Examining the paediatric retina

Dr Simon Barnard
PhD BSc FCOptom FAAO DCLP DipClinOptom

Director of Paediatric Clinics
Department of Optometry & Visual Science
City University
London, UK

This lecturein Israel has been kindly sponsored by Topcon plc http://www.topcon.co.uk

Introduction

This lecture will discuss the various methods that are used to examine the ocular fundi of babies and children.

A number of retinal specific conditions will be reviewed, these being either the more common conditions seen in paediatric practice or those serious diseases that can be difficult to differentiate from the normal. For a more extensive review of paediatric retinal conditions the reader is referred to Taylor (1990).

It could be argued that whoever carries out an eye examination should take responsibility for examining the retina. This poses a dilemma for optometrists in different parts of the world. Optometrists in some countries are not licensed to use mydriatics (e.g., Israel, Portugal, Spain, France). In those countries where mydriatics are used (e.g., UK, Holland, USA) not every optometrist dilates the pupil of every patient on every occasion. In some countries, optometrists are forbidden to examine the retina (e.g., Greece).

If mydriasis is not used, then a full view of the fundus cannot be expected and a thorough examination of the ocular fundi in children poses additional difficulties.

Mydriatics commonly used are the anti-muscarinics Tropicamide 0.5% or 1% and the sympathomimetic, Phenylephrine 2.5%. Sympathomimetics are contraindicated in premature babies and phenylephrine 10% is contraindicated in children and must never be used in infants as it may cause a cardiovascular hypertensive crisis.

Difficulties in examining children

Examining the ocular media and fundi of younger children and babies can be much more difficult than examining fully co-operative older children or adults.

Babies and infants tend to fixate on the light source of direct ophthalmoscope thus giving a view of the macular but little else. An adequate view of the optic nerve and periphery may not be possible.

Sedation and anaesthesia

If a full examination of the ocular fundus of a baby or young child is critically important e.g., suspected pathology then the ophthalmologist may use a sedative e.g., chloral hydrate, or a general anaesthetic (Taylor, 1990).

Methods of retinal examination

Non-Photographic methods

Direct ophthalmoscopy

The direct ophthalmoscope has the advantage of being relatively easy to use on co-operative patients. It provides a reasonable magnification of x15 for the emmetropic eye.

Another advantage is that a view of the fundus can be obtained without the use of a mydriatic drug making it an important technique for “routine” examinations and in countries where optometrists cannot use mydriatics.

However, because it is a monocular technique, stereopsis is not afforded and also the field of view is poor, only 10° in the emmetropic eye (two disc diameters). Another disadavantage is the relatively poor illumination as compared to indirect techniques but with the clear media of most children, this is less of a disadvantage.

A useful fundus examination with the direct ophthalmoscope can be obtained on co-operative young children (3 years and over) but younger children and infants more difficult.

It is important to seek anatomical details, particularly the disc and macular.

Indirect ophthamoscopy

Indrect methods of ophthalmoscopy employ a condensing lens to form an inverted and laterally reversed image which the optometrist then views.

The main advantages of indirect systems is Stereopsis and large field of view making changes in colour and elevation easier to detect. The illumination is also brighter than direct making viewing through media opacities easier.

The ***head set indirect*** is a very important technique for babies and children and, depending on the power of the condensing lens used may give between 45° to 60° field of view. This technique should be used prior to direct to obtain an overall view or impression of the retina with a + 20 D lens giving a compromise with regard to magnification and field of view. A +30 D may be used to obtain a larger field and a +14 D used to obtain greater detail.

It is necessary to dilate the pupil with an anti-muscarinic.

The combination of ***slit lamp microscope with a fundus lens*** (e.g., Volk) is also a very useful technique but the ability to carry out this technique is affected more by the co-operation of the patient. The potential field of view with, for example, a +90 D Volk Superfield is 120°, although the field of illumination employed is much less. The magnification of the image is x 0.7 and, when this is viewed through the slit lamp with a x 20 magnification, then a similar magnification to that of direct is obtained but with the added advantages of good illumination, stereopsis and wide field of view.

The use of a mydriatic is preferable although with a naturally large pupil, a 3-D view of the disc can be sometimes obtained without dilating.

Contact fundus lenses e.g., Goldman 3-mirror

This technique is rarely indicated for children as great co-operation is required. A central lens provides 30O view of posterior pole with mirrors used peripheral retinal examination .

Imaging systems

Direct ophthalmoscopy and head set indirect are most commonly used in paediatric optometric practice but there are ways in which retinal examination can be improved.

Modern digital imaging systems enable the optometrists to obtain excellent images of the ocular fundi of children, usually without the need to dilate. An infra-red system allows the practitioner to focus on the retina without any other ambient illumination. The camera flash is faster than the pupil response thus enabling image capture.

Digital fundus cameras are superb for photographing children aged 3 or 4 years and older. Routine use helps in terms of serial comparison and is especially helpful in comparing optic nerve appearances over time..

Can digital imaging help us with babies and children ?

OptoMap Laser Scanning Ophthalmoscope

This instrument offers a breakthrough in paediatric eye care with a number of advantages. No mydriatic is required for pupils larger than 1 ¾ mm; a field of view of up to 200° is photographed and a iew of retina and choroid may be viewed separately or combined.

The confocal system means that everything is always in focus. This means that lining up the baby exactly is less critical, and that a view, even if not the full field, is obtained.

Images can be obtained at any age. The youngest demonstrated in this lecture is that of a 3 month old infant.

Retinal anomalies in primary care practice

Swollen optic disc

A common dilemma for the optometrist is to differentiate between physiological and pathological swelling of the optic disc.

There are a number of conditions that require differential diagnosis.

Optic nerve drusen

These lesions are hyaline deposits buried in the optic nerve, displacing nerve fibre tissue and creating a swollen appearance to the optic disc. In children the drusen tend to be less visible to ophthalmoscopy than in adulthood as the condition progresses.

Drusen may be inherited as an autosomal dominant trait and are bilateral in 75% of cases. The lesions may impinge on nerve fibre bundles giving any manner of visual field defects.

Haemorrhages also can occur and these are often peripapillary and crescentic in shape.

Visual acuity is rarely affected so caution should always be taken in attributing reduced VA to drusen.

Tilted disc and situs inversus

This occurs usually high myopes. The appearance of swelling occurs because the nasal edge of nerve head is indistinct due to overlying of the retina across the disc margin.

Bergmeister's papilla

This consists of remnants of hylaoid vessels and glial supporting structures and can be confused with raised neural tissue on the nerve head.

"Choked disc"

A truly “choked disc” may be caused by **papilloedema**, which is due to a passive swelling of optic nerve head or **papillitis** which is an active inflammation of optic nerve head.

Because the ophthalmoscopic appearance of the two is very similar, it is wiser to employ the term “choked disc” until other investigations provide a definite diagnosis.

Very early changes difficult to detect or differentiate and a dilemma for the optometrist is to detect the very early “choked disc”, especially when a papilloedma, that does not manifest haemorrhages.

Papilloedema is most often associated with raised intracranial pressure (ICP).

Vision will usually be normal even if the nerve is markedly swollen. The swelling comprises congested neurones and dilated blood vessels. The congestion spreads causing retinal disturbance and choroidal folds.

Early signs of papilloedema include blurring of disc margin, an elevated disc, dilated retinal vessels and an absence of spontaneous venous pulsation on disc.

Later additional signs include splinter haemorrhages, cotton wool spots and exudatesExudates

Case history 1

0 year-old boy presented for routine check with no symptoms. He had broken his spectacles. A slightly raised disc with no haemorrhages, was observed in both eyes with slit lamp BIO. Fundus photograps had been taken 1 year before showing the change that had occurred.

An urgent referral was made for a neuro-ophthalmological opinion leading to diagnosis of a brain tumour which was successfully operated upon.

Case history 2

An 8-year old boy with ADHD attended for a routine examination. He was under the care of a paediatric endrocrinologist due to poor growth patterns for which he was taking the drug somatropin.

Direct ophthalmoscopy showed blurred disc margins, with Slit lamp BIO showing raised optic nerve heads.

Neurological and ophthalmological investigation confirmed papilloedema and raised CSF, possible secondary to somatropin.

Case history 3

Diagnosis – Pseudotumour cerebri (Benign Intracranial Hypertension - BIH)

Benign intracranial hypertension is not uncommon in childhood and can occur without precipitating cause. Known causes include withdrawl of steroids, vitamin A intoxication, and the use of tetracyclines

Case history 4

Peripheral & other retinal conditions

Choroidal naevus

CHRPE

CHRPE or congenital hypertrophy of the RPE occurs

Coloboma

Toxocara

Toxocara canis is an infection by the second stage larva of toxocara, and it is the disintegrating organism that causes inflammation. Dogs and cats are the natural hosts of the worm and human infection occurs with ingestion of eggs from contaminated pets, dirt, clothes.

Onset is usually around aged 2 or 3 years and is rare past 12 years.

Toxoplasmosis

Chorioretinitis is the most frequently recognized feature of congenital toxoplasmosis. The prevalence of intrauterine toxoplasmosis is between 1:1000 and 1:8000 live births.

It is aquired from undercooked meat or exposure to cat faeces.

Operculated tear

A small plug of sensory retina (operculum) is torn from the peripheral retina. The operculum shrinks with time (x 5).

There is a 10 -20% risk of retinal detachment although treatment is not usually indicated unless there is some retinal detachment.

Case History

5 year old boy complaining of see “lots of spots” in the clouds. Dilated examination did not show any abnormalities. OptoMap detected a small operculated hole. Referral was made to a Retinal Ophthalmologist. He then referred the image to a Paediatric Retinal Ophthalmologist by e-mail. A decision was made not to treat but to repeat OptoMap after 3 months. 3 months later there was no change in the hole.

Conclusions

Digital imaging techniques give the optometrist excellent methods of assessing the fundus in children.

To a great extent these systems take away the need to dilate the pupil.

The use of digital imaging systems will enable those optometrists not able to use mydriatics for legal reasons, to be able to assess more efficiently the retinae of their paediatric patients.

References and further reading

Barnard S & Edgar D (1996) *Pediatric Eye Care,* Blackwell Science, Oxford

Taylor D (1990) *Pediatric Ophthalmology,* Blackwell Science, Oxford

Author’s contact address

Dr Simon Barnard
Zamenhof House
58 Clifton Gardens
London NW11 7EL
UK

e-mail: simon@eye-spy.co.uk