EARLY INTENSIVE OCCLUSION IN STRABISMUS WITH NON-CENTRAL FIXATION

PRELIMINARY RESULTS

BY

JOHN SCULLY, M.B., Ch.B., D.P.H., D.O.M.S.

Senior Hospital Medical Officer, Manchester Royal Eye Hospital

Convergent squint is commonly associated with considerable loss of vision in the squinting eye, and not infrequently there is loss of steady central fixation in the same eye. Analysis of the type of fixation in children with convergent squint (Scully and Naylor, 1961; Scully, 1961) has shown that those who attend for examination a short interval after the onset of squint are less likely to have non-central fixation. The incidence of such a fixation defect is also less if the age at onset of the squint is late and if high anisometropia is absent, but the effect of the interval between the onset of squint and examination appears to be independent of these factors. This suggests that non-central fixation is an acquired condition in many patients, and that early examination and treatment may reduce the incidence of non-central fixation. Moreover, the lower incidence (15%) of non-central fixation in an unselected group of patients who have received conventional treatment, including occlusion of the good eye where necessary, compared with the incidence (25%) in new patients in the same clinic (Scully, 1961), suggests that such treatment may well have been effective in re-establishing central fixation in some patients.

Sutcliffe (1958) has found that conventional occlusion of the fixing eye, if carried out with sufficient vigour, results in the achievement of equal vision in almost all patients, some of whom are likely to have had non-central fixation, though special tests were not done to determine this. On the other hand, it has been stated (Bangerter, 1953; Cüppers, 1958) that occlusion of the fixing eye in cases of squint with non-central fixation serves only to intensify the eccentric fixation and that occlusion of the eccentrically fixing eye (which is necessary during and before pleoptic treatment) may result in the attainment of central fixation in the squinting eye. Mayweg and Massie (1958) have also advocated occlusion of the eccentrically fixing eye in an attempt to attain central fixation, but my experience of cases so treated for periods of 6 to 12 months has only infrequently resulted in the achievement of central fixation.

Selection of Patients

During the period October 15, 1960, to February 28, 1961, 245 children with convergent squint were seen as new patients at the Manchester Royal Eye Hospital; in a similar period (November 15, 1960, to February 28, 1961) 46 such patients were seen at the Salford School Ophthalmic Clinic. The type of fixation was determined in all except 41 patients who were too young to co-operate in using the visuscope. This instrument is essentially a hand ophthalmoscope in which the bulb is illuminated from the mains through a transformer. Incorporated in the instrument are test marks which may be projected on to the retina by which it is possible to measure the width of the blood-vessels, size of fundus

lesions, and differences in level of raised lesions in the retina. Its value in squint rests in the determination of the fixation by means of the star test. The patient is asked to fix a projected star, and the observer is able to locate its position in relation to the foveola. An interpretation may be made of the rigidity or otherwise of the fixation.

The type of non-central fixation is usually specified (Scully, 1961) according to the region on which the visuscope star rests (parafoveal, paracentral, or eccentric) together with a "wandering" fixation in which the star wanders over the fundus in an irregular fashion, and an "unsteady central" fixation in which the star hovers over the foveolar and perifoveolar areas; both these latter categories respond well to conventional occlusion treatment (Graham, 1961). It has been found, however, that many cases classified as parafoveal, paracentral, or eccentric also show a slight oscillatory movement of the star over a small area of the fundus, and it was felt that new patients with such an oscillatory or "plastic" type of fixation might also respond well to vigorous occlusion treatment. It had been noted that occlusion of the good eye in cases where the fixation presented as a rigid one did not respond, the fixation remaining in the same position and perhaps becoming intensified at the same site (Cüppers, 1958). For the present purpose, therefore, the primary classification is into those with and those without the "plastic" type of fixation.

A careful history of the onset of the squint was also taken, with particular reference to the age at onset and whether the squint was of a constant or an intermittent type.

Method of Occlusion

Conventional total occlusion of the fixing eye by an adhesive patch applied to the skin followed as required by "soft" patches applied to the glasses, and later by music-mending paper applied to the lenses, was used in all cases, the method differing from that in general use only by the vigour with which occlusion was pursued. Occlusion was begun at the second visit of the patient after refraction and visuscope examination, when the pupil was still dilated, and without waiting for the provision of glasses. It is well recognized that occlusion therapy in young children is regarded both by the parents and by the children with disfavour, and a default rate of 30% or more is frequent. Emphasis was placed on the necessity for immediate occlusion, and a full and detailed explanation of the meaning of non-central fixation in terms of visual acuity was given to the parent at this interview. Demonstration was given of the projection of the visuscope star on a rubber-stamp diagram of the fundus, and the significance of the fixation at different distances from the macula in terms of visual acuity, as seen direct by the parent on the Snellen chart, was clearly indicated. This full and emphatic explanation was given to each parent irrespective of the parent's intellectual powers, standard of education, or social class. At each subsequent visit changes in the fixation were shown on the fundus diagram and the meaning of this was explained. It was felt that this close co-operation with the parent was a vital factor in the successful treatment of the condition.

Results

Of the 250 children examined with the visuscope, 57 had non-central fixation. In six of these rigid eccentric

fixation was present, with a long interval of time between onset and examination, and the patients were regarded as not suitable for conventional occlusion treatment.

At the time of review the 51 patients treated had been under supervision for four to eight months. All had paid at least six visits to the hospital or clinic, although 25 had to be sent at least one letter to ensure their attendance and 13 of these had required home visiting by a health visitor, several of them on more than one occasion. Failure to attend was usually due to illness of the child or other member of the family.

All except one patient have achieved steady central fixation in both eyes, but in 27 of them this was reached only after a stage in which the originally normal eye developed non-central fixation—a "changeover" of non-central fixation. Four of these 27 had an intermediate stage in which each eye had non-central fixation; at this stage either eye might be the fixing eye, but all eventually show a changeover in squint and eccentric fixation to the originally fixing eye. In all patients with such a changeover in fixation, occlusion of the now squinting and eccentrically fixing eye was continued for two, four, or six weeks in order to establish the new-found central fixation in the other. The period of further patching was decided by two factors—the steadiness of the central fixation as estimated by the visuscope, and, perhaps even more important, the interval of time between the onset and first treatment. The cases occluded for the longer periods were those having a long time interval, with perhaps an uncertain central fixation. The procedure adopted to achieve bilateral central fixation was to occlude totally the centrally fixing and straight eye for one week only and to leave both eyes without occlusion for the second week, after which visuscope examination was repeated. In all the cases studied to date bilateral central fixation ensued.

The Table shows the results in relation to the type of squint, age at onset, interval between onset and attendance at the clinics, the final visual acuity (when the child was old enough to permit testing), and whether or not success was achieved in converting the squint to an alternating type. It will be seen that only one patient failed to achieve bilateral central fixation—this patient had an age at onset of 2 months and an interval before treatment of 10 months. Two of the group aged 3–6 years and one with an intermittent squint failed to achieve equal vision. The two former patients could not be relied upon to give an accurate E test, although

their ages at testing were 4 years and 2 months and 4 years and 7 months. The patient with intermittent squint had an age at onset of 2 years and 2 months and an interval before treatment of 5 years and 1 month, and after eight months of occlusion the visual acuity was still unequal.*

The period of occlusion required to establish central fixation in the squinting eye was slightly greater in those aged under 3 years at onset (period of occlusion from 2 to 24 weeks, average 12 weeks) than in those aged 3–6 years and those with intermittent squint, where the period of occlusion varied from 2 to 7 weeks, average 7.5 weeks, and from 2 to 19 weeks, average 8 weeks.

A changeover in eccentric fixation was also more common in those under 3 years; it occurred at any time from 2 to 26 weeks after occlusion began, though the average was between 4 and 6 weeks for all groups.

In a recent follow-up of cases who had ceased supervision several months ago, 12 have been sent for and seven have attended to date. Three of these have been re-examined three months after their last attendance, two four months after and two five months after. All have retained central fixation, five of the seven have retained equal vision, and two have lost one line on the Snellen chart.

Discussion

The results obtained from conventional occlusion in this series are astonishingly good, and are much better than those found in the amblyopia clinic of the Manchester Royal Eye Hospital in patients who have been attending hospital for some time and in most of whom the eccentric fixation has been ascertained many months and sometimes a year or two after the commencement of supervision. Two factors are probably of importance. In the first place, the time between onset of squint and treatment is relatively short in most cases, and none of the children had had any previous treatment whatever; it may well be that intermittent and ineffective treatment is a bar to subsequent achievement of central fixation, as Bangerter (1953) and Cüppers (1958) suggest. The second and possibly more important factor is the extremely intensive nature of the occlusion used in the present series. It has repeatedly been found that parents do not appreciate the importance of maintaining total occlusion for every minute of the day. Forceful explanation, followed by repeated questioning and encouragement on subsequent visits, is essential: half-hearted explanations of the condition being treated and ineffective follow-up are of no avail. In the present series this policy produced no permanent defaulters and is probably largely responsible for the excellent results.

Summary

In a consecutive series of 291 children attending as new patients with convergent squint, the type of fixation was determined in all except 41 who were too young to co-operate; 57 were found to have non-central fixation in the squinting eye. Of these, six had rigid eccentric fixation; the remaining 51, with a more "plastic" type of fixation, were treated by intensive occlusion of the fixing eye.

*Since tabulation of the results, the patient with an age at onset of 2 months has achieved bilateral central fixation and can alternate, although not freely, and the patient with the intermittent squint still has unequal vision after 11 months' occlusion.

Table of Results

Type of Squint	Age at Onset	No. of Patients	Average Interval before Treatment (Months)	Final Bilateral Central Fixation			Final Alternating Squint	Visual Acuity	
				Achieved without "Changeover"	Achieved with "Changeover"	Not Achieved		No. Tested	Equal Acuity
Constant	<2 years	7	6	2	5	—	6	—	—
	2-6 "	15	6	2	13	—	12	—	4
Inter-mittent	3-6 "	20	3-6	13	7	—	20	20	18
	All ages	9	26	6	2	1	5	6	5

All except one patient achieved bilateral central fixation, the majority of the squints becoming alternating in type, with equal visual acuity.

In over half the patients a temporary stage occurred in which the non-central fixation and the squint were transferred to the originally fixing eye.

The excellence of these results is ascribed to the fact that none had had any previous treatment, the majority attending for treatment at a relatively early stage after the onset of the squint, and, perhaps even more important, to the intensive and rigorous nature of the occlusion used.

I thank the surgeons of the Manchester Royal Eye Hospital for their reference of cases for study and treatment.

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INTRAOCULAR HAEMORRHAGE AFTER EPIDURAL INJECTION

BY

C. JUSTIN CLARK, M.D., M.R.C.P.

Consultant Physician

AND

JOHN WHITWELL, M.S., F.R.C.S.

Consultant Ophthalmic Surgeon

Royal Victoria Hospital, Bournemouth

In view of the interest in epidural injection shown in the correspondence columns of the *British Medical Journal* during the first half of 1961, we record the case histories of two patients referred to us because of the occurrence of subhyaloid haemorrhages following epidural injection.

Case Reports

Case 1.—A woman aged 36 gave a nine-year history of left lumbar backache, extending to the left leg. This followed childbirth. Examination revealed lumbar pain on extension and right lateral flexion of the spine. The straight-leg-raising test was positive on the left side but there were no other abnormal signs. X-ray examination showed narrowing of the disk space between L4 and 5, with bilateral sacralization of the fifth lumbar vertebra. On July 9, 1958, under general anaesthesia, an epidural injection of 120 ml. of isotonic saline was given, followed by manipulation of the spine by extension only. On recovery from the anaesthetic the patient complained of blurring of vision of her right eye and headache. Examination of the fundi revealed multiple retinal haemorrhages in the right eye at the pole and adjacent to the disk, several of which were subhyaloid in type. A month later, as these were still present, a lumbar puncture was carried out, with normal findings. Blood-pressure, Hess test, and bleeding, clotting, and prothrombin times were all normal, as were the blood and platelet counts. When we last saw her, in May, 1961, all haemorrhages had disappeared, but a pigmentary disturbance persisted at the right macula and her right visual acuity was reduced to 6/24. The left vision was 6/5.

Case 2.—A woman aged 39 had a six-months history of low lumbar pain radiating to the left leg. Examination showed no deformity but general limitation of movements of the lumbar spine. There was a slightly positive left straight-leg-raising sign, but the lower limbs were otherwise normal. X-ray films showed slight narrowing of the lower two lumbar disk spaces but more severe disk degeneration in the lower thoracic spine. On December 21, 1960, under general anaesthesia, an epidural injection of 120 ml. of isotonic saline was given, followed by manipulation in extension only. Next day she complained of blurred vision in her left eye, with uniocular diplopia in the right eye. Examination showed a retinal haemorrhage close to the right macula, but a very extensive left subhyaloid haemorrhage spreading infero-temporally from the disk and just involving the macula. In spite of bed rest, this latter broke forward to produce a full vitreous haemorrhage with reduction of vision to perception of light only. When she was last seen, in May, 1961, the right fundus was normal,

with 6/5 vision, but there was still a large left vitreous haemorrhage, although the vision had recovered to 6/6.

Discussion

It seems likely that the main factor causing the intraocular haemorrhages in these cases is the sudden rise in intracranial pressure. In both cases the spinal symptoms were completely relieved by the injections.

Evans (1930) demonstrated in the cadaver that epidural injection of 100 ml. of dye-stained gelatin solution reached as far as the upper cervical region. Kelman (1944) pointed out that sudden distension of the epidural space causes acute compression of the subarachnoid space, with sudden rise of the C.S.F. pressure, as shown by simultaneous cisternal and spinal readings. Evans demonstrated in a patient by simultaneous readings from a lumbar puncture needle that the C.S.F. pressure rose to 320 mm. of fluid during an epidural injection of 30 ml. of fluid. Injection of 120 ml. must therefore cause a very considerable rise of intracranial pressure, and the injection would have to be made very slowly indeed if this was to be avoided.

The optic nerve is surrounded by an extension of the subarachnoid space, and the central vein of the retina crosses this space as it leaves the optic nerve to join the orbital veins. The retinal blood circulation depends on the pressure in the central vein of the retina being a little higher than the C.S.F. pressure. A rise of the C.S.F. pressure is immediately reflected back to the retinal veins and capillaries. With a lowered intraocular pressure due to general anaesthesia and a possible rise in arterial blood-pressure caused by the rise in intracranial pressure, it is not surprising that retinal haemorrhages can occur. Retinal haemorrhages occurring in patients with subarachnoid haemorrhage may be similarly produced by a similar sudden pressure increase in the subarachnoid space caused by arterial rupture.

The main retinal vessels run superficially in the nerve fibre layer, and the smaller vessels and capillaries dip down into the retina. Haemorrhages of the latter may disrupt the retinal elements and cause permanent damage. Haemorrhages of the large superficial vessels may break forward through the internal limiting membrane, and, if still limited by the hyaloid face of the vitreous, will produce the characteristic subhyaloid haemorrhage—round with a flat top—rather like a half-