Eye Exam

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Eye Exam

Functional Anatomy

Image courtesy Dr. Karl Bodendorfer, Univ of Florida
More Detailed Internal Anatomy
Functional Assessment – Acuity (Cranial Nerve 2 – Optic)

• Using hand held card (held @ 14 inches) or Snellen wall chart, assess ea eye separately. Allow patient to wear glasses.

• Direct patient to read aloud line w/smallest lettering that they’re able to see.
Functional Assessment – Acuity (cont)

• 20/20 =s patient can read at 20` with same accuracy as person with normal vision.

• 20/400 =s patient can read @ 20` what normal person can read from 400` (i.e. very poor acuity).

• If patient can’t identify all items correctly, number missed is listed after a ‘-’ sign (e.g. 20/80 -2, for 2 missed on 20/80 line).

Snellen Chart For Acuity Testing
Functional Assessment - Visual Fields (Cranial Nerve 2 - Optic)

Lesion #1
Lesion #3

Images Courtesy of Wash Univ. School of Medicine, Dept Neuroscience
http://thalamus.wustl.edu/course/basvis.html

NEJM Interactive case – w/demo of visual field losses:
CN 2 - Checking Visual Fields By Confrontation

- Face patient, roughly 1-2 ft apart, noses @ same level.
- Close your R eye, while patient closes their L. Keep other eyes open & look directly @ one another.
- Move your L arm out & away, keeping it ~ equidistant from the 2 of you. A raised index finger should be just outside your field of vision.
CN 2 - Checking Visual Fields By Confrontation (cont)

- Wiggle finger & bring it in towards your noses. You should both be able to detect it @ same time.
- Repeat, moving finger in from each direction. Use other hand to check medial field (i.e. starting in front of the closed eye).
- Then repeat for other eye.
CNs 3, 4 & 6
Extra Ocular Movements

- Eye movement dependent on Cranial Nerves 3, 4, and 6 & muscles they innervate.
- Allows smooth, coordinated movement in all directions of both eyes simultaneously.
- There’s some overlap between actions of muscles/nerves.

Cranial Nerves (CNs) 3, 4 & 6
Extra Occular Movements (cont)

- **CN 6 (Abducent)**
  - Lateral rectus muscle → moves eye laterally

- **CN 4 (Trochlear)**
  - Superior oblique muscle → moves eye down (depression) when looking towards nose; also rotates internally.

- **CN 3 (Oculomotor)**
  - All other muscles of eye movement – also raises eye lid & mediates pupillary constriction.
CNs & Muscles That Control Extra Occular Movements

**LR**- Lateral Rectus  
**MR**- Medial Rectus  
**SR**- Superior Rectus  
**IR**- Inferior Rectus  
**SO**- Superior Oblique  
**IO**- Inferior Oblique

6 “Cardinal” Directions Movement

SO ‘4’, LR ‘6’, All The Rest ‘3’
Technique For Testing Extra-Ocular Movements

• To Test:
  – Patient keeps head immobile, following your finger w/their eyes as you trace letter “H”
  – Alternatively, direct them to follow finger w/their eyes as you trace large rectangle

• Eyes should move in all directions, in coordinated, smooth, symmetric fashion.

• Hold the eyes in lateral gaze for a second to look for nystagmus
Extra Occular Eye Movement Simulator

University of California, Davis School of Medicine – Rick Lasslo, M.D., M.S.

http://cim.ucdavis.edu/eyes/version1/eyesim.htm
Examples of Impaired Extra Ocular Movement

**L CN 6 Palsy** – L eye cannot move laterally

**Trapped L Inferior Rectus Muscle** – L eye cannot look downward

Impaired extra-ocular movement usually causes the patient to experience “double vision” when they look in the direction that’s affected.
Observation External Structures

- Pupil, iris and eyelids & lashes should appear symmetric
- Sclera should be white
- Conjunctiva clear
Examples of Asymmetry, Scleral & Conjunctival Abnormalities

- Yellow Sclera
- Asymmetric Lids and Pupils
- Conjunctivitis
- Subconjunctival Hemorrhage
Pupillary Response

• Pupils modulate amount of light entering eye (like shutter on camera)
• Dark conditions $\rightarrow$ dilate; Bright $\rightarrow$ constrict
• Pupils respond symmetrically to input from either eye
  – Direct response = s constriction in response to direct light
  – Consensual response = s constriction in response to light shined in opposite eye
• Light impulses travel away (afferents) from pupil via CN 2 & back (efferents) to ciliary muscles that control dilatation via CN 3
Pupillary Response Testing Technique

• Make sure room is dark ➔ pupils a little dilated, yet not so dark that can’t observe response – can use your hand to provide “shade” over eyes

• Shine light in R eye:
  – R pupil ➔ constricts
  – Again shine light in R eye, but this time watch L pupil (should also constrict)

• Shine light in L eye:
  – L pupil ➔ constricts
  – Again shine light in L eye, but this time watch R pupil (should also constrict)
Pupillary Response Testing Technique

• Swinging Flashlight Test
  – Looks for afferent pupil defect (CN II)
  – After observing each eye individually, move the flashlight between the left and right eye at a steady rate
  – See an example from Neuroexam.com:
Describing Pupillary Response

- Normal recorded as: **PERRLA** (*Pupils Equal, Round, Reactive to Light and Accomodation*) – w/accomodation = to constriction occurring when eyes follow finger brought in towards them, directly in middle (i.e. when looking “cross eyed”).

- Abnormal responses can be secondary to:
  - direct or indirect damage to either CN 2 or 3
    - Or parasympathetic injury to CN3 or damage to the sympathetic neurons
  - meds e.g. sympathomimetics (cocaine) $\rightarrow$ dilate, narcotics (heroin) $\rightarrow$ constrict.
Pupil Response Simulator

University of California, Davis School of Medicine – Designed by Dr. Rick Lasslo, M.D., M.S.

Corneal Reflex
Sensory CN 5, Motor CN 7

• Pull out wisp of cotton.
• W/patient looking straight ahead, gently brush wisp against the cornea (area in front of the pupil)
• Should cause the patient to blink.
• You don’t have to do this on one another.
Making The Most of Ophthalmoscopy

• Why bother?
  – Exam reveals evidence disease localized to eye
  – Retinal exam gives insight into systemic vascular Dz, CNS Dz

• **Difficult skill** – particularly in non-dilated eye – Expect to be frustrated!

• **Take time**, have patient @ comfortable height, lights low (so pupils dilate).

• **Closer** you get, the **more** you’ll **see** (like looking through a key hole)
Using Your Opthalmoscope

**Standard**
Pros: widespread, less $s
Cons: harder to see things

**Panoptic**
Pros: easy to use, magnified view
Cons: $s, less widely available

When using either scope, make sure your battery is charged!
Dr. Campbell Purchased his Oto-Ophthalmoscope 52 Years Ago In Med School - And Still uses It!
Using Your Ophthalmoscope – Standard Scope

Medium circle light, medium intensity
Instruct pt to look towards a distant point (avoid roving)
R eye → R eye
Place hand on shoulder or forehead
Grasp handle near top
Start 15 degrees temporal
Move in slowly – click focus wheel until a retinal structure comes into sharp focus - then eval ea quadrant of retina systematically
Usually start with “green” lens number 0. And rotate counter clockwise to the red numbers in order to bring things into focus

Patient usually remove their glasses (contacts ok) to cut down on reflections – Most examiners find it more comfortable to remove glasses as well
Using Your Ophthalmoscope – Panoptic

Focus sharply on a sign or object 20` away
Set aperture dial to green line
Turn on to max power
Grasp handle near top
Place scope (cushioned side towards patient) against patients orbit
Look for red reflex – then follow this in to the retina
With cushion compressed against patient, retina should be in view
If you lose the pupil, pull back, find the red reflex and repeat
Using Your Ophthalmoscope – What You Should See

- Magnified view of surface structures (pupil, iris, sclera, contact lenses) – using ophthalmoscope like a magnifying glass
- To view retina, must see thru intervening structures – if no obstruction \(ightarrow\) red reflex when look from a distance @ pupil.
Red Reflex
Viewing The Retina

- @ any time, only 15% of retina visible
- Follow vessels (branches of tree → trunk) → optic disc
- Be systematic:
  - Optic disc
  - Vessels (veins & arteries)
  - Retina (in quadrants)
  - Macula → ask the patient to look @ your light
The Retina (fully viewed)

Structures To Note:
1. Color of retina (orange-ish)
2. Arteries (smaller)
3. Veins (darker)
4. Optic Disc (head of CN2)
5. Optic Cup (center of disc)
6. Macula (sharpest focus) – center =‘s fovea
You’ll Only Get a Partial View Of the Retina – So, follow the “braches” towards the “trunk”.. They’ll point the way to the optic disc..
… heading nose-ward to reach the optic disc…
... still heading nose-ward...
.. ‘Til you finally reach the optic disc - Horray!
Pathology: Intrinsic Retinal Disease

Normal Retina

Macular Degeneration
http://eyepathologist.com

Retinal Detachment

Retinal Artery Infarct

http://www.kellogg.umich.edu/theeyeshaveit/index.html
Retinal Pathology – In-Sight Into Disease Elsewhere

Normal Retina

Diabetic Retinopathy – Marker of Systemic Microvascular Disease
http://www.diabetesandrelatedhealthissues.com/

Papilledema – Increased Intracranial Pressure
http://www.familyoptometry.com

A-V Nicking
Arteriolar Copper-Wiring
Chronic Systemic Hypertension
http://www.kellogg.umich.edu/theeyeshaveit/index.html
Summary of Skills

- Wash hands
- Visual acuity (hand held card)
- Visual fields (confrontation)
- Extra ocular movements
- Examine external eye structures (lids, sclera, pupil, iris, conjunctiva)
- Pupilary response to light – direct and consensual
- Corneal reflex
- Red reflex
- Retinal exam

⏰  Time Target: < 10 minutes