Purpose of Ophthalmoscopy

• An ophthalmoscope is used to examine the inner eye, also called the retina or the fundus
  – It is the only way (and place in the body) that veins and arteries can be seen in their natural state, non-invasively (*in vivo*).

• The funduscopic exam is (potentially) valuable clinically because many disease states can be diagnosed based on evidence seen in the inner eye.
  – includes both eye-specific disorders, as well as systemic and neurological conditions affecting the body in general
  – diseases leave clues or "footprints" which appear as changes locally in the vessels and nerves of the fundus.

• Observing the vessels in the fundus can provide an excellent idea of the state of the vasculature of other organs in the body.
Diseases which Manifest in the Fundus

- AIDS (CMV retinitis), hypertension, and diabetes are systemic diseases that manifest themselves in the fundus and thus ophthalmoscopy can provide valuable clues to their diagnosis.
- Papilledema is a sign of concussion or increased intracranial pressure.
- Other important eye disorders such as Glaucoma, Age-related Macular Degeneration, and Diabetic Retinopathy can be detected.
- Vein/Artery Occlusions -- related to Stroke
- Tumors in the retina (melanoma)
Eye Anatomy

- Cornea
- Iris
- Pupil
- Retina
- Macula
- Lens
- Optic Nerve
Ophthalmoscope Optical System

**PURPOSE:** to provide illumination and a viewing into the back of the eye

**Design conditions for optimal view of fundus:**
- the light goes through the pupil
- the light is not reflected by the cornea back into the doctor’s eye
- the light illuminates a large portion of the retina
- the visible area of the retina overlaps with the illuminated area of the retina
Traditional Ophthalmoscope

Filters & Apertures

- **3 Filters:**
  - Open/clear
  - Red-free
  - Polarizer

- **6 Apertures:**
  - Micro-spot
  - Small
  - Large
  - Cobalt
  - Fixation
  - Slit

Lens Wheel
-25 to +40 diopter range
Ophthalmoscope Technique

1. SET TO SMALL SPOT ON APERTURE DIAL
2. FOCUS DIOPTER WHEEL
   - Look through scope and turn diopter wheel until objects are in focus (focus on object 10’ or further)
3. EXAM POSITION
   - 6 inches away and at a 15 to 20 degree angle on the temporal side of your patient
   - Looking through the scope, shine light at patient’s eye and look for the red retinal reflex
4. APPROACH
   - Carefully follow the red reflex into the pupil
5. EXAMINE
   - Identify veins, arteries and optic nerve head
PanOptic (wide view) Ophthalmoscope

**Patient Side Eyecup**
- Sets the proper working distance to achieve big view
- Provides stability to maintain light alignment with pupil
- Provides leverage & pivoting point for panning around
- Occludes ambient light

**Dynamic Focusing Wheel**
- +/- 20D to focus for both practitioner’s and patient’s refractive error (blur)

**Aperture/Filter Dial**
- “Start” position – green line (small spot)
- 3 spot sizes, slit aperture, red-free filter, cobalt blue filter
PanOptic Technique

1. SET TO SMALL SPOT (green line on aperture dial)
2. FOCUS ACROSS THE ROOM on something 10 ft. away
3. EXAM POSITION
   - 6 inches away and at a 15 to 20 degree angle on the temporal side of your patient
   - Looking through the scope, shine light at patient’s eye and look for the red retinal reflex
4. APPROACH & MAKE CONTACT
   - Carefully follow the red reflex into the pupil
   - The eyecup must contact patient’s brow to achieve view
5. COMPRESS EYECUP TO MAXIMIZE VIEW
   - Make minor, fine-tuning adjustments to the focus if needed
In primary care, the ophthalmoscope is most often used on patients who:

- Are known or suspected to have Diabetes
- Are known or suspected to have Hypertension
- Complain of Headaches
- Have had any kind of Head trauma/injury
- Have loss of Vision or degraded vision (flashes, distortion, shadows)
- Are undergoing a routine Physical Examination
- Have eye Pain – including abrasions (scratches) and foreign bodies in the eye
<table>
<thead>
<tr>
<th>PREVELANT DISEASES DIAGNOSED</th>
<th>SPECIALTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetic Retinopathy</td>
<td>Internal Medicine, Family Medicine, Nephrology</td>
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<tr>
<td><em>only 30% of diabetic patients see the ophthalmogist for annual exam</em></td>
<td></td>
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<tr>
<td>Hypertensive Retinopathy</td>
<td>Internal Medicine, Family Medicine, Nephrology</td>
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<tr>
<td><em>useful in finding undetected hypertension</em></td>
<td></td>
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<tr>
<td><em>helps monitor control &amp; management of disease</em></td>
<td></td>
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<tr>
<td>Papilledema/Head Trauma</td>
<td>Internal Medicine, Family Medicine, Emergency Medicine</td>
</tr>
<tr>
<td><em>patient complaint of headaches</em></td>
<td></td>
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<tr>
<td>Central Nervous System Problems</td>
<td>Neurology</td>
</tr>
<tr>
<td><em>manifestation commonly seen in retina</em></td>
<td></td>
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<tr>
<td>Shaken Baby Syndrome</td>
<td>Pediatrics, Family Medicine</td>
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<tr>
<td><em>can visualize retinal hemorrhages consistent with syndrome</em></td>
<td></td>
</tr>
<tr>
<td>Foreign Bodies/Corneal Abrasions</td>
<td>Internal Medicine, Family Medicine, Emergency Medicine, Pediatrics</td>
</tr>
</tbody>
</table>
Ophthalmoscope for Disease Management

– Clinically valuable
  • many systemic disease states manifest in the fundus
    • AIDS, hypertension, diabetes
– Eye is extension of Central Nervous System
  • neurological disorders
– Looking for? Dots, Blots, Spots
  • + Abnormal blood vessel growth (neovascularization)
Ophthalmoscope for Disease Management

- Normal Fundus
Ophthalmoscope for Disease Management

- Diabetic Retinopathy
  - After 10 years, majority of diabetics will have some form of Diabetic Retinopathy
  - After 25 years, 85% will
  - Leading cause of blindness!

- Neovascularization (abnormal blood vessel growth) proliferative stage
- Hemorrhages & micro aneurysms (red Blots)
Ophthalmoscope for Disease Management

- **Hypertension**
  - Vessel walls become thickened and sclerotic
  - Vessel light reflex looks like copper wiring
  - When artery crosses vein, vein appears to disappear abruptly
    - “A/V nicking”
  - Hemorrhages
  - Cotton-wool Spots (retinal ischemia)
Ophthalmoscope for Disease Management

- Drusen or colloid bodies
  - Creamy yellow Dots
  - Blood vessel leakage of cholesterol-like deposits
  - Age-related macular degeneration
  - Also diabetes, hypertension
Ophthalmoscope for Disease Management

- Papilledema
  - Increased pressure in the central nervous system
  - Increased intra-cranial pressure
  - Head injuries - headache
  - Engorged veins
  - Disc elevation
Glaucoma - Cup/Disc Ratio

CUP: Inner, brighter yellow / higher reflex, recessed area.

DISC: Outer, higher pallor, larger circular area of the nerve head.

Normal ratio: 0.1 - 0.5
Symmetry between eyes very important.
Suspect glaucoma when >0.5 or asymmetrical.
Central Retinal Vein Occlusion
- Painless loss of vision
- The classical “pizza thrown against the wall” appearance of the fundus in this serious condition.
- Causes: hypertension, glaucoma, atherosclerosis, diabetes
Ophthalmoscope for Disease Management

- Chorioretinal Scar (Toxoplasmosis)
  - Congenital
  - Early lesion heals and leaves scar in a cyst.
Ophthalmoscope for Disease Management

- Detached Retina
  - The thin wall of the retina is pulled away by the retracting of the vitreous gel.
Ophthalmoscope for Disease Management

- **Benign Choroidal Nevus**
  - Grey pigmented areas are a normal occurrence (like a mole or birthmark)