An Illustrated Guide For Cranial Nerve Examination

Bedside Teaching for 2nd year medical Students

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Before Examination:

- Wash hands
- Introduce yourself
- Confirm patient details – name / DOB
- Explain the examination
- Gain consent
- Ask patient if they have pain anywhere before you begin!

Cranial Nerves

<table>
<thead>
<tr>
<th>Number</th>
<th>S/M/B</th>
<th>Name</th>
<th>Location</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN-I</td>
<td>S</td>
<td>Olfactory</td>
<td>Telencephalon</td>
<td>Smell - Special Sense</td>
</tr>
<tr>
<td>CN-II</td>
<td>S</td>
<td>Optic</td>
<td>Diencephalon</td>
<td>Vision - Special Sense</td>
</tr>
<tr>
<td>CN-III</td>
<td>M</td>
<td>Oculomotor</td>
<td>Midbrain</td>
<td>Most eye movement (up/down/pupil)</td>
</tr>
<tr>
<td>CN-IV</td>
<td>M</td>
<td>Trochlear</td>
<td>Midbrain</td>
<td>Some eye movement (superior/oblique)</td>
</tr>
<tr>
<td>CN-V</td>
<td>B</td>
<td>Trigeminal</td>
<td>Pons</td>
<td>Facial Sensory and muscles of mastication</td>
</tr>
<tr>
<td>CN-VI</td>
<td>M</td>
<td>Abducent</td>
<td>Pons/Medulla junction</td>
<td>Some eye muscle movement (outward)</td>
</tr>
<tr>
<td>CN-VII</td>
<td>B</td>
<td>Facial</td>
<td>Pons/Medulla junction</td>
<td>Motor and Intermediate nerve</td>
</tr>
<tr>
<td>CN-VIII</td>
<td>S</td>
<td>Vestibulocochlear</td>
<td>Pons/Medulla junction</td>
<td>Hearing - Special Sense</td>
</tr>
<tr>
<td>CN-IX</td>
<td>B</td>
<td>Glossopharyngeal</td>
<td>Medulla</td>
<td>Mixed - M, S and Special Sense</td>
</tr>
<tr>
<td>CN-X</td>
<td>B</td>
<td>Vagus</td>
<td>Medulla</td>
<td>Mixed - M, S and Special Sense</td>
</tr>
<tr>
<td>CN-XII</td>
<td>M</td>
<td>Spinal Accessory</td>
<td>Superior Spinal Cord</td>
<td>Neck muscles movement</td>
</tr>
<tr>
<td>CN-XII</td>
<td>M</td>
<td>Hypoglossal</td>
<td>Brainstem/Medulla</td>
<td>Tongue muscles movement</td>
</tr>
</tbody>
</table>

S = sensory  M = Motor  B = Both
CRANIAL NERVES

1. Olfactory
2. Optic
3. Oculomotor
4. Trochlear
5. Trigeminal
6. Abducens
7. Facial
8. Acoustic
9. Glossopharyngeal
10. Vagus
11. Accessory
12. Hypoglossal

FUNCTION OF CRANIAL NERVES

SENSORY  SENSORY & MOTOR  MOTOR  AUTONOMIC
Remember

Cranial Nerves formed of sensory fibres only are CN 1 (Olfactory), 2 (Optic), & 8 (Vestibulo-cochlear) (remember FIAT 128)

Remember: Cranial nerves which contains parasympathetic fibres are: 3 (Oculomotor), 7 (Facial), 9 (Glossopharyngeal) & 10 (Vagus) (Remember 1973)
(I) Olfactory = smelling

**OLFACTORY NERVE**

- It is the first cranial nerve and nerve of smell and form first order neuron of olfactory pathway.
- **Type** → Special Sensory type.
- **Origin** → From olfactory epithelium in the olfactory region of nasal cavity (superior nasal concha and opposed part of nasal septum).

Use **familial, non irritant** substance (e.g. coffee ground) and test each nostril alone

**PS : Irritant substance will test pain fibres = Trigeminal not olfactory**

(II) Optic Nerve:
**Light Reflex**

1. Light is shined on right eye only.
2. Action potentials from right eye reach both right and left pretectal nuclei.
3. The pretectal nuclei stimulate both sides of the Eddinger–Westphal nucleus even though the light was perceived only in the right eye.
4. The right and left sides of the Eddinger–Westphal nuclei generate action potentials through the right and left oculomotor nerves, causing both pupils to constrict.

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**Test:**

**A) Visual Acuity:**

**Snellen chart to assess visual acuity**
B) Colour Vision:

Ishihara plate to test colour vision

C) Light reflex:

Pupillary Reflex

Pupillary Light reflex
D) Accomodation Reflex:
E) Visual Field: Confrontation Test
F) Fundus Examination:
(III, IV & VI) Oculomotor, Trochlear and Abducent

Assess eye movement in different directions: test each eye alone and both eyes together.
Right third-nerve palsy – neutral gaze.

Left third nerve palsy
Right sixth-nerve palsy:
(A) primary position

(B) looking left

(C) looking right

(V) Trigeminal

PS: Sensation over angle of mandible is supplied by C2 not Trigeminal nerve
I. Sensory part

Compare

a. Both Sides
b. Inner & outer face
c. Each division

Method: Cotton wool touch sensation (using cotton piece) & pain sensation (using a pin) over 3 divisions – ask patient to close eyes, check for symmetry, check both centre and periphery of the face.
II. Motor part

- Temporalis muscle: clench teeth + palpate muscle
- **Pterygoids:** Fixed head; open mouth + open mouth against resistance to test tone

![Muscles of Mastication](image)

**In Unilateral pterygoid paralysis:** The jaw is deviated to the diseased side

**In Bilateral pterygoid paralysis:** inability to open mouth
III. REFLEXES: Jaw reflex and Corneal reflex

**Jaw Reflex**

Exaggerated in bilateral Upper Motor Neurone Lesion (UMNL) above level of pons

Afferent: Trigeminal nerve  
Efferent: Trigeminal nerve

**Corneal Reflex**

Afferent: Trigeminal nerve  
Efferent: Facial Nerve

Remember:

Jaw reflex (5/5)  
Corneal Reflex (5/7)

(VII) Facial Nerve:

Observe face for asymmetry/involuntary movements  
Wrinkle forehead/Bare teeth/screw eyes shut tight/blow out cheeks
Remember upper half of face innervated by both cerebral hemispheres so if upper motor neurone lesion can still wrinkle forehead
Facial Nerve Examination: Upper left: Raise your eye brow (you will see frontal corrugation due to action of frontalis muscle). Upper right: Puff out your cheeks and do not let me push the air out. Lower left: Smile and show me your teeth. Lower right: Close your eyes as tight as you can, and do not let me open them.
Facial nerve palsy: (A) at rest  (B) closing eyes  (C) smiling.

(VIII) Vestibulocochlear

Figure Weber test for lateralization (A) and Rinne test for bone conduction (B) versus air conduction (C). (From Hall T. PACES for the MRCP with 250 Clinical Cases. 2nd ed. Philadelphia: Elsevier; 2008 [p. 386, Figure 3.23].)
(IX & X) Glossopharyngeal & Vagus Nerves

**Cranial Nerve IX and X**

- Glossopharyngeal nerve:
  - Inspect mouth: “AaaaaaAaaaaaaaAaaaaah”
  - Uvula displacement
  - Asymmetrical rise of velum

- Gag reflex
  - Sensory component: glossopharyngeal nerve
  - Motor component: vagal nerve
XI Spinal accessory:

Test Trapezius = Shrug shoulders

Test Sternomastoid = Turn head against resistance
VII Hypoglossal

Examine tongue for wasting/fasciculation (flickering movements)

Ask patient to stick out tongue – if deviates suggests lesion on that side

Remember In Cranial Nerve Lesions:

Lesions in CN 5 & 12 -------------- Deviation is towards the diseased side

Lesions in CN 7 & 9 -------------- Deviation is towards the diseased side
References:


2- Online osceskills website. www.osceskills.com

3- http://geekymedics.com/eye-examination-osce-guide/

4- Tim Hall: PACES for the MRCP with 250 cases. Third edition.

5- Google images