

A guide for medical students: examining the eye in infants and young children

Miss A Gupta

SpR Ophthalmology
Manchester Royal Eye Hospital

A Gupta

INTRODUCTION

Infants and young children can be difficult to examine and this is particularly true when trying to assess vision and look in detail at the eye! In this article a few basic examination techniques are described with the aim of helping you identify a problem with a child's vision.

Vision develops rapidly in the first two years of life and then continues to 'fine tune' until about the age of 7-9 years. Thus, early detection of visual problems is vital so that children have the best chance of achieving their maximum potential vision.

The timing of the examination of a developing child is important and dictates the type of assessment performed. Ideally, the child should be examined during the newborn period (before 6 weeks), at 3 months and at 6 months. Examinations outside of these times are also performed if there are any concerns regarding visual development. Formal visual acuity evaluations should begin at 3 years. However, this must be tailored to the child's level of co-operation. Children of any age seen in the eye clinic will have a formal visual acuity with key picture cards or letter matching tests e.g. Sheridan Gardiner. From 5 years on most children will be able to cooperate with a recognition (letter) optotype test such as the Snellen Chart. Refraction (usually by an optometrist) and ophthalmoscopy should also be possible. After this children should ideally have an eye examination every 2 years.

Generally, all eye examinations should include an external inspection of the eyes, a test for visual acuity (which is dependent on age), assessment of ocular motility, muscle imbalance, stereopsis and ophthalmoscopy. At a specialist hospital eye service a refraction (test for glasses) is also performed.

You will get the best from children if they are comfortable, relaxed and well at the time of examination. Trying to deal with irritable, upset children is guaranteed to exhaust you by the end of clinic. Below, we discuss the methods used to assess children under 5 years of age.

AN AGE SPECIFIC GUIDE TO CLINICAL EXAMINATION

Newborns- 2 years

Firstly, conduct an external inspection of the eyelids and orbits - Are they symmetrical and structurally normal? Do the lids close properly? Can he/she open their eyes? Generally neonates/young infants open their eyes when held upright or leaned slightly forward. Is there any evidence of a lid mass, discoloration or proptosis? Are the lids droopy? If so, do they

obscure the visual axis and risk the development of amblyopia.

Often most of this information is gained through observing the child whilst talking to the parents. It is also useful to note if the child is interacting with the environment, fixing and following and making eye contact. Most of the examination is usually opportunistic- often losing the opportunity when you try to formally examine the eyes.

To test visual acuity use a toy to see if the child can fix and follow it (an interesting brightly coloured toy often helps). The smaller the toy the child can see, the better the vision (although this is a very crude test). Another gross test of visual acuity involves using 'hundreds and thousands'. If the child is able to see and pick up the small sweets at 33cm the visual acuity is at least 6/24.

There are other tests available which are usually performed by orthoptists e.g. preferential looking tests using Cardiff acuity cards/Lea Grating cards. These tests involve shapes with variable outlines and black stripes of varying thickness respectively. If the child looks up or down (depending on where the picture is placed on the card) it is apparent to the observer that the child can see the object. High frequency (thin lines) and shapes with a thin outline are harder to see and an assessment of visual acuity is made accordingly (see figures 1, 2 and 3 below).



Figure 1: Cardiff acuity cards. The figures illustrate the outlines of the shapes. The finer the outline the more difficult it is to see the shape.

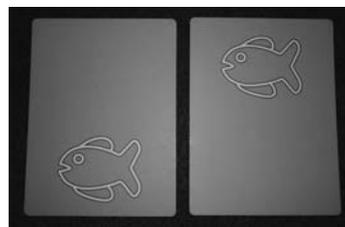


Figure 2: The cards also have images placed inferiorly so that the tester can be sure that the child has seen the image by tracking the child's eye movement.



Figure 3: Lea grating cards

It is important to cover either eye with your hand (one eye at a time) to see if the child objects. Try to see if they can fix and follow the toy with the uncovered eye. If there is poor vision in one eye the child may try to pull themselves away when their good eye is covered. This is known as 'objection to occlusion'.

Use a torch and loupes (magnifier) to look at the conjunctiva, sclera, cornea and iris. Is one cornea larger or smaller compared to the other? Are they both clear? Cloudy corneas can be a sign of congenital glaucoma and also other ocular conditions. Look at the pupil and test the pupil reflexes- are they round? Are they equal in size? Do they react equally to light? (a good mnemonic to remember is 'PERLA': Pupils Equal and Reactive to Light and Accommodation).

In order to assess the alignment of the eyes you can shine a torch light onto the cornea and observe the reflections produced in both eyes. Asymmetry of the reflections may indicate a squint is present - this is known as the Hirschberg test.

Testing ocular motility and vision can be hard in young children! Ocular motility is tested by trying to get the child to follow a target such as a pen torch or a toy and moving into the different positions of gaze whilst keeping the head steady. This can be achieved by playing with the child and taking the opportunity to move the toy into different positions of gaze whilst keeping the head still.

Finally, see if you can obtain a red reflex with an ophthalmoscope and compare the reflex you see in each eye. The reflex should be red and equal in both eyes. If no red reflex is seen, this can be an indication to the presence of cataracts, retinoblastoma or other childhood eye diseases. You may be able to see if any obvious cataract is present with the ophthalmoscope.

2-4 years of age

A visual acuity should be obtained by 3 years of age at the latest. If this is not possible repeat again 4-6 months later. If this is unsuccessful then a referral to an orthoptist or ophthalmologist is warranted.

Many of the above principles also apply to this age group. A range of specialist picture-matching tests are available to test visual acuity (This is usually possible from around 2.5 years of age). Deciding which one to use depends on the capability of the child. Different tests are available for children who are older but unable to read letters or numbers. Examples include the tumbling E chart (see figure 4).

5 years and older

All the techniques previously discussed should be performed. Almost all children should be able to read a recognition letter chart and therefore have a formal vision test. Most children of this age are co-operative with ophthalmoscopy and refraction.

All children above the age of 6 months should ideally have an assessment of stereopsis. There are many different tests available to measure stereopsis, each varying in the degree of stereopsis they measure. These tests are usually performed by an orthoptist.

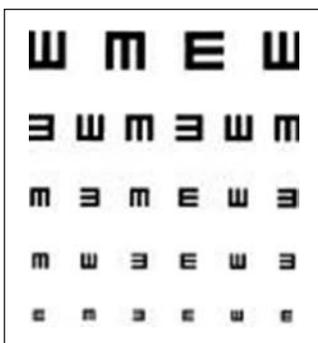


Figure 4: The tumbling E chart

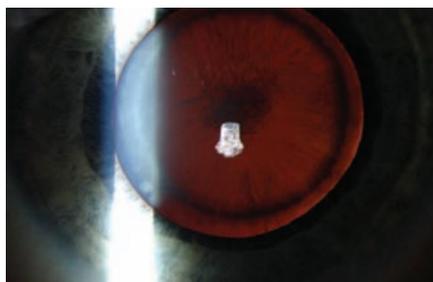


Figure 5: Congenital cataract



Figure 6: Left Esotropia (also note the epicanthal folds)



Figure 7: Left Exotropia (the fixating eye is the right eye)

1. Never forget that a good history is vital and should include family history, consanguinity, birth history, information regarding the mother's condition during pregnancy and any problems encountered.

2. If a child wears glasses test their visual acuity and eye movements with their glasses on.

3. At the start of the examination introduce yourself, be friendly and try to 'win' them onto your side by, for example, chatting about their clothing/how old they are, where they go to school etc.

4. During the ophthalmoscopy examination make sure both eyes are kept open (this makes the examination easier as otherwise the open eye rolls upwards)

5. Try to keep them at ease by asking their age/favourite colour etc. Don't be afraid to be a little bit silly! Although too much noise may be somewhat distracting!

IMPORTANT EYE CONDITIONS

What are you looking for?

Carrying out the assessments well is important but it is important to be clear about what you are looking for:

Many conditions (a few of these are discussed below) need to be picked up early in order to ensure the child has the best chance of developing a 'normal' or near normal visual system. This not only means good visual acuity but also other visual functions such as using both eyes together to give good binocular vision and depth perception.

Congenital cataracts (see figure 5) - Many congenital cataracts are familial (Autosomal Dominant, Autosomal Recessive or X Linked). However, some congenital cataracts are associated with a variety of systemic disorders. Therefore, children with congenital cataracts usually need assessment by a paediatrician as well as an ophthalmologist. Cataracts may occur with some metabolic disorders. The infantile onset cataracts seen in galactosaemia may reverse with dietary manipulation. Other causes of congenital cataracts include chromosomal disorders such as Down's syndrome and congenital infections (Toxoplasmosis, rubella, herpes simplex/ varicella, Cytomegalovirus (CMV); a helpful mnemonic to remember these infections is TORCH). The finding of a cataract in a child requires prompt referral, for example a cataract found in the first year of life needs to be removed as soon as can be practicably achieved.

Strabismus ('Squints') - Strabismus is a misalignment of the two eyes so that the eyes are not looking in the same direction. This misalignment may be constant or intermittent. An esotropia or convergent strabismus (the most common type of strabismus in children) is an inward turn of the eye (see figure 6). Exotropia (Divergent Strabismus) is an outward turn of the eye (see figure 7). Vertical strabismus is less common but may arise in conjunction with a horizontal strabismus. (In hypotropia the non-fixing eye is lower than the fixing eye and in hypertropia the affected eye is higher).

There are many causes for strabismus. Refractive error (the need for glasses), either long-sightedness (hypermetropic accommodative) or a difference in focus between the two eyes (anisometropia) may cause strabismus. Other ocular pathology may lead to 'sensory' strabismus. This ocular pathology may affect any of the structures in the eye from the cornea through to the retina. Thus as strabismus may be a symptom of a more serious underlying cause, it is vital all children with a misalignment of the eyes have a comprehensive eye examination. However, most strabismus is not associated with serious eye disease, but this must be excluded.

If one eye doesn't see as well as the other, referral to the ophthalmologist is warranted. Treatment is often initiated in the form of occlusion or 'patching' (this treatment involves literally wearing a patch over the good eye) and/or wearing glasses. Patching the good eye encourages the eye with poorer vision to be used and therefore the visual function in this eye to 'catch up'. Regular orthoptic checks are done to ensure that the amblyopic eye improves. Loss of vision in the patched eye is very rare. It is important that parents understand this concept and thus encourage the child to wear the patch. The potential transferability of the visual system is greater the younger the child. The brain becomes more 'hard wired' as the child becomes older. Thus younger children have the best chance of gaining visual function after patching treatment is started.

Glasses - If a child has a visually significant refractive error they should be prescribed glasses and encouraged to wear them. The child's parents should understand the importance of this so they in turn can reinforce wearing the glasses as recommended. Not wearing the appropriate prescribed spectacles can itself lead to amblyopia. The need for glasses may be indicated by reduced acuity, onset of strabismus/squint or visual discomfort (asthenopia). A difference in the refractive error (need for glasses) between the two eyes (anisometropia) can also be an important cause of amblyopia.

Retinoblastoma - this is a rare childhood cancer of the retina. It can manifest in many ways, but most frequently as a white pupillary reflex, a squint, poor vision or rarely pain in the eye. This is a serious condition which requires urgent treatment. It has implications for the family should they plan further children and also implications for the child when they come to having a family. Children with this condition are managed in specialist units by a paediatric ophthalmologist, oncology and genetics teams.

The signs below should alert you that there is an ocular condition which needs further assessment.

Infants and toddlers (up to age 2):

- Jerky eye movements (Nystagmus) - you may be able to see fine movements of the eyes, these may be worse in a particular gaze.
- Eye turn, squint - this is very important and should not be overlooked. Any strabismus is abnormal after 3 months.
- One pupil larger than the other (or smaller)
- Droopy eyelid
- Closes or covers one eye
- Head tilts or head turn

- Red eyes/discharge
- Watery eyes
- Shies away from light/ keeps eyes closed
- No interest in visual stimuli
- Delayed development in other areas (speech, hearing, not grasping/reaching for objects)
- Poor hand-eye coordination

Children: 2-5 years:

- Eye turn, squint- again this should not be overlooked.
- Persistent rubbing of eyes
- Red rimmed eye lids
- Covers or closes eyes when looking at objects
- Avoids reading/puzzles (activities where clear vision is needed)
- Headaches

At risk children include:

- Premature babies
- Family history of glasses, patching, pre-school eye problems, lazy eye, surgery
- Low birth weight babies
- Special needs children

There are many other eye diseases manifesting in children that may cause poor vision or lead to blindness (such as childhood glaucoma) but due to the brief nature of this article they will not be discussed here. We recommend that a more extensive ophthalmology text is referred to, if further information is required.

ACKNOWLEDGEMENT

Mr I.C Lloyd (Consultant Paediatric Ophthalmic Surgeon, Manchester Royal Eye Hospital) for his help and expertise in drafting this manuscript.

REFERENCES

American Academy of Paediatrics, Committee on Practice and Ambulatory medicine, Section on Ophthalmology.

Eye Examination and Vision Screening in Infants, Children and Young Adults.

Paediatrics. 1996; 98: 153-157

American Association for Paediatric Ophthalmology and Strabismus. Policy Statement. 2003