

Lecture

Neurological Examination - I

Dr. Eyad M. Hussein

MD, Ph.D of Neurology

**Consultant & Head of Neurology Department,
Nasser Hospital**

الرجاء تحويل الجوال إلى وضع الصامت مع الشكر



Examination

1. **General examination:** consciousness level, general look, physical appearance, pulse, blood pressure, O₂ saturation, temperature, R.R.,.
2. **Examination of other systems:** ENT, Eyes, Neck, Respiratory system, Cardiovascular system, Gastrointestinal system, Skin & musculoskeletal system
3. **Neurological examination.**

Neurological Examination





Neurological Examination

I. Mental Status

a. State of consciousness:

- Glasgow coma scale (Eye opening, Verbal response, Motor response)
- Grading of coma.

Glasgow Coma Scale (GCS)

Category	Response	Points
E ye opening	Spontaneously	4
	To speech	3
	To pain	2
	None	1
V erbal response	Oriented	5
	Disoriented, confused conversation, able to answer questions	4
	Inappropriate responses (words)	3
	Incomprehensible speech (sound)	2
	None	1
M otor response	Obedient commands	6
	Localizes to pain	5
	Withdraws from pain	4
	Abnormal (spastic) flexion, (decortication)	3
	Extensor (rigid) response, (decerebration)	2
	None	1

(GCS minimum = 3: maximum = 15)

Classification of Coma

Grade	Consciousness	External stimulus
I. Lethargy or drowsiness	Disturbed	Response to verbal and painful stimuli (but not vigorous nor continuous)
II. Stupor	Disturbed	Response to verbal and painful stimuli (vigorous)
III. Semi-coma	Lost	No response to verbal stimuli with preserved response to painful stimuli
IV. Coma	Lost	No response to both verbal & painful stimuli



b. Orientation: for time, place and persons.

c. Memory:

- For recent events (lost = anterograde amnesia).
- For remote event (lost = retrograde amnesia).
- For certain period of time (lost = circumscribed amnesia).



d. Intelligence:

Assessed by Intelligent Quotient "IQ" test.

The patient is considered of average intelligence when he & the doctor "understand" each other.

e. Mood: Abnormalities include:

- Depression, euphoria, emotional liability.
- Apathy (indifference).

f. Behavior & perception.



Mentally of Normal Patient

The patient fully conscious, well oriented for time, place & persons, with normal behavior, mood & memory, cooperative & of average intelligence.

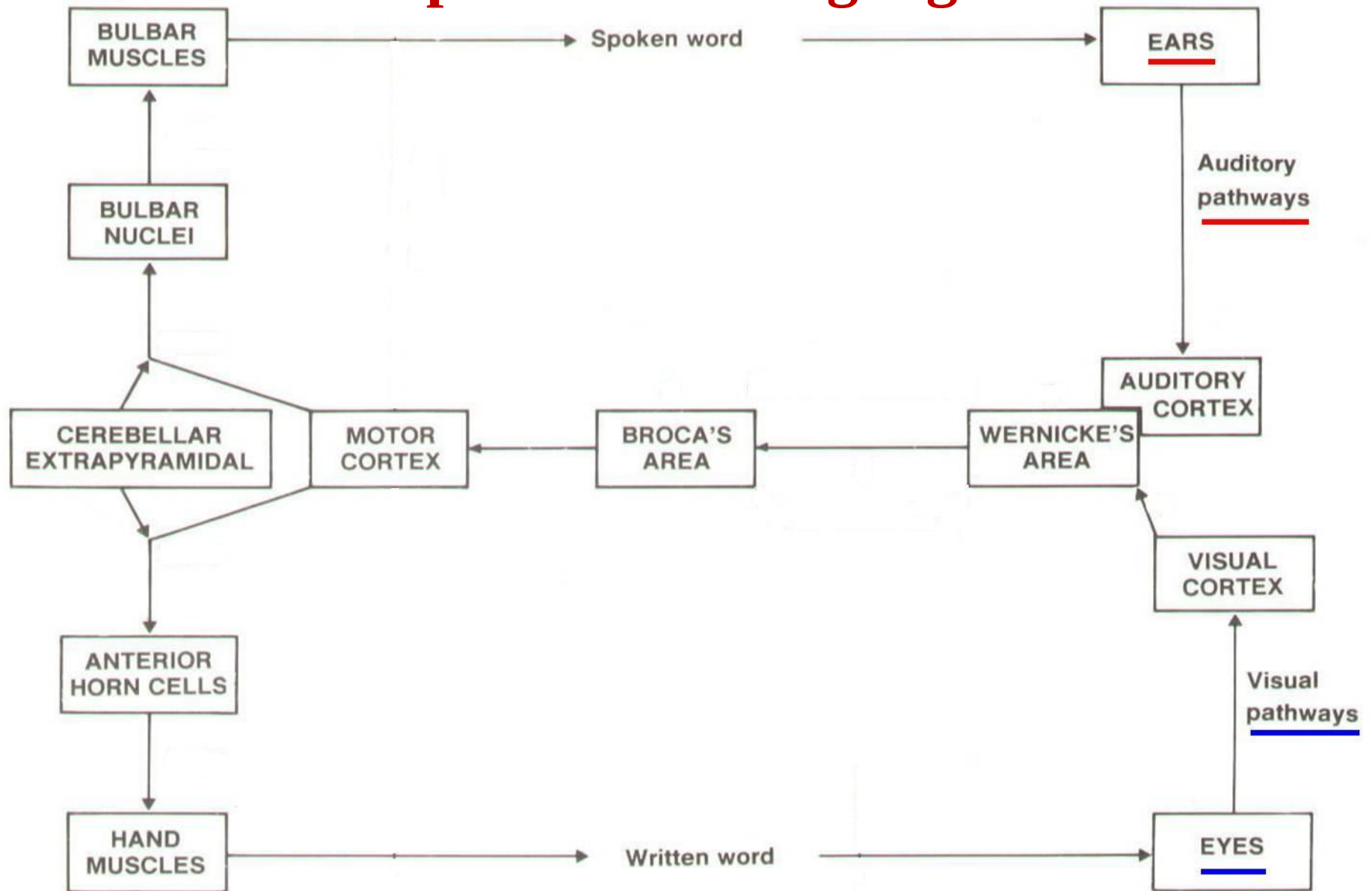
II. Speech Examination

The process of speech involves two stages:

I- Speech formulation.

II. Speech articulation.

Speech and Language





Types of Speech Disturbances

1. **Aphasia:** inability to speech formulation in the absence of sense organs lesion or mental defect.
2. **Dysarthria:** difficulty in articulation with normal formulation (i.e. normal speech center).

Types of Aphasia

- A. Sensory Aphasia:** lesion in Wernicke's center "area 22":
The patient hears but does not understand sound.
[الاستماع فقط]
- B. Verbal (Brocca's or expressive) aphasia** → lesion in Brocca's area or area 44: The patient can not express his ideas in spoken word but the patient understand what ever told him.
- C. Global aphasia:** Sensory aphasia + Motor aphasia.
- D. Jargon's Aphasia:** lesion in supramarginal area "area 40":
The patient can speak but the words are meaningless and have no relation to each other (word salad).

2. Dysarthria

Definition: difficulty in articulation with normal formulation (i.e. normal speech center)

It might be due to:

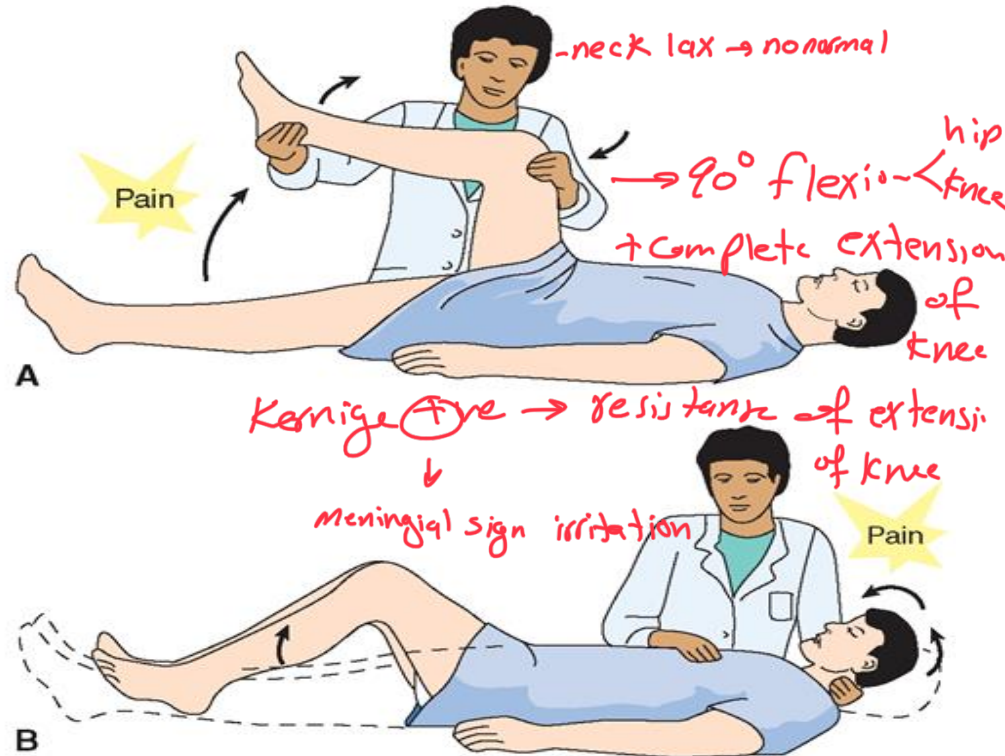
1. Bilateral pyramidal lesion (pseudobulbar palsy).
2. Lower motor neuron lesion of cranial nerves concerned with speech:
 - a. Nuclear: True bulbar palsy.
 - b. Nerves: Lesion in 5, 7, 9, 10, 11, 12 cranial nerves.
 - c. Neuromuscular: Myasthenia.
 - d. Muscles: myopathy.
3. Multiple sclerosis.
4. Cerebellar lesions.
5. Parkinson's disease and parkinsonian syndromes.

Other Types of Speech Disorders

1. **Aphonia (dysphonia):** phonation is lost but articulation is preserved, hence the patient talks in a whisper.
Causes of Dysphonia:
 - a. **Organic causes:** due to disease of the larynx or the nerve supply of vocal cord (recurrent larynx nerve lesion), bulbar syndrome.
 - b. **Functional cause:** conversion disorder.
2. **Palelalia:** repetition of the last sentence or words of the patient's own speech. It occurs in extrapyramidal lesions.
3. **Echolalia:** repetition of the last sentence or words that the patient hears. It occurs in severe dementia.
4. **Mutism:** absence of any attempt at oral communication (in bilateral frontal lobe or third ventricle lesion).
5. **Anomic (nominal, amnestic) aphasia:** difficulty naming familial object or persons.

III. Examination of Meningeal Irritation Signs

- a. **Neck rigidity (stiffness):** Passive flexion of neck leads to neck rigidity. *meningitis → there is abnormal WBCs [inflammation]*
- b. **Positive Lasegue's sign “Straight leg raise test”:** Raise the leg of supine patient by flexion of the hip (while the knee is extended). Normally it can be raised to 90° without discomfort. Here it is painful and limited.
- c. **Positive Kernig's sign:** Passive flexion of the hip at 90° and flexion of the knee in a supine patient. Trial to extend slowly is limited and painful.
- d. **Positive Brudzinski's sign:** *له اشارت + دے اخر بخیر*
- **Neck Brudzinski's sign (upper Brudzinski's sign):** Passive flexion of neck leads to flexion of both knees and hips. *to relieve the pain*
 - **Leg Brudzinski's sign (lower Brudzinski's sign):** *سیاتیق* Passive flexion of one hip and extension the knee leads to flexion of the other hip



* supine position extension of knee
 laSague sign -ve -> normal flexion 90° of hip
 +ve -> flexion 90°
 more severe -> more severe



IV. Cranial Nerves Examination

له نغصه كرم (1-12)

1. Olfactory Nerve Examination

Test substance should be:

← ما بنخلهم يشعوا الحار. هدية خالص

- Familiar.
- Non irritant.
- Test each nostril alone.
- Eyes should be closed.

لحسان ما نخل
irritation to the
trigeminal N.

ما نخله يشع حار (لازم يشع بكل فتحة حارة..)

????????????



Lesion of the Smell Pathway

فocal damage of olfactory bulb → tumors
من الخطر

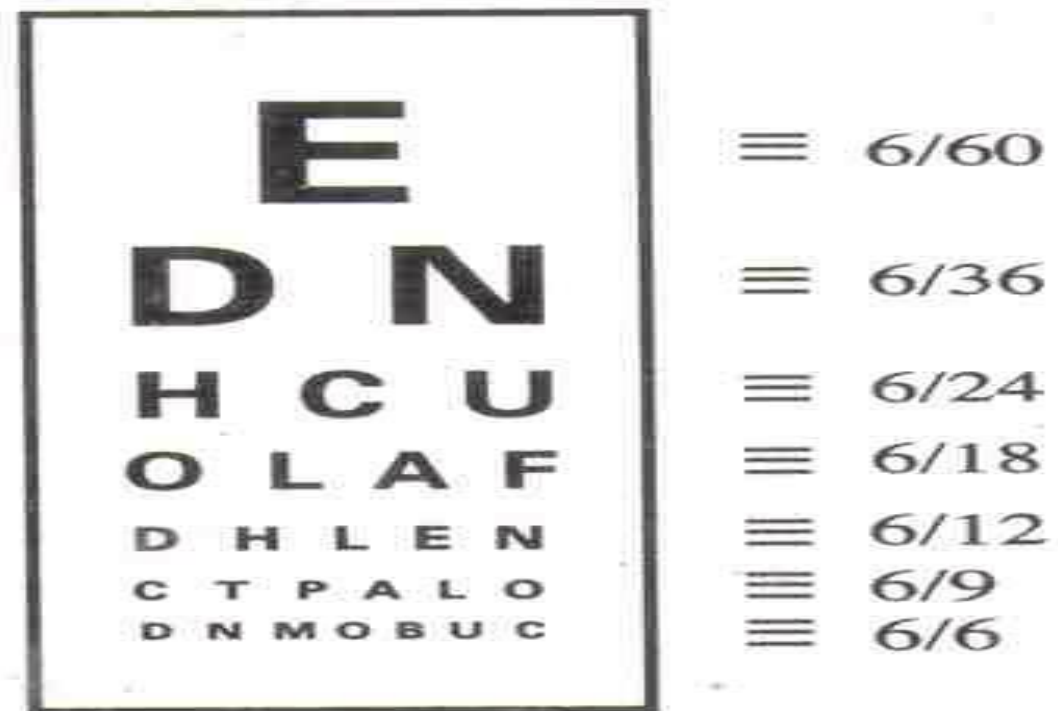
1. Unilateral hyposmia or anosmia.
2. Bilateral hyposmia or anosmia.
3. Parosmia (Smell hallucination)
4. Cacosmia (bad smell in chronic sinusitis)
5. Olfactory agnosia

← عدم التمييز بين الروائح

2. Optic Nerve Examination

a. Visual Acuity Examination

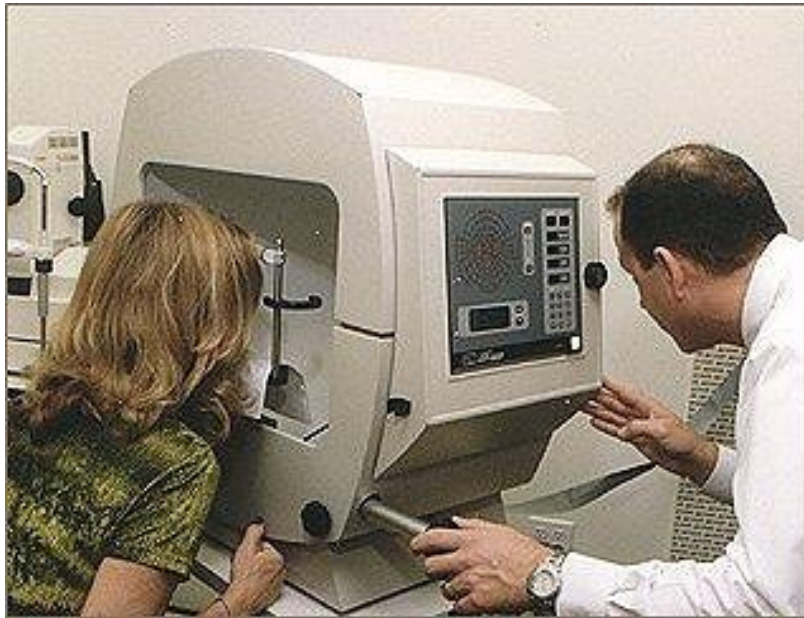
Acuity of vision: with a Snellen chart. The normal acuity is 6/6 to 6/9 in each eye.



Snellen's test types

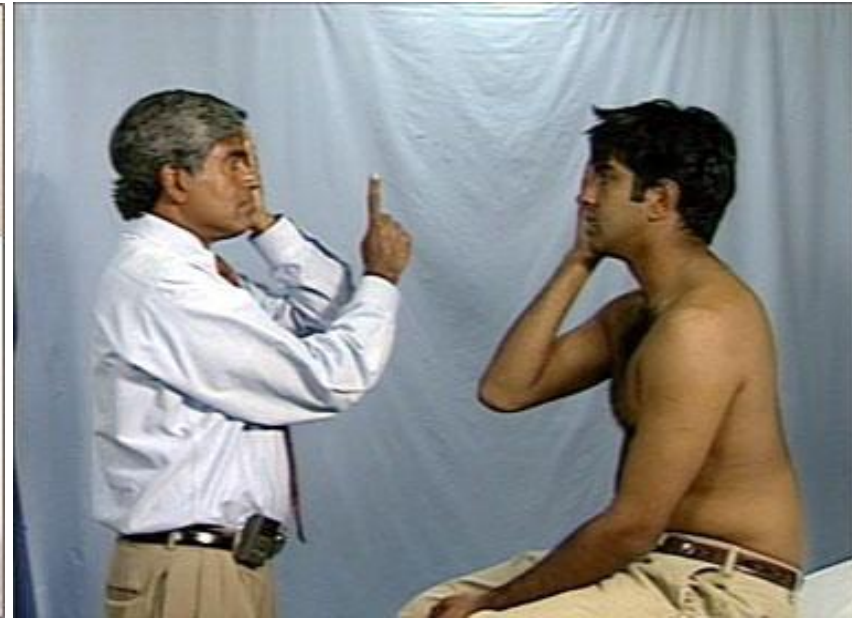
b. Visual Field Examination

Checked by **confrontation**, if abnormal recorded with Goldman screen “**Perimeter**”.



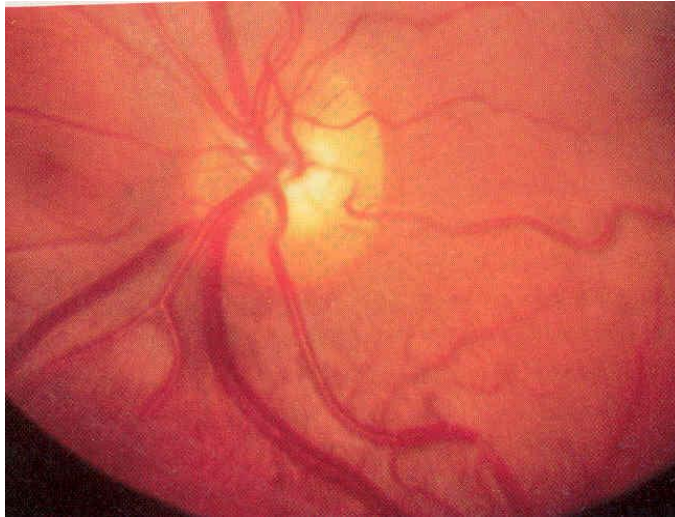
Perimeter

لہ میں خطیہ معیار پر

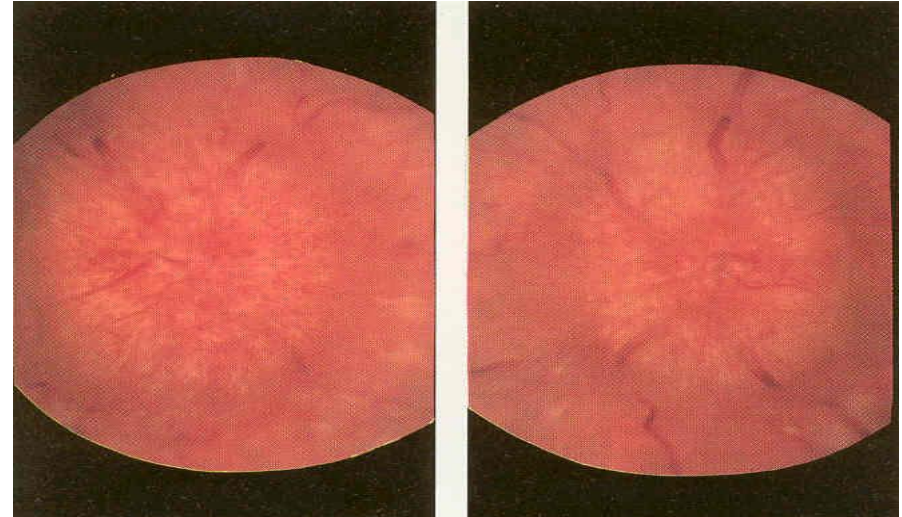


Confrontation Test

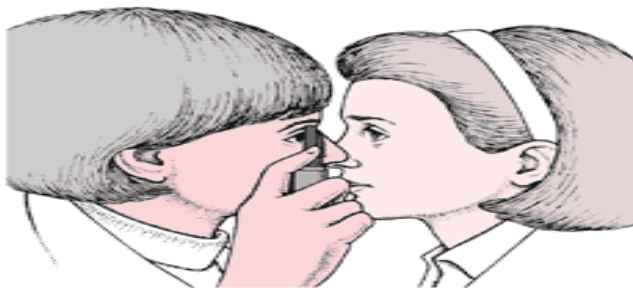
c. Fundus Examination (Ophthalmoscopy)



Normal optic nerve disc



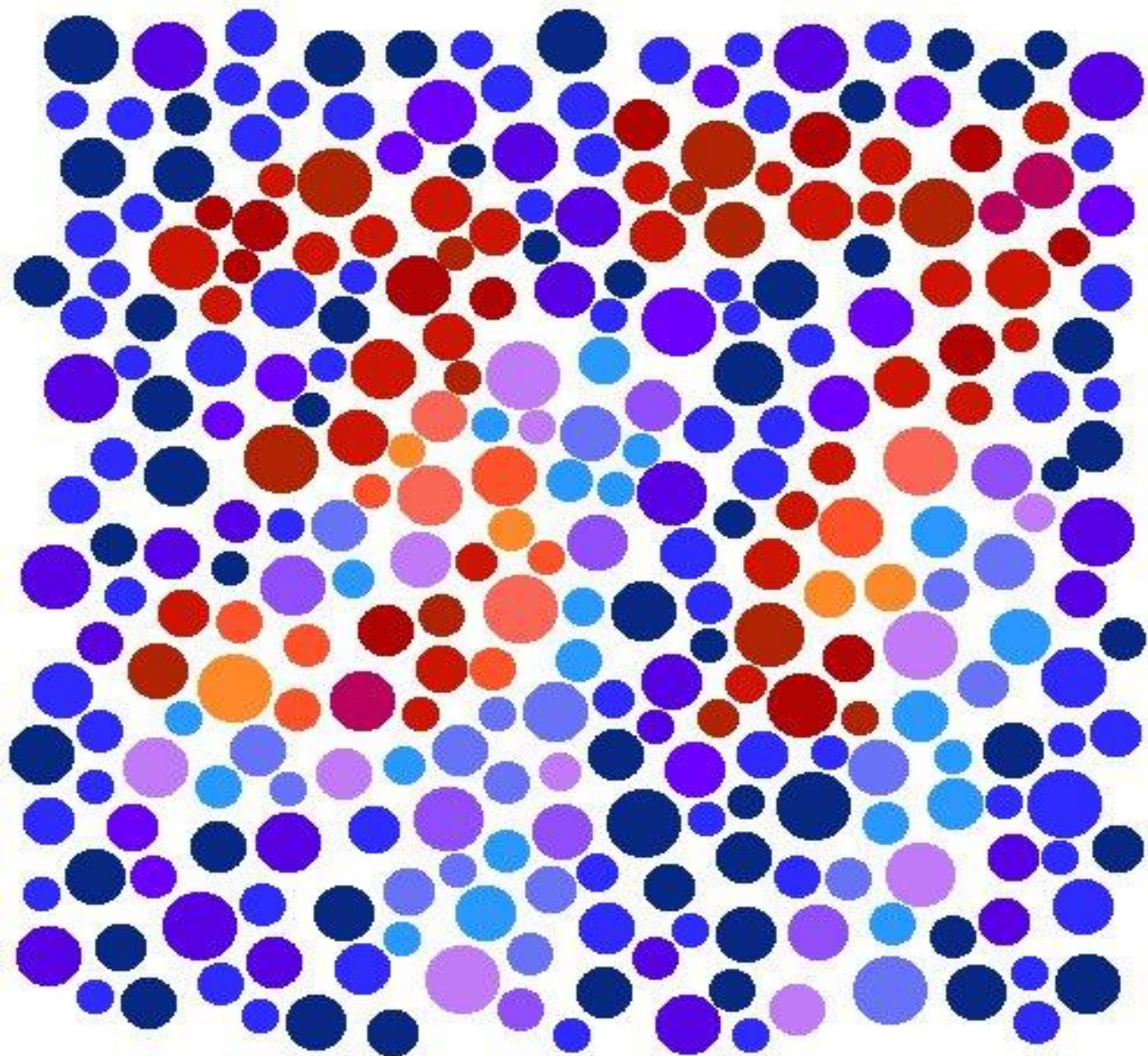
Papilledema due to ↑ ICP.



Ophthalmoscopic Examination



d. Color Examination



3, 4, 6. The Ocular Nerves (III, IV, VI) Examination

* light reflex → afferent:- optic N

→ efferent:- oculomotor nerve [E.W.N] → IO of III N → N. to IO.M → ciliary ganglion → sph. Pup. M.

A. Inspection

Motor - نبيأ فيه بعض الحركات

1. Pupils:

• Normal pupil is RRR (Regular, Round,

by light reflex → Reactive to light and accommodation), Miosis, Mydriasis.

2. Ptosis: < unilateral or bilateral complete or partial

• Complete. in 3rd N. palsy

• Partial. in Horner syndrome

3. Squint:

• Divergent → oculomotor N palsy → medial rectus adduction

• Convergent → 6th palsy

نقصه جبراد H shape

B. Examine for extraocular movements:

1. **Test for abducent nerve** (lateral rectus muscle): by looking lateral (external).
2. **Test for trochlear nerve** (superior oblique muscle): by looking by looking downward and medial.
3. **Test for oculomotor nerve** by looking in all other direction.

C. Nystagmus.

D. Light Reflex.

نقصه جبراد one eye
direct reflex
indirect reflex
myosis

E. Accommodation Reflex.

* perlia N. → contraction of
incentral group.
both medial recti muscle

Cranial nerve palsy

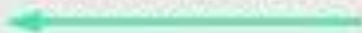
Exam findings – evidence of incomitance

Right 3rd nerve palsy

+ mydriasis
+ ptosis..

[diversion paralytic squint]

Direction of gaze



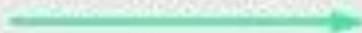
Smaller angle of horizontal squint

Primary position



Right eye turns downwards and outwards

Direction of gaze



Unable to adduct right eye
Larger angle of squint
Double vision further apart

Right 4th nerve palsy



No obvious squint



Right eye turns upwards and outwards



Right eye elevates more as it moves medially
Double vision further apart

لما يطلع ياتي

Right 6th nerve palsy



Unable to adduct right eye
Larger angle of squint
Double vision further apart



Conversion squint
Right eye turns medially



Able to adduct right eye
No obvious squint

ليس مريض طبيعى
Med > reduct

Light Reflex

- **Direct Light Reflex:** Light in one eye leads to constriction (miosis) of the same eye
- **Indirect Light Reflex :** Light in one eye leads to constriction (miosis) of the opposite eye



Accommodation and Convergence Reflex

Patient is asked to follow your finger from a far point to a near one:

- ❖ Convergence (contraction of both medial recti muscle).
- ❖ Miosis (contraction of constrictor pupillae muscle).



Lesion of the Oculomotor Nerve

- **Ptosis:** paresis of the levator palpebra superioris muscle.
- **Squint:** divergent paralytic.
- **Diplopia:** occurs only on elevation of eye lid.
↳ double of vision.
- **Mydriasis:** dilated fixed pupil.
- **Loss of light and accommodation reflexes.**

➤ Causes of the oculomotor nerve lesion:

- **Aneurysm** of the posterior communicating artery.
Compression to the root of ocul. Mot. N.
- **Infarction** of the third cranial nerve: HTN, DM.
- **Midbrain tumor**, infarction or hemorrhage: **Weber syndrome**.
- **Cavernous sinus thrombosis.** → *complete painful ophthalmoplegia.*
↳ 2,3,4 N

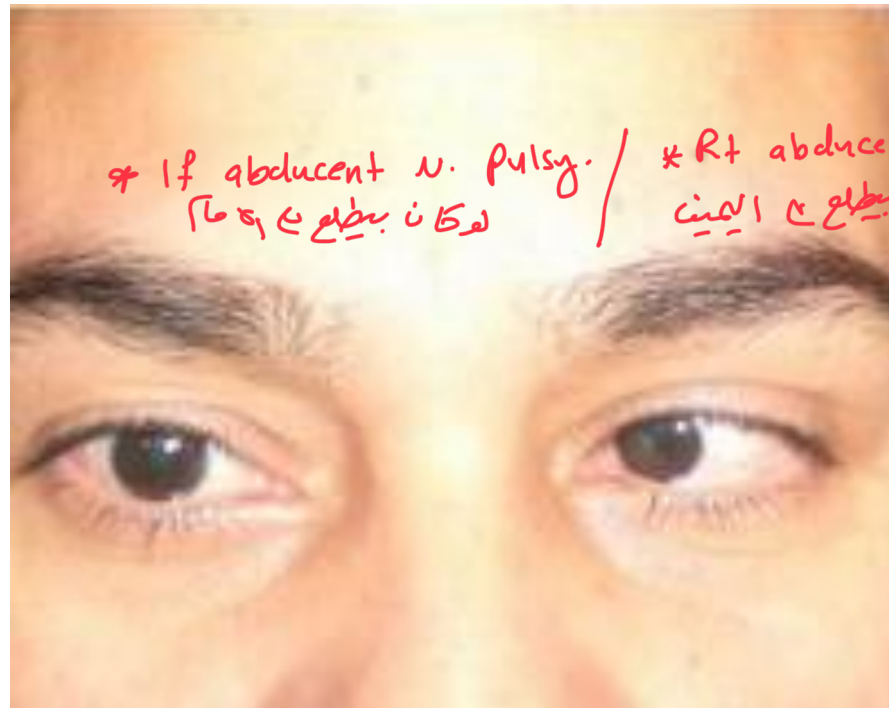
→ mydriasis: compression..

← hemiplegia داخل ال Brainstem يكون الخلل ..

Rt complete ptosis
divergence squint ← مقلبة العين



* If abducent n. palsy / * Rt abducent n. palsy
لذلك نبطع العين / لذلك نبطع العين



Lesion of the Trochlear Nerve

1. Diplopia on looking down and out. [lateral]
2. Limitation of movement during examination for eye movement down and ~~medially~~. lateral

Lesion of the Abducent Nerve

1. Diplopia on looking out wards.
2. Limitation during examination of eye movement in the outward direction. abduct the eye laterally.
3. Convergent paralytic squint.

5. Trigeminal Nerve Examination

Lp mixed N.

- **Sensory part:** test for pain and touch sensation. Compare both sides of face, inner and outer part, each division of trigeminal nerve. Examination of terminal branches of the trigeminal nerve

- **Superficial Reflexes:** palatal, corneal and conjunctival reflexes.
 - Corneal reflex → A: ophthalmic N. E: Facial N.
 - palatal reflex → A: V2 + IX E: X + cr XI

- **Deep reflex:** jaw reflex (see reflexes examination).

→ Jaw move.

A: - V3
E: - V3

عنت شتوف المني
- unilateral facial hyposthesia.
- dermatome med.
نقطة في Face من شتوف
الحركة.

by tongue depressor + palatal reflex



اولی تر نحوه ال inspection
➤ Motor part:

- **Observe the skin over the temporal and masseter muscles:** asymmetry suggests muscle atrophy.
- **Ask the patient to clench his or her jaws:** Palpate the masseter and temporal muscles for asymmetry of volume and for tone.
↳ uni lateral Atrophy
- **Observe for deviation of the tip of the mandible as the jaws are opened:** Deviation is to the weak side.
- **Ask the patient to move the jaw from side to side against the resistance of your palm:** The paralyzed side will not move laterally

Lesions of Trigeminal Nerve

after 40 year only pain / focal lesion.
1/2 trigeminal neuralgia
decrease sensation

1. **Sensory affection:**

- a. Trigeminal neuralgia.
- b. Loss of sensation over the face.

2. **Motor affection:** weakness of the mastication muscles and the jaw is deviated to side of lesion.

Helps zoster → ophthalmic pathway [ganglion lesion involved]
 H2V 1st oph branch 3rd & 4th
 trigeminal nerve 1st oph branch



↳ post herpetic neuralgia..



maxillary branch most affected

7. Facial Nerve Examination

➤ **Motor part:** *by inspection firstly.* muscle of expression of the face.

Observe patient as he talk and smiles, watching for:

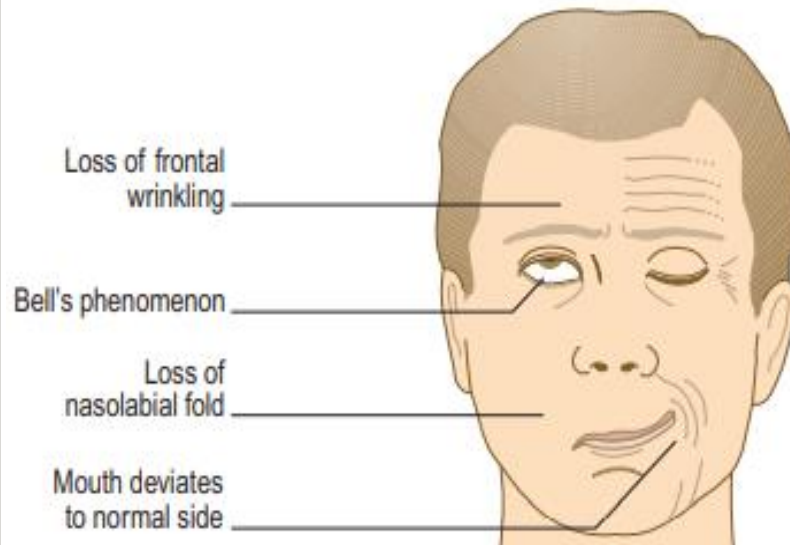
- Eye closure. Bell's phenomena may be seen.
- Absent nasolabial fold and dropping (asymmetrical) of mouth angle.

Patient then instructed to:

- Wrinkle forehead by looking upwards.
- Close eyes while examiner attempts to open them (orbicularis oculi muscle).
- Purse lips while examiner presses cheeks (buccinator muscle)
- Show teeth (orbicularis oris muscle).

➤ **Sensory part “chorda tympani”:** examine of taste over anterior 2/3 of tongue (applying a drop of sweat or salty substance over each side of the tongue separately).

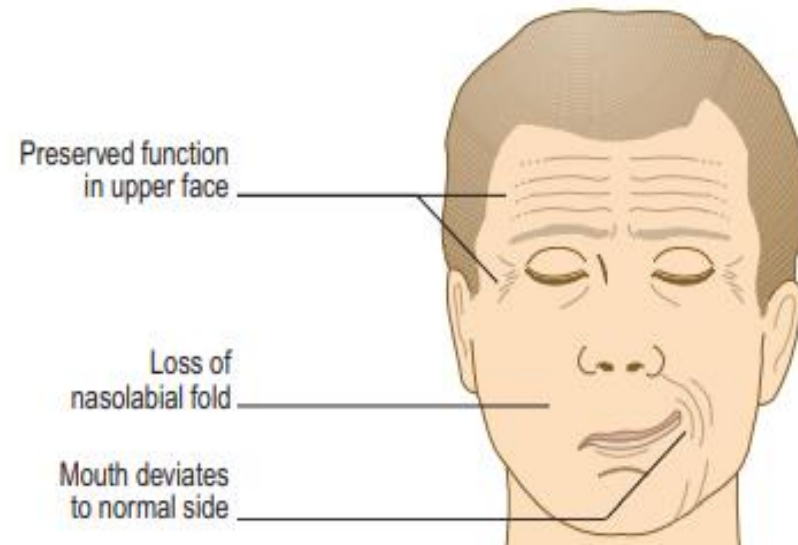
➤ **Reflexes:** corneal and conjunctival reflexes.



Right-sided lower motor neurone lesion

nucleus damage → Rt side hemiplegia

** pontine lesion:- damage to the*



Right-sided upper motor neurone lesion

*If cerebral hemisphere problem
↳ Rt hemiplegia*

A**B****C**

Rt hemiplegia
↳ if symptoms...

Bell's phenomenon



8. Vestibulo-cochlear Nerve Examination

a. Examination of the Cochlear Component of VIII Nerve

- **Test by whispering numbers into one ear.**
- **Audiometry.**
- **Weber's test:** place tuning fork in middle of the head. Normally vibration are heard in the middle of the head.
- **Rinne's test:** using the vibration tuning fork, compare air conduction (in front of ear) with bone conduction (on mastoid process).

	Weber's Test	Rinne's Test
Normal	Vibration are heard in the <u>middle of the head</u>	Air conduction is better than bone conduction
<u>Conductive</u> deafness	Vibration are heard in <u>affected ear</u>	<u>Bone</u> is better than air
<u>Nerve deafness</u>	Vibration are heard in <u>normal ear</u> <i>intact side</i>	<u>Both</u> air and bone are diminished

← لا يسمع بأذن bone يعني العصب سليم.

Weber test



Normal

Conductive loss, same ear
or
Sensorineural loss, opposite ear



on the mastoid.

Rinne test

Air conduction (AC)

← اخضع من Bone

Bone conduction (BC)

← in the mastoid bone

$AC > BC = \text{Normal}$

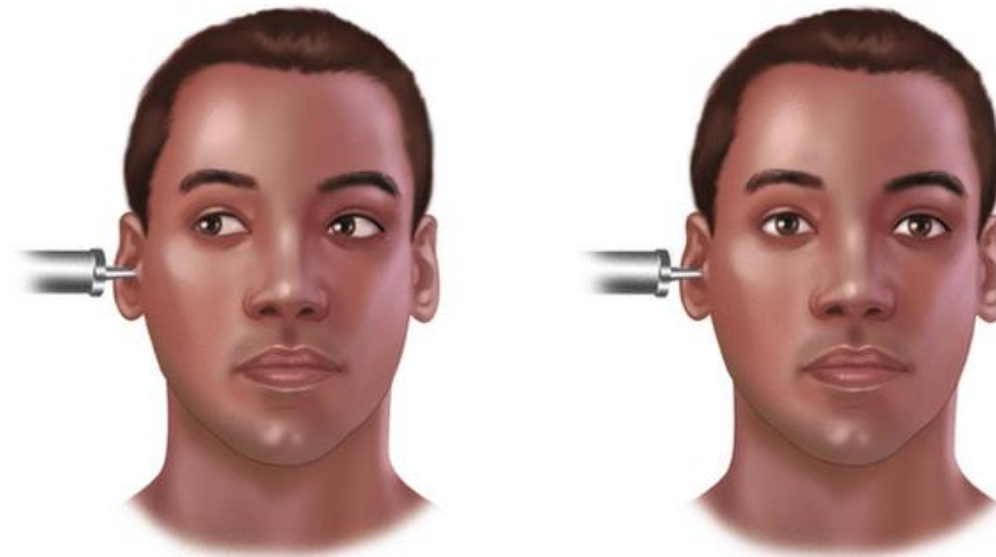
$BC > AC = \text{Conductive loss}$

b. Examination of the Vestibular Component of VIII Nerve

خى ICU ۾ شان ۾ ڪو ڊاڪٽر
Brain stem death
or not

➤ **Oculovestibular reflex (caloric testing):** nystagmus towards the irrigated ear is seen when ice-cold water is run into the external auditory meatus . This indicates an intact vestibular nerve and brainstem. The test is used in the diagnosis of brainstem death.

➤ **Nystagmus**



Lesion of the Vestibulo-Cochlear Nerve

A. Lesion of the Cochlear Division:

1. Tinnitus in irritative lesion.
2. Deafness in destructive lesion.

B. Lesion of the Vestibular Division:

1. Vertigo. *neuritis → severe vertigo*
2. Spontaneous nystagmus.
3. Ipsilateral incoordination.

غیر نکیل

9, 10. Examination of the Glossopharyngeal and Vagus Nerves + cr XI.

➤ Examine the uvula:

- By inspection normally central ^{+symmetrical}
- Ask the patient to say “Ah”. In paralysis it is deviated to opposite side of lesion ^{but if it deviated to the left → intact side}

➤ Palatal reflex: “afferent- V nerve, efferent- X nerve” ^{+IX}

stimulation of soft palate leads to its elevation

➤ Pharyngeal reflex : “afferent- IX nerve, efferent- X nerve”

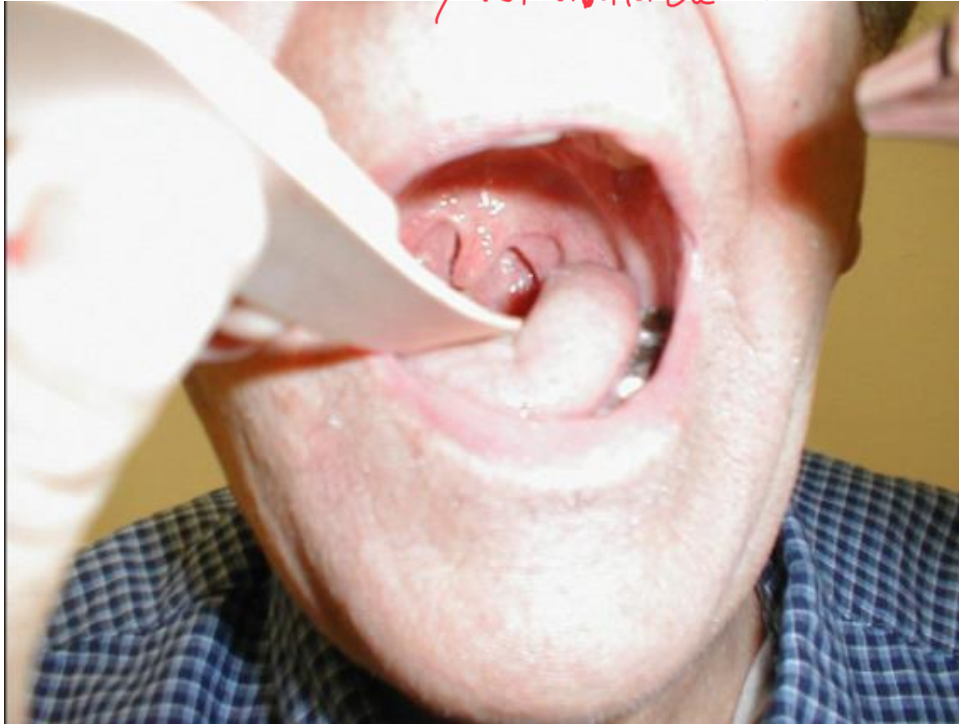
stimulation of posterior pharyngeal wall leads to local contraction and gag reflex

➤ Isolated X nerve lesion occur in cases of thyroid gland surgery [✓]

^{damage recurrent laryngeal n.}

- Speech examination.
- Swallowing examination.

If drop of palate / R+ uvula deviation



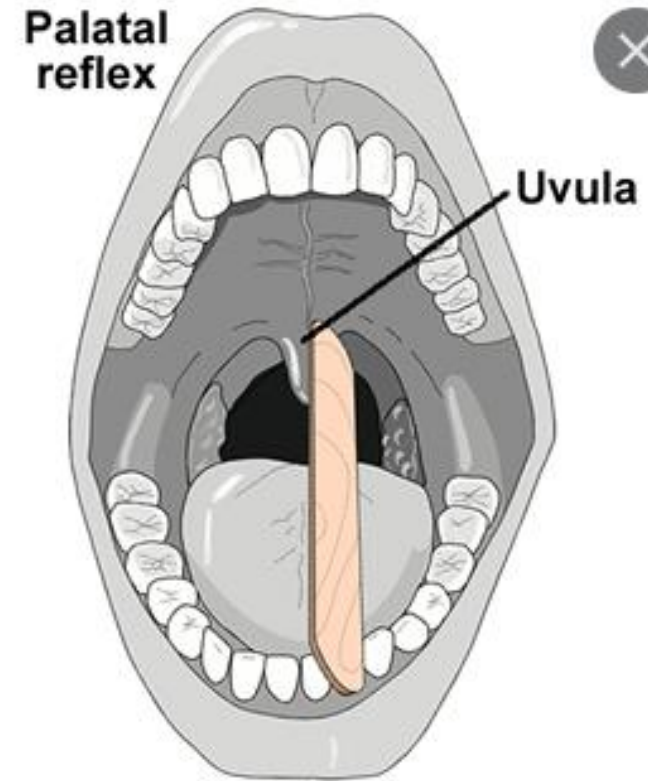
Normal



Examination of the Uvula



gag reflex
Pharyngeal Reflex



Palatal Reflex

Lesion of the Glossopharyngeal Nerve

1. Loss of taste and general sensation from the posterior 1/3 of the tongue.
2. Loss of sensation in the pharynx
3. Ipsilateral loss of pharyngeal reflex .
4. Some pharyngeal weakness (^{mild}dysphagia).

Lesion of the Vagus Nerve *تقرئ*

1. Palatal paralysis:

- أنف* a. Nasal tone of speech. ✓
- b. Drop of palatal arch on paralyzed side and shift uvula to opposite side. ✓
- c. Fluid regurge. ✓ *esophageal dysphagia [neurogenic]*
- d. Loss of palatal reflexes. ✓

2. Pharyngeal paralysis:

- a. Neurogenic ^{*food & fluid*} Dysphagia. ✓
- b. Loss of pharyngeal reflex. ✓

3. **Laryngeal paralysis:** hoarseness of the voice. *[dysphonia]*
damage of recurrent laryngeal N.

Others: tachycardia and constipation.

11. Lesion and Examination of the Accessory Nerve

Lesion:

- Ipsilateral paralysis of **sternocleidomastoid muscle** (rotation of the head and neck to the same side)
- Ipsilateral paralysis of **trapezius muscle** (inability to shoulder shrugging)

Examination:

- **Sternocleidomastoid muscle:** ask the patient to turn his chin against resistance
- **Trapezius muscle:** elevation (shrug) of shoulders against resistance



12. Hypoglossal Nerve Examination

↳ Motor

➤ Inspection tongue for

- Deviation
- Wasting / Atrophy.
- Fasciculation
- Abnormal movement: in chorea
- Dimpling on tapping: in myotonia
- **Others** : ulcers (Behcet's disease), red glazed (in vitamin deficiency)

ALS → fasciculation + atrophy
of the tongue
tongue

- myotonia → dimpling tongue
contraction + delay
of relaxation
↑ contractility M.

➤ **Power of muscles:** ask the patient to push the inner side of cheek by his tongue



Lesion of the Hypoglossal Nerve

UMNL: corticonuclear tract lesion.

- **Unilateral lesion:** deviation of the tongue to opposite side of lesion (corticonuclear lesion): in cerebral stroke or tumor
- **Bilateral lesion:** inability to protrude tongue, in pseudo bulbar syndrome

LMNL: in bulbar syndrome, syringobulbia, medullary stroke

- **Unilateral lesion:** deviation of the tongue to same side of lesion (hypoglossal nucleus or nerve)
- **Bilateral lesion:** inability to protrude tongue
- In both LMNL presented muscle wasting and fasciculation

early
[Atrophy]



LMA [Atrophy]



Thank You

Done ☒