TREATMENT OF ECCENTRIC FIXATION BY THE USE OF A RED FILTER*†

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THE treatment of amblyopia and eccentric fixation is said to be associated with special problems. In some centres pleoptics have been used, but the need for trained staff and special equipment can pose difficult problems. The harmful effects of conventional occlusion of the fixing eye have been stressed by Arruga (1962). Recently, Brinker and Katz (1963) have drawn attention to the fact that, as the fovea contains only cones, a red filter placed before the eye with non-central fixation while the dominant eye is occluded, may have the effect of inducing central fixation by preferential stimulation of the fovea. This is because under red illumination only the photopic mechanism is active so that the cones of the fovea should be preferentially stimulated. However, Scully (1961) and von Noorden (1965) have pointed out that in many cases of eccentric fixation occlusion of the dominant eye does in fact lead to central fixation in the affected eye. In the present study, occlusion of the conventional type was compared with occlusion using the red filter in patients with eccentric fixation. Because the dangers of conventional occlusion have been so often stressed in such cases, it was decided that all patients should be given one month's inverse occlusion to the eccentric eye, before starting occlusion of the dominant eye, regardless of whether red filter treatment was subsequently used or not.

Method

Patients presenting with amblyopia associated with strabismus were routinely examined with the Visuscope, and the fixation was assessed as central or as non-central. The dominant eye was always occluded while carrying out the visuscopy through a dilated pupil. No attempt was made to distinguish eccentric fixation from eccentric viewing. Only patients with eccentric fixation were included. Patients under age 4 years were excluded because the results of conventional occlusion were thought to be satisfactory in this age group (Oppel, 1964; von Noorden, 1965).

The age distribution, the duration of the squint, as stated by the parents, and the original visual acuity are shown in Figs 1-3 (overleaf).

All patients were given an initial period of one month's inverse occlusion with a patch to the amblyopic eye. Thereafter they were divided randomly into two groups:

(1) *Red Filter Group*.—These patients had the dominant eye occluded and a red filter was placed over the eye with eccentric fixation.

(2) *Control Group*.—These patients had the dominant eye occluded with a patch.

A red celastoid filter (supplied by Messrs. Clement Clarke Ltd.) was fixed to the patient's glasses with sellotape. The red filter selectively transmitted light of wavelengths from 600 to 700 mμ. All patients had previously been refracted and supplied with glasses.

Patients were seen monthly and the visual acuity and fixation were checked at each visit.

The visual acuity was measured by Snellen's charts or the illiterate E test. Whether the patient subsequently learnt to read or not the E test was continued if this had been used at the beginning. Treatment was stopped when no further improvement in visual

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FIG. 1.—Age distribution.

FIG. 2.—Duration of strabismus (as reported by parents).

FIG. 3.—Initial visual acuity in affected eye.

acuity was obtained, and the results were classified as follows:

(a) *Cured*.—Central fixation restored, with a final visual acuity of 6/12 or more.

(b) *Improved*.—Eccentric fixation persisted but there was a gain of two or more lines of visual acuity.

(c) *Poor*.—Eccentric fixation persisted with a gain of only one line or less in visual acuity.

Results (Table)

In the control group ten patients out of fifteen were cured, but in the red filter group only six out of 21; this difference is not quite statistically significant ($\chi^2 = 3.72$; $P > 0.05$).

In the control group thirteen patients out of fifteen were cured or improved, while in the red filter group only ten out of 21 were cured or improved. This difference is statistically significant ($\chi^2 = 4.2$; $P < 0.05$).

Group	Result			Total
	Cured	Improved	Poor	
Red Filter	6	4	11	21
Control	10	3	2	15

Discussion

With respect to age and duration of squint the patients in the red filter group tended to be slightly older and to have squinted longer than the controls. The "average duration of squint" in the control group is 2.8 years, while in the red filter group it is 3.6 years. This puts the control group at an advantage, and might account for their better results.

On the other hand, if the six patients in the red filter group whose "duration of squint" was 5 years are excluded, the average duration of squint of the remaining fifteen red filter patients is 3.1 years, and their average age only 5.8 years as opposed to 5.6 years for the controls. The results for this group of red filter patients were four cured, three improved, and eight poor. Thus seven out of fifteen red filter patients were cured or improved compared with thirteen out of fifteen in the control group. This difference is statistically significant ($\chi^2 = 3.98$; $P > 0.05$).

Results similar to those in the red filter group in this study have been obtained by other authors who have used the red filter treatment. Brinker and Katz (1963) had good results in five cases out of eight, Cowle, Kunst, and Philpotts (1967) in seven cases out of ten, and Aichmair (1965) in 21 out of forty. It is interesting that von Noorden (1965) obtained benefit in eleven of twenty patients in whom conventional occlusion had been abandoned.

The remarkably good results obtained in the control group emphasize that conventional occlusion would seem to be effective in the majority of cases of eccentric fixation. Scully (1961) had only one failure in 51 such cases treated with conventional occlusion, though a further six cases were excluded initially. Von Noorden (1965) agreed that the majority of such cases responded to conventional occlusion. In the present study there was nothing to suggest that occlusion of the sound eye was detrimental in cases of eccentric fixation; no case was made worse by this treatment.

The initial treatment with inverse occlusion did not seem to have much effect. A few patients who had initially steady non-central fixation subsequently developed wandering non-central fixation. No case was restored to central fixation by this treatment, but perhaps the duration was too short; Arruga (1962) used longer periods, but Catford (1967) used mainly one month's inverse occlusion.

Some other authors have recommended different ways of using the red filter. Cowle and others (1967) used the red filter 4 to 6 hours a day, and at other times occluded the eccentric eye. The dominant eye was occluded while the red filter was in use. Lyle and Wybar (1967) recommended that the eccentric eye should be covered the whole day except when the red filter was being used, and that the red filter should be used for only 10 minutes at first and then extended to half the day, the dominant eye being occluded.

Summary

The results of conventional occlusion and red filter occlusion in the treatment of eccentric fixation are compared. All patients were given an initial period of one month's inverse occlusion (of the eccentrically fixing eye). There was no evidence to suggest that the continuous use of the red filter while the dominant eye was occluded was of any benefit.

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