children and is reflected in good compliance. All patients had been prescribed maintenance occlusion. The low incidence of regression in our study may be due to the inclusion of maintenance occlusion in the treatment regime. The benefits of this 'weaning off' of the occlusion are not established but it has been reported that vision is more likely to be maintained with this regime[4] and our data support this view.

In the questionnaire one patient reported negative emotions about the occlusion treatment and felt the vision had not improved sufficiently to warrant the distress experienced. The vision had improved from 6/60 to 6/18 and had not regressed. The positive response of the other patients supports the studies of Hrisos *et al.*[6] and Choong *et al.*,[7] who concluded that there is no evidence to indicate that occlusion therapy has a negative psychosocial impact on children although at the time of treatment the child can be distressed. It is possible that patients who had a negative experience of occlusion therapy would be less likely to attend for re-test so a cautious interpretation is required. At the re-test visit patients were shown their original vision and they appreciated the effect the patch had on improving their acuity.

Conclusion

Occlusion therapy for amblyopia can be beneficial and the improvement in acuity is more likely to have been maintained than regressed in patients who attend for re-test 5 years or more after treatment.

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