Review of Cranial Nerves

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CN 1- Olfactory

• Check air movement thru ea nostril separately – push gently on outside of nostril, occluding it. Then ask patient to inhale/exhale thru other, assuring it’s unobstructed.
• Screen for problems w/sense of smell using alcohol pad.
• Ask patient to close eyes & present alcohol pad slowly up towards the nostril being tested (checking ea separately).
• Odor normally detectable @ distance of ~10cm
Functional Assessment – Acuity (CN 2 – Optic)

- Using hand held card (held @ 14 inches) or Snellen wall chart, assess each eye separately. Allow patient to wear glasses.
- Direct patient to read aloud line with smallest lettering that they’re able to see.
• 20/20 =s patient can read at 20` with same accuracy as person with normal vision.
• 20/400 =s patient can read at 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).
Functional Assessment - Visual Fields (Cranial Nerve 2 - Optic)

Optic Tracts and Lesions - Washington University SOM
Checking Visual Fields By Confrontation – CN2

• 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 at 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.
Checking Visual Fields By Confrontation CN2 (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 2&3 - Pupilary Response

- Pupils modulate amount of light entering eye (like shutter on camera lens)
- Dark conditions $\rightarrow$ dilate; Bright $\rightarrow$ constrict
- Pupils respond symmetrically to input from either eye
  - Direct response $\Rightarrow$ constriction in response to direct light
  - Consensual response $\Rightarrow$ 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
CNs 2&3 - Pupillary Response Testing Technique (cont)

- Make sure room is dark → pupils dilated, yet not so dark can’t observe response – use your hand to provide “shade” over eyes
- Shine a light in R eye:
  - R pupil should constrict
  - Again shine light in R eye, though this time watch L pupil (should also constrict)
- Shine a light in L eye:
  - L pupil should constrict
  - Again shine light in L eye, though this time watch R pupil (should also constrict)

Pupil Response Simulator - UC Davis
CNs 2&3 - Describing Pupillary Response

• Normal recorded as: **PERRLA** (Pupils Equal, Round, Reactive to Light and Accomodation) – with 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
  – meds e.g. sympathomimetics (cocaine) → dilate; narcotics (heroin) → constrict.
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

[Anatomy - Extraocular Muscles](http://www.e-sunbear.com)
CNs 3, 4 & 6
Extra Ocular Movements (cont)

- CN 6 (Abducens) ➔ 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 eye movement – also raises lid & mediates pupilary constriction.
CNs 3, 4 & 6 - & Muscles That Control
Extra Ocular Movements

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

6 “Cardinal” Directions

SO ‘4’, LR ‘6’, All The Rest ‘3’
CNs 3, 4, & 6: Techniques For Testing Extra-Ocular Movements

• To Test:
  – Patient doesn’t move head, following your finger w/their eyes as you trace out letter “H”
  – Alternatively, direct them to follow finger w/their eyes as you trace large rectangle

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

Eye Movement Simulator - UC Davis
Function CN 5 - Trigeminal

• Sensation:
  – 3 regions of face: Ophthalmic, Maxillary & Mandibular

• Motor:
  – Temporalis & Masseter muscles
Function CN 5 – Trigeminal (cont)

Motor
- Temporalsis (clench teeth)
- Masseter (move jaw side-side)

Sensory
- Ophthalmic (V1)
- Maxillary (V2)
- Mandibular (V3)

* Corneal Reflex: Blink when cornea touched - Sensory CN 5, Motor CN 7
Testing CN 5 - Trigeminal

- Sensory:
  - Ask pt to close eyes
  - Touch ea of 3 areas (ophthalmic, maxillary, & mandibular) lightly, noting whether patient detects stimulus.

- Motor:
  - Palpate temporalis & mandibular areas as patient clenches & grinds teeth

- Corneal Reflex:
  - Tease out bit of cotton from q-tip - Sensory CN 5, Motor CN 7
  - Blink when touch cornea with cotton wisp

Anatomy of Masseter and Temporalis Muscles
Testing CN 5 - Trigeminal

- Sensory:
  - Ask pt to close eyes
  - Touch ea of 3 areas (ophthalmic, maxillary, & mandibular) lightly, noting whether patient detects stimulus.

- Motor:
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- Corneal Reflex:
  - Tease out bit of cotton from q-tip - Sensory CN 5, Motor CN 7
  - Blink when touch cornea with cotton wisp
Function CN 7 – Facial Nerve
Facial Symmetry & Expression - Precise Pattern of Inervation

R UMN

R LMN - Forehead

R LMN – Face

L UMN

L LMN - Forehead

L LMN - Face
CN 7 – Exam

• Observe facial symmetry
• Wrinkle Forehead
• Keep eyes closed against resistance
• Smile, puff out cheeks

Cute.. and symmetric!
The Ear – Functional Anatomy and Testing  
(CN 8 – Acoustic)

• Crude tests hearing – rub fingers next to either ear; whisper & ask pt repeat words
• If sig hearing loss, determine Conductive (external canal up to but not including CN 8) v Sensorineural (CN 8)

Inner Ear Anatomy
(www.ncbegin.org/audiology)

CN 8 - Defining Cause of Hearing Loss - Weber Test

- 512 Hz tuning fork - this (& not 128Hz) is well w/in range normal hearing & used for testing
  - Get turning fork vibrate→ striking ends against heel of hand or
    Squeeze tips between thumb & 1st finger
- Place vibrating fork mid line skull
- Sound should be heard =ly R and L → bone conducts to both sides.
CN 8 - Weber Test (cont)

- If **conductive** hearing loss (e.g. obstructing wax in canal on L) → louder on L as less competing noise.
- If **sensorineural** on L → louder on R
- Finger in ear mimics conductive loss
CN 8 - Defining Cause of Hearing Loss - Rinne Test

- Place vibrating 512 hz tuning fork on mastoid bone (behind ear).
- Patient states when can’t hear sound.
- Place tines of fork next to ear→ should hear it again – as air conducts better then bone.
- If BC better then AC, suggests conductive hearing loss.
- If sensorineural loss, then AC still > BC

Note: Weber & Rinne difficult to perform in Anatomy lab due to competing noise – repeat @ home in quiet room!
Oropharynx: Anatomy & Function CNs 9 (Glosopharyngeal), 10 (Vagus) & 12 (Hypoglossal)

- **Uvula midline - CN 9**
- Stick out tongue, say “Ahh” – use tongue depressor if can’t see - palate/uvula rise -CN 9, 10
- **Gag Reflex** – provoked with tongue blade or q tip - CN 9, 10
- **Tongue midline** when patient sticks it out → CN 12
  - check strength by directing patient push tip into inside of either cheek while you push from outside
Neck Movement
(CN 11 – Spinal Accessory)

- **Turn head to L into R hand** → function of R Sternocleidomastoid (SCM)
- **Turn head to R into L hand** (L SCM)
- **Shrug shoulders** into your hands
Summary of Skills

- Wash Hands
- CN1 (Olfactory) Smell
- CN2 (Optic) Visual acuity; Visual fields
- CNs 2&3 (Optic, Occulomotor) Pupillary Response to light
- CNs 3, 4 & 6 (Occulomotor, Trochlear, Abdusccens) Extra-Ocicular Movements
- CN 5 (Trigeminal) Facial sensation; Muscles Mastication (clench jaw, chew); Corneal reflex (w/CN 7)
- CN 7 (Facial) Facial expression
- CN 8 (Auditory) Hearing
- CN 9, 10 (Glossopharyngeal, Vagus) Raise palate (“ahh”), gag
- CN 12 (Hypoglossal) Tongue
- CN 11 (Spinal Accessory) Turn head against resistance, shrug shoulders

Time Target: < 15 minutes