MAYO CLINIC

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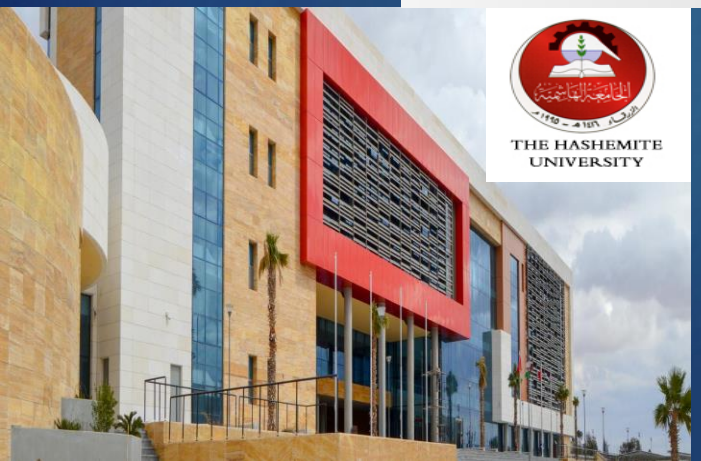

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THE EUROPEAN ASSOCIATION OF NEUROSURGICAL SOCIETIES

What are the goals?

- Determine whether in fact neurological dysfunction exists.
- Determine the affected system : motor, sensory , CN or several.
- Determine the Location of the problem (where Is the pathology).
- Determine the possible causes (What is the pathology).

Neurological History

1) Nature & location of the symptoms
2) Time relationships
3) Precipitating, exacerbating & relieving factors
4) Associated symptoms
5) Past history
6) Drug history
7) Family history
8) Social history
9) Witness evidence

➢ Nature & location of the symptoms

- Clarify the meaning of the terms used by the patients to describe their Sx.

- Determine which parts of the body are affected by Pain, weakness or sensory loss

- Be aware of terms :
  - Blackouts
  - Vertigo
  - numbness

➢ Time relationships

- The onset, duration and pattern of symptoms over time.

- When did it start?
- Suddenly or gradually?
- How long did they last?
- Constant or intermittent?
- Do the symptoms occur at certain time?

➢ Precipitating, exacerbating or relieving factors

- What were you doing when Sx start?

- What are the triggers of the Sx?
  - Sleep
  - Posture
  - Coughing
  - Exercise

- Any activities to ease the Sx?

➢ Associated symptoms

- Ask about other features of neurological disease which accompany the Sx.

- Headache
- Fits/ Faints / funny turns
- Memory/ attention
- Sensory Sx
- Sphincter disturbance
- Sexual dysfuction
- Vision/ hearing/
- Sleep/ appetite / mood

➢ Past history

- A full past medical history is essential.
- Note for any prev. neurological events
- Elderly >> DM, HTN ?
- Younger >> detailed accounts of birth and early development

➢ Drug history

- Consider drug-related cause for symptoms.
- Make complete list of recent and current medications
- Examples :

- Statins >>> H/A
- Steroids >> memory changes/ visual loss/ myopathy
- Bisphosphonates >> dysphagia
- Cimetidine >> peripheral neuropathy
- Antidepressant >> tremor

➢ Family history

- Ask for genetic Dx affect the nervous system :
- Neuropathies
- Ataxias
- Huntington's Dx
- Epilepsy
- M.S
- Vascular diseases

- The possibility of an uncommon genetic condition should be considered.

➢ Social history

- Ask for occupational factors relevant to neurological Dx.
- Exposure to toxins >> peripheral neuropathies
- Entrapment neuropathies
- Stress-related Sx & syndrome

- Ask for marital status / any domestic violence?
- Smoking ?
- Alcohol and drug abuse
- Sexual history ? (for syphilis & HIV)

➢ Witness evidence

- Obtain an account of the patient's Sx from a close relative or associate in :

- Younger patients
- Cognitive impairments
- Who developed seizure attacks
- Syncopal attack
- Any change in LOC/ awareness

The Neurological Examination

1) Consciousness
2) Cranial nerves
3) Sensory and motor examination
4) Reflex testing
5) Coordination
6) Gait and stance
7) Making sense of the neurological examination

Always consider:

- In general, the neurological examination is not applied to asymptomatic, otherwise healthy people as the would be quite low.

- It is sometimes appropriate to perform only certain parts of the neurological examination. These situations will become apparent *with experience.*

- Consciousness

Glasgow coma scale

BEHAVIOUR	RESPONSE	SCORE
Best Eye Response	Spontaneously To speech To pain No response	4 3 2 1
Best Verbal Response	Oriented to time, place, person Confused Inappropriate words Inappropriate sounds No response	5 4 3 2 1
Best Motor Response	Obeys commands Moves to localized pain Flexion withdrawal from pain Abnormal flexion(decorticate) Abnormal extension(decerebrate) No response	6 5 4 3 2 1
Total Score	Best response Comatose client Totally unresponsive	15 8 or less 3

➢ Cranial nerves examination

Olfactory nerve (CN I)

A. Make sure that the patient is able to inhale and exhale through the open nostril.

B. Have the patient close their eyes.

C. Present a small test tube filled with something that has a distinct, common odor to the open nostrils. The patient should be able to correctly identify the odor at approximately 10 cm.

➢ Cranial nerves examination

Optic nerve (CN II)

A. Visual Acuity (Snellen chart).

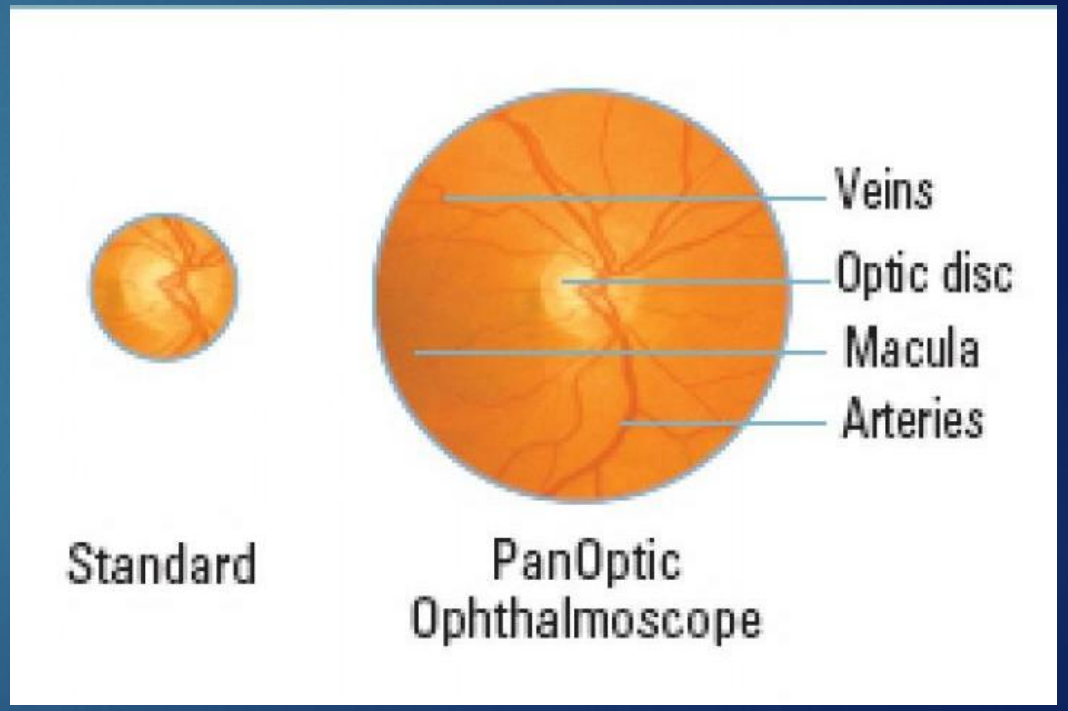
B. Fundoscopy

C. Colour vision.

D. Visual field.

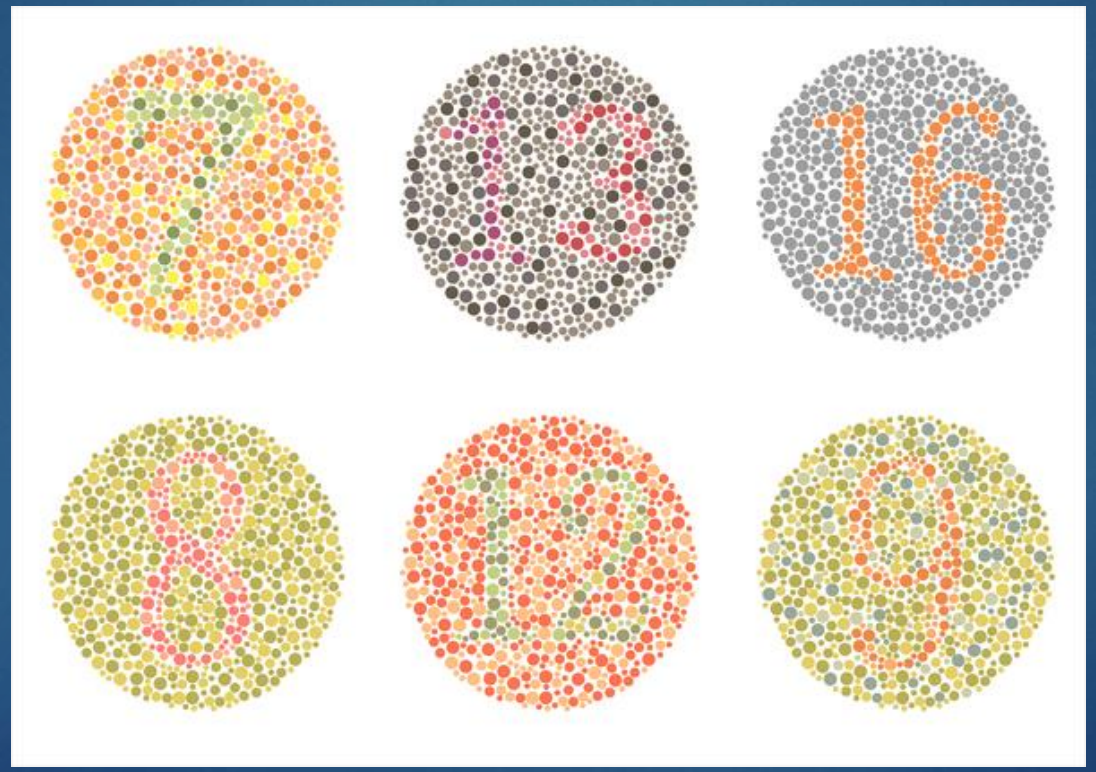
➢ Cranial nerves examination

Optic nerve (CN II)…..Fundoscopy



➢ Cranial nerves examination

Optic nerve (CN II)…..ocular vision



Ishihara's test

➢ Cranial nerves examination

Optic nerve (CN II) ….visual field

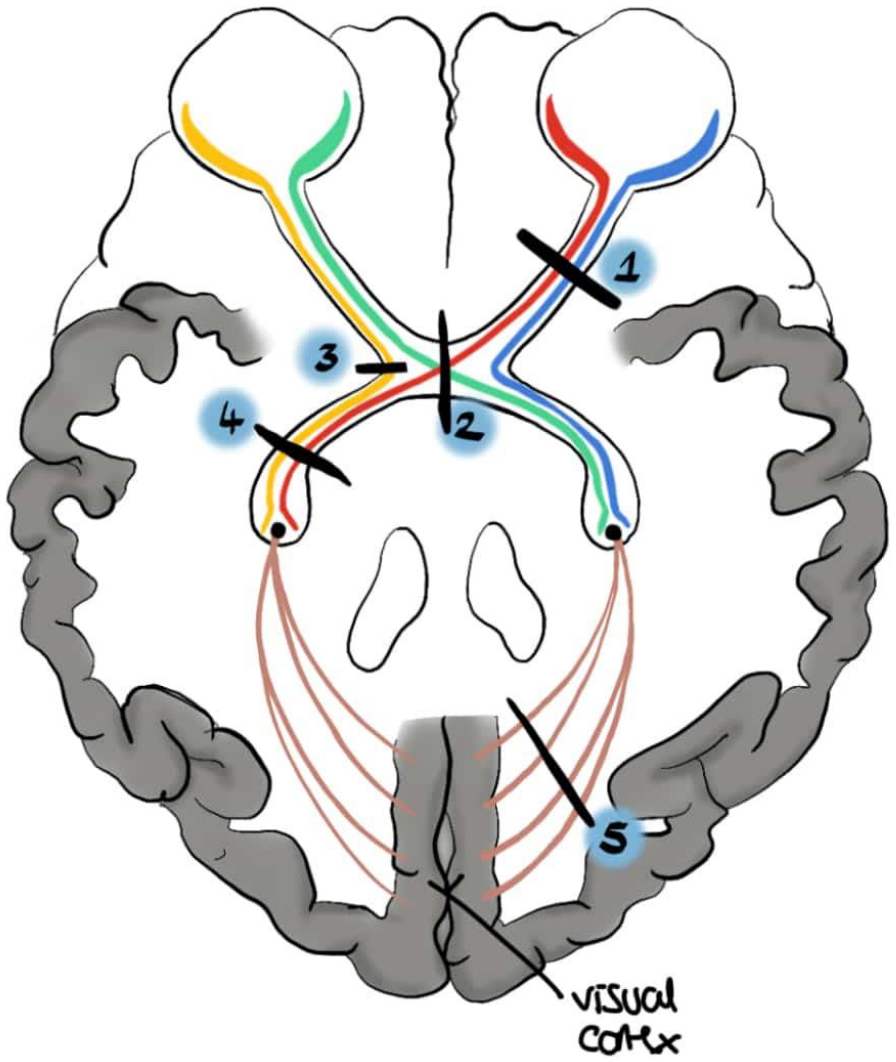
A. The examiner should be nose to nose with the patient, separated by 1 m.

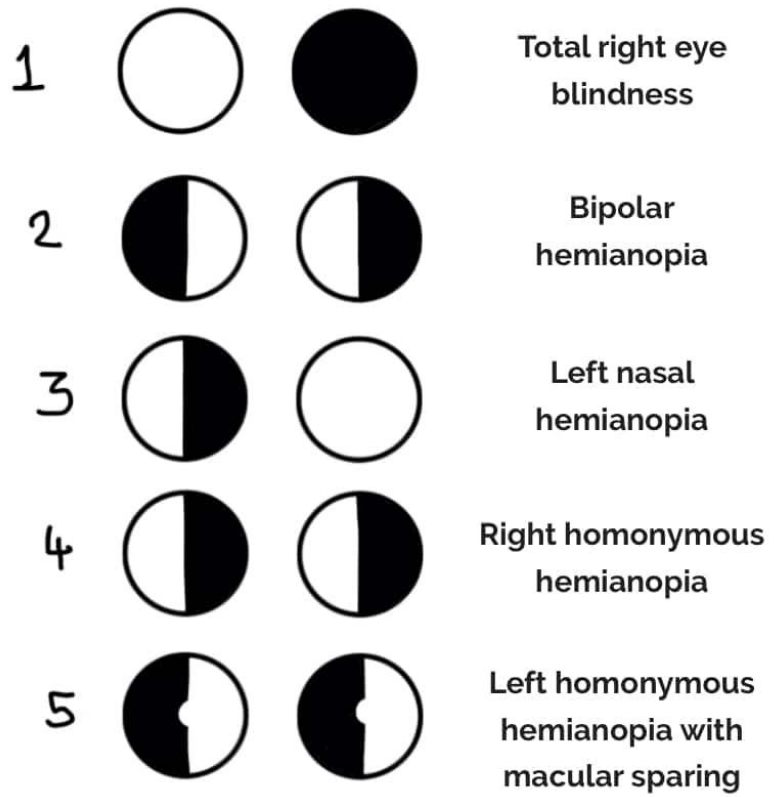
B. Each eye is checked separately. The examiner closes one eye and the patient closes the one opposite. The open eyes should then be staring directly at one another.

C. The examiner should move their hand out towards the periphery of his/her visual field on the side where the eyes are open. The finger should be equidistant from both persons.

D. The finger is then moved out to the diagonal corners and moved inwards from each of these directions. Testing is then done starting at a point in front of the closed eyes. The wiggling finger is moved towards the open eyes.

E. The other eye is then tested.





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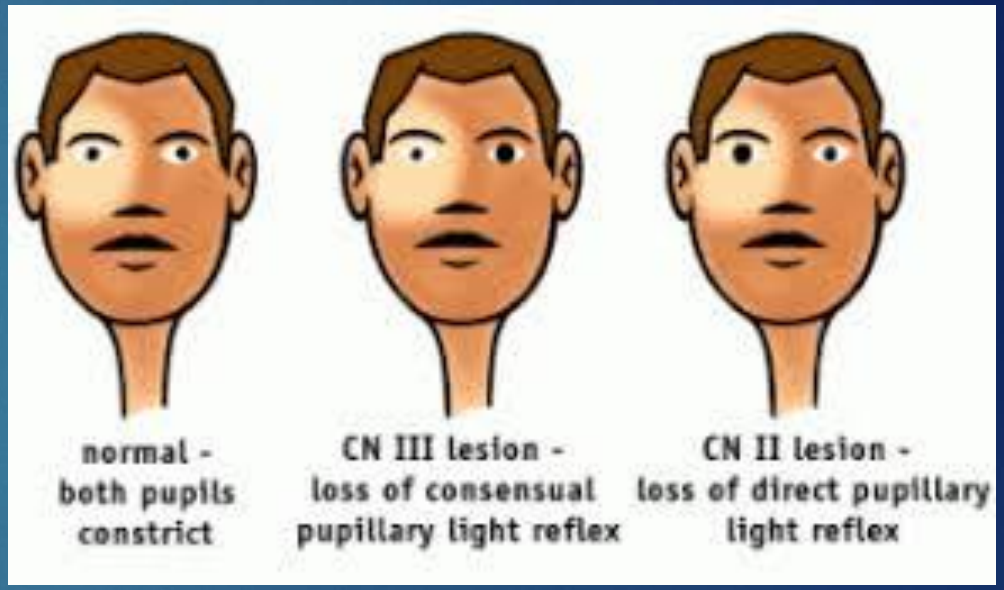
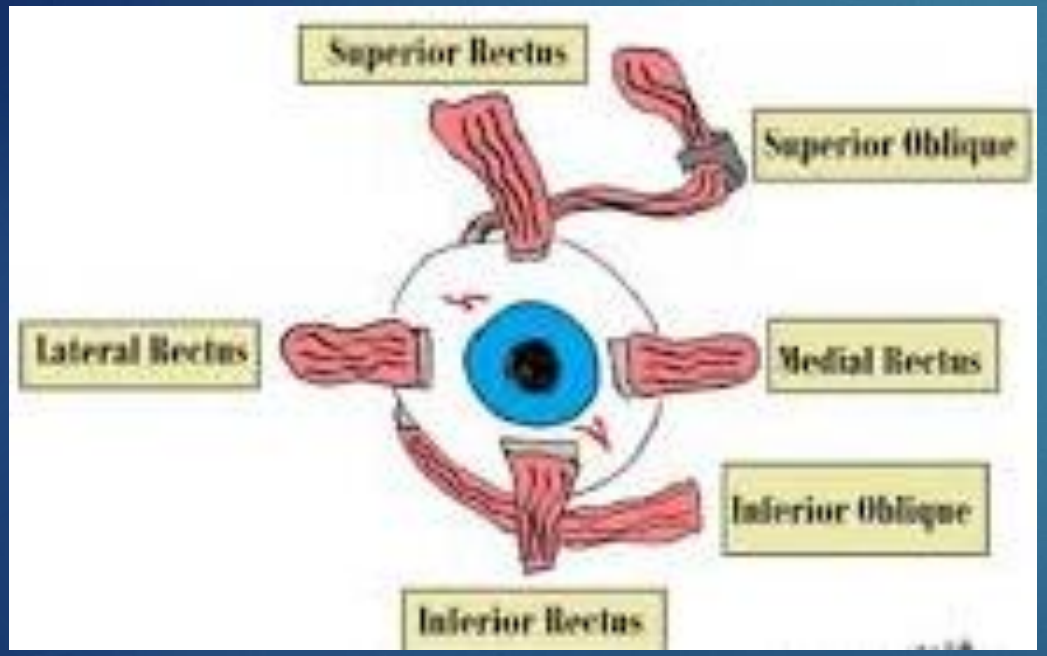
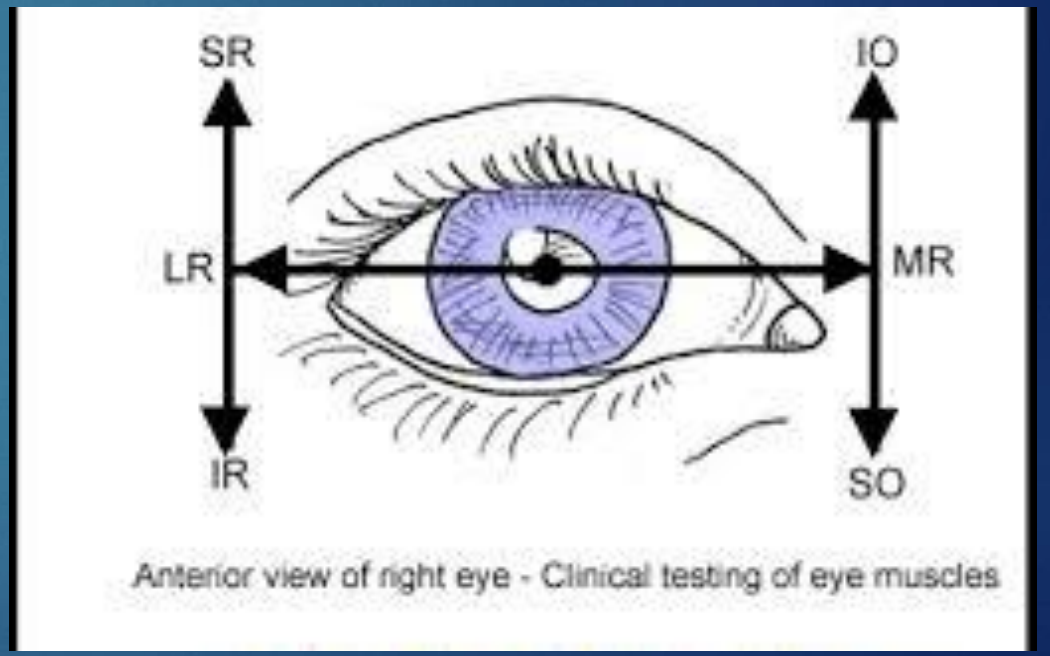
Pupillary light reflex examination



➢ Cranial nerves examination

Oculomotor N. (CN III) & Trochlear N. (CN IV) & Abducens N. (CN VI)





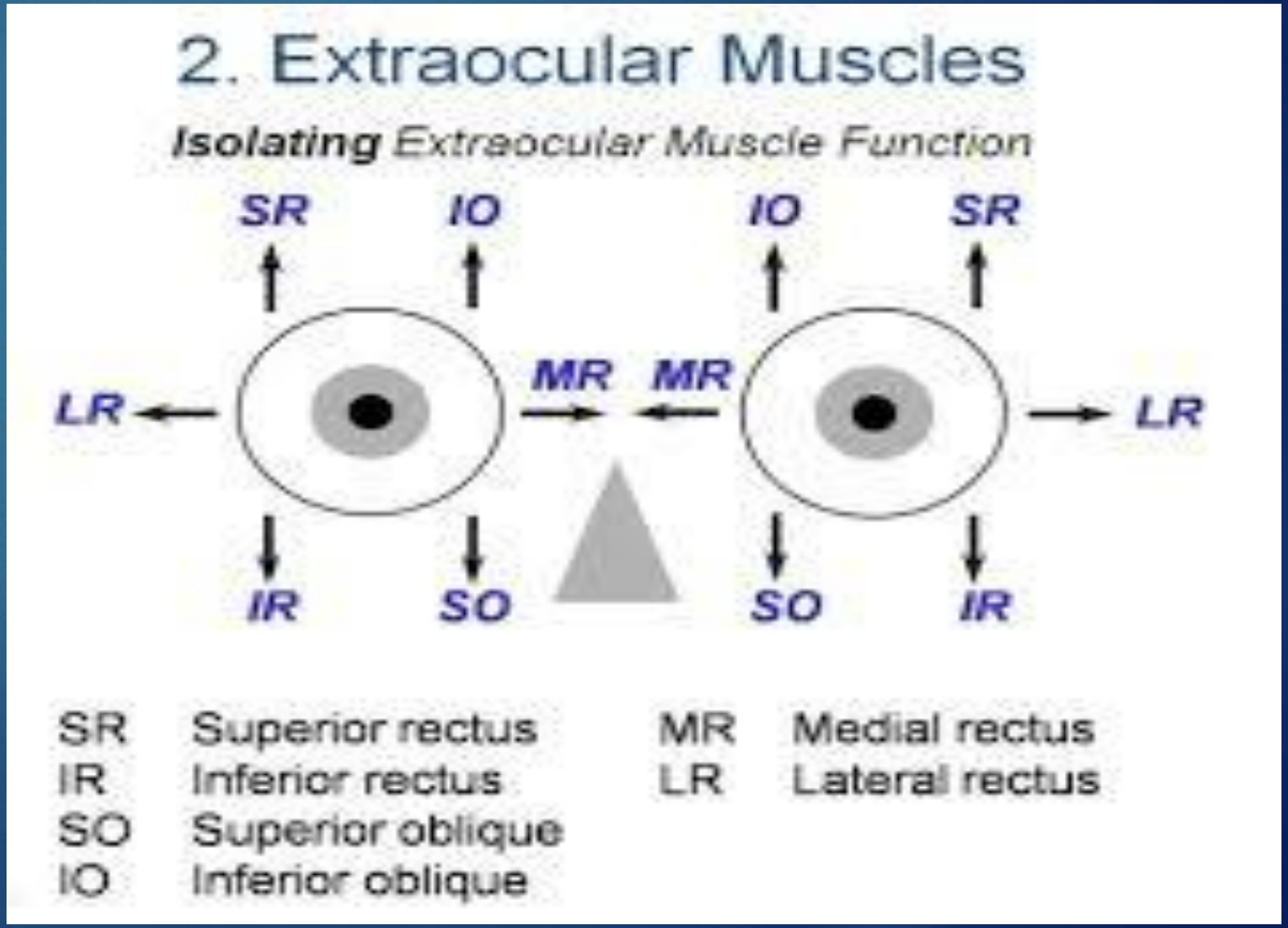
➢ Cranial nerves examination

Oculomotor N. (CN III) & Trochlear N. (CN IV) & Abducens N. (CN VI)

CN III >> SR, IR, IO, MR

CN IV >> SO

CN VI >> LR



➢ Cranial nerves examination

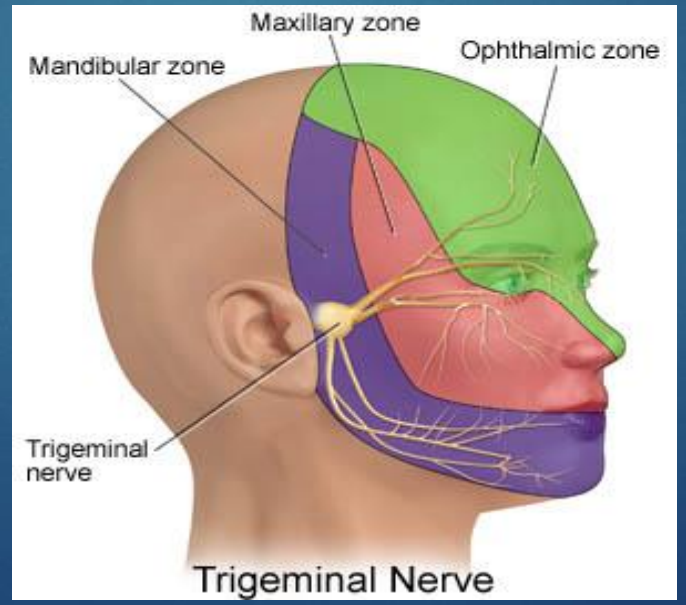
Trigeminal Nerve (CN V)

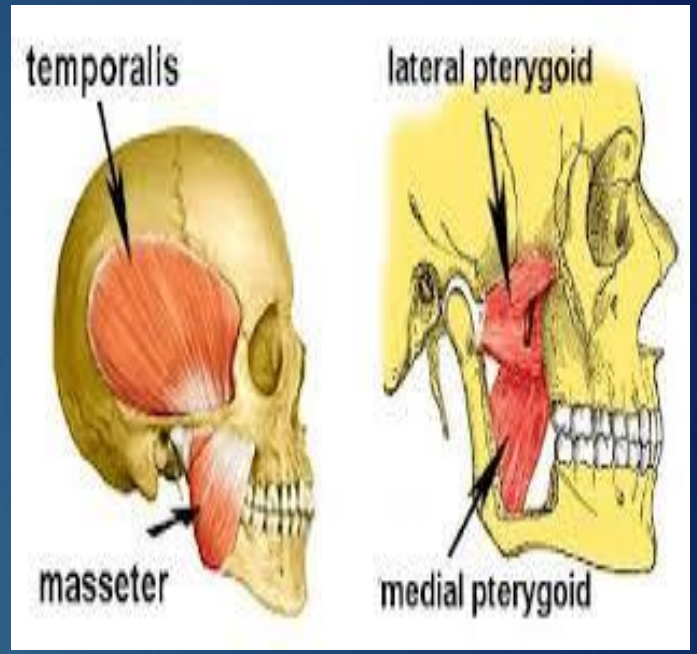
Sensory

There are three divisions:
- ophthalmic (V1)
- maxillary (V2)
- mandibular (V3).

Motor

For the muscles of mastication.





➢ Cranial nerves examination

Trigeminal Nerve (CN V)…..motor

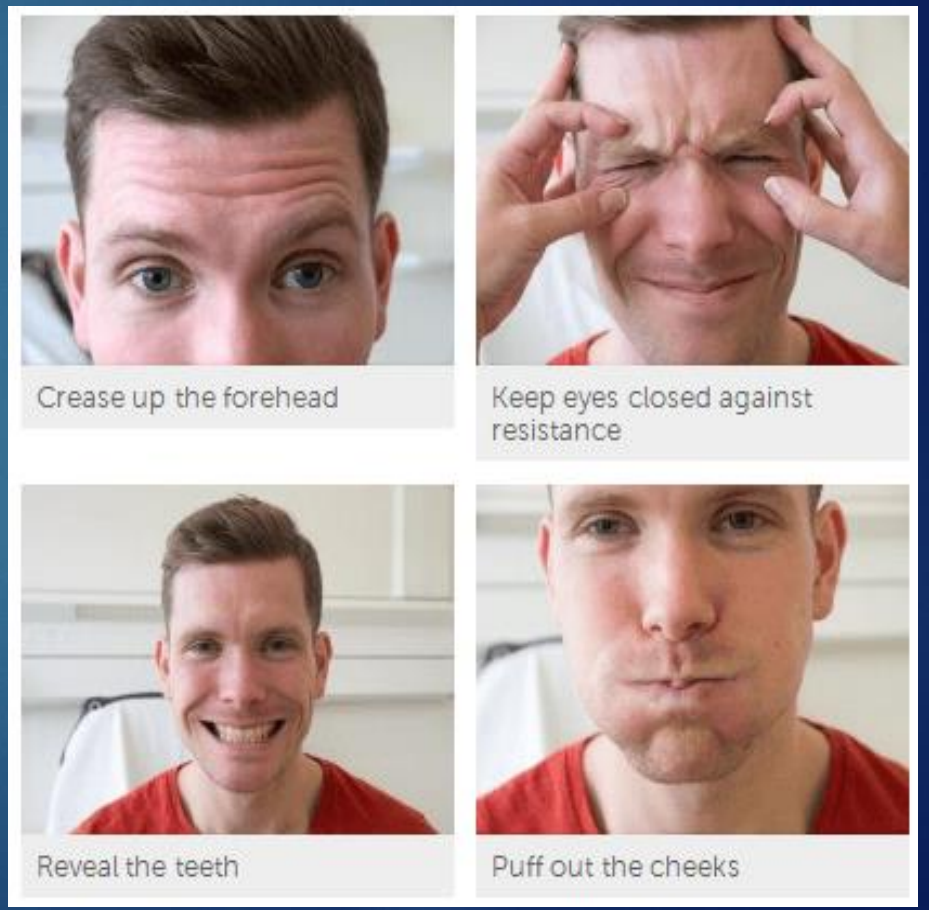
➢ Cranial nerves examination

Trigeminal Nerve (CN V)…..sensory

➢ Cranial nerves examination

Facial Nerve (CN VII)

1. Muscles of facial expression
2. Stapedius muscle : dampens loud noises
3. Sensory supply to the external auditory meatus
4. Taste anterior 2/3 of the tongue
5. Parasympathetic supply to the lacrimal glands.



➢ Cranial nerves examination

Vestibulo-cochlear Nerve (CN VIII) …..Auditory

- Test one ear at a time. Block the opposite ear
- Hold your watch by the patient's ear. Discover how far away from
- Rubbing your fingers together. Increase in volume until your patient hears.
- *If the hearing in one ear is reduced,* perform Rinne's and Weber's tests.

➢ Cranial nerves examination

Vestibulo-cochlear Nerve (CN VIII) …..Auditory

1. Determine by history and crude acuity testing which ear has the hearing problem.

2. ***Webber test :***

- conductive hearing deficit >> the Webber will lateralize to the affected ear.
- sensorineural deficit >> the Webber will lateralize to the normal ear.

3. ***Rinne test :***

- conductive hearing deficit >> BC > AC in the affected ear
- sensorineural hearing deficit >> AC > BC in the affected ear.

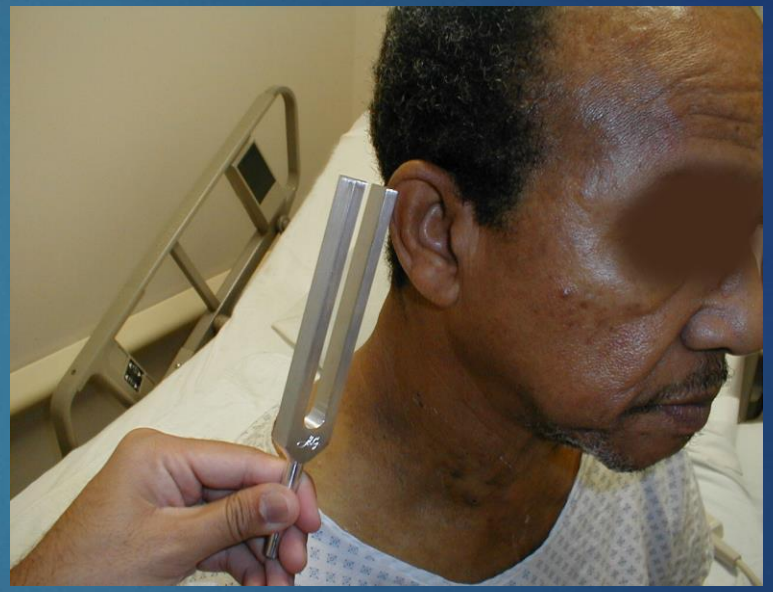
➢ Cranial nerves examination

Vestibulo-cochlear Nerve (CN VIII) …..Weber's test

Hold the 256 or 512 Hz tuning fork on the vertex of the head.
Ask in which ear the sound is louder: the good ear or the deaf ear.

➢ Cranial nerves examination

Vestibulo-cochlear Nerve (CN VIII) …..Rinne's test



Hold a 256 or 512 Hz tuning fork on the mastoid process (BC) then in the front of the ear (AC). Ask the patient in which position the sound is louder.

➢ Cranial nerves examination

Glossopharyngeal Nerve (CN IX) & Vagus Nerve (CN X)

- *CN IX*

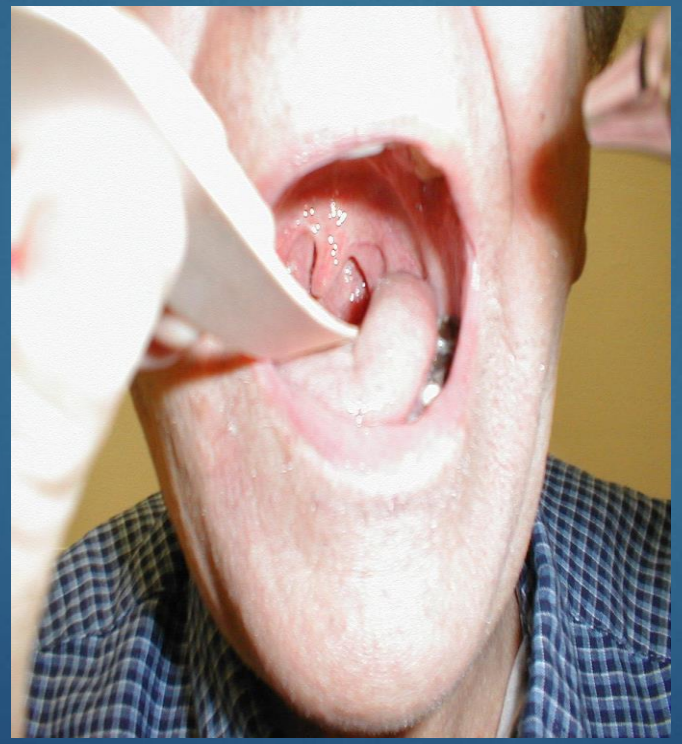
1. *Sensory*: posterior one-third of tongue, pharynx, middle ear.
2. *Motor*: stylopharyngeus.
3. *Autonomic*: to salivary glands (parotid).

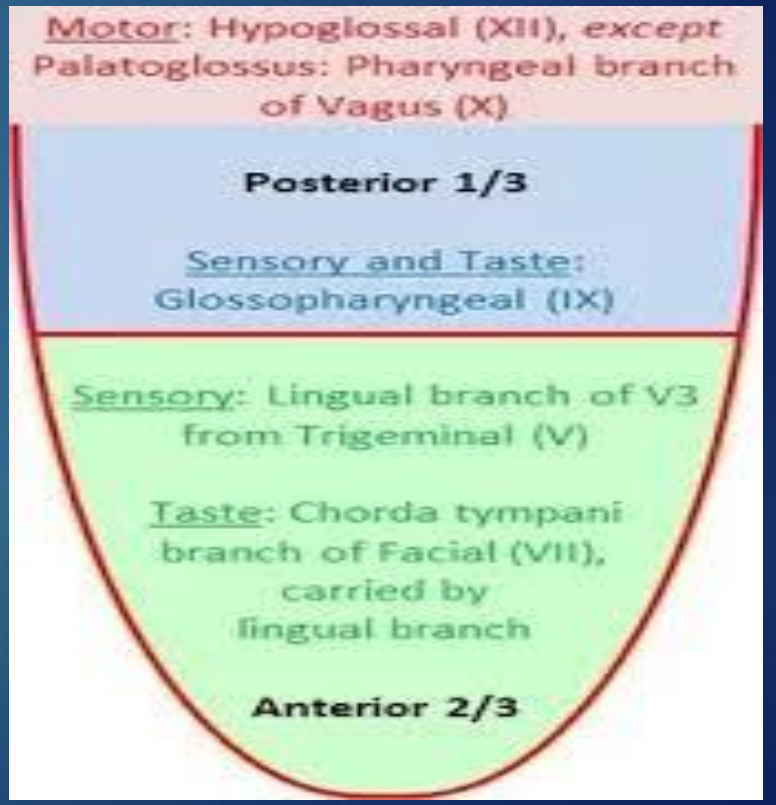
- *CN X*

1. *Sensory*: tympanic membrane, external auditory canal and external ear.
2. *Motor*: muscles of palate, pharynx, larynx (via recurrent laryngeal).
3. *Autonomic*: afferents from carotid baroreceptors, parasympathetic supply to and from thorax and abdomen.

➢ Cranial nerves examination

Glossopharyngeal Nerve (CN IX) & Vagus Nerve (CN X)





➢ Cranial nerves examination

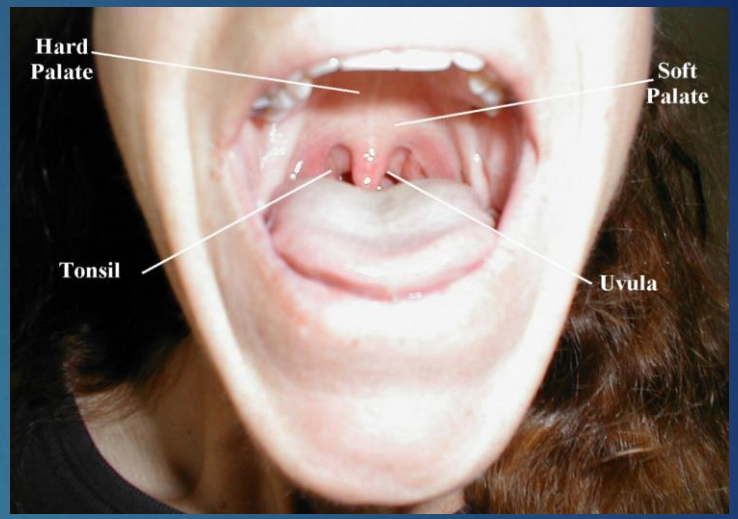
Accessory Nerve (CN XI)

1. *Sensory*: none.
2. *Motor*: trapezius muscle and sternocleidomastoid muscle.

➢ Cranial nerves examination

Hypoglossal Nerve (CN XII)

1. *Sensory*: none.
2. *Motor*: intrinsic muscles of the tongue.



➢ Motor examination

Inspection

1. Symmetry
2. Tremor
3. Wasting
4. Scars

➢ Motor examination

Strength grading

Grade 0	No movement is observed
Grade 1	Only a trace or flicker of movement is seen or felt in the muscle, or fasciculation is observed
Grade 2	Movement is possible only if the resistance of gravity is removed
Grade 3	Movement against gravity is possible but not against resistance of the examiner
Grade 4	Muscle strength is reduced but muscle contraction can move joint against gravity and resistance
Grade 5	Muscle contracts normally against full resistance

ACTION	INSTRUCTION	ANATOMY (1 Muscle; 2 Nerve Root; 3 Nerve)
Shoulder abduction	"Lift your arms into a 'chicken position'" Test each side together, push arms down at elbow. "Stop me from pushing your arms down"	1: Deltoid 2: C5 3: Axillary Nerve
Arm flexion	"Put your arms in front of you in a 'boxer position' fist facing in" Place your hand around wrist and steadily pull out. "Stop me from pulling your arm out"	1: Biceps 2: C6 3: Musculocutaneous Nerve
Arm extension	Stay in a 'boxer position'. Place your hand around wrist and push arm in. "Push against my hand"	1: Triceps 2: C7 3: Radial Nerve
Wrist Flexion	"Hold your arms straight out, make a fist." Hold the forearm and your hand under their fist. "Push my hand down towards the ground"	1: Flexor Carpi Ulnaris 2: C8

Wrist Extension	"Now cock your wrists back." Hold the forearm and use your fist to apply force to their hand. "Stop me from pushing your wrist down"	1: Carpi Ulnaris 2: C7 3: Radial Nerve
Finger Abduction	"Spread your fingers" Use your index and small finger to squeeze their fingers closed. "Stop me from pushing your fingers together"	1: Interossei muscles 2: T1 3: Ulnar nerve
Thumb Abduction	"Turn hand palm up, bring thumb towards the ceiling" [to 90 degrees] Use your thumb to push their thumb into their palm. "Stop me from pushing your thumb down"	1: Abductor pollicus brevis 2: T1 3: Median nerve

Hip Flexion	"Keeping your knee straight, lift your leg off the bed" Hold their thigh with your hand. "Stop me from pushing your leg down"	1: Psoas 2: L2 3: Femoral
Hip Extension	"Push your leg down" Hold underneath their thigh. "Push your leg into the bed"	1: Gluteus Maximus 2: L5/S1 3: Inf. gluteal nerve
Knee Flexion	"Bend your leg at the knee and rest your foot flat on the bed." Hold their leg around the back of the calf. "Don't let me straighten your leg/Pull your heel in towards your bottom"	1: Hamstrings 2: L5 3: Sciatic
Knee Extension	Holding their leg on the shin. "Try to straighten you leg, push against my hand away with your leg"	1: Quads 2: L3/4 3: Femoral
Dorsiflexion	Place leg straight again: point toes toward face. Place your hand on the dorsum of foot. "Stop me from pulling your foot down"	1: Tibialis anterior (and others) 2: L4/5 3: Deep Peroneal
Plantar flexion	Place your hand on the sole of the foot. "Push down against my hand"	1: Gastronemeus (and others) 2: S1/2 3: Tibial nerve

➢ Sensory examination

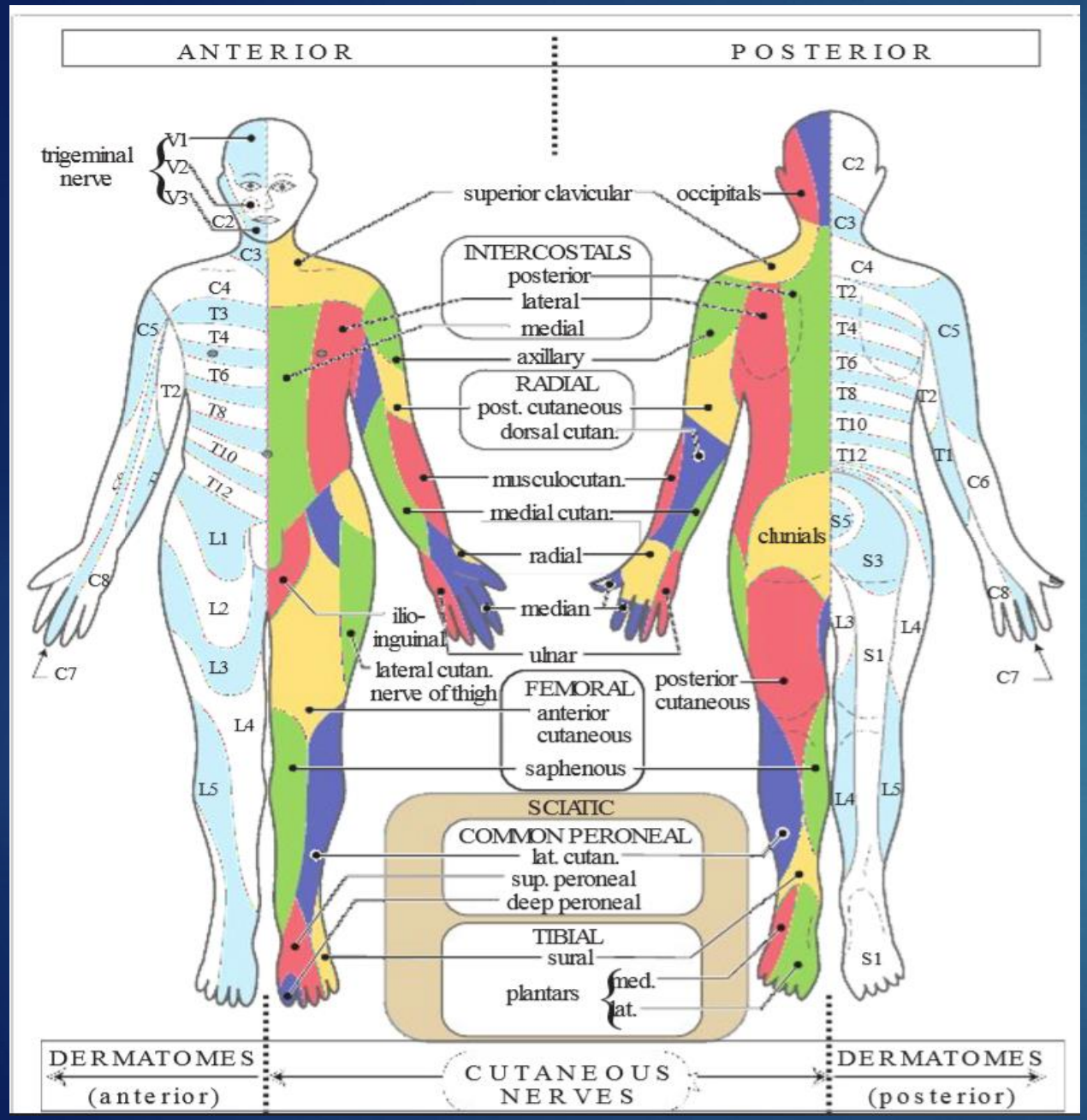
Dermatomes…..upper limbs

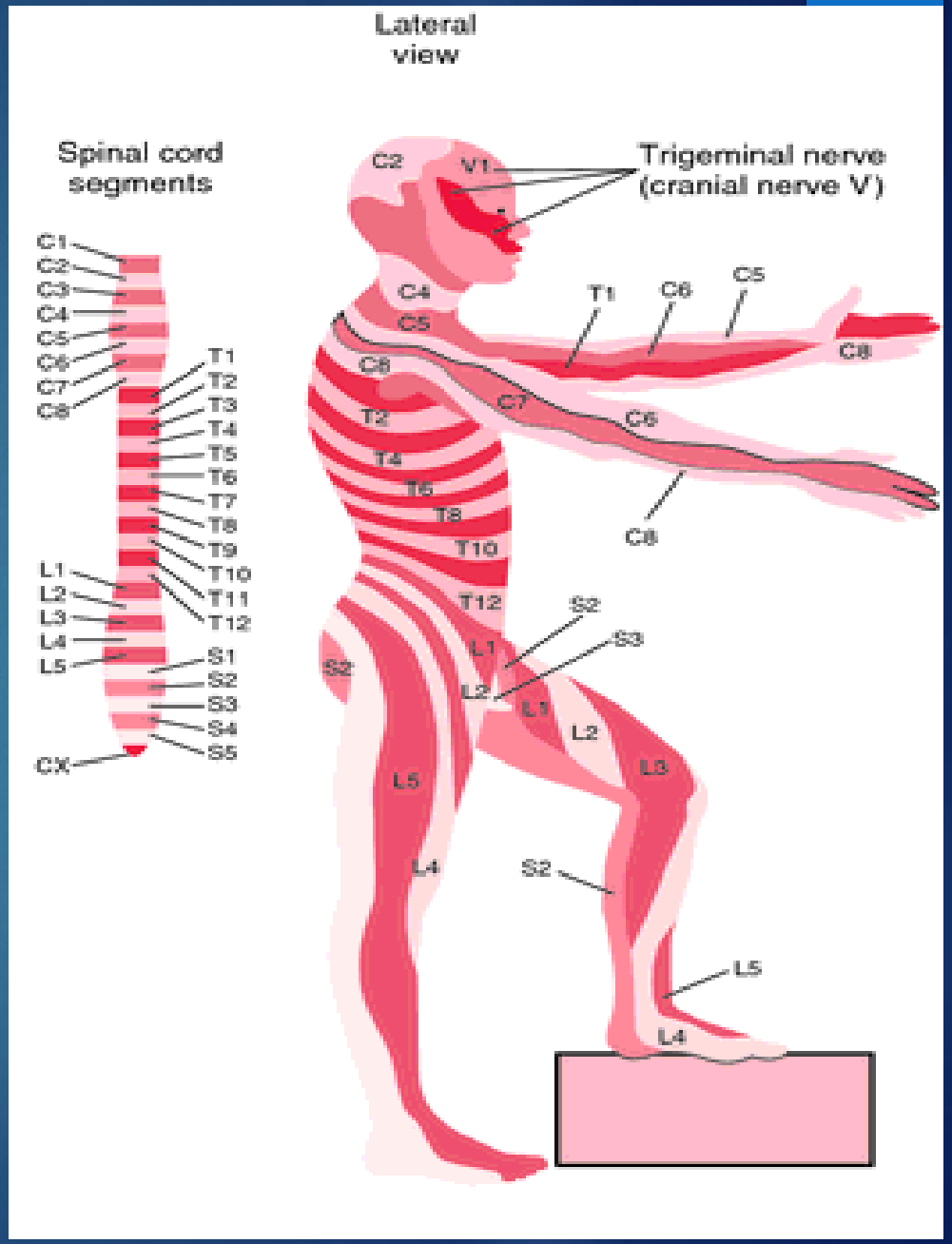
- Outer shoulder/regimental badge area: axillary nerve C6
- Outer forearm: lateral cutaneous C5
- Thumb: median nerve C6
- Middle finger: median nerve C7
- Little finger: ulnar nerve C8
- Back of the hand – radial side: radialnerve C5-T1
- Medial antecubital fossa: medial cutaneous T1

➢ Sensory examination

Dermatomes…..lower limbs

- Inner thigh: upper L1, mid L2
- Medial side of knee: L3
- Medial malleolus: L4
- Big toe: L5
- Heel: S1
- Popliteal fossa: S2
- Anal sensation/tone needs to be tested if concern about spinal cord lesions: S3 and S4


ANTERIOR
POSTERIOR
trigeminal nerve
V1
V2
V3
C2
C3
C4
T3
C5
T4
T6
T2
T8
T10
T12
L1
C8
L2
L3
C7
L4
L5
superior clavicular
occipitals
INTERCOSTALS
posterior
lateral
medial
axillary
RADIAL
post. cutaneous
dorsal cutan.
musculocutan.
medial cutan.
radial
median
ulnar
ilio-inguinal
lateral cutan. nerve of thigh
FEMORAL
anterior cutaneous
saphenous
posterior cutaneous
SCIATIC
COMMON PERONEAL
lat. cutan.
sup. peroneal
deep peroneal
TIBIAL
sural
plantars
med.
lat.
clunials
S5
S3
S1
DERMATOMES (anterior)
CUTANEOUS NERVES
DERMATOMES (posterior)

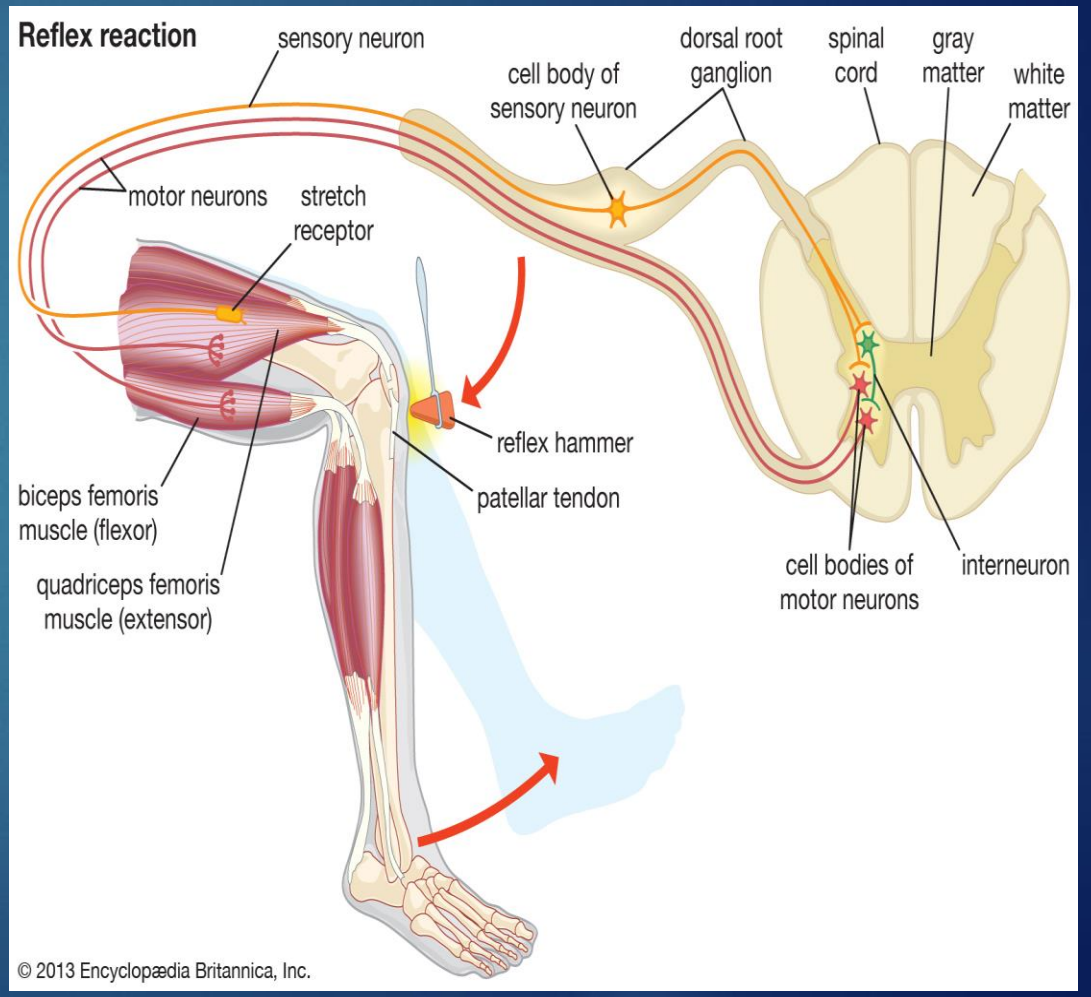

Lateral view
Spinal cord segments
C1
C2
C3
C4
C5
C6
C7
C8
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
L1
L2
L3
L4
L5
S1
S2
S3
S4
S5
CX
Trigeminal nerve (cranial nerve V)
V1

Reflexes

- Brisk or diminished deep tendon reflexes often give clues to the presence of disease of the upper or lower motor neuron.

- UMN lesion >>
  - hyper-reflexia
  - Increased tone
  - Spasticity

- LMN lesion >>
  - Hypo-reflexia
  - Decreased tone
  - Flacidity



➢ Reflexes

Biceps ….. (*C5*/C6)

Musculocutaneous n.

Flexion of the forearm

➢ Reflexes

Brachiradialis ….. (C5 / C6)

Radial N.

Supination of the forearm

➢ Reflexes

Triceps ….. (C6 / C7)

Radial N.

Extension of the forearm

➢ Reflexes

Knee jerk ….. (L3 / L4)

Quadriceps Femoris M

Femoral N.

Extension of the leg

➢ Reflexes

Achilis reflex ….. (S1)

Gastrocnemius & soleus

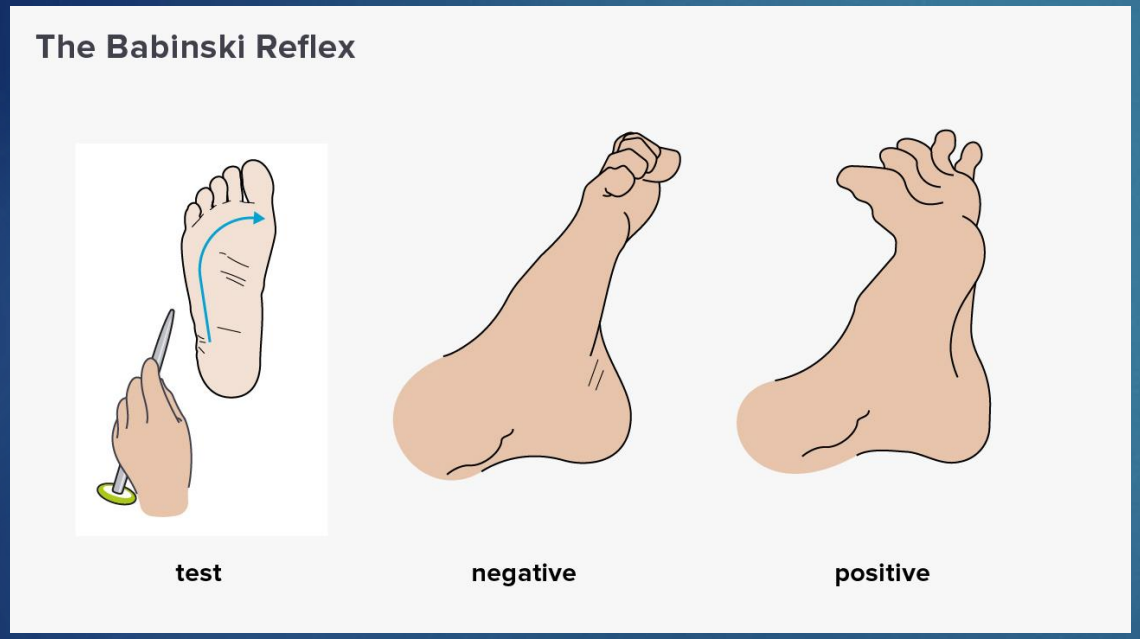
Planter-flexion of the foot

➢ Reflexes

GRADE	ASSESSMENT ON PHYSICAL EXAMINATION
0	Reflexes absent
1	Reflexes diminished but present
2	Normal reflexes
3	Reflexes increased
4	Clonus present

➢ Reflexes

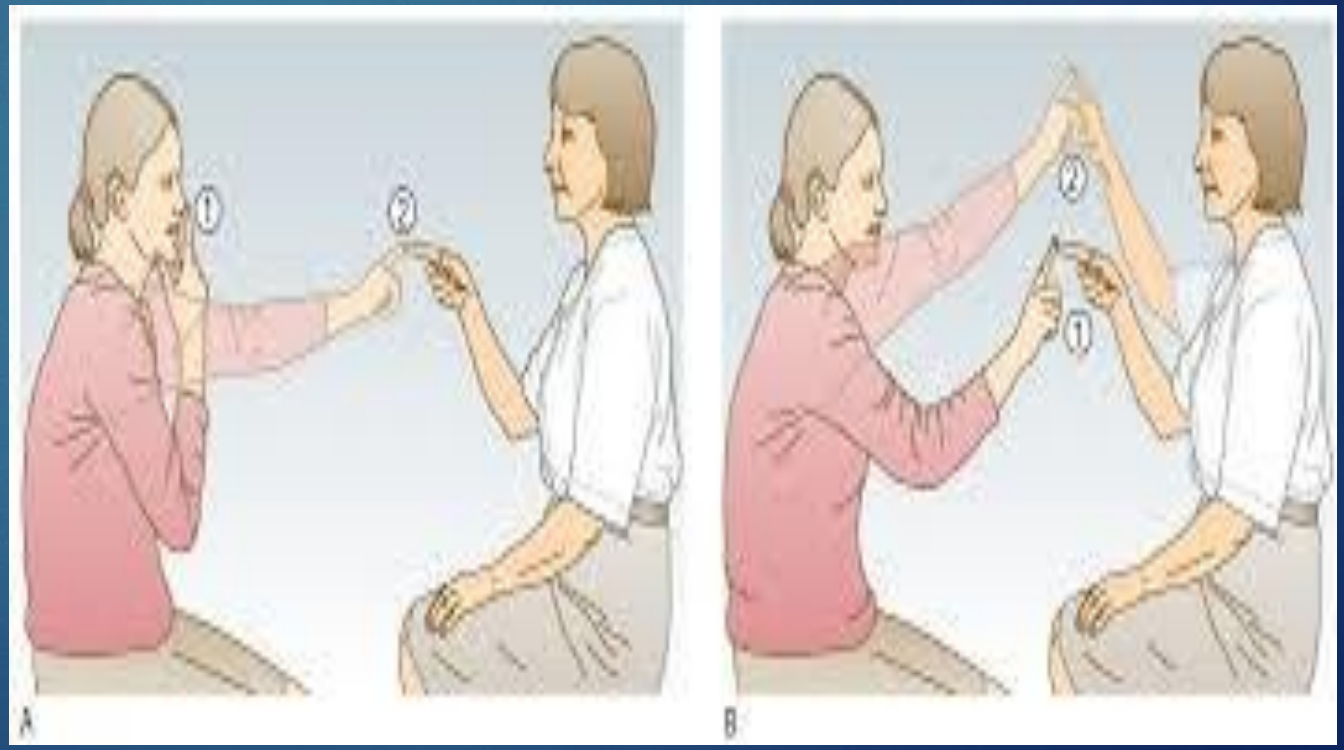
Babinski response



➢ Coordination

Cerebellar signs …..

1. finger-nose test



➢ Coordination

Cerebellar signs …..

2. Rapid alternating movement

➢ Coordination

Cerebellar signs …..

3. Heel to shin test

Good luck