

## **Enhancing your Peripheral Retinal Examination: BIO and Scleral Indentation**

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### **Abstract**

The peripheral retinal exam and scleral indentation are vital aspects of patient care. Technology creates difficult choices when selecting a BIO and condensing lenses. This course reviews basic and advanced techniques with live demonstration and hands-on experience, using other attendees as patients. A variety of BIO's and lenses will be available.

### **Learning Objectives**

- I. To obtain proper alignment with the binocular indirect ophthalmoscope (BIO) system, allowing for an optimal view of the peripheral retina.
- II. To become familiar with the various options for BIO's (i.e. head-mounted vs. spectacle mounted, Xenon vs. LED light source, wire vs. wireless).
- III. To realize the benefits of the available condensing lenses (i.e. magnification, power, filters, coatings).
- IV. To perform scleral indentation successfully and to be familiar with common indications and contraindications of scleral indentation.
- V. To accurately interpret the results of a peripheral retinal examination and scleral indentation.

### **Course Outline**

#### **I. Background:**

- a. The light source from your binocular indirect ophthalmoscope (BIO) illuminates the patient's fundus. The diverging light rays from the fundus are focused by a convex condensing lens into an aerial image, which is focused on the examiner's fundus. The image that is perceived is inverted and backward.
- b. The ocular system contains mirrors or prisms which optically narrow the examiner's pupillary distance, allowing both light rays to reach both of the examiner's pupils.
- c. Anatomy review
  - i. Tarsal plate
    1. Dense connective tissue tethered laterally by canthal tendons
    2. 8-12mm high in the center of the upper lid
    3. 4-5mm high in the center of the lower lid
    4. 1mm thick
  - ii. Ora serrata
    1. Anterior limit of neural retina
    2. Scalloped appearance (especially nasally)
    3. 2mm wide nasally and 1mm wide temporally

4. Begins approximately 7mm behind the limbus nasally and 8mm temporally
5. Will see gray or “salt and pepper” appearance of the circumferential band
- iii. Vitreous base
  1. Straddles the ora
  2. 1.5-2.00mm anterior to ora serrata, 1-3mm posterior to ora, and several mm into the vitreous body
  3. Can be marked by increase in pigmentation secondary to vitreous traction which causes RPE hyperplasia, however the area just posterior to vitreous base can appear lighter in color than the adjacent retina

## II. Equipment

- a. Binocular Indirect Ophthalmoscope
  - i. Head-mounted BIO
    1. Loosen both the top and back strap so that the instrument can easily slip over your head
    2. Crown strap (top strap) should support the majority of instrument’s weight—tighten this strap first
    3. Tighten the back strap only enough to prevent slipping of the scope as you tilt your head from shoulder to shoulder—it should sit just under your occipital protuberance
  - ii. Spectacle-mounted BIO can be customized to the examiner’s spectacle prescription and other refractive needs
  - iii. Oculars
    1. Bring the oculars as close to the eyes as possible thus increasing field of view. As you look straight ahead, the oculars should be perpendicular or tilted slightly down from your line of sight.
    2. Oculars can be adjusted laterally for each eye individually based on monocular pupillary distance. Hold your thumb up in front of you approximately 18 to 20 inches from your scope. Close one eye while viewing your thumb. It should be in the center of your field of view with each eye individually. With both eyes open, you should see one object centered at the point of regard (18 to 20 inches).
    3. Each ocular has a +2.00 or +2.50 lens (depending on the manufacturer). The aerial image formed by the condensing lens is usually about 30cm from the spectacle plane of the clinician requiring approximately 3.00D of accommodation. If necessary, manufacturers can put more or less power in the oculars. These lenses can easily be removed from your BIO (and plano lenses can be put in their place) if necessary.
  - iv. Light source with adjustable mirror
    1. Xenon vs. LED light source
    2. Adjust the light to be in the upper ½ of your field of view. This is done by rotating the mirror directly under the light source.
  - v. Other options when purchasing
    1. Wireless
    2. Filters
    3. Battery packs
    4. Video projection
- b. Condensing Lens

- i. Size, power, composition, tints and coatings are all variable and based on individual preference
- ii. Power ranges:
  - 1. Low (+12.00 to +16.00 D)
  - 2. Intermediate (+18.00 to +22.00 D)
  - 3. High (+25.00 to +40.00)
  - 4. The lower the power of the lens, the greater the distance needs to be between the patient's eye and the lens, but the greater the magnification. The field of view is greater with the more powerful lenses (assuming equal diameter of lenses).
- iii. Proper orientation of the lens is essential for proper imaging of the fundus. The lens has two convex surfaces, one more convex than the other. The less convex surface must be held toward the patient (usually marked with a silver lining).
- c. Scleral indenter (scleral depressor)
  - i. Pencil-shaped depressor
  - ii. Articulating (i.e. thimble-type) depressor

### **III. Procedure**

- a. Preparing the patient
  - i. Educate and fully dilate your patient with one or more mydriatic agents
  - ii. Recline patient if desired and not contraindicated.
- b. Insert the condensing lens into the optical system close to the patient's eye. Lens should be held *an entire* "finger distance" away from the patient's eye, using the middle or ring finger on the patient's face to brace your lens within the optical system.
- c. Align the lens so that it is perpendicular to the light source, and also so that the light is directed into the patient's pupil. The condensing lens has two light reflexes (one off the front surface and one off the back surface) that can be used to obtain and maintain proper lens alignment. Superimpose these reflexes assuring perpendicular alignment of the lens within the optical system.
- d. The optical system that you have created includes the light source (which is lined up with oculars and clinician's eye properly), the condensing lens and the patient's pupil. The system **MUST** be maintained throughout the examination: all components must be kept in line with one another. In doing this, the patient's pupil acts as the center of rotation.
- e. Maintain an appropriate working distance. The BIO should be approximately 20 inches away from the patient's eye. The closer in you move toward the patient, the more difficult it becomes to obtain a quality fundus image.

### **IV. Interpretation of Image**

- a. The image seen in the condensing lens is an aerial, real and inverted image.
  - i. If your patient is looking superiorly, you are viewing the superior fundus.
  - ii. If your patient is looking up and to his/her left, you will be viewing the superior nasal retina of his/her right eye and the superior temporal retina of his/her left eye.
- b. The image seen is inverted **AND** backwards. If you see a lesion and it does not appear in the center of the lens, move the optical system toward the area of the lens where you see the lesion.

### **V. Scleral indentation**

- a. Scleral indentation is considered the standard of care in many cases. It may be necessary in order to obtain any peripheral view at all in patients with an extremely anteriorly positioned ora serrata.
- b. Scleral indentation
  - i. Causes a change in the angle of the reflectance of the light exiting the patient's eye. This results in increased contrast between the choroid/RPE and the sensory retina.
  - ii. Decreases retinal translucency which increases contrast between a retinal hole or tear and the surrounding retinal tissue.
  - iii. Allows the examiner to more easily view and identify retinal flaps or tags extending into the vitreous because you can see lesions *in profile*.
- c. Clinical Indications
  - i. Unable to view anterior retina, due to poor dilation or anteriorly displaced ora serrata
  - ii. Symptoms of flashes or floaters
  - iii. Recent history of blunt trauma. Note: scleral indentation is contraindicated if a hyphema is present.
  - iv. High axial myopia
  - v. Previously diagnosed peripheral retinal anomaly
  - vi. Lattice degeneration: breaks will be easier to evaluate and any holes will appear darker and surrounding tissue lighter if there is an edematous cuff of subretinal fluid
  - vii. Peripheral retinal holes or breaks: if fluid is present you will notice white with pressure and breaks will open up in a gaping manner
  - viii. White without pressure with areas of possible breaks
  - ix. Questionable hemorrhages versus holes: hemorrhages will just become elevated with indentation and holes will either gape open, look larger and/or darker with a surrounding edematous cuff.
  - x. Questionable areas of possible retinal detachment or flat retinoschisis.
- d. Contraindications
  - i. Recent intraocular surgery (previous 6 weeks)
  - ii. Suspected penetrating injury
  - iii. Hyphema
  - iv. Ruptured globe
- e. Cautionary tips
  - i. Glaucoma patients should be examined very gently. Scleral indentation can briefly increase IOP by about 10mmHg. Glaucoma patients with significantly elevated IOP should have their IOP lowered with topical and or oral medications in office prior to scleral indentation – mandatory if the glaucoma is advanced.
  - ii. Patients will experience *some* discomfort during scleral indentation. However, with proper technique the discomfort is minimized. Advise the patient it will feel like pressure and demonstrate by pressing with your finger on the closed globe.
  - iii. Indentation does **not** enlarge existing retinal holes, tears, or detachments, nor has it been documented to *cause* retinal holes, tears, or detachments.
  - iv. If you press too far anteriorly you will put pressure on an EOM or the ciliary body and it will be painful for the patient.
- f. Procedure (Trans-lid technique)
  - i. Patient must be fully dilated and must be reclined.

- ii. Clean scleral indenter with an alcohol swab before each use (if indenter was in contact with mucous membrane, it will require high level disinfection after use).
- iii. Instruct your patient to look in the opposite direction of the retinal you will be examining. To examine superior fundus, instruct patient to look down
- iv. Position the blunt indenter tip slightly above the primary skin fold of the upper lid. This will ensure that pressure is not exerted on the tarsal plate.
- v. Position the indenter tip at 12:00 and position your light so that it will enter the pupil at 6:00
- vi. As the patient slowly looks up to mid-peripheral to peripheral gaze, gently guide the indenter back into the orbit following the eyelid.
- vii. Always ensure that the indenter is tangential (NOT perpendicular) to the globe. Be careful to not push the indenter against the patient's brow bone.
- viii. Once the indenter is in position and your patient is looking in the direction of interest, insert your lens and light source into position
- ix. Scanning the retinal reflex without the condensing lens may be helpful to indicate proper position of the indenter. The indented area of retina will usually give a darker reflex than the rest of the retina.
- x. Keep the stalk of the indenter so that it *bisects* the visible pupil, placing the foot of the indenter directly in alignment with the area of peripheral retina you are examining. Your light source should enter the pupil exactly opposite (180° away from) the indenter.
- xi. The indenter is now an essential part of the optical system you have created. It must be exactly in line with your BIO light source and the clinician's visual axes.
- xii. Lid control is extremely important, as with any BIO examination of the peripheral retina. One lid is often being controlled by the indenter, however.
- xiii. Once you have your area of indented retina in view, *translate* the indenter. Move indenter side to side and then up and down, looking at the lesion in question in different profiles when applicable:
  - 1. Is there a loose edge/flap?
  - 2. Are there adhesions in the vitreous that become evident with motion?
  - 3. Is the area darker or lighter with indentation?
  - 4. Does the area become elevated only, or does it have appreciable edges?
- g. Temporal and nasal examinations
  - i. Trans-lid technique
    - 1. Position indenter at the canthus and have patient look opposite where you want to examine, as with superior and inferior views
  - ii. Trans-conjunctival (or trans-scleral) technique often must be utilized.
    - 1. Requires topical anesthetic
    - 2. Requires high-level disinfection of scleral indenter
    - 3. Procedure:
      - a. Carefully position the indenter on the bulbar conjunctiva at the medial or lateral canthus and proceed as with the trans-lid technique.
- h. Additional points to note

- i. The indenter allows for viewing approximately 1 ½ clock hours. The need to reposition the depressor depends on the flaccidity of the patient's eyelids. The indenter can often be easily moved from side to side without repositioning.
- ii. If you are right-handed, examine the superior fundus from the patient's right side and the inferior areas from the left side (in both cases with the indenter in left hand and condensing lens in right)
- iii. The equatorial retina may also be depressed simply by changing the patient's gaze. Instruct the patient to leave the extreme gaze and move to a more primary gaze (like when examining the midperipheral retina). This will allow indentation of the equatorial retina.
- iv. With proper technique, the scleral indentation procedure will be uncomfortable but very rarely painful to the patient. The patient should feel pressure NOT pain. If pain or extreme discomfort is evident, the examiner must re-evaluate his or her technique.