

Importance & Techniques of Cranial Nerves Testing

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Keywords: Cranial nerves, motor nerves, nerve injuries, facial trauma

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ABSTRACT

Trauma to the maxillofacial region might be sustained due to road traffic accidents, industrial accidents, assaults, domestic violence, gunshot injuries, warfare injuries (military setting), and the abuse of children and elderly persons. Facial trauma may be associated with damage to one or more of the sensory or motor nerves. Systemic & periodic neurological examination of the face is important not only for the primary assessment of the severity of injury in terms of assessment of neurological disability but also to set a criterion as a base line data for the particular patient in order to understand the type & amount of recovery with the passage of time (whether partial or full). Such studies will also help the surgeon in understanding the long term implications of any nerve injuries on the structure & function of the face and whether timely diagnosis and intervention has any improved effect on the long term prognosis of the patient. The following article clearly describes the techniques of examination of cranial nerves I to XII with a pictorial representation.

INTRODUCTION

Trauma to the maxillofacial region mandates special attention for the simple fact that the face contains portals of entry to airway and food, in addition to the organ systems that control specialized functions like vision, hearing, smell and taste. Facial trauma may be associated with damage to one or more of the sensory or motor nerves^{1,2}. Since the nerves are closely related to the bones, and at times pass within them through bony canals & foramina, any fracture of the bones of the facial skeleton is invariably associated with some amount of nerve injury, presenting as transient or permanent loss of sensation or function³, thus

hampering some of the basic functions of the human body (like vision, hearing, smell, taste, and tongue movements etc.), besides affecting facial expressions and aesthetics.

The inferior alveolar & mental nerves within the mandible, the lingual nerve as it is in close relation to mandible, the infraorbital nerve, the zygomatico temporal & zygomatico facial nerves & one or more branches of the facial nerve exemplify the nerves that may exhibit signs & symptoms of damage related to facial trauma³. These lead to varying extents of sensory alterations or loss and motor disturbances that may remain for varying extents of time⁴. Systemic & periodic neurologic examination⁵, thus,

should include careful evaluation of all cranial nerves, with special attention directed toward cervical spine injuries⁶.

Techniques of Cranial Nerves Testing⁷⁻¹¹

These techniques were demonstrated and photographed after duly obtaining informed consent from the patient as well as an approval from the ethical committee of M M Dental College, Mullana during the period 2009-10.

1. Cranial Nerve I: Olfactory Nerve: (Figure 1):

- (a) Anatomical area/ muscle supplied: Olfactory mucosa of nasal cavity
- (b) Effect of loss of sensation/ function: Inability of the patient to recognize various odors
- (c) Testing method: Asking patient to recognize various odors by closing one nostril & putting the substance near the open nostril for e.g., substances like aromatic ammonia



2. Cranial Nerve II: Optic Nerve: (Figure 2):

- (a) Anatomical area/ muscle supplied: Eyeball (nerve of vision)
- (b) Effect of loss of sensation/ function: Loss of acuity of vision
- (c) Testing method: Asking the patient to read letters of various size written on a white chart paper
Testing field of vision: Using index finger of one arm stretched laterally & movement of this finger while keeping the patient's head straight forward & testing patient's field of vision.



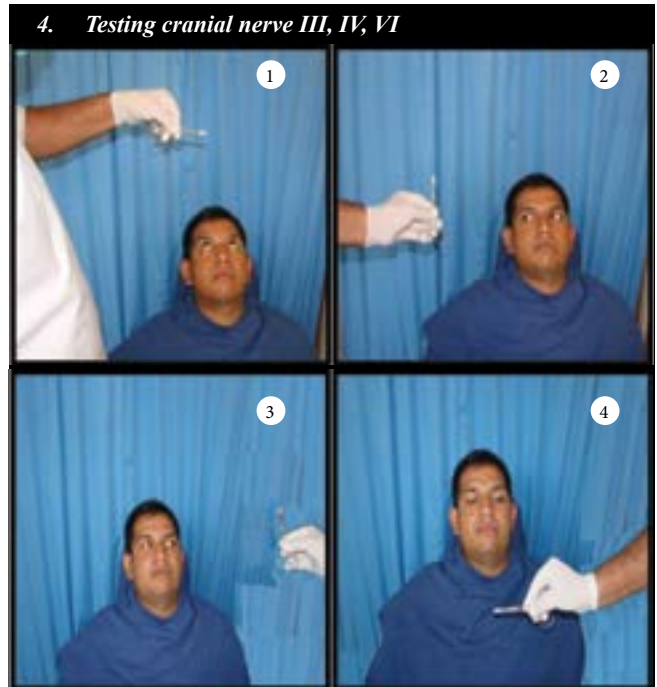
3. Cranial Nerve III: Oculomotor Nerve: (Figure 3, 4):

- (a) Anatomical area/ muscle supplied: Extraocular muscles of the eye, Superior ractus, Inferior ractus, Medial ractus, Inferior oblique
- (b) Effect of loss of sensation/function: Movement of eyeball in various directions
- (c) Testing method: Check for Diplopia: "presence of lateral squint"
For levator palpebrae superioris: Drooping of upper eyelid
For sphincter pupillae: Fixed & dilated pupil/ Loss of light reflex by using torch light
For ciliaris muscle: (Fixed & dilated pupil/ Loss of accommodation reflex): Asking the patient to concentrate on the tip of a pen as it is brought closer from a distance



4. Cranial Nerve IV: Trochlear Nerve: (Figure 4):

- (a) Anatomical area/ muscle supplied: Extraocular muscle of the Eye, Superior oblique



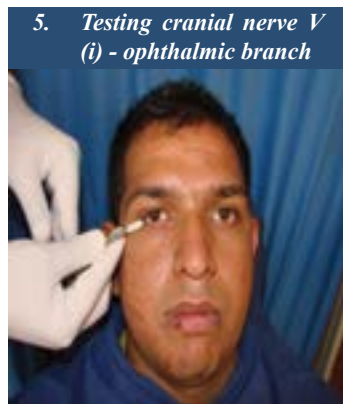
- (b) Effect of loss of sensation/ function: Deviation of eye medially due to unsynchronized movements between Superior oblique (affected) & Inferior ractus (normal) on trying to look downwards
- (c) Testing method: Diplopia on “looking downwards”

5. Cranial Nerve VI: Abducent Nerve: (Figure 4):

- (a) Anatomical area/ muscle supplied: Extraocular muscle of the eye, Lateral ractus
- (b) Effect of loss of sensation/ function: Deviation of eye medially due to unsynchronized movements between Lateral ractus (affected) & Medial ractus (normal) on trying to look forwards.
- (c) Testing method: Diplopia on “looking forwards”

6 (i). Cranial Nerve V: Trigeminal Nerve: Ophthalmic Branch: (Figure 5):

- (a) Anatomical area/ muscle supplied: Conjunctiva of eyelids, Lower forehead and Scalp
- (b) Effect of loss of sensation/ function: Absence of touch sensation in respective regions
- (c) Testing method: Corneal reflex: Inability to close eyelids as soon as the cornea is touched with a cotton bud.



6 (ii). Cranial Nerve V: Trigeminal Nerve: Maxillary Branch: (Figure 6):

- (a) Anatomical area/ muscle supplied: Zygomatic



branches (Zygomatico facial & Zygomatico temporal), Alveolar branches, Infraorbital branches

- (b) Effect of loss of sensation/ function: Absence of touch sensation in respective regions.
- (c) Testing method: Loss of sensation over zygomatic area (Zygomatic br.),
Loss of sensation in maxillary teeth, associated gingival & cheek (Alveolar br.),
Loss of sensation over skin of lower eyelid, side of nose, upper lip (Infraorbital br.)

6 (iii). Cranial Nerve V: Trigeminal Nerve: Mandibular Branch: (Figure 7a, 7b):

- (a) Anatomical area/ muscle supplied:
Anterior division: Muscles of mastication
Posterior division: Inferior alveolar nerve: Mandibular teeth, skin of chin, labial mucosa over anterior teeth
Lingual nerve: Mucosa of tongue anterior to presulcal area, floor of mouth, mandibular lingual gingiva
Auriculotemporal nerve: Skin of tragus, meatus & tympanic membrane



- (b) Effect of loss of sensation/ function:
Anterior division: Inability to bite on the affected site
Posterior division: Absence of touch sensation in these respective regions
- (c) Testing method:
Anterior division: Movement against resistance
Posterior division: Loss of sensation in their respective areas.





7. Cranial Nerve VII: Facial Nerve: (Figure 8a, 8b):

(a) Anatomical area/ muscle supplied:

Muscles of facial expressions (motor division),

Sensory innervations to anterior 2/3rd of tongue (sensory division)

(b) Effect of loss of sensation/ function:

Asymmetry in facial shape or depth of furrows, Eg. Nasolabial fold, asymmetry in spontaneous facial expressions & blinking (motor division),

Change in taste sensation of Anterior 2/3rd of tongue (sensory division)

(c) Testing method:

Asking patient to smile, puff off cheeks, clench eyes tightly, and wrinkle eyebrows (motor division)

Checking the taste sensation of Anterior 2/3rd of the tongue (sensory division)

8a. Testing cranial nerve VII – sensory division



8b. Testing cranial nerve VII – motor division



8. Cranial Nerve VIII: Vestibulo-Cochlear Nerve: (Figure 9):

(a) Anatomical area/ muscle supplied: Hearing (Cochlear N.), Balance (Vestibular N.)

(b) Effect of loss of sensation/ function:

Deafness (Inability of the pt. to hear properly), Tinnitus (constant ringing in ears),

Position & movement of head in space is altered resulting in disequilibrium & vertigo

(c) Testing method: Rubbing the fingers together near pt's ear, asking the patient to walk on a straight line.

9. Testing cranial nerve VIII



9. Cranial Nerve IX & X: Glossopharyngeal Nerve & Vagus Nerve: (Figure 10):

(Because the 9th and 10th cranial nerves control similar functions, they are tested together)

10. Testing cranial nerves IX and X



(a) Anatomical area/ muscle supplied: Soft palate, Fauces, Pharynx, and Post. 1/3rd of tongue

(b) Effect of loss of sensation/ function: Inability in swallowing, palate elevation; Loss of Gag reflex; Altered taste in posterior 1/3rd of tongue

(c) Testing method: Movements of the soft palate & uvula: Asking the patient to swallow & asking the pt. to say ah-h-h, Gag Reflex: Touching the back of throat with a tongue blade, Taste: Post. 1/3rd of tongue: Check taste with sugar/ salt

10. Cranial Nerve XI: Accessory Nerve: (Figure 11):

(a) Anatomical area/ muscle supplied: Sternocleidomastoid & Trapezius

(b) Effect of loss of sensation/ function: Inability of the patient to neck turning & shoulder shrugging

(c) Testing method: Asking the patient to turn the neck & shrug the shoulders against resistance provided by the examiner



11. Cranial Nerve XII: Hypoglossal Nerve: (Figure 12):

- Anatomical area/ muscle supplied: Tongue muscle
- Effect of loss of sensation/ function: Ipsilateral paralysis of the tongue & hemi atrophy
- Testing method: Asking the patient to stick out his tongue & observe for deviation,

(On protrusion: tongue deviates to affected side, On retraction: affected side rises higher than the unaffected side, If bilaterally affected: tongue is motionless & swallowing difficult)



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