General Optical Council
Approved CET For Specialist Optometrist (Supplementary Prescribing)

Binocular indirect ophthalmoscopy

Part 2

In the second part of his discussion of headset BIO, **Dr Dan Rosser** considers adaptations to the technique, such as when dealing with children or wishing to view the furthest periphery. CET Module C14528, one general CET point, suitable for optometrists

Examining children

As referred to in part one of this article (*Optician* 30.07.10), headset binocular indirect ophthalmoscopy (HBIO) has much to commend it as a technique for examining the ocular fundus in children. A thorough retinal examination with HBIO in a child requires a dilated pupil. Clearly, if a topical anti-muscarinic agent is to be used, it is desirable to use one capable of inducing cycloplegia in addition to mydriasis such that an accurate objective refraction may be performed as well.

Clinicians will vary in their criteria for employing cycloplegia when examining a child. Some of the factors which may prompt the use of cycloplegia are listed in Table 1. A significant disadvantage of the use of most cycloplegics in children is the pronounced stinging which occurs on instillation. A screaming child may distress both parent and practitioner (to say nothing of the child themselves), and may result in reduced willingness to cooperate with the remainder of the examination and/or return for subsequent visits.

One way to avoid this is the use of the topical anaesthetic proxymetacaine prior to the instillation of the cycloplegic. Proxymetacaine induces little or no discomfort, especially in children (probably on account of a good quality tear film), and renders the subsequent installation of cyclopentolate a completely comfortable experience. Practitioners wary of this approach may be reassured to know that it has been advocated by a number of consultant ophthalmologists with a specialist interest in paediatric eye care. The author also takes the precaution of asking the parent to discourage the child from rubbing their eyes while waiting for the cycloplegic to take effect, as topical anaesthetics may temporarily render the corneal epithelium more fragile. Table 2 lists a number of tips for a successful HBIO examination in a young patient.

TABLE 1
Factors which may prompt use of cycloplegia

Young age
Poor cooperation
Inability to demonstrate normal visual function
Signs of ocular abnormality
Family history of ocular problems including high or asymmetric refractive error
Parental concerns

Note on the use of mydriasis before HBIO in adult patients

Although the risk of inducing angle closure glaucoma through the use of tropicamide alone is extremely low (Pandit and Taylor 2000), in these litigious times it is prudent for the practitioner to take one or two precautions in this respect. Where it is possible to examine the patient at the slitlamp, then the anterior chamber width may be assessed directly by gonioscopy, or indirectly using the methods of Van Herick or Smith. Where slitlamp examination is impossible, the width of the anterior chamber angle may be estimated indirectly by assessing the iris profile using the 'shadow test'. In this test, a torchlight is held temporal to the eye in roughly the same plane at the iris, and directed towards the eye (Figure 1). The extent of the resultant shadow on the nasal iris is proportional to the convexity of the iris, which is in turn proportional to the width of the angle. If the shadow extends no further than half way from the limbus to the pupil margin, then angle closure is unlikely to be precipitated by pupil dilation. If the edge of the shadow approaches the pupil margin, then the risk of precipitating angle closure is increased.

When seeking to examine the peripheral retina, tropicamide may be combined with phenylephrine in an attempt to maximise pupil size. Although this approach is relatively commonplace in the hospital eye service, it should only be done after considering the potential side effects and drug interactions (see Table 3).

In the interests of limiting the risk of unwanted side effects and/or interactions, it may be prudent to limit the use of phenylephrine to the 2.5

TABLE 2
Tips for a successful HBIO examination in children

Encourage the child to remain seated on their parents lap where they will feel more secure
Use a condensing lens of around 28-30D (as it is more forgiving in the presence of poor cooperation) perhaps progressing to a lower powered lens with high magnification if the cooperation is adequate
Start with the minimum possible light intensity
Quiz the child as to what they can see through the condensing lens (they will see little more than a bright light but their attempts to see through the lens will aid your examination)
Use humour or any other techniques which diffuse tension and put the child at their ease. The author is of the opinion that children ages three to six years often respond well to being asked questions which they perceive as being 'grown-up'. Personal favourites include asking the child whether they drive a car, or complementing them on an item of clothing/footwear, and perhaps asking where they purchased it!

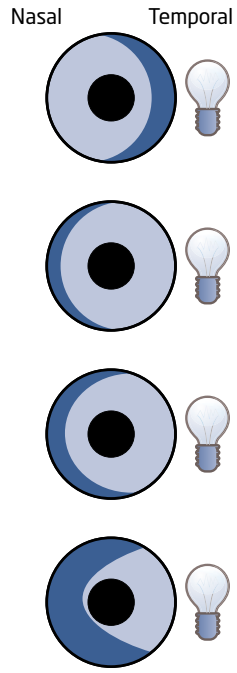

Figure 1 The 'shadow test' for estimating the likelihood of angle closure following mydriasis

per cent dose. It should be noted that the risk of precipitating angle closure in susceptible eyes is slightly higher when tropicamide and phenylephrine are used in combination. If mydriasis is employed, the patient should be advised as to the benefits and risks, what to expect afterwards, and what to do if they experience unexpected symptoms.

Scleral indentation

Scleral indentation is generally considered a challenging technique, and should probably only be attempted by practitioners who have become comfortable with and proficient in HBIO. There follows a brief description of the technique and for further information the reader should consult a specialist text (see 'further reading').

Scleral indention technique (Figure 2)

- It is particularly helpful for the patient to be in the supine position if scleral indention is to be employed
- Place the indenter on the forefinger of the hand which will not be used to hold the lens
- Ask the patient to look in the opposite direction to the region to be viewed. (eg if the superior retina is to be viewed, initially ask the patient to look inferiorly)
- Place the indenter against the eye such that the tip rests beyond the tarsal plate (Figure 2a)
- Ask the patient to look in the direction of the region to be viewed, allowing the indenter to move with the eye (Figure 2b)
- Introduce the lens and ensure the indenter is in line with the viewing axis
- While looking through the HBIO place gentle tangential pressure against the eye and look for the mound produced by the indenter (the 'mouse under the carpet' appearance).
- The indenter is constantly moved or 'rolled' while the retina is ▶

TABLE 3

Phenylephrine: Contraindications and cautions

Contraindications

Hypersensitivity to phenylephrine or any other of component of the preparation. Contraindicated in patients with cardiac disease, hypertension, aneurysms, asthma, thyrotoxicosis, long-standing insulin-dependent diabetes mellitus and tachycardia; patients on monoamine oxidase inhibitors (MAOI), tricyclic antidepressants and anti-hypertensive agents (including beta-blockers); patients with closed angle glaucoma and patients with a narrow angle (prone to glaucoma precipitated by mydriatics).

Cautions

To reduce the risk of precipitating an attack of narrow angle glaucoma, evaluate the anterior chamber angle before use. Corneal clouding may occur if phenylephrine 10% is instilled when the corneal epithelium has been denuded or damaged.

Children and the elderly (avoid 10% strength).

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Figure 2a Positioning the indenter

Figure 2b Scleral indentation

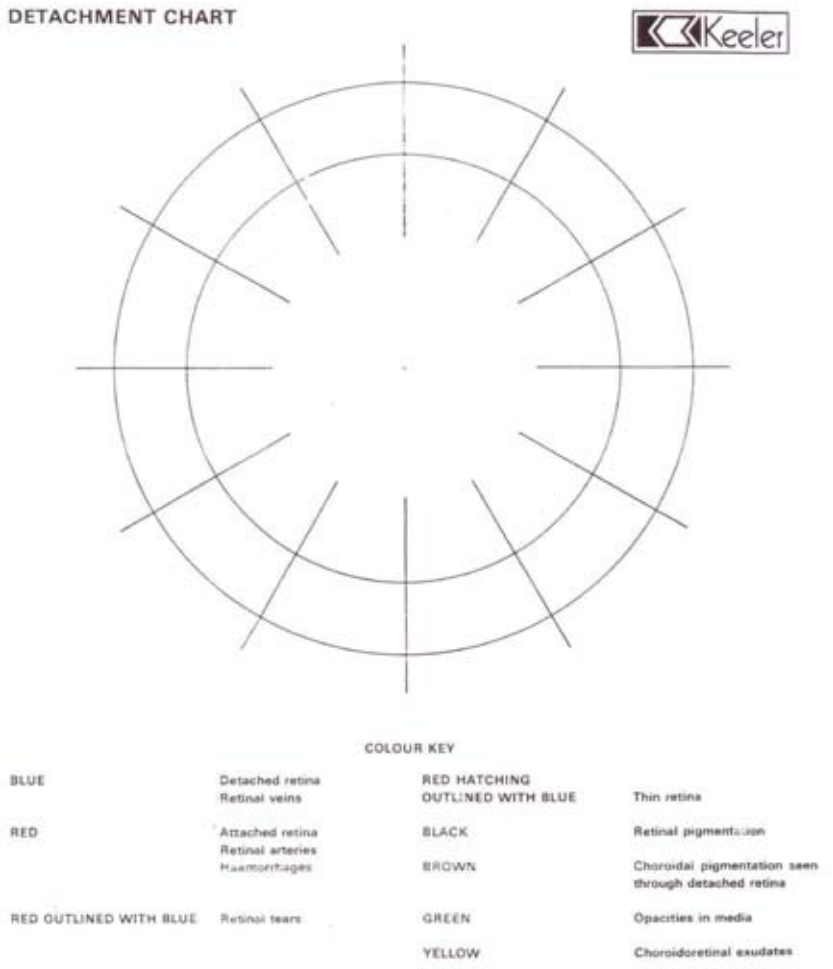

Figure 3 Recording chart

simultaneously inspected
- The indenter should be removed and the technique repeated for each clock hour.

Tips:
- The ora begins around 7mm posterior to the limbus.
- Aim to work from the equator anteriorly to the ora serrata
- The pressure required should be no more than that used to palpate the globe when estimating intraocular pressure
- Slightly more pressure is required to indent through the thicker inferior eyelid
- If in doubt err on the side of putting pressure posteriorly as pressure too anteriorly is uncomfortable and will not bring the retina into view
- The 3 and 9 o'clock positions may be examined by dragging the upper or lower lid to the required area using the indenter.

Recording your findings

Where HBIO is employed to view the peripheral retina, a standard chart is often used to record the findings (see Figure 3). The recording of findings is complicated by the horizontally and vertically inverted image, and it is generally recommended that the process of recording is practised along with the HBIO technique itself. It is commonplace for the examiner to rotate the chart by 180° to record their findings before returning the chart to its original orientation, such that any abnormalities are shown at the correct clock hour. Many clinicians place the chart on a clipboard on the supine patient's chest during this process. An international convention exists by which any peripheral retinal abnormalities are colour coded on the chart to ease interpretation (see Table 4).

Recording charts generally have at least two concentric circles to indicate the equator and the ora (and possibly a third representing the ciliary processes). They also commonly have the 12 clock hours indicated. Figure 4 shows an example of a recorded lesion.

Electronic imaging

It is possible now to use a headset BIO with a live video feed to a computer (Figure 5). A digital camera is incorporated into the headset within the light unit and a simple USB link allows communication with the computer. Keeler uses the Debut Video Capture software. Once installed this allows a live image to be viewed on screen which, when using a laptop and a cordless unit, is portable enough to use in any clinic or a domiciliary setting. A foot pedal is available to allow capture while still viewing rather than having to look away to press the button on the computer. A record button allows one to capture video in AVI format or less memory digesting mpg or wmv format. A snapshot facility allows still image capture. ▶

TABLE 4
Convention for colour coding peripheral retinal abnormalities

Blue	Detached retina
	Retinoschisis (striped)
	Lattice degeneration (cross-hatched)
	Retinal veins (optional)
Red	Retinal breaks (outlined in blue)
	Retinal vessels
	Haemorrhage
	Aneurysms
	Retinal neovascularisation
	Attached retina (optional)
Brown	Pigmentation Photocoagulation scars (shaded or striped)
Green	Media opacities
Orange	Exudate
Yellow	Oedema

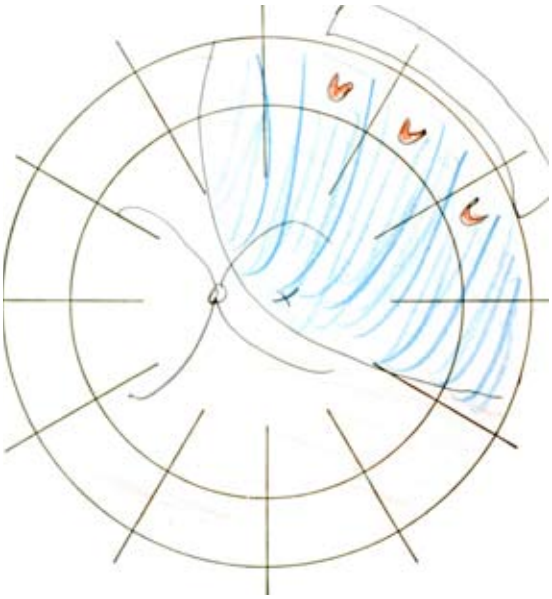

Figure 4 Example of a record for a detachment

Figure 5 Camera output to laptop

All may then be saved alongside the patient's notes and help to avoid some of the potential inaccuracy one might have using hand-drawn recording technique alone. As with any imaging software, there is the potential to adjust the view by resetting the brightness, saturation, and so on, once the image has been captured. Modern units also now include rechargeable power units freeing up the clinician from the power flex (Figure 6).

Cases illustrating possible indications for HBIO in optometric practice

1 **Suspicion of retinal detachment**: RB, a moderately myopic businessman, attended his community optometrist reporting acute onset flashes and floaters in his right eye. Four years earlier, RB had been referred from the same practice for a small peripheral retinal tear which was subsequently successfully treated with retinopexy. Unfortunately, RB was due to depart on holiday for one week the following morning and was not keen to postpone. RB's visual acuity remained normal and his intraocular pressures were symmetrical. Although the right eye exhibited a positive Shafer sign (tobacco dust in the anterior vitreous cavity (Figure 7)) on slit-lamp examination, this had been present at his original referral and therefore did not necessarily indicate a new retinal break. Accordingly, he was dilated with 1 per cent tropicamide and underwent peripheral retinal examination with scleral indentation. As no break was identified, an ophthalmic casualty appointment was arranged for immediately after his return. RB was provided with a sheet listing the symptoms of retinal detachment and was advised to seek medical advice without delay should he develop any of these symptoms.

2 **Domiciliary LVA visit**: A local nursing home requested a domiciliary assessment on one of its residents who had complained of increased difficulty with reading and was unfit to attend the practice. On assessment PA's visual acuity was 6/18 and 6/24 in the right and left eyes respectively and this could not be improved further with refraction. Near acuity with a +3.00 dioptre reading addition was a slow N8, but this improved to a fluent N6 with a +8 dioptre illuminated hand magnifier. Direct ophthalmoscopy revealed a moderate degree of cortical cataract, which made a clear view of the fundus impossible. The shadow test suggested angle closure following mydriasis to be unlikely and the patient's pupils were therefore dilated with 1 per cent tropicamide. The improved fundus view possible with HBIO allowed any co-existing retinal pathology to be ruled out. Following a discussion about the pros and cons of cataract surgery, PA declined cataract surgery and instead opted to purchase a magnifier. A one-year follow up visit was arranged.

3 **Paediatric fundus assessment**: The mother of a three-year-old child

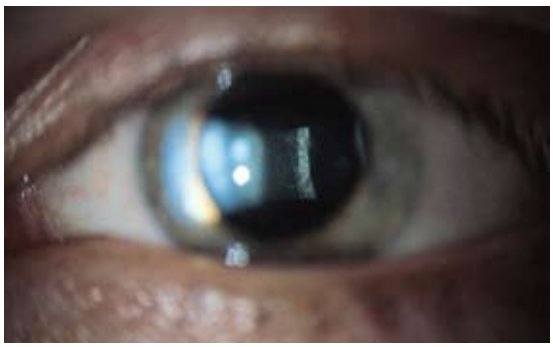

Figure 6

(KM) brought her daughter for a first assessment with her community optometrist. The mother was concerned that her daughter's left eye was turning in when she tired. She reported that KM was in good health, and had been full term with a normal delivery. KM had an older brother (aged five) who wears spectacles full time which make his eyes look larger. Unaided vision with both eyes open was 6/12 (Crowded Kay's pictures). KM would not cooperate with monocular acuities but appeared to object equally to occlusion of either eye. Although KM's eyes appeared straight to a pen torch light, her left eye appeared intermittently to converge to an accommodative target. Cycloplegic retinoscopy was carried out under 1 per cent cyclopentolate preceded by 0.5 per cent proxymetacaine and gave a result of +6.00DS in both eyes. KM would not cooperate with direct ophthalmoscopy but HBIO with a +28D lens allowed an excellent view of the fundus of either eye ruling out any retinal abnormality. KM was reassessed following two months of full-time spectacle wear (+4.00D in both eyes). Her mother reported that KM had quickly accepted the spectacles and that she had not noticed any turn while KM was wearing them. Her visual acuity was measured monocularly at 6/7.6 in each eye (crowded Kay's pictures), and cover test with spectacles revealed no deviation.

4 **Severe learning difficulties with high myopia**: JK, a 24-year-old male with severe learning difficulties attended the practice. He had recently moved to the area and his new carers were keen to have his eyes assessed. Although JK's communication was limited to non-verbal methods, his carers had noticed that he tends to

Figure 7 Shafer sign (Image courtesy of J Kanski, *Clinical Ophthalmology*, 4th edition, Butterworth-Heinemann)

hold objects close to him. They had also ascertained from her previous carers that he used to have spectacles, but had not had any for at least two years. His carers also explained that JK has a tendency to lash out at anyone coming very close to him (whether familiar to him or not!). JK was unable to comply with any form of visual acuity measurement at 3m although he did seem attracted to a bright light. At a near distance, he did show interest in objects and photographs. Cycloplegic retinoscopy with hand held lenses was carried out under 1 per cent cyclopentolate preceded by 0.5 per cent proxymetacaine and gave a result of -5.00DS in the right eye and -6.00DS in the left. The ocular media appeared clear in both eyes during retinoscopy. In view of the carer's earlier comments, direct ophthalmoscopy was avoided (even with reasonable cooperation, the poor field of view associated with high myopia would have made screening the fundus very difficult). JK cooperated reasonably well with HBIO with a +28D lens which afforded a good view of the retina. Aside from myopic peripapillary atrophy, both fundi appeared normal. Spectacles were prescribed to the full prescription details above. JK was reviewed after three months of spectacle wear. Although it was again impossible to achieve a precise measure of visual acuity, his carers reported good cooperation with the spectacles and increased interest in the television and other objects across a room. They also felt that JK was more relaxed and demonstrated less frustration since resuming spectacle wear.

Summary

HBIO was originally devised to improve the view of the peripheral retina when examining cases of suspect retinal detachment. Detailed and thorough examination of the peripheral retina with HBIO in these cases requires considerable experience with the technique. Although few optometrists can claim proficiency in scleral indentation, it is the author's view that HBIO can be a very useful instrument in the armoury of the community optometrist. Even without scleral indentation, when combined with the informed use of Shafer's sign, HBIO is still a good technique for determining whether a retinal break is present in patients with symptoms of acute onset flashes and floaters. As described above, the technique has much to commend it for use with children, patients with learning difficulties, and those who are housebound, wheelchair bound or bed bound.

MULTIPLE-CHOICE QUESTIONS – take part at opticianonline.net

1 Which of the following lenses is recommended for use with a poorly co-operative child when undertaking headset BIO?
A 90D
B 45D
C 28D
D 15D

2 Which of the following drops may usefuly reduce an adverse reaction by a child to cyclopentolate if instilled previously?
A Tropicamide
B Amethocaine
C Proxymetacaine
D Oxybuprocaine

3 Which of the following statements about phenylephrine 10 per cent is false?
A It may usefully supplement tropicamide to maximise dilation
B It is not available to optometrists
C It may cause corneal clouding
D It is not recommended for children

4 Which of the following statements about visualising the far periphery is true?
A The ora serrata is around 17mm posterior to the limbus
B Indentation should be performed by placement of the indenter onto the sclera directly
C The indenter should not be pushed into the globe as this may precipitate a detachment
D Indentation should be carried out around the entire circumference of the eye

5 International convention suggests that a detached area of retina is recorded in what colour?
A Blue
B Green
C Red
D Black

6 What is the significance of Shafer's sign?
A It indicates a patient has had a PVD
B It suggests that there is no retinal damage
C It is good evidence of a peripheral retinal break or tear
D It is always a sign of a detachment

Successful participation in this module counts as one credit towards the GOC CET scheme administered by Vantage and one towards the Association of Optometrists Ireland's scheme.
The deadline for responses is September 23 2010

Figure 8 Extensive rhegmatogenous detachment

● Images and video from a headset unit will be published on our website shortly.

Further reading

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