ABC of Ophthalmology

P A GARDINER

MANAGEMENT OF DEFECTS OF VISION IN EARLY CHILDHOOD

Developing the brain

At birth both the retina and the occipital cortex are incomplete. Development of these elements depends on use, so correct vision is important in childhood. If the eye receives no stimulus vision will be impaired and the actual apparatus for seeing will not become fully developed.

Vision therefore has to be learnt by degrees at the proper time, one vital period being infancy. Thus a child with congenital cataracts must have surgery early to avoid a permanent and irreversible visual defect, which would occur if surgery were delayed much beyond the first year.

Babies are interested in their fingers or blanket threads or crumbs from a very young age but do not become interested in more distant events until they leave their cots and become mobile. Visual experience therefore seems to be acquired first from near objects and later from distant ones.

The infant builds up a framework of visual information that is secure for near objects before venturing into the space beyond. It is much harder to establish a relationship with distant areas, possibly because of the sheer number of visual impressions that need analysis—movement and colour being added problems. Judging distances, for example, requires much experience and experiment.

Action to establish normality of vision

Therefore a system for detecting defects is needed. Children who are learning all the time will not complain about a visual defect until they can make valid comparisons with their fellows. This often does not happen until about the age of 10, but by then they will often suppress the knowledge of their defect for fear of the treatment.

Ideally every infant's acuity should be tested in infant welfare and developmental clinics. When time or skill is short particular attention should be paid to certain groups.

Antenatal and perinatal influences may have important effects on vision. For example, rubella in the first three months of pregnancy may cause cataracts in an infant. Oxygen given at birth may blind or seriously impair vision. Very small babies have a greater risk of eye defects than others, as do twins.

Children with any physical or mental handicap—particularly the brain-damaged—are likely to have more than one handicap, and this may be visual. Another special group are the deaf, who although they are not especially likely to have visual defects, do need a higher visual standard earlier than other children if they are not to be at a disadvantage in lip reading and interpreting the moods of others by vision rather than tone of voice. Infants whose close relatives had defects from infancy also need special examination.

In all these groups positive action to establish the normality of vision is essential and can be carried out in infant assessment centres. Doctors should not be satisfied by negative results but should seek specialist help if any doubt arises. By the age of 2 visual performance in these groups should have been correctly assessed and any necessary treatment started. In many children doubt will remain and continuing regular assessments need to be made.

Family history and hereditary disorders

Colour blindness—X linked recessive inheritance

Hereditary visual disorders will generally manifest themselves at the same age in each generation. It is therefore senseless to look for glaucoma in an infant because many relatives became glaucomatous in middle age. It is also a misconception that myopic parents will produce short-sighted babies unless they themselves were born short-sighted. If the parents became myopic later in childhood, however, then their children are likely to repeat this pattern.

Severe refractive disorders

Congenital disorders of refraction, whether long sight or astigmatism, appear to be inherited conditions. If they are very severe in the parent they should be looked for in early childhood. Mild refractive anomalies are not important to infant development, but severe forms may be. This is particularly true of severe hypermetropia, which predisposes to the appearance of squints or to the neglect of one eye. Once refraction has been performed and an anomaly identified it is a matter of judgment precisely when to order glasses.

Despite the growth of the eye, any optical anomaly will alter very little except in those who acquire myopia during later childhood.

As well as establishing the transparency of the eye and presence of a normal retina, any ophthalmological investigations must include an assessment of refraction. Severely abnormal acuity may have a profound effect on visual development. Glasses must be provided even at very early ages.

When screening among children was not performed it was common to see adults severely short-sighted from birth or later who had never worn glasses. When given glasses these improved their sight only slightly. Often the extra amount of vision proved an intolerable amount of visual information and the glasses were discarded. This state of affairs is preventable only by finding and treating defects as soon as they arise in childhood.

Simple tests of vision

Short-sighted children benefit immediately from glasses. Their unaided good near vision will have provided them with a background of partial visual education that the highly long-sighted child does not possess. The long-sighted child will therefore have to learn to interpret the new images that glasses provide him with before deriving the greatest benefit.

The tests available up to the age of 3 are cumbersome, time consuming, and often inconclusive. So further investigation is needed by an ophthalmologist in the children in the groups at risk who do not carry them out convincingly. These tests include those based on optokinetic nystagmus, unmasking balls of varying diameters, and matching tests. Test failures should never be expressed confidently as a visual defect in the absence of an ophthalmological examination because it is so often due to a lack of concentration rather than to visual failure.

The place and technique of testing visual acuity must depend on the level of accuracy that is being aimed at. Thus a paediatric assessment centre will need the whole panoply of apparatus. There are, however, several useful but non-complex methods that can be used in ordinary surroundings so that a health visitor (for example) can make some judgment on the need for further advice. These include spinning a coin; this should attract a child's attention, but the crucial moment is when the coin falls silent. If the child moves to pick it up it is evidence of useful vision and that he was not just responding to the noise. Another important piece of evidence is if a child turns his eyes towards a torch, but beware of the click of the switch being heard. Small sweets such as Smarties and, even better, "hundreds and thousands" are also useful in testing a young child's ability to see.

The most reliable simple test of basic ocular function is the pupil's reaction to light. If this is present in an infant who is otherwise normal then the outlook for useful vision is good, however unresponsive to other tests he may be.

School entry: greater demand on eyesight

2 years	No gross defect ?
5 years	Test: Distance vision Near vision Colour vision
>5 years	Myopia ?

The increasing development of skills and mobility makes more demands on eyesight the older the child grows. Formal screening of visual acuity at school entry is therefore essential. This test is necessary not only on general grounds but also to ensure that education is not retarded. It is wise to include a test for near vision as well as distant vision, because impaired near vision will increase fatigue and indicates hypermetropia or astigmatism.

The examination at school entry should include a simple test for colour vision defects in boys. About 10% of boys have difficulty with colour discrimination and about 5% have a considerable hereditary red-green deficiency. Any defect remains unchanged through life but it seems sensible to identify it as early as possible.

Colour blindness is so rare as to be of little importance, but defects in discrimination can catch out and distress young children who are unaware of their defect.

It should be established before the age of 2 that there is no gross defect in sight and by 5 that both distance and near vision are adequate in each eye if not perfect. After 5 deterioration in the absence of disease is not likely to occur except in the 10-15% of children destined to become short-sighted in middle or late childhood.

The photograph of the optokinetic nystagmus drum is reproduced by kind permission of Keeler Instruments Ltd.