

Ophthalmoscopy for the general practitioner

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DIRECT OPHTHALMOSCOPY

Description: Direct ophthalmoscopy allows for the visual examination of the retina and ocular media. The hand-held direct ophthalmoscope uses the patient's eye as a simple magnifier by aligning its viewing and illuminating beams (Fig. 1). This produces an erect, magnified, well-detailed real image of the retina. Compared to other fundus-viewing instruments, it is the easiest to master, provides for greatest patient comfort and can be used through smaller pupils. Although acceptable screening views are obtained through an undilated pupil, routine pupillary dilatation enhances the field of view.

Direct ophthalmoscopy is indicated for ocular fundus examination, evalua-

tion of an eye's media and evaluation of a patient's fixation pattern.

The ophthalmoscope head (Fig. 2) connects to a handle that serves as the power source. The head contains a variable range of plus and minus lenses used to compensate for refractive errors. The light is projected through a variably sized aperture and correcting lens to illuminate the fundus. Adjusting the aperture changes the beam size, which helps control reflections. A red-free filter is available to more easily identify haemorrhages and the nerve fibre layer of the retina. A fixation target is included in many ophthalmoscopes to assess where the centre of the macula, the fovea is situated.

The new Pan Optic ophthalmoscope

has the big advantage of a much wider viewing field of about 25 degrees versus the 5 degrees of the standard ophthalmoscopes.

This wide view enables the viewer to observe the whole macula area and gives a "birds eye view" of macula diseases such as diabetic maculopathy and age related macula degeneration.

SKILLS WORKSHOP

A. Instrumentation:

Direct ophthalmoscope, topical ophthalmic mydriatic/cycloplegic solution(s) i.e. tropicamide or cyclopentolate

B. Technique:

- 1. Dilate the pupils** with topical mydriatic/cycloplegic solution. Tropicamide is the mydriatic of choice for routine funduscopy as it has a short duration of action of 6 hours. **Dim the room lights** to maximize pupil dilation and reduce glare. Position the patient's eyes at a similar level to yours. **Ask the patient to fixate at a distance target.**
- Holding the ophthalmoscope in your right hand, align your right eye with the ophthalmoscope's aperture and brace it against your cheekbone. Attempt to keep your opposite eye open to minimize accommodative spasm and eyelid discomfort.
- Place the right index finger along the right side of the lens dial wheel. **Dial in a +5 dioptre lens.** Push down and rotate the rheostat illumination dial, usually located toward the top of the handle. Set the illumination in the **midrange of beam intensity**, varying it as needed to improve the clarity of the image.

Fig. 1. Basic optical principle of direct ophthalmoscopy. The viewing and illumination systems are aligned, using the patient's eye as a simple magnifier

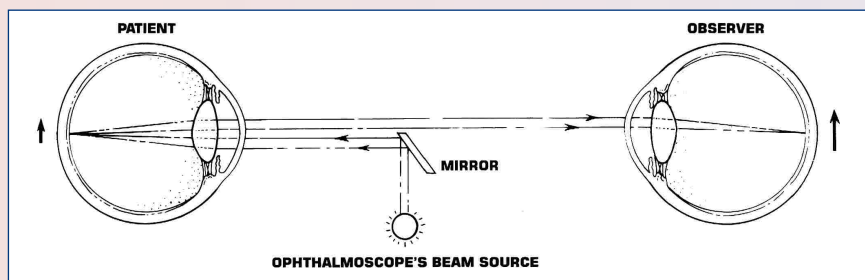
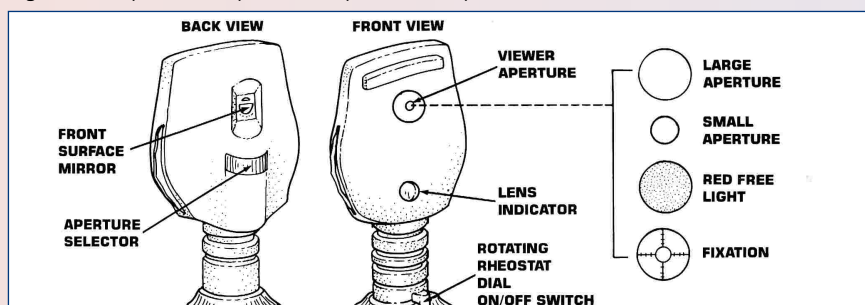


Fig. 2. Direct ophthalmoscope head components and aperture selections



C. Examining the eye for media opacities

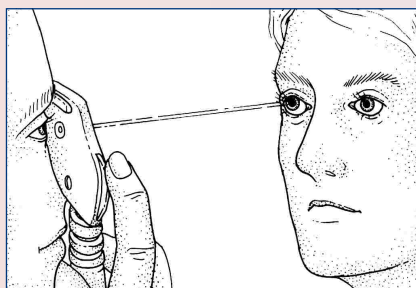


Fig. 3. Positioned at 10 to 12 inches in front of the patient, the examiner moves forward and observes the red reflex for opacities, judging their location.

1. Direct the ophthalmoscope's light beam into the patient's right pupil at a distance of 40 to 50cm, angled from a slight temporal position (**Fig. 3**).
2. Move forward until the red retinal reflex is in focus and examine for opacities. If opacity is present, ask the patient to look in a certain position while you keep the ophthalmoscope stable, OR move the ophthalmoscope beam keeping the patient's eye stable.
3. If the examiner moves the ophthalmoscope, determine if the opacity moves in the same or opposite direction as your movement.
 - Same-direction movement indicates that opacity is in front of the crystalline lens (optical centre of eye).
 - Against movement indicates an opacity posterior to the lens.

D. Closer viewing: the optic disk and macula

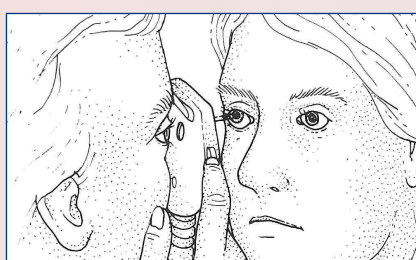


Fig. 4. A. Proper examiner-patient alignment during direct ophthalmoscopy, using the knuckles as a point of rotation during examination.

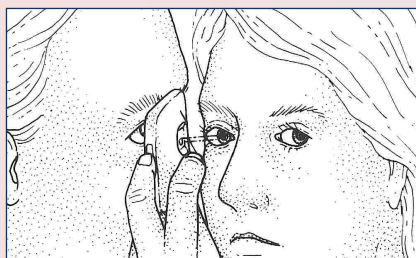
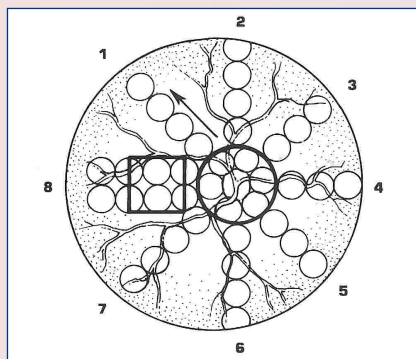
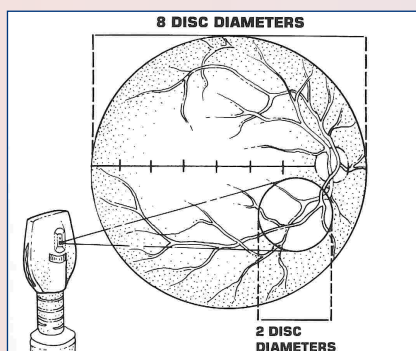


Fig. 4.B. The examiner should rotate in the opposite direction of the fundus area being examined.



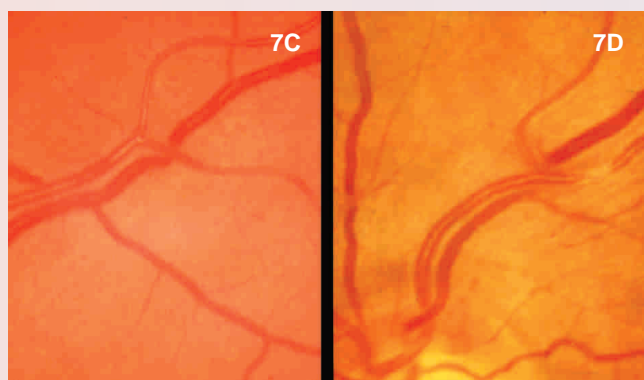
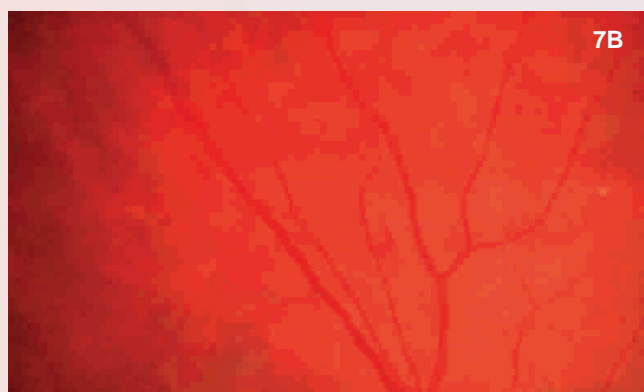
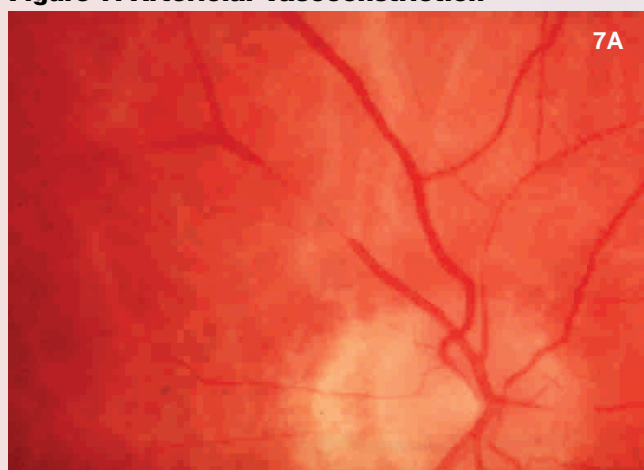
1. Reduce the plus power (+5,+4,+3...) as the patient's eye is approached.
2. Attempt to keep your head position vertical so as to not block the patient's fixation with his or her opposite eye. Stop when your knuckles lightly touch the patient's cheek (**Fig. 4A**). This area of contact can act as a rotational point for examination movements, insuring a close working distance and resultant optimal field of view (**Fig. 4B**).
3. Slowly continue with plus reduction until the retina is in focus, noting any anomalies along the way.
 - The **hyperopic**, or **far-sighted eye**, requires more "**plus**" (**green number**) lenses for clear focus of the fundus.
 - The **myopic**, or **near-sighted eye**, requires "**minus**" (**red number**) lenses for clear focus.
4. A circular area approximately two disc diameters in size is visualized when emmetropia (**Fig. 5**) is present. Direct your fixation slightly nasally to locate the optic disc. Note the following:
 - Colour, margins and shape,
 - Peripapillary retinal changes,
 - Presence or absence of spontaneous venous pulsation, and the
 - Horizontal and vertical cup/disc ratios.
 - Observe disc tissue for sloping margins of the cup and/or pallor.
 - Estimate the depth of the cup by focusing at the anterior-most cup edge and then reducing plus power until the bottom of the cup is clear (a dioptre = 1/3mm).
5. Follow the retinal blood vessels outward from the disc into the posterior pole in a systematic quadrantal fashion (**Fig. 6**). Go as far as possible. Note the following:
 - The A/V ratio.
 - Crossing appearances.
 - Vessel calibre.
 - Arterial light reflex
6. Look at the surrounding retinal tissue for:
 - Blood, fluid, exudates,
 - Elevation
 - Pigment alteration.
7. Make small dioptre power adjustments if needed to compensate for ocular movements, unsteadiness, and changes in tissue area observed.
8. Increase the range of the retinal area visualized by asking the patient to look in the same direction as the quadrant being examined.
9. Examine the macula area. Ask the patient to look directly into the ophthalmoscope beam for the exact localization of the foveal area. Note the presence or absence of the foveal light reflex. To determine the patient's fixation pattern, change the ophthalmoscope's aperture to the fixation target, instruct the patient to occlude the opposite eye with his or her hand and to fixate on the centre of the target.
10. Repeat the entire procedure on the opposite eye by moving to the patient's opposite side and using your left hand and left eye.

Interpretation.

Hypertensive retinopathy:

The hallmark of hypertensive retinopathy is **bilateral arteriolar attenuation** due to vasoconstriction (Fig 7A-D). Depending on the severity of the hypertension flame-shaped retinal haemorrhages (Fig 7E) and yellowish exudates can be seen, which if present in the macula, have a star shape (Fig 7F). Cotton wool spots represent focal retinal ischemia. Malignant hypertension additionally presents with papilloedema (Fig 7G). These signs in isolation are only seen in younger patients with hypertension.

Figure 7. Arteriolar vasoconstriction



Young adults with an acute hypertensive crisis rarely also develop choroidal changes that are visible ophthalmoscopically as follows:

- **Elschig spots** that are small, black spots surrounded by light yellow haloes which represent focal choroidal infarcts
- **Siegrist streaks** that are flecks arranged linearly along choroidal vessels which are indicative of fibrinoid necrosis associated with malignant hypertension
- **Exudative retinal detachment** which is rarely seen in patients with severe acute hypertension i.e. in eclampsia

In older patients there are also associated arteriosclerotic changes of which arterio-venous (AV) narrowing (nipping) at the crossings is the most important sign. Arteriosclerosis can be graded as follows:

- **Grade 1:** Slight broadening of the arteriolar light reflex, mild generalised attenuation of the arterioles.
- **Grade 2:** Broadening of the arteriolar light reflex and deflection of the veins at the AV crossings (Salus sign)
- **Grade 3:** Copperwire appearance of the arteriolar, banking of the veins distal to the AV crossing (Bonnet sign), tapering of the veins on either

side of the arteriolar (Gunn sign) and right angled deflection of veins at the AV crossings.

- **Grade 4:** Silverwiring of the arterioles additional to grade 3 changes

Complications of hypertensive retinopathy include the following:

- Retinal vein occlusions (centrally or in branches) (Fig 9A)
- Retinal artery occlusions (centrally or in branches) (Fig 9B)
- Retinal artery macroaneurysm (Fig 9C)
- Anterior ischaemic optic neuropathy (optic nerve head infarct) (Fig 9D)

Caveat: When hypertensive changes are only found in one eye, suspect carotid artery obstruction on the side of the "normal" eye, sparing the retina from the effects of the hypertension

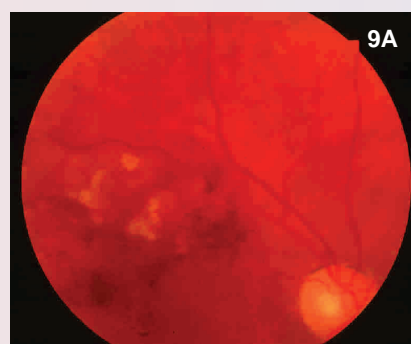
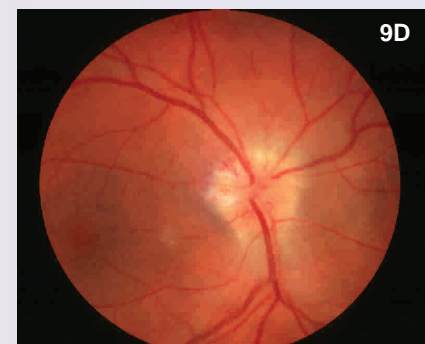
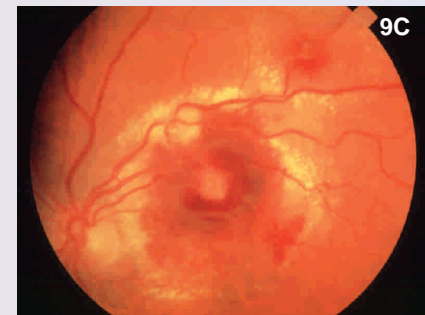
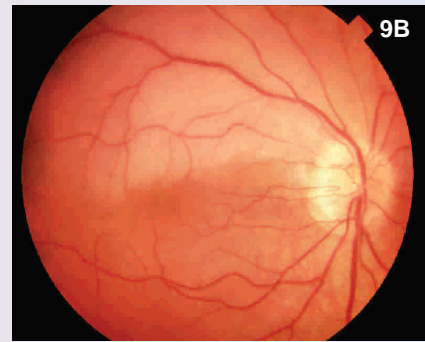
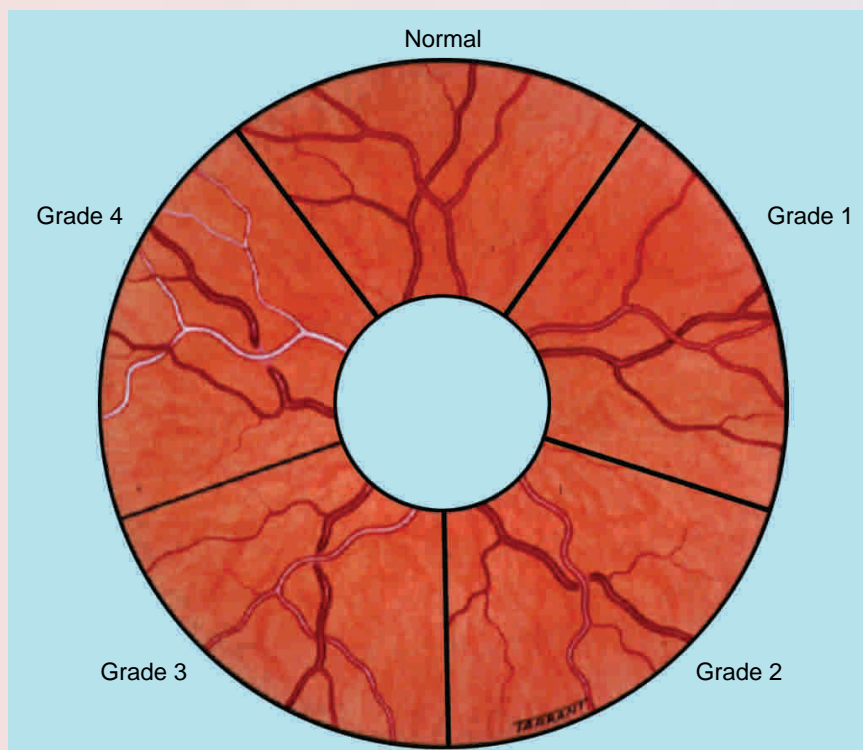


Figure 8: Grading of arteriolosclerosis



Contraindications/ Complications.

Aside from some discomfort due to glare, this procedure should present no risk to the patient.

Pupil dilatation does not effect distant vision to a great extent but near vision (for reading) is severely impaired due to the cycloplegic effect of the anticholinergic I effect that inhibits accommodation. Therefore always use the shortest acting mydriatic i.e. Tropicamide which has a duration of action of 6 hours.

The risk of inducing an acute angle closure glaucoma by dilating the pupil is remote, but must be kept in mind if the anterior chamber is obviously shallow in an elderly patient.

References:

1. Atlas of Primary Eyecare Procedures. Linda Casser, Murray Fingeret. H. Ted Woodcome
2. Appleton & Lange 1997, 2nd Edition.
3. Clinical Ophthalmology. A systematic approach. Jack J Kanski
4. Butterworth-Heinemann 2003, 5th Edition
5. The Wills Eye Manual. Office and Emergency Room Diagnosis and Treatment of Eye Disease. Douglas J Rhee and Mark F Pyfer
6. Lippincott Williams & Wilkins. 3rd Edition.