Basic Cranial Nerve Examination

**WIPE**
- **W**ash hands
- **I**ntroduce yourself
- **P**ermission
- **P**osition (Patient sitting facing you, maintain comparable eye level)
- **E**xposure (Face exposed only, i.e. remove hats etc)

**Identify Patient** (confirm the following details before starting)
- Name
- Age
- Date

**Inspection**
- Whilst many students skip past a general inspection as they are concerned about the complexity of cranial nerve examinations, this should always be included with any abnormalities being noted.
  - Does the patient look in pain?
  - Is he/she comfortable?
  - Is he/she fully aware of what is happening?
  - Facial Asymmetry?
  - Overall build (BMI)
  - Are there any indicative findings in the patient’s surroundings (hearing aid, glasses)
A key concept is to understand which nerves you are testing at each stage of the examination. Remember in an exam you may be asked to examine all or just a selection of cranial nerves.

**CN I (Olfactory Nerve):**

*(Smell)*

Identify abnormal changes in smell. Whilst clinically this can be identified with the presence of smelling salts (or similar equipment), you are unlikely to have these to hand in an OSCE. In this case simply asking the patient if they have noticed any abnormal changes (e.g. coffee not smelling as expected) will suffice. If there are abnormalities found further questioning and investigation will be warranted.

**CN II (Optic Nerve):**

*(Visual Acuity, Visual Fields, Accommodation and Light Reflexes)*

Possible tests:

- Snellen Chart (visual acuity)
- Ishihara Chart (colour vision)
- Fundoscopy
- Visual Fields / perimetry (identify any field defect)
There are several methods of assessing visual fields but at a medical student level testing via **confrontation** is usually accepted due to its relative ease. Other methods will be described elsewhere but should be understood especially as many are not all that difficult!

1. Ensure the patient can see clearly out of both eyes before starting (e.g. checking by counting fingers).

2. Ask them to cover one eye. Cover the corresponding eye on yourself (i.e. cover your right eye if the patient is covering their left). Ensure your face is on the same level as theirs and there is about 1 metre distance between you.

3. Ask the patient to look directly into your open eye.

4. Begin movement from the outermost point (outside their visual field) and ask the patient to tell you when they can see the tip of your finger, and if it disappears & reappears (i.e. a blind spot) at any point. The

**Visual Field Defects**

- **NORMAL**
- **Bi-Temporal Hemianopia**
- **Bi-Nasal Hemianopia**
- **Left Homonymous Hemianopia**
- **Right Homonymous Hemianopia**

Remember these are just a few of the defects possible. The key to interpretation lays in understanding the anatomy of the optic tract and normal ‘formation’ of the visual field.

**N.B:**

Bi-temporal Hemianopia is always an exam favourite in relation to pituitary tumours.
movement of your fingers should be along a plane equal distance between yourself and the patient.

5. Compare their visual field to your own, noting any defects found. If available a pointer with a red tip can be used for greater accuracy, but ‘wagging’ your fingers is usually an acceptable alternative at this stage. Asking the patient to tell you when they can see your finger ‘wagging’ can then be cross-checked by asking them to tell you once they have stopped moving.

6. Repeat this for the other eye.

Commonly the visual field for each eye can be divided crudely into 4 quadrants, at minimum you should examine each of these directly, although in practice testing 8 equally separated positions is more accurate (i.e 8 point star).

- Upper Temporal
- Lower Temporal
- Upper Nasal
- Lower Nasal
CN III (Oculomotor), IV (Trochlear) and VI (Abducens): 

(Eye Movements and Light Reflex (CN IV))

In this section you are assessing eye movements. A simple formula can be used to remember which nerve innervates which ocular muscle.

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<tbody>
<tr>
<td>• Lateral Rectus Muscle: Innervated by the Abducens Nerve (CN VI)</td>
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<tr>
<td>• Superior Oblique Muscle: Innervated by Trochlear Nerve (CN IV)</td>
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<tr>
<td>• All other ocular muscles are innervated by the Oculomotor Nerve (CN III)</td>
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It is important to understand the movements that are elicited by each muscle and the resultant abnormalities that will likely result from damage to the muscle or innervating nerve.

- When testing eye movements maintain a distance greater than 1 foot between your hand and the patient to prevent accidentally triggering the accommodation reflex and convergence of the eyes. Your hand movement should again be along a single plane. For simplicity an ‘H-plot’ can be performed as shown, alternatively an 8 pointed star can be adopted.
- Identify:
  - In straight gaze check for squint/strabismus & when looking off-centre comment on any increase of the size of the strabismus or restriction of eye movement (e.g. Cranial Nerve Palsies III, IV, VI).
  - Nystagmus.
  - Diplopia (double vision) through discussion with patient during examination this stage
  - Lid Ptosis.
• Direct and Consensual Light reflexes (this includes CN II). Understanding the anatomy of the tracts is essential in interpreting any pupillary abnormalities.
• Near Pupil Reflex
• Convergence
• Relative afferent pupillary defect assessment (RAPD) (not shown on video as not usually considered as part of a basic examination for medical students but should really be understood, offered and performed).

CN V (Trigeminal Nerve):
(Facial Sensation, Muscles of Mastication, Corneal Reflex)

• Sensation:
  Establish a reference point to start with so that they are aware of what the cotton wool feels like (e.g. the sternum). Ask the patient to close their eyes and test the sensation in the distribution of this nerve. Remember to compare left and right sides of the face, it is a good idea to test each section ‘out of order’ to prevent the patient consciously or unconsciously predicting your sequence and masking any defect.

3 Divisions:
• V₁ Ophthalmic Branch
• V₂ Maxillary Branch
• V₃ Mandibular Branch
• **Motor:**
Muscles of mastication (Temporalis, Masseter and Pterygoids muscles are the most important here, be prepared to list these if questioned)

• **Corneal reflex:**
Can be elicited using cotton wool also but should not usually be performed unless necessary as this is uncomfortable for the patient. Offer it in an OSCE however.

**CN VII (Facial Nerve):**

*(Muscles of Facial Expression, Taste to Anterior 2/3 of Tongue, Nerve to Stapedius, Corneal Reflex)*

• Test muscles of facial expression: all the ‘funny faces’ shown. Identify any abnormalities or asymmetry (may indicate facial nerve palsy)
• Taste can be tested directly or obtained from history if proper apparatus is not available *(this may be questioned earlier with CN I if preferred)*
• Extra test: lesions to the facial nerve may cause hyperacusis.

**CN VIII (Vestibulococlear Nerve):**

*(Hearing and Balance)*

A tuning fork is required for examination of this nerve, balance is not routinely tested in a cranial nerve examination.

• **‘Whisper test’:**
Crudely test ability of patient to hear by occluding one ear and whispering a number in the other before asking them to repeat it. Alternatively rubbing your index finger and thumb together close to the ear may be an alternative.

• **Weber’s Test**
Using a tuning fork placed on the centre of the forehead note any lateralization in sound experienced by the patient. If it is louder in one
ear than the other this implies that there is conductive deafness (in the ear in which it seems louder) or that there is sensorineural deafness in the other ear.

- **Rinne’s Test**
  
  Remember **air conduction** should normally be better than **bone conduction**. Place the vibrating tuning fork on the mastoid process as ask the patient to confirm that they can first hear the fork and then when the sound stops. At this point remove the fork and hold it close to the ear and ask them if they can now hear it again. In a healthy patient the sound should be audible (this is a negative Rinne’s test).

  **Interpretation:**
  
  o If there is lateralization of sound found in Weber’s test but Rinne’s test is negative, this implies a conductive defect in that ear.
  
  o If Rinne’s test is positive this suggests the presence of a sensorineural defect in the tested ear.

**CN IX (Glossopharyngeal Nerve):**

*(Gag reflex - sensory segment and sensation of the palate)*

- Assess movements of the soft palate (using pen torch to increase visibility)
- In an examination setting the gag reflex should be explained but not performed as it is somewhat uncomfortable for the patient.
**CN X (Vagus Nerve):**

*(Pharyngeal Muscles and Gag Reflex)*

- Identify any hoarseness of voice (remember the recurrent laryngeal nerve is a branch of the vagus)

**CN XI (Spinal Accessory Nerve):**

*(Trapezius and sternocleidomastoid muscles)*

- Assess weakness in these muscles by asking the patient to shrug their shoulders and turn their head against resistance.

**CN XII (Hypoglossal Nerve):**

*(Muscles of Tongue)*

- Assess tongue Movements

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**To conclude your examination you should:**

- Further Vision Assessment (Fundoscopy should always be offered. Whilst this may not be possible in an exam setting, remember this should be considered part of the cranial nerve assessment. Further visual field assessment may be performed)
- Investigations: (CT, MRI etc)
- Further audiology assessment
Example of how to present findings:

• General introduction:
  o “This is Hank Scorpio a 58 year old man who presented with .... ... On examination I found...”

• Important Positive Findings
  o List these off

• Important Negative Findings
  o However, there was no.... (these should be those relevant to ruling out differentials)

• Clinical Conclusions
  o “These findings are consistent with...”
  o Then be prepared to explain how you would like to proceed (investigations and management etc)