

Current Practice

SPECIAL SENSES

Amblyopia or the Lazy Eye

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In these days of extended medical curricula and wider post-graduate training and experience, one would expect such remarks as "My doctor said Johnny was too young for anything to be done" or "He will grow out of that slight squint in time" to be things of the past. Regrettably, they seem to be as common as ever. Misconceptions about visual development on the part of some doctors and child welfare workers may lead to permanent visual loss and to a great deal of parental distress.

The amblyopic or in lay terminology "lazy" eye has poor sight, usually permanently, and is almost useless. In some cases disorders such as congenital optic atrophy may be the cause and are untreatable; but usually amblyopia is due to arrested physiological development after an untreated visual handicap.

Normally the anatomical development of the eye is accompanied by corresponding physiological development, each stage of which is related to the growth of the child and his visual needs. If, then, the eyes, visual pathways, and occipital cortex are considered as a unit, perfect function is attained only during a specific period of growth. After that it is too late to expect full visual function if it has not already occurred.

The Eye in Early Life

The newborn infant will soon follow a light but does not see small objects clearly since the macula is not formed until the sixth month. Further, though the baby's eye is relatively large compared with his other organs it is still smaller than an adult's, so it tends to be hypermetropic (long-sighted). The visual acuity is low, improving slowly until the age of 4 or 5 years, when an acuity of 6/9 or 6/6 should be attained. An infant who has a large eye at birth may become myopic when fully grown, but an excessively small eye, or one shortened antero-posteriorly, may remain hypermetropic throughout life, though perhaps not so severely as at birth. The hypermetropic eye has to accommodate more in near vision than the normal; and as accommodation and convergence are linked reflexes overconvergence may result. Hence the majority of children with convergent squints are hypermetropic, and correction of the refractive error is the first step in treatment.

Binocular vision is not present in a young infant, but with the development of the macula it soon becomes established, though it is not fully developed until the age of 5 or later. If treatment of a squint is delayed until that age, the formative years as far as binocular vision is concerned have mostly passed, and weak or absent binocular vision may result; while if refractive errors have also been left uncorrected standard

visual acuity may never be obtained. At present regulations do not provide for medical examinations, including sight testing, until the child is of school age. In some areas owing to shortage of school places children may not start school until aged 5½ or even more and then may not be visually tested till well through their first school year. So the critical age of 5 is usually passed before a sight-test is carried out.

Mode of Onset of Amblyopia

Amblyopia ex anopsia, as opposed to amblyopia due to organic disease in the eye, is curable only if discovered early in life. Though special methods can be used for the treatment of well-established amblyopia they usually have only partial success. So it is important to bear in mind the circumstances in which amblyopia may arise:

(1) *A squint*, however slight, if it consistently affects the same eye will soon lead to amblyopia. This is due to suppression or active neglect of the eye by the visual cortex because of the need to avoid the discomfort of diplopia and confusion (the formation of dissimilar images in corresponding retinal points). Suppression occurs readily in an infant, so diplopia rarely arises, and the diagnosis depends on early observation and detection of the squint. Any suspicious case should be referred to an ophthalmologist as early as possible. To say that the squint will disappear in time or "he will grow out of it" is partially correct in the case of a slight convergent squint with amblyopia, since a blind or disused eye tends to diverge towards the position of rest. A convergent squint, therefore, may gradually straighten cosmetically, but a slight divergent squint tends to get worse. So a child over 5 who has dense amblyopia may not require operative correction for the cosmetic appearance of his convergent squint; but to allow a case of convergent squint to reach this stage is as bad as waiting for a gangrenous limb to drop off spontaneously to save the surgeon the trouble of amputating it.

(2) *A unilateral error of refraction* or dissimilar refractive errors (anisometropia) may cause amblyopia without an accompanying squint. If the error is not corrected before or soon after the age of 5 the more normal eye will dominate the other entirely, the blurred retinal image being suppressed by the visual cortex. Even if glasses are worn, amblyopia may persist unless orthoptic treatment is given to overcome this suppression.

(3) *Congenital hypermetropia or astigmatism* may occur bilaterally in the absence of squint, and if it is not corrected early bilateral amblyopia may be the inevitable result. Such cases are often very tragic; the degree of amblyopia may be only partial, yet if the visual acuity in at least one eye with correcting glasses is not 6/12 or better the patient cannot qualify for a driving licence.

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Prevention of Amblyopia

Factors which produce amblyopia, such as squint and refractive errors, tend to be familial. Ideally every child should be sight-tested before the age of 5 rather than after, especially if there is a known case of amblyopia or squint in the family. It is surprising how often one hears a mother proffer the information that "his dad has one eye which has always been weak" when her child is discovered to have unilateral blurring of vision—after the age at which a good result from a spectacle correction can be expected. She seems to be quite unaware of the possibility of a familial tendency in many ocular disorders and the importance of early correction.

Mass screening in the form of an assessment of visual acuity is the only reliable means of detecting early amblyopia. Certainly all young members of an affected family should be tested. A full refraction by an ophthalmologist may not be necessary since there are subjective methods of sight testing which can be carried out by relatively unskilled workers. It is true that these are not so reliable as objective testing by means of retinoscopy after the instillation of atropine, but they form a fairly satisfactory guide and a method of selecting doubtful cases for further testing. The most commonly used tests for children under 5 are:

(1) *The "E" Test* The child is expected to orientate a cut-out letter E in the direction of E's of graded sizes in different directions (upside-down, backwards) on a chart at the customary six metres (see Fig. 1), but this depends on a sense of spatial orientation, which is not usually developed till the age of 4 or later. In most cases a preliminary period of instruction and practice at home is needed, and if large numbers of children are to be tested in one sitting it can be time-consuming.

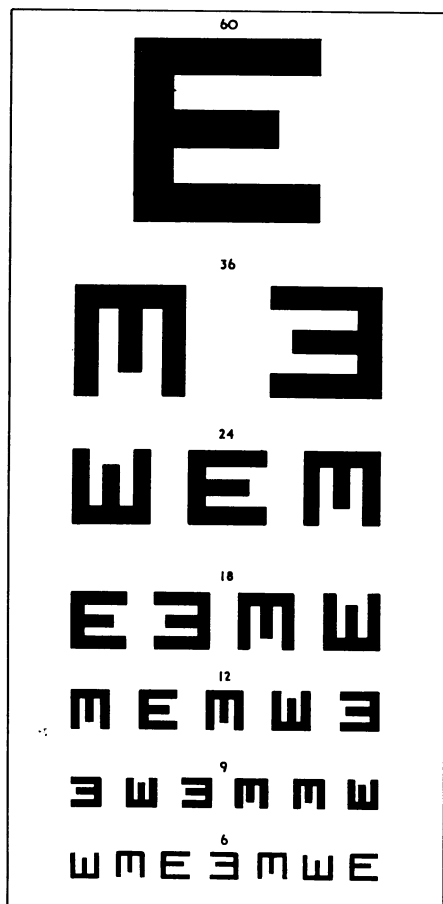


FIG. 1.—Type used for the "E" test.

(2) *The Sjögren Hand Test* (see Fig. 2). In this test a set of cards with the black silhouette of a hand of graded sizes is used, and the child is asked to orientate his hand in the same direction as the one on the card shown. The objections to this test are similar to those for the "E" test.

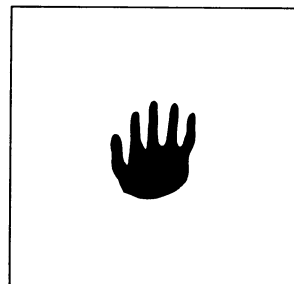


FIG. 2.—One of the Sjögren Hand Test Cards, varying in size, but similar in design.

(3) *Picture Tests* These depend on recognition of silhouettes by the child of such objects as an engine or a ship. He may never have seen the objects pictured and may therefore fail to name them, though his vision is normal; also it is difficult to design these pictures so that they are related accurately to the Snellen sizes of the usual test type.

(4) *Ffooks's Symbol Test* (see Fig. 3). This in my opinion is the most useful and practical visual test for young children. Three symbols are used—the square, the circle, and the triangle. These are among the first shapes to be recognized by the developing child, so that the test can be performed at an early age, usually at 3 and sometimes younger. The symbols are most conveniently presented, one on each side of a cube, and are of the graded Snellen sizes. They bear a similarity to each other, like that of the letters of the conventional Snellen type, so that the ability to distinguish them is closely related to the visual acuity and does not require a developed sense of spatial orientation as well.



FIG. 3.—Symbols used in Ffooks's "Cube" Test.

The apparatus comprises two cubes (alternatively cards can be used but are not so easily managed). One side of the cube is presented to the child, who then indicates the same symbol from plastic reproductions of the symbols placed immediately in front of him. It is easier to get good co-operation and concentration if the test is carried out in semi-darkness with a bright light shone on the cube, and the plastic symbols put on a white background. No preliminary training is required, and the test can usually be carried out in a few minutes.

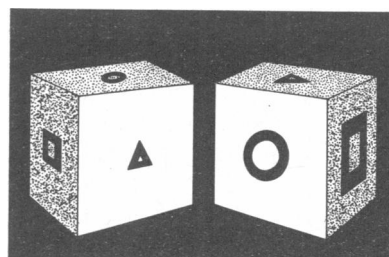


FIG. 4.—Ffooks's cubes for visual acuity testing in children.

Management of Amblyopia

Once reduced visual acuity has been detected or is suspected the child should be referred to an ophthalmologist for a complete examination, which includes a refraction under the full cycloplegic action of atropine. If a squint is found or suspected further assessment by an orthoptist should be made, but glasses should first be given for any errors of refraction which may be found.

In cases of dissimilar refractive errors, improvement in vision does not usually occur just from wearing glasses unless suppression of the worst eye is overcome by occlusion of the better eye. This applies also if a squint is present. Occlusion forces the child to use the neglected eye, but the treatment should be carried out in association with the orthoptist: without full preliminary assessment occlusion may merely reinforce an abnormal visual habit in cases where false retinal correspondence is occurring or a false "macula" is becoming established.

Effective occlusion requires an Elastoplast cover fixed to the skin all round the margin of the orbit or as a shield over the spectacle lens and side piece if glasses are worn (Fig. 5). Otherwise the child will be tempted to use the better eye by peering round the edges of an inadequate cover. The parents' co-operation is essential, since the child will need sympathetic management and encouragement at first and should be induced to use the amblyopic eye by looking at books, doing jigsaw puzzles, or even looking at television.



FIG. 5.—Occlusion, worn over spectacles.

In schoolchildren with gross amblyopia occlusion is impracticable except during a long school holiday or when a squint, if present, is of late onset, when recovery of vision may not take long. Otherwise prolonged occlusion of several months may be necessary until vision in each eye is equal. In most children, the earlier the age of onset of the squint and the longer its duration the more difficult it is to eliminate amblyopia.

Pleoptics

This is a form of treatment for amblyopia in older patients when occlusion has failed and in those with a long established or neglected condition or with abnormal binocular

function. It requires frequent visits to an orthoptist and demands the expenditure of much time and effort on the part of therapist and patient. Detailed description of the technique is out of place here; but, briefly, selected areas of the retina are either stimulated or suppressed by a dazzling light which is partially shielded, so that true foveal fixation is eventually elicited rather than paramacular fixation. The success of this type of treatment is difficult to forecast since it depends on many factors such as the age of onset and the type of abnormal vision. On the whole, cases with squint originating from birth or soon after do badly—a conclusion reached by most exponents of pleoptics,²—whereas those cases which are of later onset may improve noticeably, with the re-establishment of normal binocular vision in some instances. It has been shown relatively recently that amblyopia is almost always accompanied by some degree of eccentric fixation (Fig. 6). The diagnosis of the exact correspondence this abnormal fixation has with particular areas of the retina, with consequent abnormal spacial projection, is important as a guide to prognosis. Examples of the fate of such patients even after several weeks of intensive pleoptic therapy³ are a man of 29 who lost his good eye after a motor accident but had

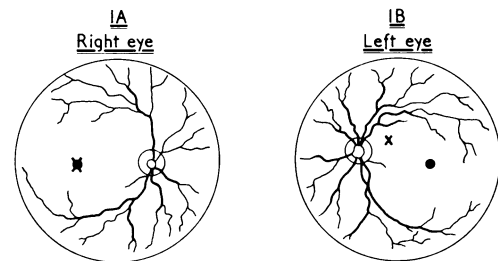


FIG. 6.—Fundus of normal right eye and amblyopic left eye, showing fixation points ('X').

only 5/60 vision in his remaining eye, which improved to only 6/36, and a girl of 6 whose amblyopic eye attained a visual acuity of only 6/18 from 6/24 after three months' treatment.

Conclusion

I hope this brief article on amblyopia will bring home to all practitioners the importance of early treatment of squint and in particular will make them aware of the importance of early eye testing, especially in "high risk" children. The type of testing described for very young children should be possible to carry out in a surgery in a few minutes and could often be undertaken by a nurse. Though some cases of missed amblyopia can be rescued by pleoptics, conventional methods of treatment given during early life are more likely to be successful.

The apparatus for Ffooks's Cube Test is available from Instrumedic Ltd., 11 and 15 Wigmore St., London W.1.

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