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An instructional video on the uses of the binocular indirect ophthalmoscope

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Pacific University

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Pacific University

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Abstract
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Degree Type
Thesis

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AN INSTRUCTIONAL VIDEO
ON THE USES OF THE
BINOCULAR INDIRECT OPHTHALMOSCOPE

By
ANDREW JOHN MCKENZIE
THOMAS ANDREW NEAL

A thesis submitted to the faculty of the
College of Optometry
Pacific University
Forest Grove, Oregon
for the degree of
Doctor of Optometry
May 1993

Adviser:
Mark A. Williams, O.D.
AN INSTRUCTIONAL VIDEO
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Signatures

Andrew J. McKenzie

Thomas A. Neal

Mark A. Williams, O.D.
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Biographical Data

Andrew J. McKenzie received his Bachelor's Degree in Visual Sciences from the College of Arts and Sciences, Pacific University, and his Doctor of Optometry from the College of Optometry, Pacific University. He plans to open a private practice in Grand Junction, Colorado, specializing in Infant and Pediatric Vision Care and Vision Therapy.

Thomas A. Neal received his Bachelor's Degree in Zoology from the College of Arts and Sciences, University of Wyoming, and will receive his Doctor of Optometry from the College of Optometry, Pacific University. He is entering the armed forces to serve his country as an optometry officer.

Dr. Mark A. Williams received his Bachelor of Science in Optometry with Distinction from Indiana University and his Doctor of Optometry with Honors from Indiana University. He is currently licensed in Indiana with an optometric legend drug certification, in Oregon, and in Washington with therapeutic certification. He is currently a Staff Optometrist in the Portland Veterans Administration Medical Center, and is also an Assistant Clinical Professor at Pacific University, College of Optometry in Forest Grove, Oregon.
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Acknowledgements

We wish to express our thanks to the following persons for their assistance and encouragement in this endeavour: Dr. Mark A. Williams, for his help in collecting videotape and all his time; Derek Balbag with Lombart Instruments, for loaning us needed equipment; Steve Dehner and Scott McAdoo for production assistance; and Colin Stapp, who runs the A/V department in the College of Optometry, for providing lighting, cameras, and access to editing equipment.

We wish to express our thanks to the following institutions or companies for their assistance in this endeavour: Heine USA Ltd., for loaning us the Video Omega 150 Video BIO unit; Pacific University and the College of Optometry, for providing funding, equipment and space for the project; and Lombart Instruments for loaning us optometric equipment.
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The BIO is a sophisticated diagnostic instrument, crucial to primary optometric care, so mastering its use is a must for all optometry students. The BIO provides a better overall view of the retina compared with direct ophthalmoscopy. It allows the examiner to view a larger area of the retinal surface with lower magnification than direct ophthalmoscopy. But, more importantly, it presents a sharp, stereoscopic image and excellent lighting of the retina. This makes the BIO a much better instrument for observing and evaluating retinal health.

<table>
<thead>
<tr>
<th>Criteria</th>
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<tr>
<td>Field of View</td>
<td>10 Degrees</td>
<td>40-60 Degrees</td>
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<td>Magnification</td>
<td>15X</td>
<td>1.5-3X</td>
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The BIO headset holds the optics of the BIO on the examiner's head in front of the examiner's eyes. It must do two things: First, it must reduce the examiner's interpupillary distance to 10-20 millimeters so the examiner can look through the patient's pupil and view the retina in stereo, and second, it must project light along the examiner's visual axis and into the patient's eye, so that it may be reflected off the patient's retina and be seen by the examiner.

Adjustments that can be made on most BIO's include: Individual adjustable oculars to fit the optics to any interpupillary distance, adjustments for the size and height of the projected light, various filters for the light source, and variable brightness (which is usually adjusted on the power source). In addition, most headsets can be fit with lenses to compensate for the examiner's refractive condition.

The condensing lens is the other piece of equipment necessary to view the retina with the BIO headset. It is held a short distance from the patient's eye during viewing. The condensing lens forms a real, inverted, reversed, and magnified image of the patient's retina in space between the condensing lens and the examiner. The lenses are designed to be held with the less convex side facing the patient to reduce aberrations caused by the cornea and lens of the patient. This side is identified with a white or silver stripe around the rim of the lens. As condensing lens powers increase, the area of retina which may be viewed increases and the magnification of that area decreases.

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<th>Lens Power:</th>
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Condensing lenses are also available clear or with an amber tint. Amber tinting is designed to increase patient comfort by filtering high energy, short wavelength visible light. However, the examiner's perception of color may be somewhat distorted by this filtering.

Before examining a patient, the doctor should have the BIO headset comfortably and correctly fitted to his or her head. Adjustments which
need to be made include P.D. and light height. Each eye should see the light centered or slightly below center, as the doctor holds his hand at arms length and shines the light onto it. The brightness of the light source must be high enough for the doctor to have a good view, but hopefully not so bright as to make the patient uncomfortable. Always discuss with the patient what will be taking place during the exam.

The scope of this video does not include procedures for safe dilation. Consult other reference material for patient dilation protocols.

To facilitate a thorough examination, the patient is best reclined to horizontal and raised or lowered to the doctor's hip level. From this position, the doctor can comfortably hold the lens at the appropriate distance from the patient's eye.

The condensing lens is held between the thumb and forefinger, and the middle finger helps orient the lens in the proper direction. The remaining two fingers of the doctor's hand are rested lightly on the patient's forehead, nose, or cheek to steady it. The lens should be held close to the patient's eye at first, so the doctor can easily find and get centered on the pupil. Then, the lens is slowly backed away until the view of the retina fills the lens. During this procedure, some patients will need help keeping their eye open. The doctor's free hand and free fingers can do this.

As one looks through the headset, two reflections are seen on the condensing lens, one off the front surface and one off the back. Use these reflections to help keep the lens oriented properly. As you view the posterior pole out to the equator, the reflections should be kept close to each other to avoid causing aberrations. To correct the aberrations caused by the peripheral crystalline lens when the extreme periphery is viewed, tip the condensing lens so that the reflections move apart into the long axis of the pupil.

When performing an exam, several points should be noted. Start the exam in the extreme periphery to allow the patient time to get used to the light, and finish at the posterior pole. Be systematic in the exam so you do not miss anything. One suggested method is to mentally divide the patient's eye into eight quadrants of 45 degrees each - superior, superior temporal, temporal, inferior temporal, inferior, inferior nasal, nasal, and superior nasal - and to proceed from one quadrant to the next in order. The
patient's gaze is then directed into each of these positions while the doctor places himself opposite each position. As each quadrant is viewed, the examiner should move his head sideways about eight to ten inches to either side so nothing is missed. This procedure is done in the extreme periphery and again in the mid-periphery. Finish up by viewing the posterior pole.

Documentation of findings is as important as the exam itself. Note size and position of all lesions. Remember that your condensing lens view is inverted and you must correct for this, either mentally or by turning the recording sheet 180° and drawing as you see it. Various authors have suggested color schemes for diagramming. The overriding concern is that you and others can interpret accurately what you recorded, and that it accurately represents what you saw in the patient's eye.

Retinal landmarks seen in all eyes are in roughly three areas, the posterior pole, the mid-periphery/equator, and the periphery. Within the posterior pole, note the appearance of the optic nerve head, the central retinal vasculature, the macula, and the choroidal vasculature. In the mid-periphery/equator, note the appearance of the choroidal vortex veins, which run circumferentially around the equator, the choroidal arterial vasculature, the central retinal vasculature, ciliary nerves, and ciliary arteries. In the far periphery, the central retinal vessels can be seen turning parallel to the ora serrata, and the ora serrata itself can be seen. Adding scleral depression can bring the pars plana of the ciliary body into view.

This completes the description of the video. It is intended as an introduction, not to instruct the student in procedures for dilation nor in the diagnosis or management of retinal lesions. Other resource material must be consulted for this information.
Appendix

Information to instructors

This video presents basic information for the student regarding the function and use of the binocular indirect ophthalmoscope. Included are "BIO view" looks at various retinae. Before showing the video in an instructional setting, you should review it so you can be prepared to pause playback and answer questions or point out pertinent things.

Different optometrists have different philosophies on the best way to do a complete retinal exam, so the video does not say anything about procedure in that context. The only references made are to reclining the patient for the exam and some strategies on how to organize the exam. As instructor, you should demonstrate your preferred method for navigating around the patient during the exam.

Following the credits of the video is an additional 14 minutes of retinal shots which were collected and not used in the video. Below is a key to the views seen in the order in which they are presented. You may decide to include this portion as a matter of interest to the students.

- Cat footage - Unusual retina, and a retinal detachment with a vitreous hemorrhage.
- White without pressure.
- Vitreoretinal tuft.
- Pavingstone Degeneration (early) with some RPE hyperplasia.
- Pavingstone, 1 spot.
- Posterior Pole- normal.
- Vortex ampulla.
- Vortex ampulla and Pavingstone.
- More Pavingstone.
- Vortex ampullas.
- Pavingstone Degeneration.
- Toxoplasmosis scars (3 of them) with different powered lens views.
- RPE Hypertrophy with different powered lens views.
- Toxoplasmosis scars (3 of them) with different powered lens views.
- Peripheral retina to posterior pole scan - normal.
- Posterior Pole - normal, with vitreal floater.
- Lattice Degeneration.
- Scleral depression - notice the retinal indentation.
- Laser scar. This was "prophylactic treatment" of some lattice degeneration by an aggressive ophthalmological resident.
- Posterior pole - normal.
- Lattice Degeneration.
- Comparison of different powered lenses (in order 30, 2.2, 20, and 15 diopter lenses) on a schematic eye.

Included in this appendix for your convenience are reproductions of the charts and graphics which were used in the video. Feel free to reproduce and distribute them if you wish.

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Table 1-Comparison and contrast of Direct and Binocular Indirect Ophthalmoscopy

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Table 2-Mags and Fields of View of various power condensing lenses
Fig. 1 - Ocular Mirror System example

Fig. 2 - Optics of Condensing Lens

Fig. 3 - Light Pathway