Retinal Examination

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Fundus Anatomy and Landmark of the Retina

- **Posterior Pole:** optic nerve, macula
- Equator: vortex veins
- Peripheral retina: ora serrata, long posterior ciliary nerves, short posterior ciliary nerves
Fundus Anatomy and Landmark of the Retina

- Posterior Pole: - optic nerve
  - macula
- Equator: vortex veins
- Peripheral retina: ora serrata
  - long posterior ciliary nerves
  - short posterior ciliary nerves
Fundus Anatomy and Landmark of the Retina

- Posterior Pole: optic nerve
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- *Peripheral retina:* ora serrata
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  - short posterior ciliary nerves
Fundus Anatomy and Landmark of the Retina

- Posterior Pole: -optic nerve
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- Equator: vortex veins
- Peripheral retina: ora serrata

long posterior ciliary nerves
short posterior ciliary nerves
There are various methods of examining the retina.

These include:
- direct ophthalmoscopy
- monocular indirect ophthalmoscopy
- binocular indirect ophthalmoscopy

A comparison chart of the 3 instruments can demonstrate the advantage and disadvantages of the 3 instruments.
Lesion size/distance in disc diameters

Eg: lesion is 1/2DD in size Hx V and 2DD away superior temporal from the optic nerve head
<table>
<thead>
<tr>
<th></th>
<th>Direct Ophthalmoscopy</th>
<th>Monocular Indirect Ophthalmoscopy</th>
<th>Binocular Indirect Ophthalmoscopy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image</td>
<td>Upright</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnification</td>
<td>15x (high)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field of View</td>
<td>10 degrees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equivalent in DD size</td>
<td>2DD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pupil size</td>
<td>Undilated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stereopsis</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>good</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working Distance</td>
<td>Very short</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Media Evaluation</td>
<td>Excellent</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Monocular Indirect Ophthalmoscope

Instrument:

• Magnifying eyepiece
• Relay system re-inverts image to a real one
• Image is focused using eye piece
Indication of use:

- Small pupils
- Uncooperative children
- Patients intolerant to bright illumination
- One handed technique
- Person who is monocular
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<tbody>
<tr>
<td>Image</td>
<td></td>
<td>Upright</td>
<td></td>
</tr>
<tr>
<td>Magnification</td>
<td></td>
<td>5x fixed mag</td>
<td></td>
</tr>
<tr>
<td>Field of View</td>
<td></td>
<td>40-45 degrees</td>
<td></td>
</tr>
<tr>
<td>Equivalent in DD size</td>
<td></td>
<td>8DD</td>
<td></td>
</tr>
<tr>
<td>Pupil size</td>
<td></td>
<td>Undilated</td>
<td></td>
</tr>
<tr>
<td>Stereopsis</td>
<td></td>
<td>No stereopsis</td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td></td>
<td>Fair</td>
<td></td>
</tr>
<tr>
<td>Working Distance</td>
<td></td>
<td>Short distance</td>
<td></td>
</tr>
<tr>
<td>Media Evaluation</td>
<td></td>
<td></td>
<td>--</td>
</tr>
</tbody>
</table>
**Binocular Indirect Ophthalmoscope**

**Instrument**: consists of a:

- optical viewing system
- rheostat illuminating system
- headband
Fig. 7: Standard components of the binocular indirect ophthalmoscope.
(Illustration by Laurel Cook)
Optics:

• Light from B.I.O. directed into patient’s eye

• Reflected beams from retina are focused using a high plus lens

• Aerial image produced
<table>
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</thead>
<tbody>
<tr>
<td>Magnification</td>
<td></td>
<td>2.5x (variable)</td>
<td>Inverted</td>
</tr>
<tr>
<td>Field of View</td>
<td></td>
<td>40-45 degrees</td>
<td></td>
</tr>
<tr>
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<td></td>
<td>8DD</td>
<td></td>
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<td></td>
<td>Dilated</td>
<td></td>
</tr>
<tr>
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<td></td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td></td>
<td>Excellent</td>
<td></td>
</tr>
<tr>
<td>Working Distance</td>
<td></td>
<td>Arms length</td>
<td></td>
</tr>
<tr>
<td>Media Evaluation</td>
<td></td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>
Condensing Lens:

Magnification: \( \frac{F \text{ eye}}{F \text{ condensing}} = \text{Mag} \times \)

### Magnification versus field of view

<table>
<thead>
<tr>
<th>Lens size</th>
<th>Magnification</th>
<th>Field of View</th>
</tr>
</thead>
<tbody>
<tr>
<td>20D</td>
<td>3x</td>
<td>less than 30D lens</td>
</tr>
<tr>
<td>30D</td>
<td>2x</td>
<td>greater than 20 lens</td>
</tr>
<tr>
<td>15D</td>
<td>4x</td>
<td>less than 20 and 30D lens</td>
</tr>
<tr>
<td>2.2D</td>
<td>mag equivalent of 20D</td>
<td>field of view equivalent of 30D</td>
</tr>
</tbody>
</table>
Technique

- PD measurement
- Location of light source
- Headband fit vs. spectacle
- Obtain stereopsis
- Holding the condensing lens
- Examiner and patient position
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Fig. 7: Standard components of the binocular indirect ophthalmoscope.

(Illustration by Laurel Cook)
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Technique

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Binocular Indirect Ophthalmoscopy

• Holding the condensing lens

• Distance of condensing lens and eye

• Red reflex

• Filling the condensing lens image
Binocular Indirect Ophthalmoscopy

- Examine the retina in a chronological order
- Obtain overlapping views
- 9 positions to examine
eg. To examine the patient’s right eye at the 3 o’clock position, direct the patient’s gaze to that position (3 o’clock)

- You record your results in the 3 o’clock position

- However in your view at this position everything is inverted and reversed
Long ciliary nerve
Universal (Goldmann) 3-Mirror Lens

- Contact technique: lens with slit lamp biomicroscope
- Lens placed on the cornea
- 3-dimensional view obtained
- Used both on undilated and dilated pupil
Universal (Goldmann) 3-Mirror Lens

- **Central lens**: used for posterior pole evaluation
- **Trapezoid mirror**: for equatorial retinal evaluation
- **Rectangular mirror**: for equator to ora retinal evaluation
- **Gonio mirror**: evaluation of the ora serrata
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Goldmann 3 Mirror Lens

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Hand-held Condensing Lens

**Advantages:**

* Non-contact
* Provides stereopsis
* Use with slit lamp biomicroscope
* Well illuminated view of the posterior pole
* Alternative procedure to Goldmann 3 mirror lens
Biomicroscope

Light Source

Reversed Inverted Aerial Image

90D Lens

Patient
INDIRECT OPHTHALMOSCOPY AND SLIT LAMP BIOMICROSCOPY LENSES
Condensing Lens

* double aspheric lens
* clear or yellow coated
* available in many different powers
* pupil dilation desirable
* lens alignment, visual axis centration, vertex distancing tilting is needed in this procedure
## Comparison of auxiliary lenses

<table>
<thead>
<tr>
<th>Lens size</th>
<th>Magnification</th>
<th>Field of View</th>
<th>working distance from cornea</th>
</tr>
</thead>
<tbody>
<tr>
<td>60D</td>
<td>1.09</td>
<td>67 degrees</td>
<td>11mm</td>
</tr>
<tr>
<td>78D</td>
<td>0.87</td>
<td>68 degrees</td>
<td>7 mm</td>
</tr>
<tr>
<td>90D</td>
<td>0.72</td>
<td>69 degrees</td>
<td>6.5mm</td>
</tr>
<tr>
<td>Superfield</td>
<td>0.76</td>
<td>116 degrees</td>
<td>----------------------------</td>
</tr>
<tr>
<td>Super 66</td>
<td>1.00</td>
<td>96 degrees</td>
<td>----------------------------</td>
</tr>
</tbody>
</table>