

# Examination of the Eye

August 2012

# Aims of this workshop (I.M.H.O.)

- Be more comfortable with examination of the eye
- To formulate a working diagnosis
- Write/Discuss a referral (that will be accepted)

Ophthalmic examination can be quite daunting;

- Hopefully not because ophthalmologists are terrible to refer patients to...
- But it is “the eye!”
- And teaching unfortunately tends to be quite limited

# The basics

- A thorough examination includes:
  1. Inspection
  2. History
  3. Clinical examination
  4. ± Investigations

# Inspection

Typically can quickly give an impression of:

- Severity of patient's complaint
- Whether this may be an emergent case (e.g. Orbital cellulitis)
- Has the patient got an obvious strabismus / ptosis / proptosis?

# History

Ever since Medical School, there is always an emphasis on obtaining a good history...

From my perspective (especially if receiving referrals), the relaying of a good history;

- Makes it easier to triage the case and, hence,
- The patient is seen appropriately and (likely) more quickly

# The very quick version...

Hopefully I will not be crucified by my colleagues;

- the bare minimum to make a referral is a history and a visual acuity
- So, if that is your objective for attending this symposium then my job here is done and we can have afternoon tea.
- But to continue on in a more serious manner...

# History (cont.)

Patients can present with a variety of ophthalmic complaints, and these include:

- Pain/Discomfort  $\pm$  Redness
- Discharge
- Visual complaints or other

# History (cont.)

Some important aspects to consider when taking an ophthalmic history include:

- The nature of the complaint (can sometimes be extremely difficult for patients to describe)
- Acute or slow onset
- Unilateral or Bilateral
- Systemic symptoms
- Past Ocular history

# Acute vs. Slow onset

- Acute onset tends to lend urgency to referral
- BUT be aware that some acute presentations may actually be acute awareness of a chronic problem, e.g.
  - The dense cataract that was unnoticed until the patient rubbed their other eye
  - Amblyopia hitherto unknown
  - Asymmetric macular degeneration

# Unilateral vs. Bilateral

- When obtaining a history from patients, it can sometimes be difficult to determine if the complaint affects 1 or both eyes
- However, spending a little time to carefully question the patient will help direct you further
- In general, bilaterality suggests generalised/systemic disease or that pathology is likely to be behind the optic chiasm... But occasionally patients may be unlucky and have a disease process independently affecting both eyes

# Pain / Discomfort

- The nature of a patient's symptoms may suggest the likely pathology;
  - A foreign body sensation or grittiness tends to be corneal pathology, and if blinking seems to accentuate the discomfort, there may be a subtarsal FB
  - Photosensitivity is a very generalised symptom that may sometimes suggest iritis
  - Itchiness is associated with allergic conditions
  - Severe eye pain with haloes (and a cloudy cornea) is likely to be acute glaucoma
  - Headache in the presence of acute visual loss in a patient over the age of 50 years is Giant Cell Arteritis until proven otherwise

# Discharge

- Watery discharge;
  - If not associated with any significant ocular discomfort or inflammation may be due to blocked tear drainage
  - If associated with itch, suggests acute allergic eye disease
  - If associated with significant inflammation and a concurrent URTI, could be a viral conjunctivitis
- Purulent discharge; typically associated with bacterial conjunctivitis
- Mucopurulent discharge; usually Chlamydial infection, and discharge tends to be worse in the morning

# Visual complaints

A number of different visual modalities make up our visual experience and thus patients may notice a change of their...

- Visual acuity or clarity of vision
- Visual field or area of vision
- Colour vision

Furthermore, patients can sometimes describe further visual symptoms, e.g.

- Floaters
- Flashes / Scintillations / other photopsias
- Diplopia
- Distortion / Metamorphopsia

# Blurred vision

- Most difficult job is clearly (pardon the pun) defining what the patient means by blurred vision because they may mean:
  - Cloudy vision
  - Diplopia
  - Shadow/Grey (over a certain area)
  - Blotchy
  - Distortion
  - Hemianopia

# Some causes of “blurred” vision

- Epiphora
- Corneal opacity
- Dry eye
- Refractive error
- Cataract
- Uveitis
- Vitreous haemorrhage
- Retinal detachment
- Retinal/Macular oedema
- Vascular occlusions
- Optic nerve pathology:
  - Neuritis
  - Glaucoma
  - Atrophy
- Cortical causes including hemianopias, ambylopia
- Strabismus

# Visual field changes

If unilateral, strongly suggests ophthalmic pathology that is anterior to the optic chiasm

If bilateral (and confirmed on examination) then likely to be behind/at the optic chiasm and thus in the domain of the physician / neurologist / neurosurgeon

Patients may notice a VF defect but usually it is found on clinical examination

# Some causes of VF changes

## Unilateral

- Retinal pathology:
  - Vascular occlusions
  - Retinal detachment
  - Inflammatory conditions
- Optic nerve pathology:
  - Neuritis
  - Ischaemic neuropathy
  - Glaucoma
  - Others

## Bilateral

- Chiasmal pathology:
  - Pituitary tumour/apoplexy
- Cortical pathology:
  - CVA
  - SOLs
- Migraine (temporary VF changes)

# Changes in colour vision

It would be very unusual for a patient to complain of a change in their colour vision, but perhaps a patient may be perceptive enough to notice this if they close their good eye.

Possible causes include:

1. Optic neuritis
2. Optic neuropathy (acute / chronic)
3. Asymmetric macular disorders

# Flashes and Floaters

What do these symptoms represent?

- **To the patient;**
  - something ranging from annoying to worrying
- **To you;**
  - something ranging from annoying to worrying (tending to the worrying side)
- **To ophthalmologists:**
  - something ranging from annoying to worrying (depending upon the history and your clinical findings)

# Flashes and Floaters

- Not all flashes and floaters = a retinal detachment
- What could flashes and floaters signify?
  - Retinal detachment
  - Vitreoretinal traction
  - Posterior vitreous detachment
  - Posterior uveitis/White dot syndromes

# Scintillations and other photopsias

Scintillations are usually associated with migraines, however the patient's subjective description are varied, ranging from;

- Twinkling lights
- Waterfall effect
- Jagged lines

The visual aura from migraine typically lasts 10 to 30 minutes, preceding the headache (if they do develop a headache)

More importantly, the scintillations should occur in both hemifields of vision, as purely unilateral symptoms may indicate unilateral pathology (e.g.

# Diplopia

The symptom of diplopia can be very distressing and disabling

When a patient complains of diplopia, it could indicate a problem ranging from the innocuous to possibly life-threatening...

The most important aspect of a patient's diplopia is;

- Is it **binocular** diplopia or **monocular** diplopia?
- Binocular diplopia indicates misalignment of the visual axes and therefore tends to suggest more worrying pathology (i.e. EOM palsy, physical displacement of the eye/s from a space occupying lesion)

# Causes of “Monocular diplopia”

Monocular diplopia is most commonly due to optical / ocular causes.

- Refractive error or astigmatism
- Corneal opacity or corneal ectasia
- Cataract
- Vitreous opacities
- Retinal pathology (macular oedema, retinal folds)

# Binocular diplopia

If you confirm binocular diplopia, then the history should continue to:

- a) Determine if there are any other symptoms that may localise the pathology or suggest a cause:
  - Headache
  - Weakness / Numbness / Paraesthesia
- b) Elucidate cardiovascular risk factors
- c) Determine if there is variability to the diplopia (?Myasthenia)
- d) Is there a past history of thyroid problems (thyroid eye disease) or previous cancer (?metastases)

# Metamorphopsia and Distortion

“Straight lines (or what should be straight lines) don’t look straight anymore”

“Things seem to be bent / curved / wriggly / wobbly”

Most commonly associated with ARMD or macular pathology;

- Macular oedema (e.g. caused by a choroidal / subretinal neovascular membrane)
- Pathophysiology can be explained as trying to view a movie projected onto a non-flat or uneven surface

# “Others”

Patients may present complaining of:

1. Anisocoria , and questioning should include:
  - Duration of symptoms
  - Any diplopia?
  - Headache / neckache?
  - History of trauma / medication / plant sap to eye/s
  - Eye pain / Photophobia
2. Lid lesions:
  - Has there been growth?
  - Sun exposure
  - Ulceration / Bleeding

Examination of the eye

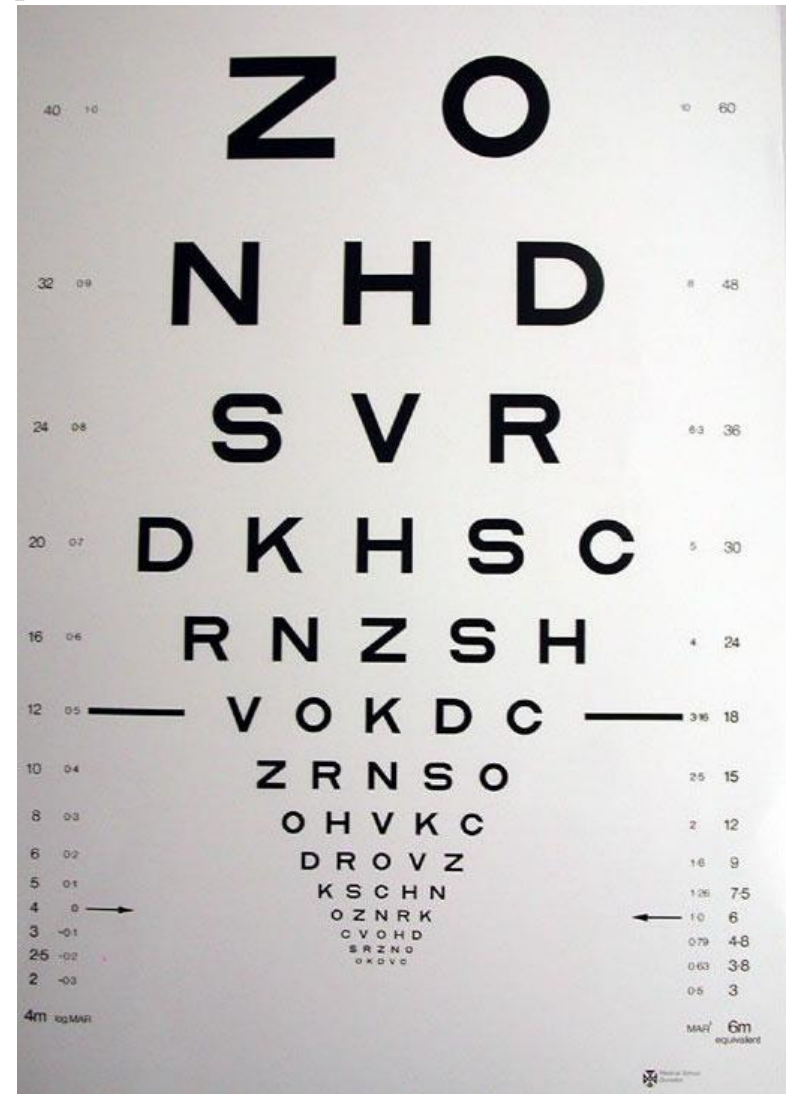
**Volunteers required!**

# Equipment

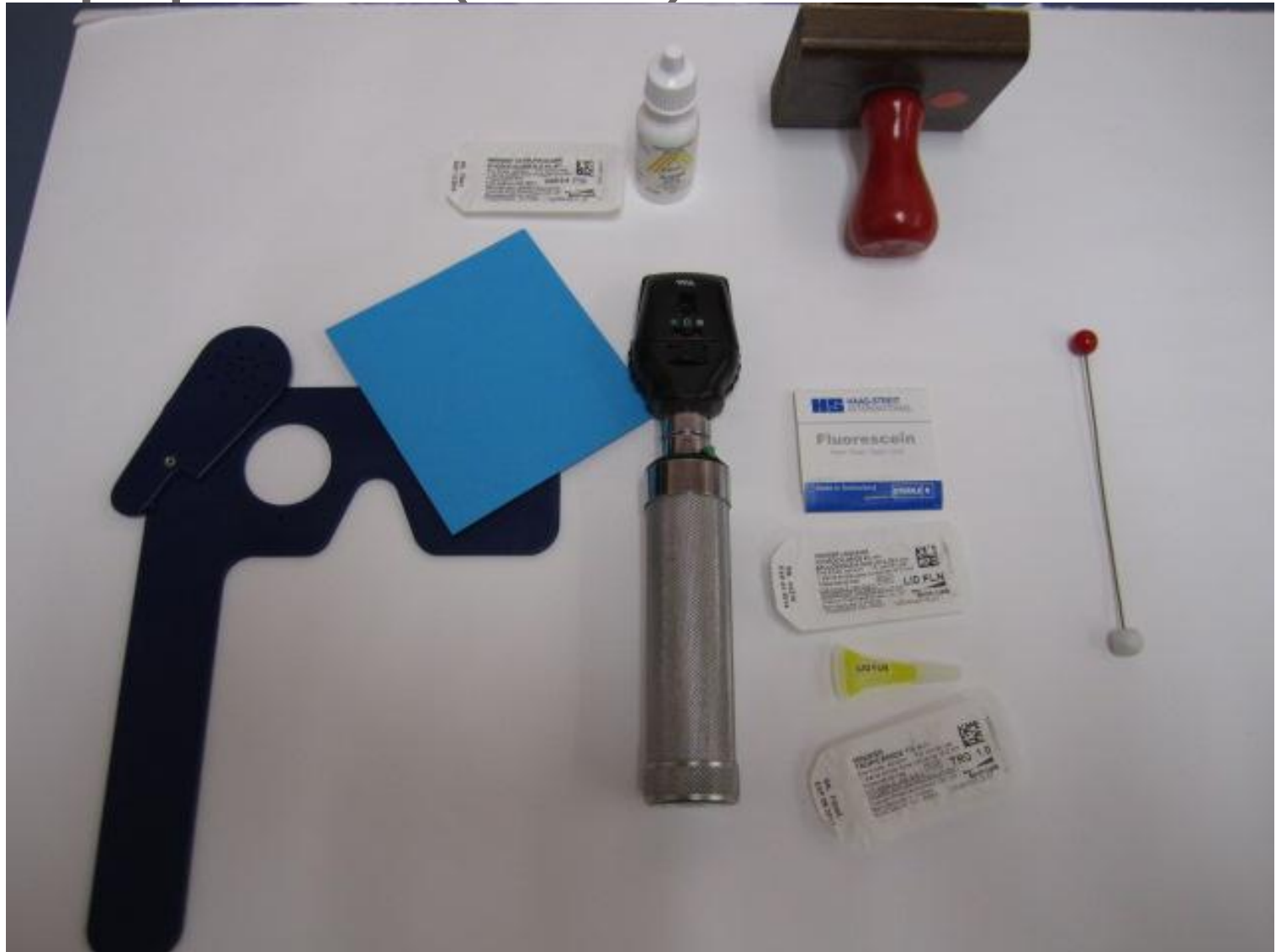
- What equipment will I need?
  - Vision testing chart (Snellen, LogMar, etc.)
  - Bright light source (pen-torch) or Direct Ophthalmoscope
- What else may be useful to have?
  - Occluder / Pinhole
  - Local anaesthetic
  - Red target / Hatpin
  - Fluorescein dye (drops / strips)
  - Slit-lamp
  - Dilating drops (Tropicamide)

# Equipment (cont.)

|                        |        |        |
|------------------------|--------|--------|
| <b>A</b>               | Metric | Feet   |
|                        | 6/60   | 20/200 |
| <b>D F</b>             | 6/36   | 20/120 |
| <b>H Z P</b>           | 6/24   | 20/80  |
| <b>T X U D</b>         | 6/18   | 20/60  |
| <b>Z A D N H</b>       | 6/12   | 20/40  |
| <b>P N T U H X</b>     | 6/9    | 20/30  |
| <b>U A Z N F D T</b>   | 6/6    | 20/20  |
| <b>N P H T A F X U</b> | 6/5    | 20/16  |



# Equipment (cont.)



# Equipment (cont.)

However, I have forgotten the most important thing...



# Vision testing / Visual acuity

- Standardised visual acuity charts (as previously pictured); designed to determine the spatial resolving capability of the eye, but...
- Recognise that vision (and our recording of visual acuity) is a subjective (and not absolute, objective) measurement
- Visual acuity is recorded as a ratio;
  - The numerator is the test distance (4m, 6m, 20 feet)
  - The denominator is the “distance that the object would be identified by a person with good (4/4, 6/6, 20/20) vision”

# Visual acuity (cont.)

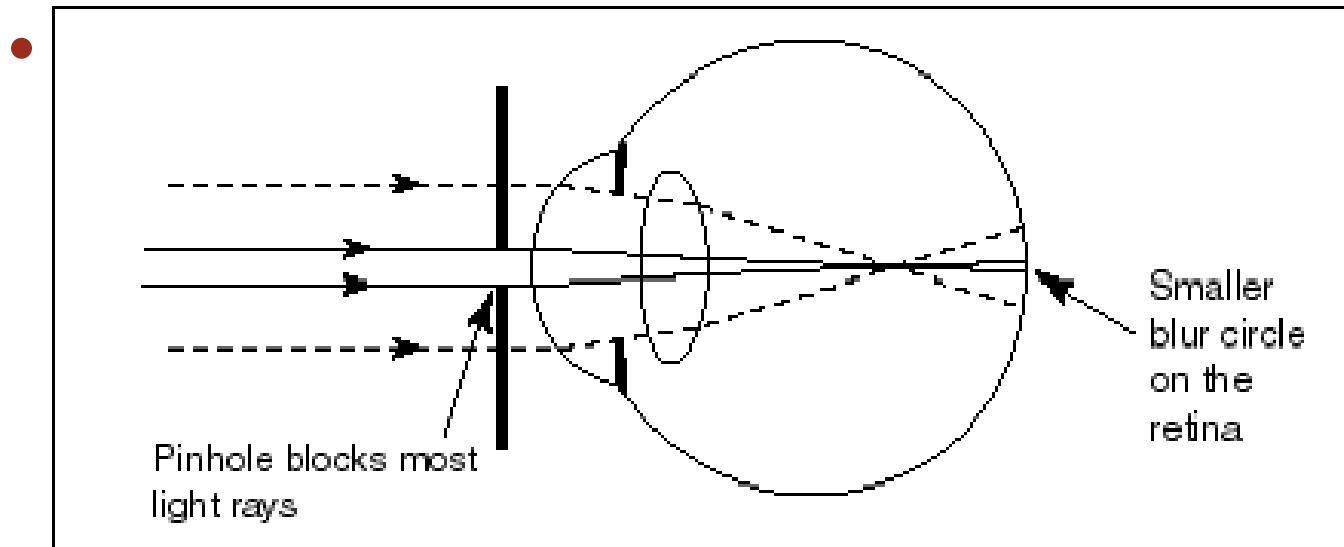
- Ideally, the vision chart would be back-illuminated with a white fluorescent light source, so that contrast is near-total (i.e. Black letters on white background)
- The test distance is reasonably accurately measured (and marked so that the patient or chart can be positioned quickly)

# Visual acuity (cont.)

- If a patient has “distance glasses” or bifocals, then they should wear them during testing.
- Don’t test a patient’s distance vision with their reading glasses as it will render them artificially short-sighted.
- Test 1 eye at a time (which to test 1<sup>st</sup>?)
- Be mindful of:
  - Peeking
  - Which eye is being tested

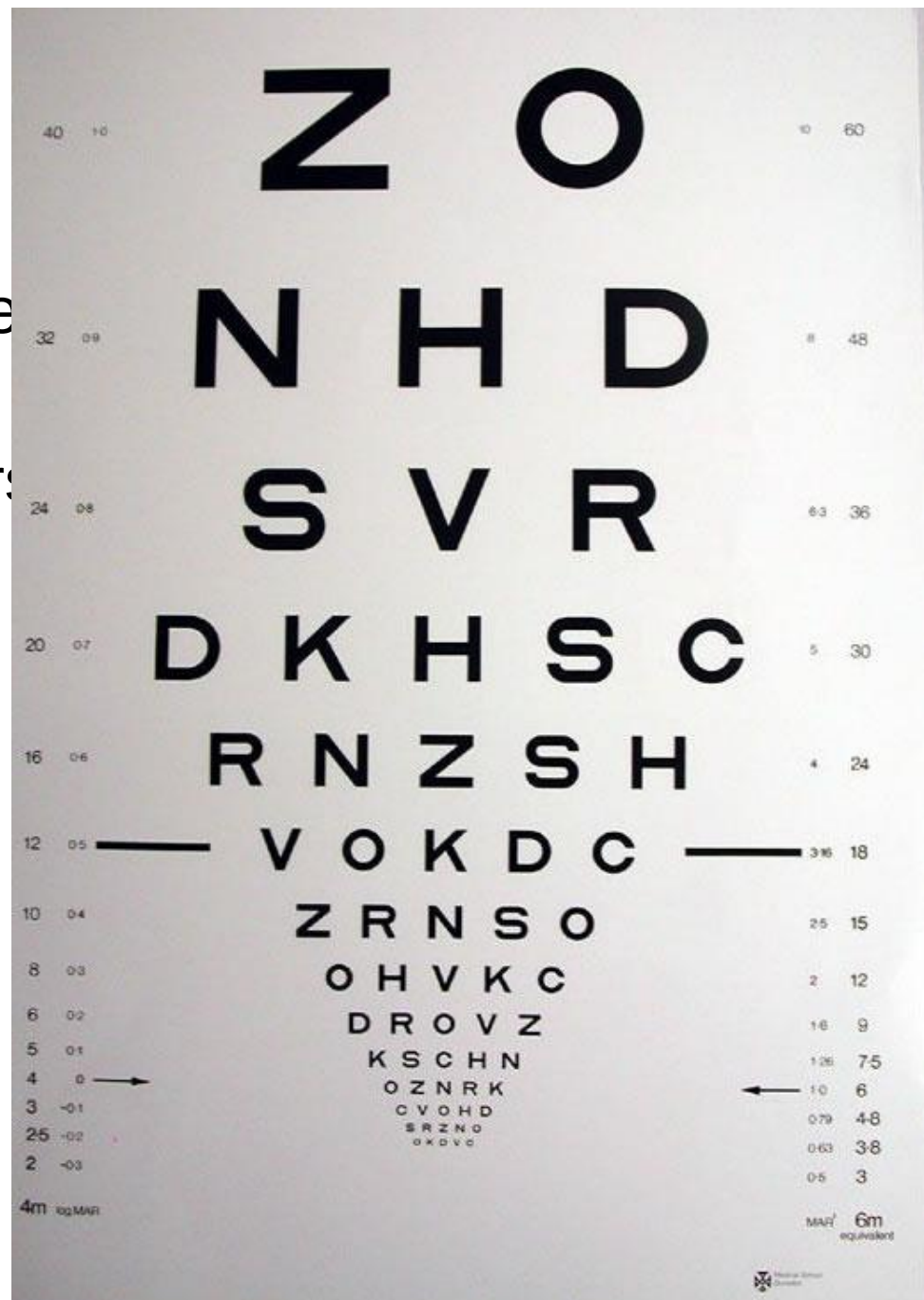
# Visual acuity (cont.)

- Patient reads the smallest line that they are able to (and sometimes requires encouragement ++)
- Remember to use a pinhole (either part of the occluder, or “make-your-own”) to check if the visual acuity improves:



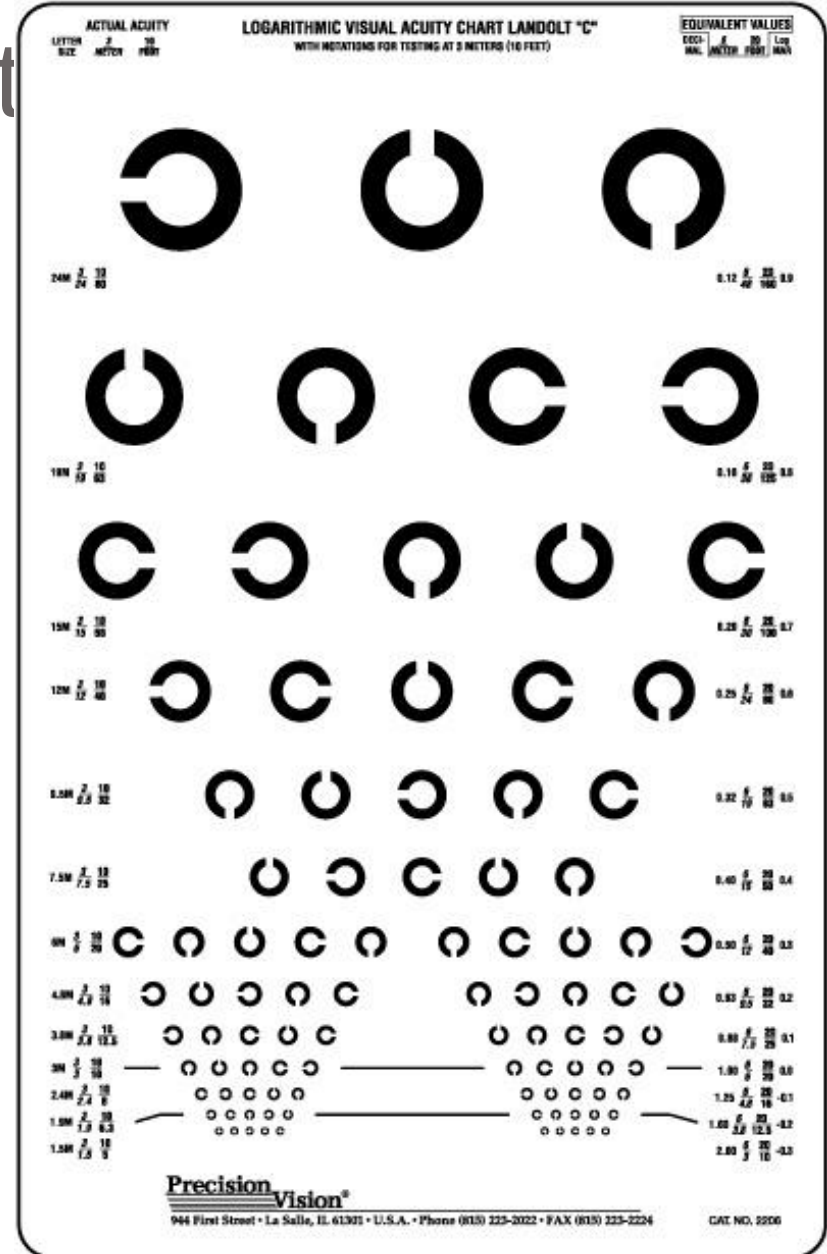
# Visual acuity

- Majority of the line
- - “missed letters”
- + additional letters

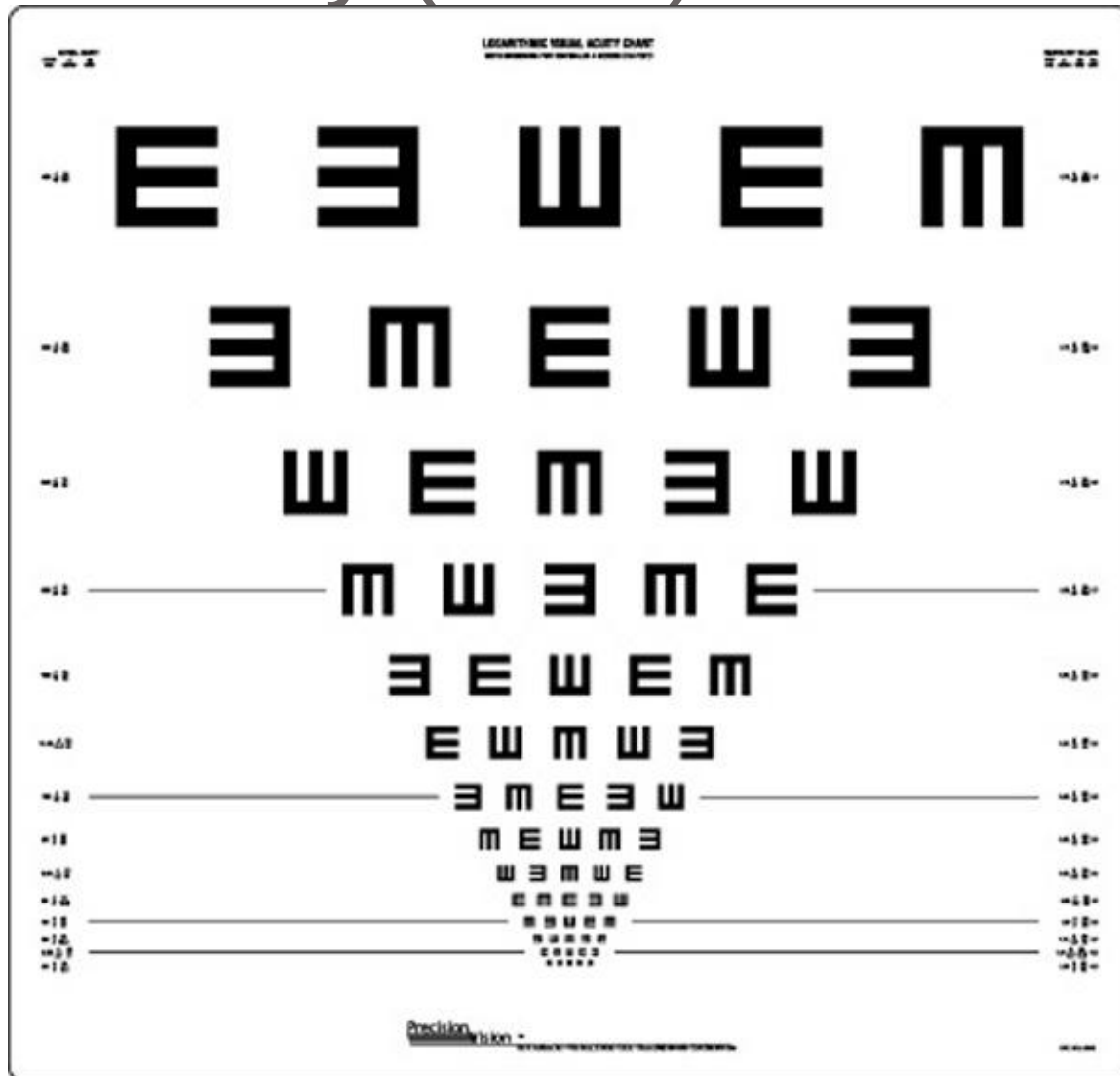


# Visual acuity (cont)

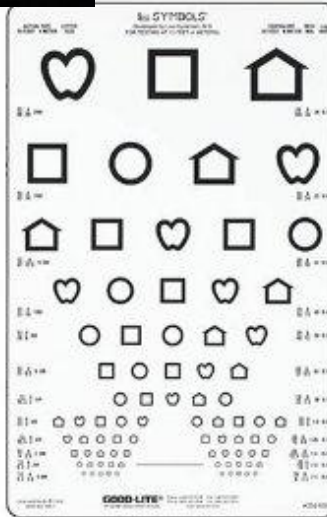
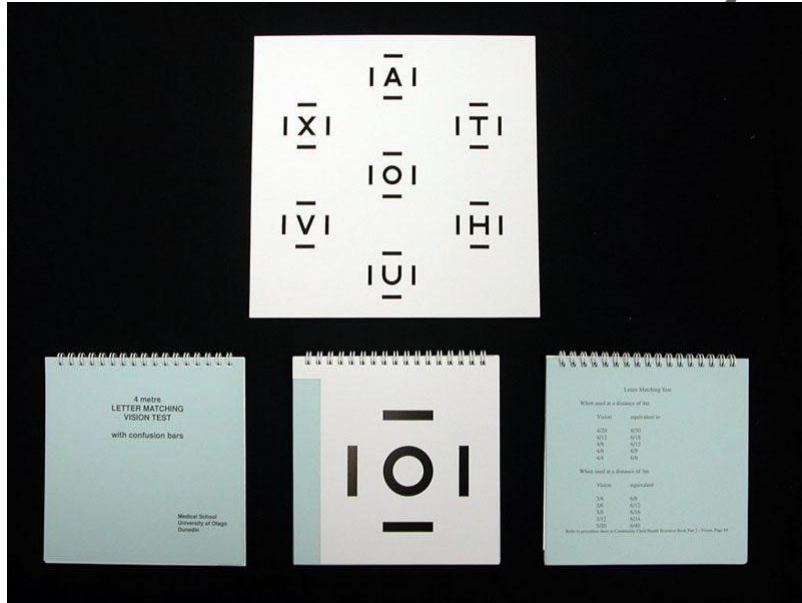
- The visual acuity of illiterate patients can be tested (but it isn't expected that you will have these charts in your rooms)



# Visual acuity (cont.)



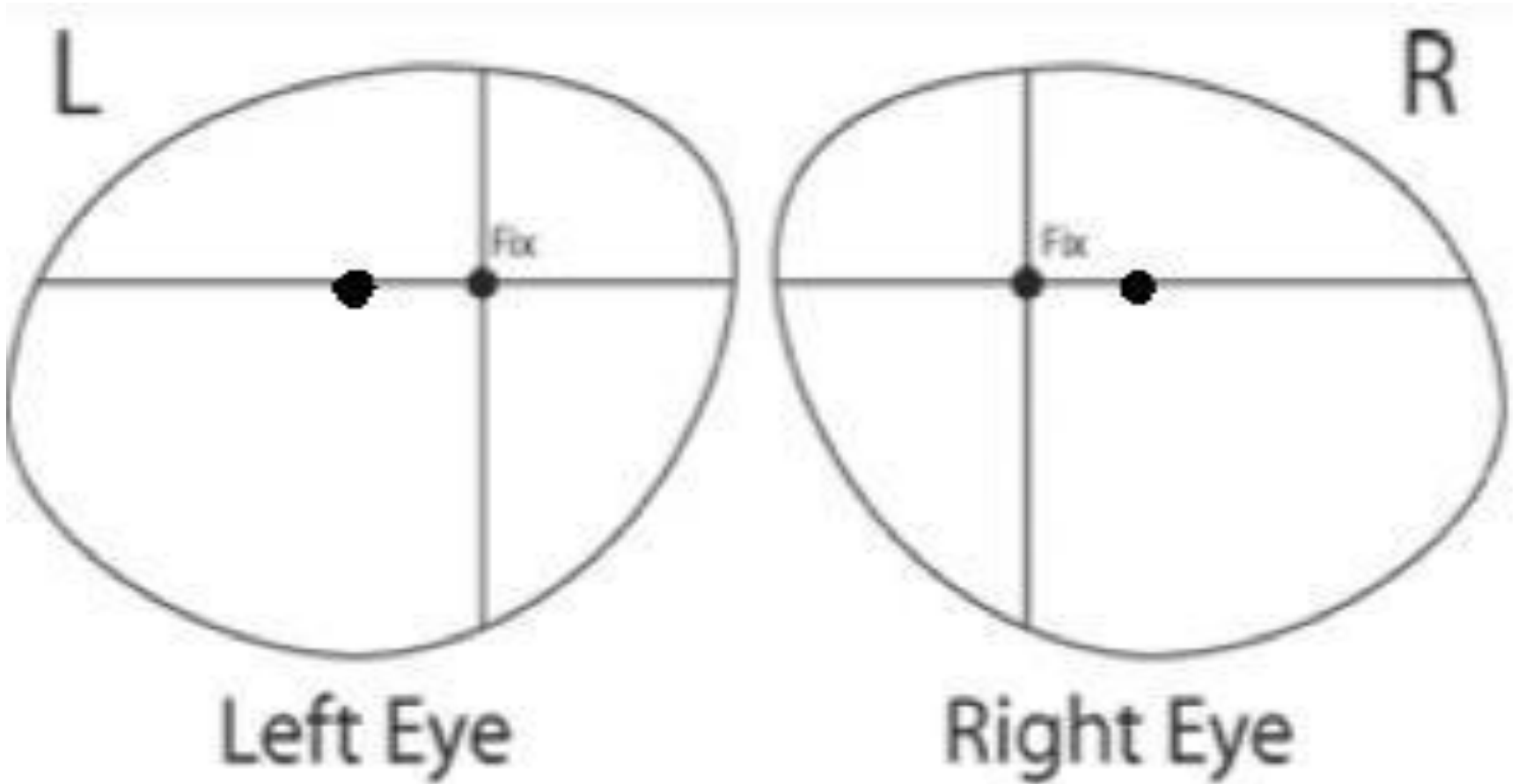
## Visual acuity (cont.)



# Visual fields

- Minimal equipment is required unless you are hoping to detect a subtle change in a patient's visual field
- It just needs you, a cooperative patient and an occluder for the patient ("pirate patch", patient holding a cover over their eye)
- 2 ways of testing the visual field;
  - Gordon Sanderson's perimetry method...
  - Confrontation...

# Normal Visual Field



# Visual field (cont.)

- Test 1 eye at a time
- You can then;
  - Directly ask the patient if they notice a VF defect
  - Slowly bring the target (likely your finger) from the periphery towards the centre
  - Test for neglect by presenting targets (e.g. Fingers) in left and right hemifields of vision, simultaneously
- Could also determine the size of the blind spot with a hatpin, or other small object

# Visual field (cont.)

- Subtle VF defects can be detected with the use of red targets and asking if the patient notices a difference in the quality of the colour (“red desaturation”; where the affected area perceives the red target to be “washed out” / more faded in appearance)
- More subtle defects usually require Perimetry testing (Goldmann perimeter, Bjerrum screen, Computerised / Automated perimetry)

# Strabismus and Diplopia

As mentioned during the history part of this talk, determining if the patient is suffering from monocular or binocular diplopia dictates your examination (and an ophthalmologist's level of concern)

In the scenario of **binocular diplopia**;

- Inspect for:
  - Obvious strabismus / ocular misalignment
  - Ptosis; with a “down-and-out eye” could indicate CN III palsy
  - Proptosis / inflammation; Thyroid eye disease or orbital cellulitis (especially if patient acutely unwell)

# Strabismus

## Inspection:

- Ocular misalignment may be obvious
- (If the strabismus is acute in onset) the patient will have difficulty negotiating the room or 1 of their eyes may be closed or patched

# Strabismus (cont.)

- The “direction” of ocular misalignments are defined as;
  - **Eso**-deviations: convergent or “cross-eyed”
  - **Exo**-deviations: divergent or “wall-eyed”
  - **Vertical** deviations
  - Combination of a horizontal and vertical deviation
- The strabismus may be **comitant** (the angle of deviation is the same regardless of the direction of gaze) or **incomitant** ( usually associated with paretic / restrictive conditions)
- Furthermore, they may be;
  - Intermittent / Latent: **-phorias**
  - Constant / Manifest: **-tropias**

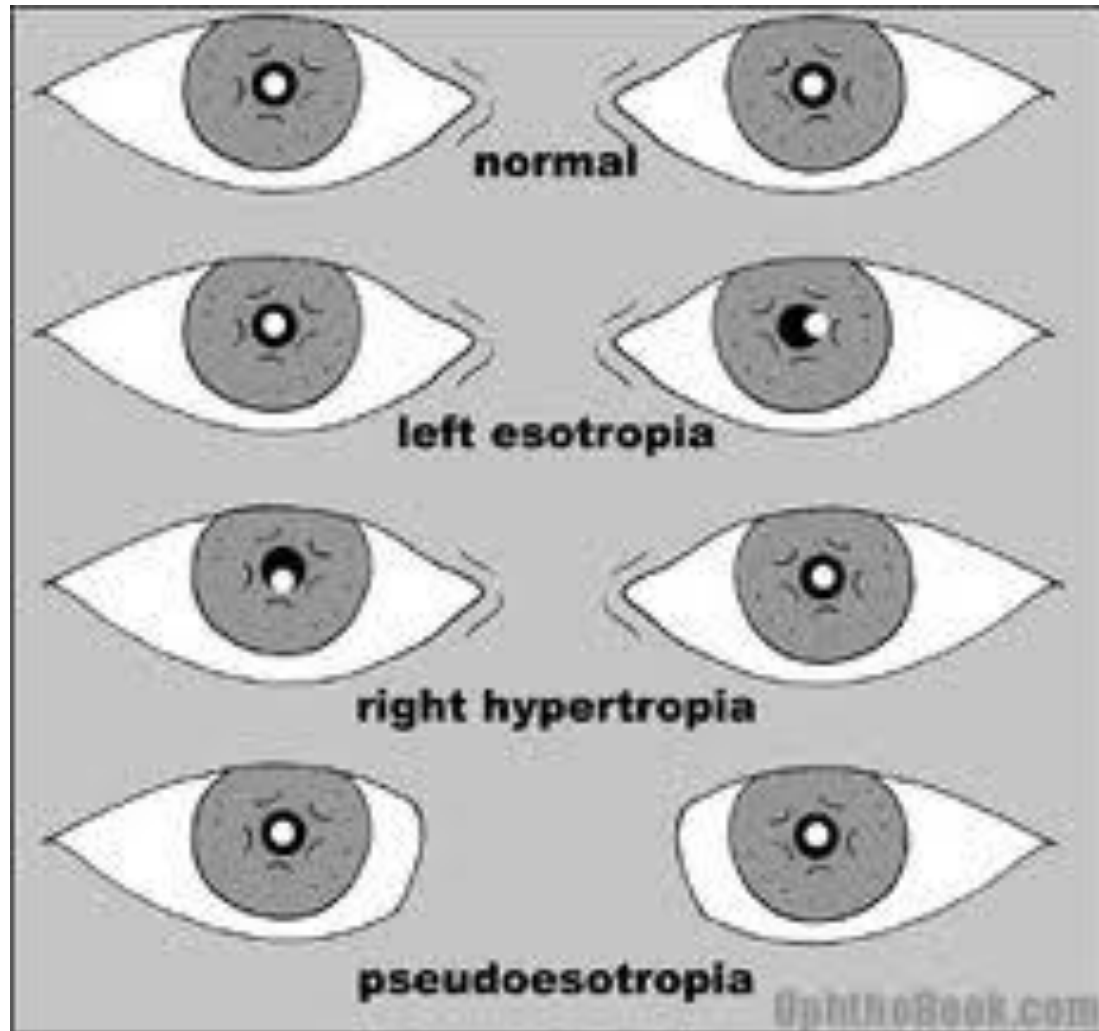
# Strabismus and corneal light reflex

Examining a patient's corneal light reflexes (with a torch or ophthalmoscope) may demonstrate a strabismus

Method:

- With the patient looking at your light, observe the reflection in the corneas, and relationship to the pupil
- If reflexes are central, then manifest squint is less likely (but possibly has a –phoria / latent squint)
- If 1 of the corneal reflexes is non-central, then likely to be manifest squint

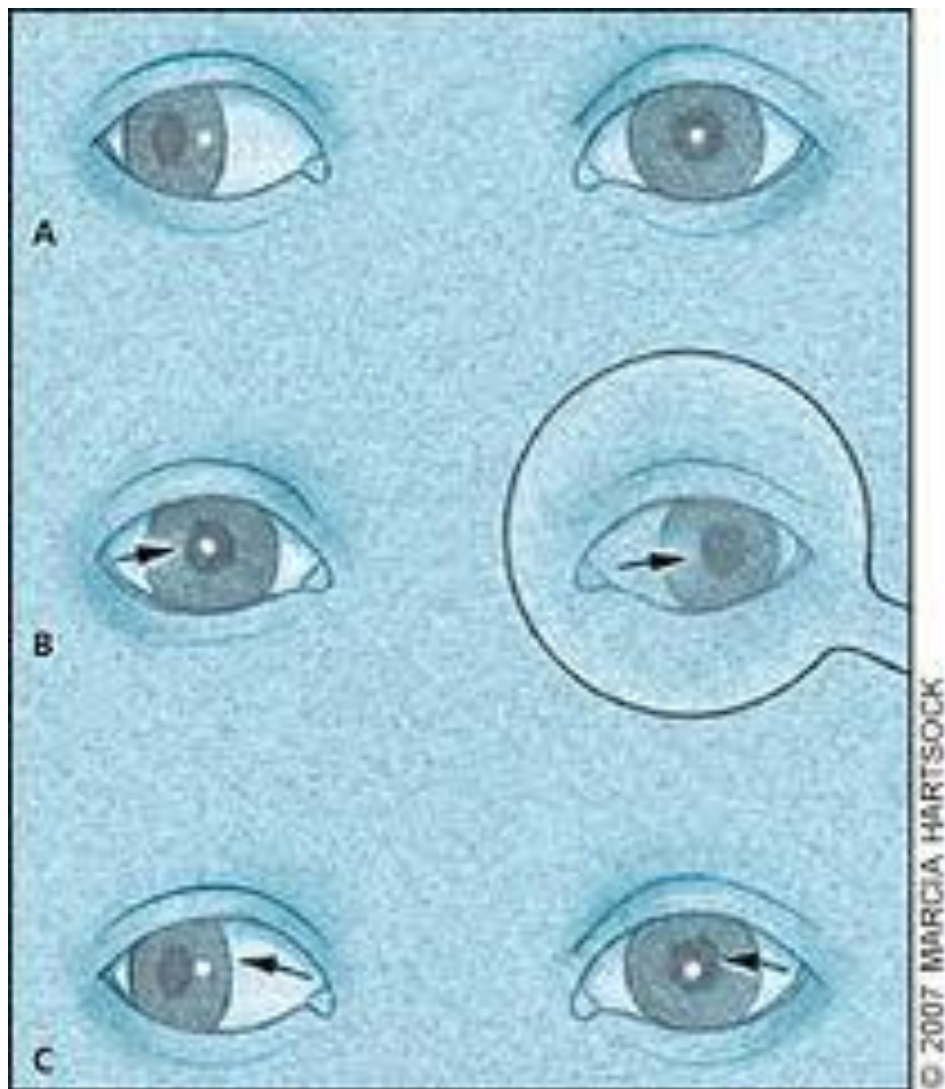
# Corneal light reflexes



# Cover test (cont.)

- A cover test relies on the patient being able to fixate on a target with either eye; that their vision is sufficiently good or the fixation target is reasonably easy to see
  - With the patient's gaze in "Primary position" (straight ahead), they look at a distant object (be specific)
  - One eye is covered and you observe for movement of the eye that is not covered, as it takes up fixation of the target
  - Repeat the process for the other eye
  - Definite repeatable fixation movements of the eye that is not covered indicates a -tropia / manifest strabismus

# Cover test (cont.)

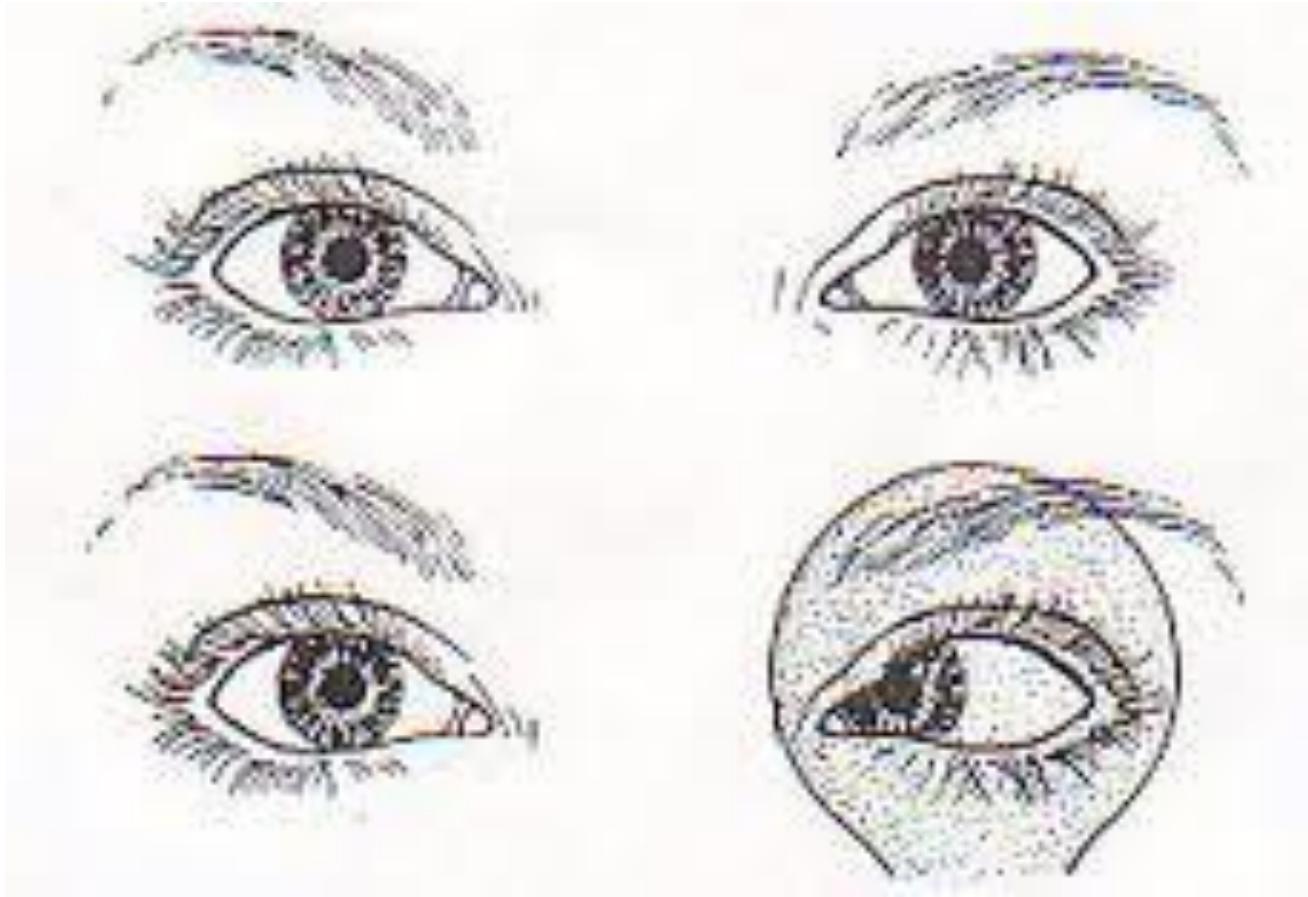


# Cover test (cont.)

Other tests include;

- Cover-Uncover test:
  - There is no observable movement with the cover test
  - Observe the covered eye as it is uncovered
  - If there is a refixation movement of the now-uncovered eye, this indicates a latent strabismus / -phoria
- Alternate cover test;
  - Alternately cover the eyes and observe for fixation movements
  - Dissociates the eyes hence both -phoria and -tropia detected

# Cover-Uncover test



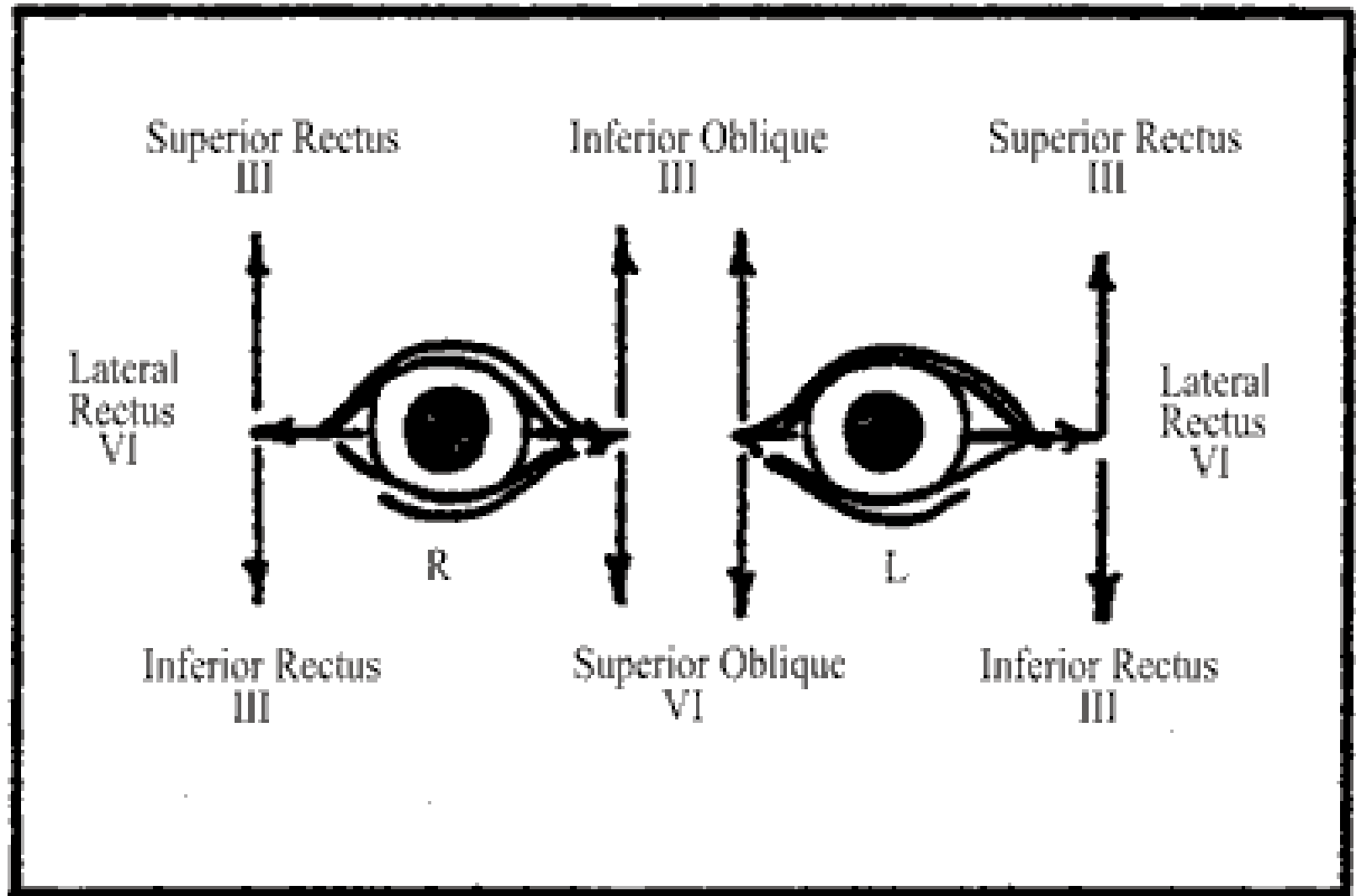
# Extraocular movements

Examining a person's eye movements requires compliance and, in the case of children, usually requires interesting toys as fixation targets

Method:

- Using the target (toy, pen, finger) at short distance
  - Start with target in the primary position
  - Steadily move the target to the six positions of extraocular muscle actions (see diagram on next slide)
  - Can also test up- and down-gaze

# Extraocular movements (cont.)



# Recent patient



Primary  
position



Right  
gaze



Left  
gaze

# Vertical Diplopia

Vertical misalignment is generally more complex as 8 extraocular muscles are responsible (basically) for vertical movements, compared to 4 horizontal recti for Eso- or Exo- deviations

3 step test or Bielchowski Head Tilt Test:

- Examine (and measure) the deviation in Primary position, left and right gaze, and left and right head tilt
- Can sometimes isolate the muscle that is involved

# Pupillary examination

Inspection:

- Anisocoria
- Strabismus
- Ptosis

Reflexes: the pupillary reaction to light requires functioning photoreceptors, optic nerve, Edinger-Westphal nucleus and pupillomotor nerve fibres (travelling on CN III)

- Direct
- Consensual
- Relative Afferent Pupil Defect / Swinging flashlight test
- Accommodation

# Video of RAPD



# Any other tests to consider?

Up until this point, we have tested CN II, III, IV and VI.

The presence of 2 (or more) cranial nerves being affected increases the concern.

Hence, consider testing CN V (remembering corneal sensation, and before instilling local anaesthetic) and CN VII

Also CN XI and XII, ± more complete neurological exam (especially if CVA, MS etc. suspected)

# Examining the eye (finally!)

## Inspection:

- Redness / Inflammation
- Discharge
- Ptosis
- Proptosis
- Cloudy cornea / scars

# The direct ophthalmoscope

- An extremely versatile and essential item of ophthalmic equipment;
  - Checking the pupil reflexes
  - Detect ocular misalignment (observing the corneal light reflexes)
  - Media opacities and leukocoria
  - A preliminary assessment of the angle
  - Blue light filter for checking fluorescein uptake
  - Fundoscopy

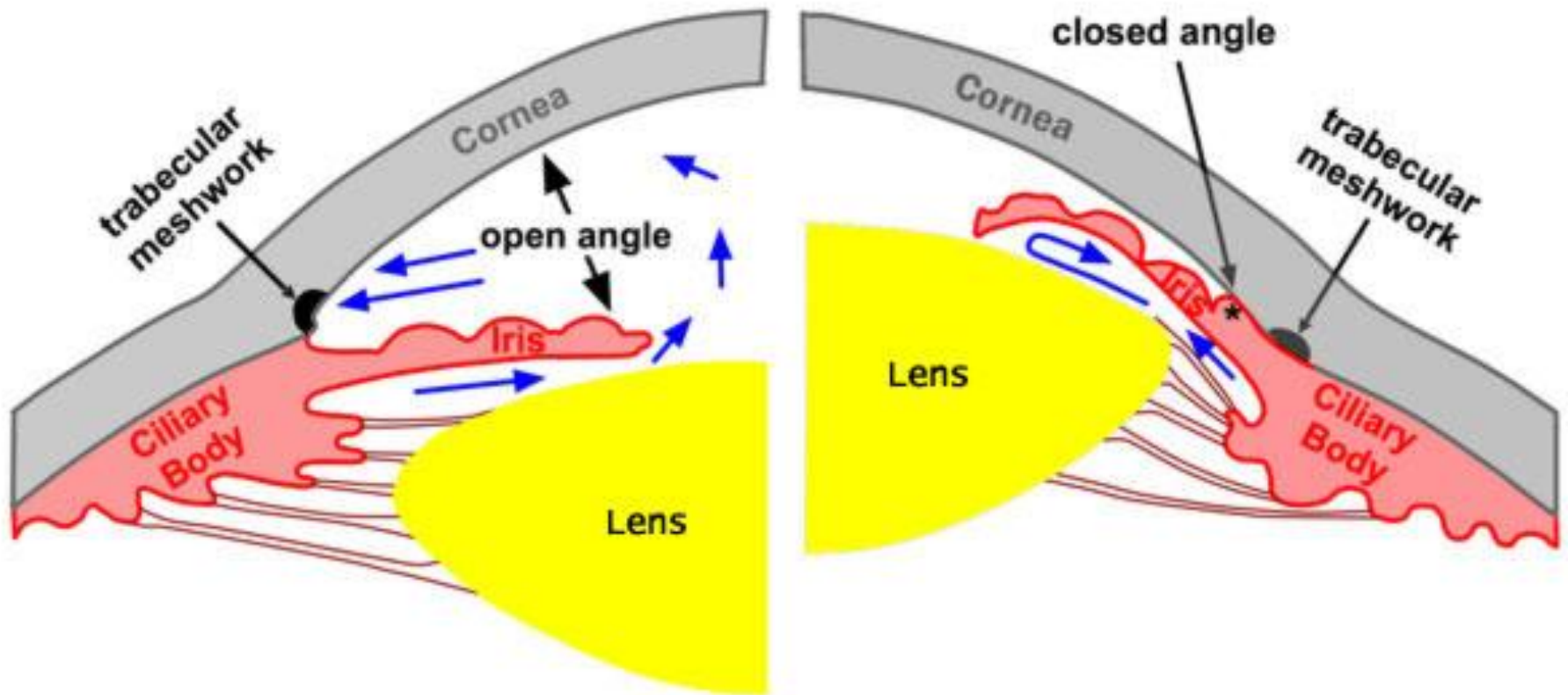
# The direct ophthalmoscope (cont.)



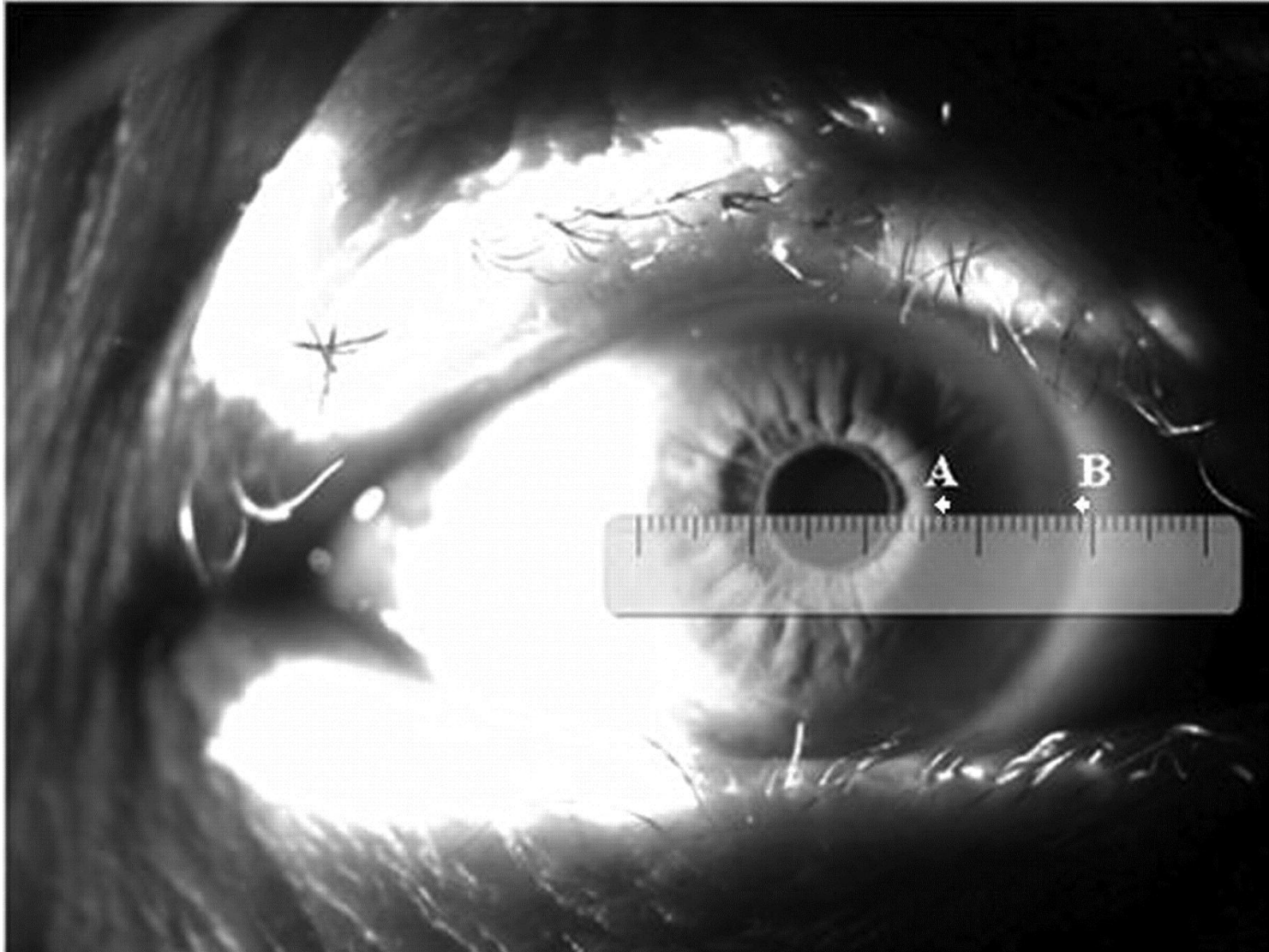
# The reflex



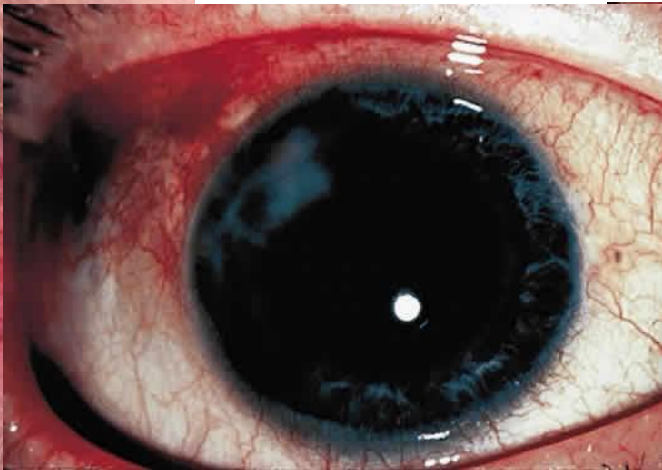
# Narrow angles and angle closure



# The eclipse sign



# Various red eyes



# Fundoscopy

Like any skill, requires practice, practice, practice

When introducing ophthalmoscopy to students, I suggest that funduscopy is peeking into a room (fundus) through a hole (pupil), so the view will be much easier if the hole is larger...

But what if I cause angle closure?

It is probably better to cause an attack of AACG, recognise it, begin treatment (lowering the IOP) and refer urgently, rather than a patient waiting a day (to a week+ !!?) before they seek attention

# Fundoscopy (cont.)

A dimly-lit room is preferable, as well as getting the patient to look or gaze at a distant object; this will help to have the pupil as large as possible by needing less illumination to perform fundoscopy and by relaxing accommodation

Most ophthalmoscopes have lenses built-in, that help to correct for a degree of refractive error in the examiner and / or the patient

# The direct ophthalmoscope (cont.)



# Fundoscopy (cont.)

- Have the patient seated comfortably and position yourself so that you are also comfortable, and eye-to-eye with the patient
- Looking through the eyepiece, identify the red reflex and slowly advance toward the patient, using your left eye to examine their left eye and right for their right
- Placing your free hand on the patient's eyebrow helps to:
  - Stabilize the patient and yourself
  - Prevent a collision

# Fundoscopy (cont.)

I generally recommend locating the optic disc 1<sup>st</sup> as you then have a landmark for further examination

The physiologic “blind spot” (and hence the optic disc) is generally between 10° – 15° temporal (or lateral) to the visual axis, so position yourself there, and slowly approach the patient

If you identify any retinal vessel/s, use them to locate the optic disc; blood vessels get larger as they approach the disc, the apex of any branching vessels will “point” to the disc

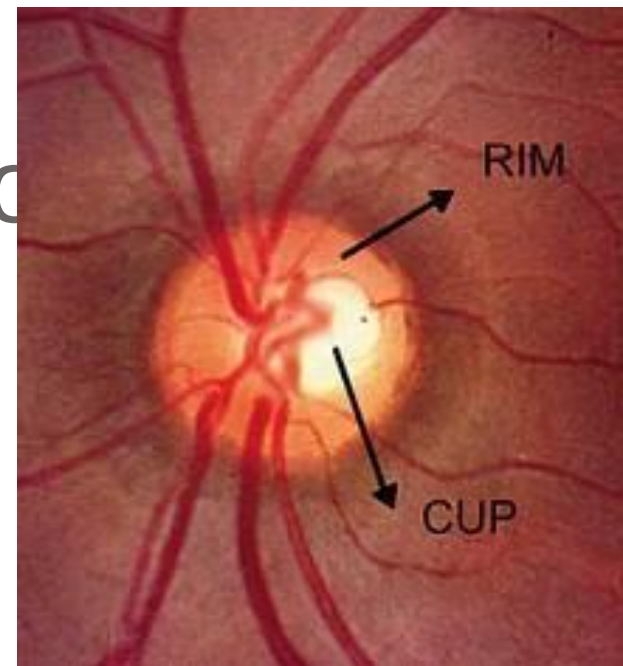
# Fundoscopy (cont.)

What do we look for when examining an optic disc?

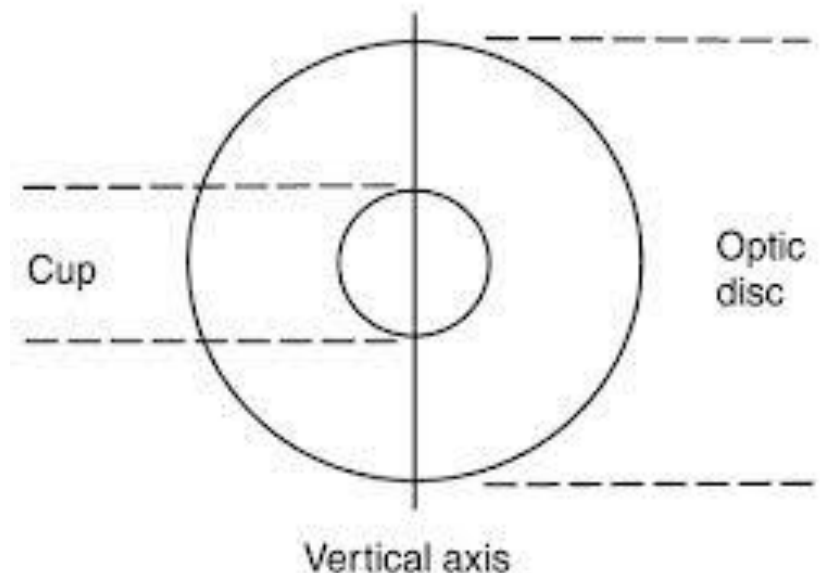
- Cup
- Colour
- Contour

# The Cup – Disc ratio

- The vertical ratio is determined as pictured
- A C-D ratio of 0.6 or greater is more suspicious for glaucoma, or a difference between the two eye of  $> 0.2$

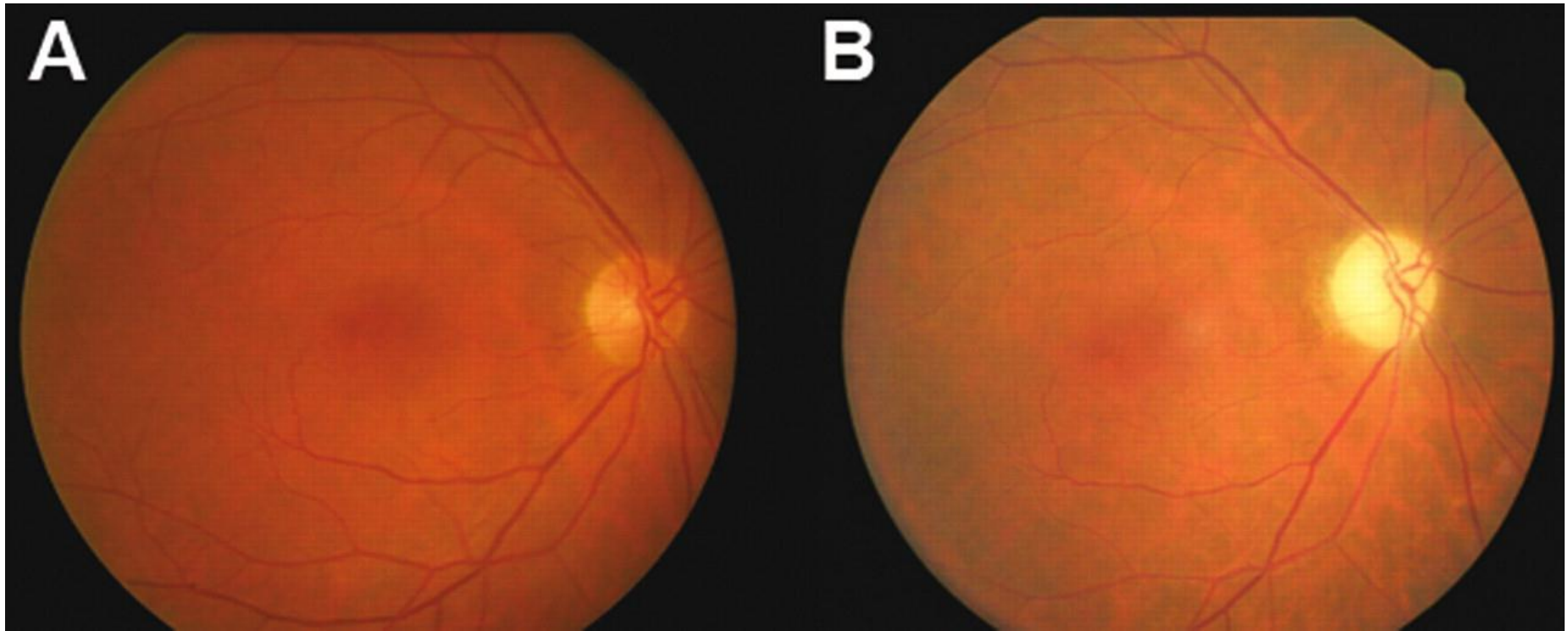


Measurement of Optic Cup/Disc Ratio



# Colour of the Disc

- It can be difficult to determine disc pallor, however, comparing the two eyes may help (or if there is a photograph from previous, as below)



# Contour of the disc

- Any focal thinning (suggestive of glaucoma)

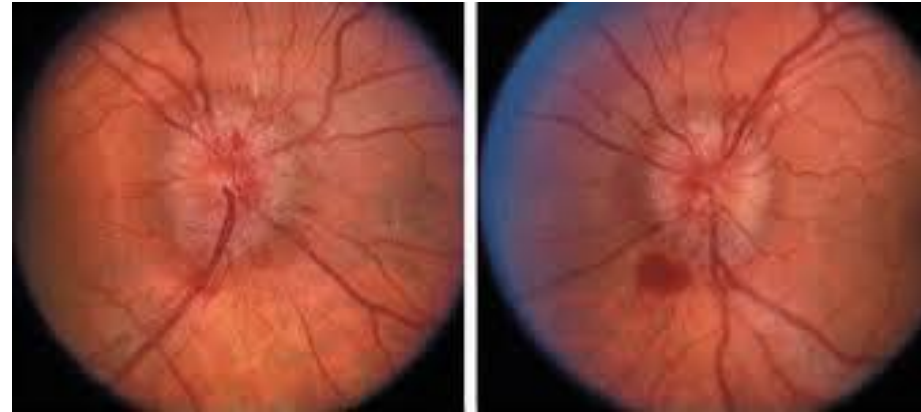


- Haemorrhages



# Contour of the disc (cont.)

- Blurred disc margins (optic neuritis, papilloedema, ischaemic optic neuropathy)



# Fundoscopy (cont.)

- **Vasculature:**
  - trace the course of the blood vessels
  - Arteries are thinner, a brighter red with a lighter reflection centrally
  - Veins have a larger diameter, and are darker red
- **Peripheral retina:**
  - Difficult with a direct ophthalmoscope but may detect a retinal detachment (fits with VF defect)
- **Macula:**
  - Last area to examine as you get the patient to look directly at your light
  - May see haemorrhages, drusen, hard exudates

Thank you