

STEPS OF EYE EXAMINATION - FUNDUS

Step 1: Approach the patient

- Read the instructions carefully for clues
- Shake hands, introduce yourself
- Ask permission to examine him “I would like to examine your eyes, if it is all right with you”

Step 2: General inspection:

- **General appearance** (rarely helpful): foot ulcer or necrobiosis lipoidica in DM
- **Look at the eyes:**
 - Arcus lipidus at young age suggest DM.
 - Pupil is usually (but not always) dilated for the examination (in the absence of pupillary dilatation, only the optic nerve can be reliably assessed)

Step 3: Check your ophthalmoscope: check that light works and is on the correct beam (standard), start with short focal length (find ‘0’ and then rotate the focus ring clockwise until the number + **10** is obtained)

Step 4: Ask permission to turn off lights or draw the curtains

Step 5: Sit opposite the patient and tell him that you are going to shine the light into his eyes, and ask him to keep looking at a distant point straight ahead at his eye level (e.g. a light switch, a spot on the wall).

Step 6: Hold the ophthalmoscope in your right hand to examine the patient’s right eye (and vice versa). Place your other hand on the patient’s forehead, catch his upper eyelid with your thumb and gently retract it against the orbital rim. Use your right eye to examine the patient’s right eye (and vice versa). Look at the patient’s eye with the ophthalmoscope in the same horizontal plane as his eye, from a distance of about 30 cm and an angle about 15 degrees temporal to his line of fixation aiming at the centre of the back of the patient’s head.

Step 7: Look through the pupil to check the red reflex (the pupil appears pink, as in bad flash photographs): opacities in the media of the eye (cornea, anterior chamber, lens and vitreous) will appear as black specks or lines against the red reflex of the fundus. The red reflex is attenuated or lost in any condition affecting the transparency of structures in front of the retina (e.g. cataract, vitreous haemorrhage), and in any condition affecting apposition of the normally transparent retina with the underlying red vascular choroid (e.g. retinal detachment). Do not attempt fundal examination in an eye with absent red reflex.

Step 8: Come closer to the patient’s head while progressively rotating the focus ring anticlockwise (to increase the focal length) until the lens comes into focus. Look at the **lens** for early cataract in diabetics. Cataracts usually have a fine web-like appearance structures in front of the fundus.

Step 9: Come further closer to the patient’s head while progressively rotating the focus ring anticlockwise, to look through the **vitreous** for

- Opacity (e.g. asteroid hyalinosi)
- Haemorrhages
- Fibrous tissue or new vessel formation (proliferative diabetic retinopathy)

Step 10: Come further close to the patient’s head such that you are touching your hand resting on the patient’s forehead while progressively rotating the focus ring anticlockwise until the **retina** comes into focus. The retina is usually observed with a zero or a slightly negative lens if the patient is myopic. Tilting your head sideways gives both the patient and yourself ‘breathing space’ and enables you to get close to the patient’s eye. The closer you are, the easier it is to angle your ophthalmoscope into each quadrant and the bigger your field of view of the fundus

Step 11: Localize the disc and examine it and its margins: Staying in the same horizontal plane at an angle about 15 degrees temporal to the line of fixation aiming at the centre of the back of the patient's head will bring the optic disc in view. If it is not, focus on a blood vessel and follow it backwards against the angles of their branches, in the direction of convergence of the blood vessels into the optic disc. If the optic disc is not sharply focused, the lenses of the ophthalmoscope should be gradually adjusted until the disc becomes sharply focused. Note the optic disc margins, colour and cup.

- **Normal appearance of the disc:**

1. **Optic disc margins:**

- Normal disc is rounded or slightly oval with clear margins.
- The nasal margin of the disc is normally blurred (less sharply demonstrated than the temporal margin).
- A rim of dark pigment or white sclera is sometimes normally seen surrounding the optic disc (particularly the temporal side) - common in highly myopic eyes

2. **Optic disc colour:**

- Normal disc is pink in colour.
- The temporal side of the disc is usually paler than the nasal side.
- The colour of the optic disc varies (quite pale if only the four main vessels are seen on the disc; while much pinker if the vessels have early branches on the disc itself).
- In infancy and old age, optic disc is naturally pale due to thin vessels.

3. **The optic cup** is a depression in the central part of the optic disc. It is paler than the surrounding rim of the disc, and from it the retinal vessels enter and leave the eye. Normal optic cup is slightly on the nasal side of the centre of the optic disc and its diameter is less than 50% of the disc diameter

- **Abnormalities of the optic disc:**

1. **Pinker disc with blurred disc margins (or with blurred cup)** → swelling (oedema) of the optic nerve head. The disc looks pinker than normal (hyperaemic) and may approach the colour of the surrounding retina (often difficult to find, with the vessels disappearing without an obvious optic disc). Oedema of the optic nerve head results from either raised ICP (papilloedema) or from inflammation (papillitis = optic neuritis):

- **Papilloedema** usually produces more swelling, with humping of the disc margins and not usually associated with visual loss (may enlarge the blind spot). If papilloedema develops rapidly, there will be marked engorgement of the retinal veins with haemorrhages and exudates on and around the disc, but with papilloedema of slow onset there may be little or no vascular change, even though the disc may become very swollen.
- In **papillitis** swelling of the optic disc is usually slight, distension of the retinal veins is less marked than in papilloedema, haemorrhages and exudates are rarely present, and there may be signs of intraocular inflammation, such as a hazy vitreous. There is often visual loss (central scotoma) and pain on moving the eye.
- Be aware of the following conditions which might be mistaken for papilloedema:
 - The normally blurred nasal margin may be mistaken for papilloedema
 - Hypermetropic fundus appears crowded due to small size of the eye, may be mistaken for papilloedema
 - **Drusen:** colloid bodies that may occur on disc, may be mistaken for papilloedema
 - **Myelinated nerve fibres:** opaque white fibres or patches radiating (for a short distance) from the disc, may be mistaken for papilloedema. The patch has a characteristic feathered edge and retinal vessels may disappear for a short distance within it. It is harmless non progressive congenital anomaly

2. **Pale disc with normal cup** → optic atrophy. Because there is wide variation in colour of the normal disc, a useful sign of optic atrophy is reduction in the number of capillaries on the disc (the number of capillaries that cross the disc margins is reduced from the normal 10 to 7 or less). Optic atrophy is either primary (due to pressure, ataxia, Leber's, dietary, ischemia, syphilis, cyanide, sclerosis) or secondary (following papilloedema):

- **Primary optic atrophy:** disc is flat and white with clear-cut edges
- **secondary optic atrophy**(following papilloedema): the disc is greyish-white in colour and its edges are indistinct
- N.B. the following conditions may be mistaken for optic atrophy (pale disc):
 - The normal temporal pallor may be mistaken for optic atrophy
 - The normal pallor of the disc in infancy and old age (due to thin vessels) may be mistaken for optic atrophy
 - The normal rim of dark pigments or white sclera seen sometimes surrounding the optic disc may make disc seem pale
 - Myopic fundus (myopic eye is large, so disc appears paler)

3. **Pale disc with deep cup** → **chronic glaucoma** (commonly idiopathic)

Step 12: Trace the arterioles and venules out from the disc noting particularly:

- **Colour:** arteries are light-coloured and veins are burgundy-coloured
- **Calibre:** the diameter of arteries is two-thirds the diameter of veins. Look for arteriolar narrowing and vessel irregularity - seen in grade I hypertensive retinopathy
- **Increased reflectiveness** (silver wiring): seen in grade I hypertensive retinopathy
- **AV crossing points:** look for AV nipping (the vein narrows markedly as it is crossed by the artery) - seen in grade II hypertensive retinopathy
- **Microaneurysms:** saccular pouch; appears as round dots separate from blood vessels (seen in background retinopathy)
- **Neovascularization:** new vessels appear as fine frond-like vessels, often near the disc, frequently coming off the plane of the retina and therefore may be out of focus (seen in proliferative diabetic retinopathy)
- **Bright yellow object within lumen of artery:** cholesterol embolus, usually due to unilateral proximal atherosclerotic lesion (often common or internal carotid stenosis)
- **Look at the retinal veins as they turn into the optic disc and see if they pulsate, going from convex to concave.** This is best appreciated as you look along the length of a vein as it runs into the optic disc. Retinal venous pulsation is normal finding and indicates normal intracranial pressure, while its absence may reflect raised intracranial pressure or may be normal (absent in 15% of normal people)
- **Common mistakes on examining the blood vessels:**
 - Choroidal artery: a small vessel running from disc edge towards macula, mistaken for new vessels
 - Tortuous vessels (normal variant), may be mistaken as vessel irregularities of grade I hypertensive retinopathy

Step 13: Look at the retinal background: examine each quadrant of the fundus and especially the macular area and its temporal aspect. The macula is an area of densely packed photoreceptors (the fovea being its centre of excellence) and its corresponding visual axis is the area of central vision. So, the macula will come in to view if you ask the patient to look at the ophthalmoscopic light. The macula is found two disc diameters from the temporal margin of the disc and appears as a pale yellow spot on a slightly darkened area of the retina. It can be difficult to see. Ideally, you should use the narrow beam (the dot light) for this (if it is available in your ophthalmoscope). Look particularly for haemorrhages (dot, blot, flame-shaped), microaneurysms, exudates both hard (well-defined edges; increased light reflex) and soft (fluffy with ill-defined edges; cotton-wool spots). If hard exudates are present see if these form a ring (circinates in DM).

- **General background:**
 - **Pigmented background:** normal especially in dark-skinned races. If striped, called tigroid
 - **Pale background:** either clear (normal in fair-skinned people, also seen in albino) or cloudy (macula appears as “cherry-red” spot, vessels narrow – seen in retinal artery occlusion)
- **Red lesions:**
 - **Dot haemorrhages:** thin, vertical haemorrhages that may be difficult to differentiate from microaneurysms - seen in background diabetic retinopathy
 - **Blot haemorrhages:** larger, full-thickness bipolar layer haemorrhages that represent larger areas of capillary occlusion - seen in background diabetic retinopathy
 - **Flame haemorrhages:** superficial bleed shaped by nerve fibres into a fan with point towards the disc - seen in grade III hypertensive retinopathy. Florid haemorrhages are seen in retinal venous thrombosis – may be in only one quarter or half of the retina
 - **Subhyaloid haemorrhages:** irregular superficial haemorrhages usually with flat top - seen in subarachnoid haemorrhages
- **White/yellow lesions:**
 - **Hard exudates:** yellowish sharp-edged lesions with increased light reflex. It may form a ring around the macula (macular star) - seen in background diabetic retinopathy, grade III hypertensive retinopathy
 - **Soft exudates (cotton wool spots):** white fluffy spots, caused by retinal infarcts - seen in proliferative diabetic retinopathy, grade III hypertensive retinopathy, SLE, AIDS
- **Black lesions:**
 - **Moles:** flat, usually rounded lesions – normal
 - **Laser burns:** black-edged round lesions, usually in regular pattern; often mistaken for retinitis pigmentosa
 - **Retinitis pigmentosa:** rare, black lesions like bone spicules in periphery of retina
 - **Melanoma:** raised irregular malignant tumour

Step 14: Stay examining until you have finished and are ready to present your findings. Stop at the disc, the macula, and in each quadrant of each eye and ask yourself the question “are there any abnormalities? What are they?” before moving on to the next area. Do not be put off by the impatient words of your examiner

Step 15: Thank the patient

THEORETICAL NOTES

Moving parts of the ophthalmoscope:

- On/off switch, usually with brightness control
- Focus rings (occasionally two):
 - a. -20/+20 for correction of the patient's vision (usually set at zero): if the patient is myopic turn the ring anticlockwise, and if hypermetropic, turn it clockwise. An oblique view of the patient with his spectacles on tells you if he is long- or short-sighted; if his face is smaller through his eye glasses he is myopic; if his face is larger he is hypermetropic. The severity is estimated according to how much his face looks smaller or larger
 - b. -10/+10 for correction of your vision: if you are short- or near-sighted (myopic) and not using glasses or contact lenses you will have to turn the focus dial anticlockwise to focus to look at a normal eye. If you are long- or far-sighted (hypermetropic) turn the focus dial clockwise. Establish what correction you need before approaching the patient
- Beam selector (sometimes): it gives you the following choices:
 - a. Standard: for general use
 - b. Narrow beam for looking at the macula
 - c. Target (like a rifle sight): to measure the optic cup
 - d. Green to look for haemorrhages (red appears as much darker)
- dust cover (sometimes)