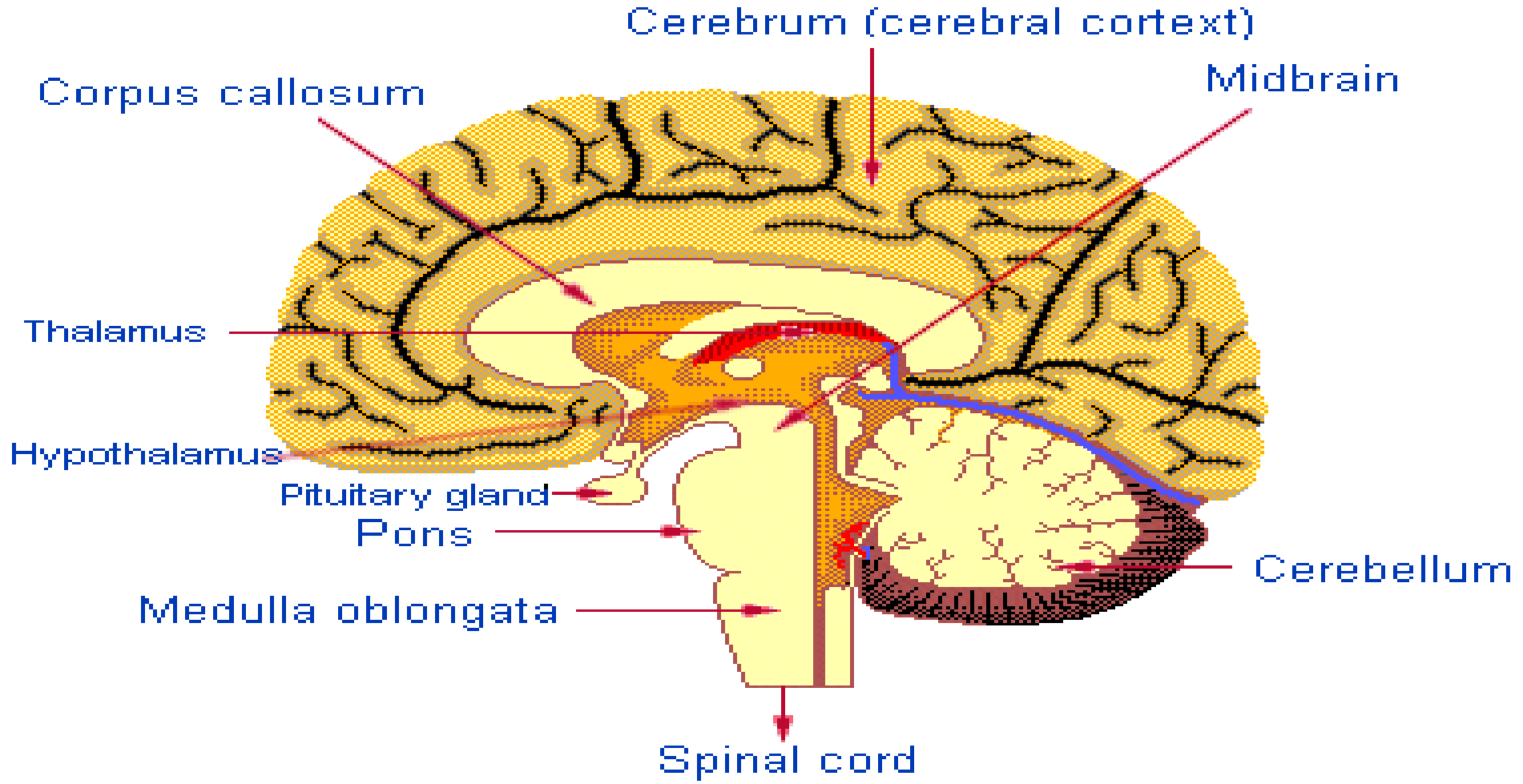
ASSESSMENT OF THE NERVOUS SYSTEM

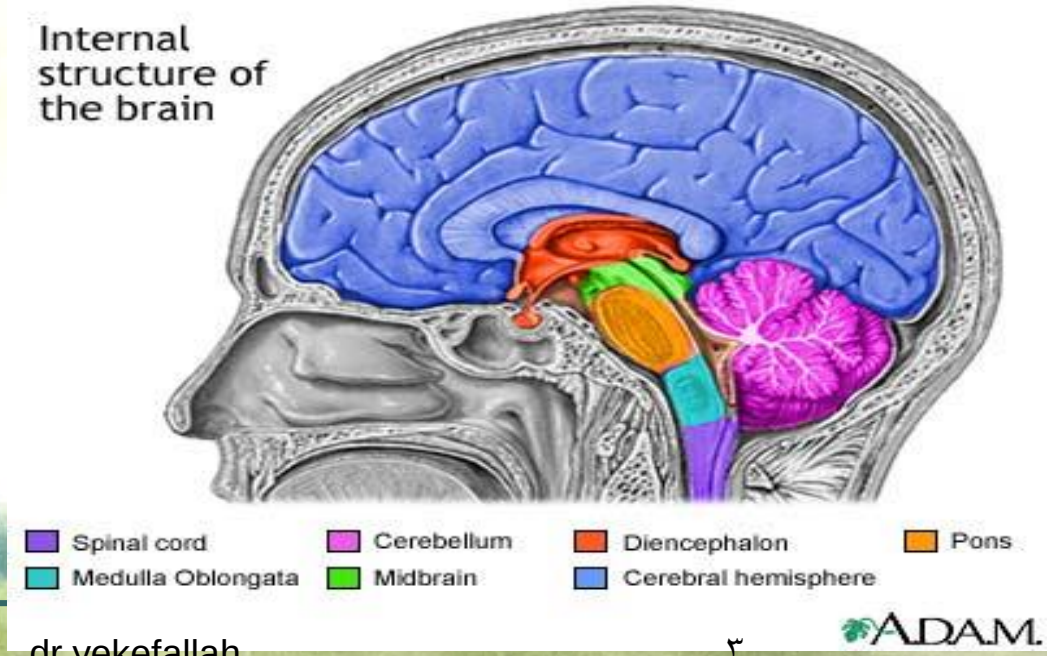


OBJECTIVES

- *After completion of this session the students should be able :*
- To learn a basic Nervous System Examination
- To differentiate between “normal” and “abnormal”
- To apply findings to common clinical presentations
- To document findings in a structured, systematic way

Outlines

- Introduction
- Review of anatomy and physiology
- Nursing assessment



Introduction

- The nervous system consists of the central nervous system (CNS), the peripheral nervous system, and the autonomic nervous system. Together these three components integrate all physical, emotional, and intellectual activities. The CNS includes the brain and spinal cord. These two structures collect and interpret voluntary and involuntary sensory and motor signals. A brief overview of the anatomy and physiology of the CNS is provided

Introduction

A complete neurological assessment consists of five steps:

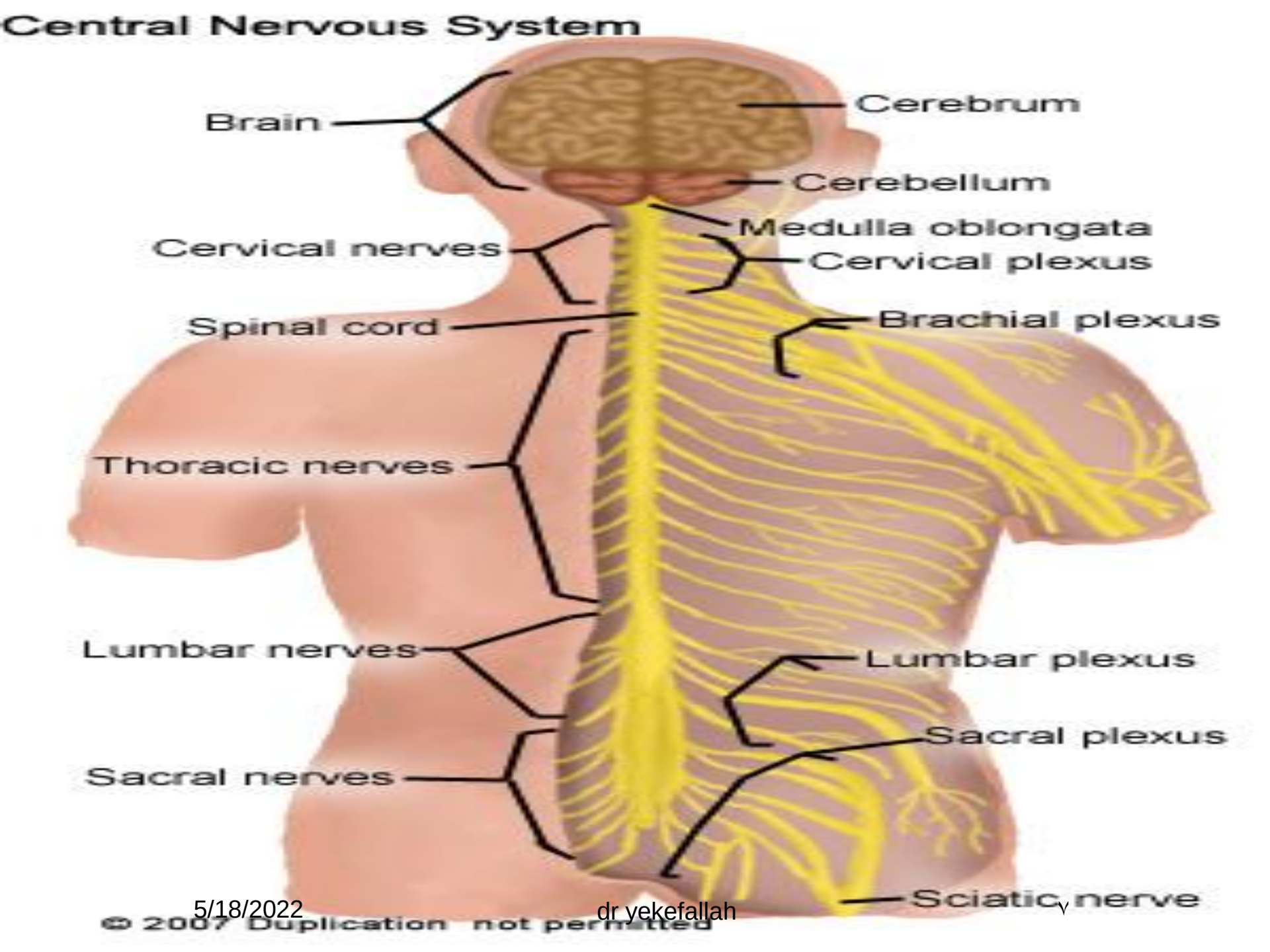
- o Mental status exam
- o Cranial nerve assessment
- o Reflex testing
- o Motor system assessment
- o Sensory system assessment .

- A simple means of gathering a great deal of information about the patient's neurological system is to observe the patient walking, talking, seeing, and hearing. Watching the patient enter the room is also important in giving the examiner information.

Cont.

As the patient enters the room, check the following :

- Posture and motor behavior .
- Dress, grooming, and personal hygiene .
- Facial expression .
- Speech manner, mood, and relation to persons and things around him


Central Nervous System
Brain
Cerebrum
Cerebellum
Medulla oblongata
Cervical nerves
Cervical plexus
Spinal cord
Brachial plexus
Thoracic nerves
Lumbar nerves
Lumbar plexus
Sacral plexus
Sacral nerves
Sciatic nerve
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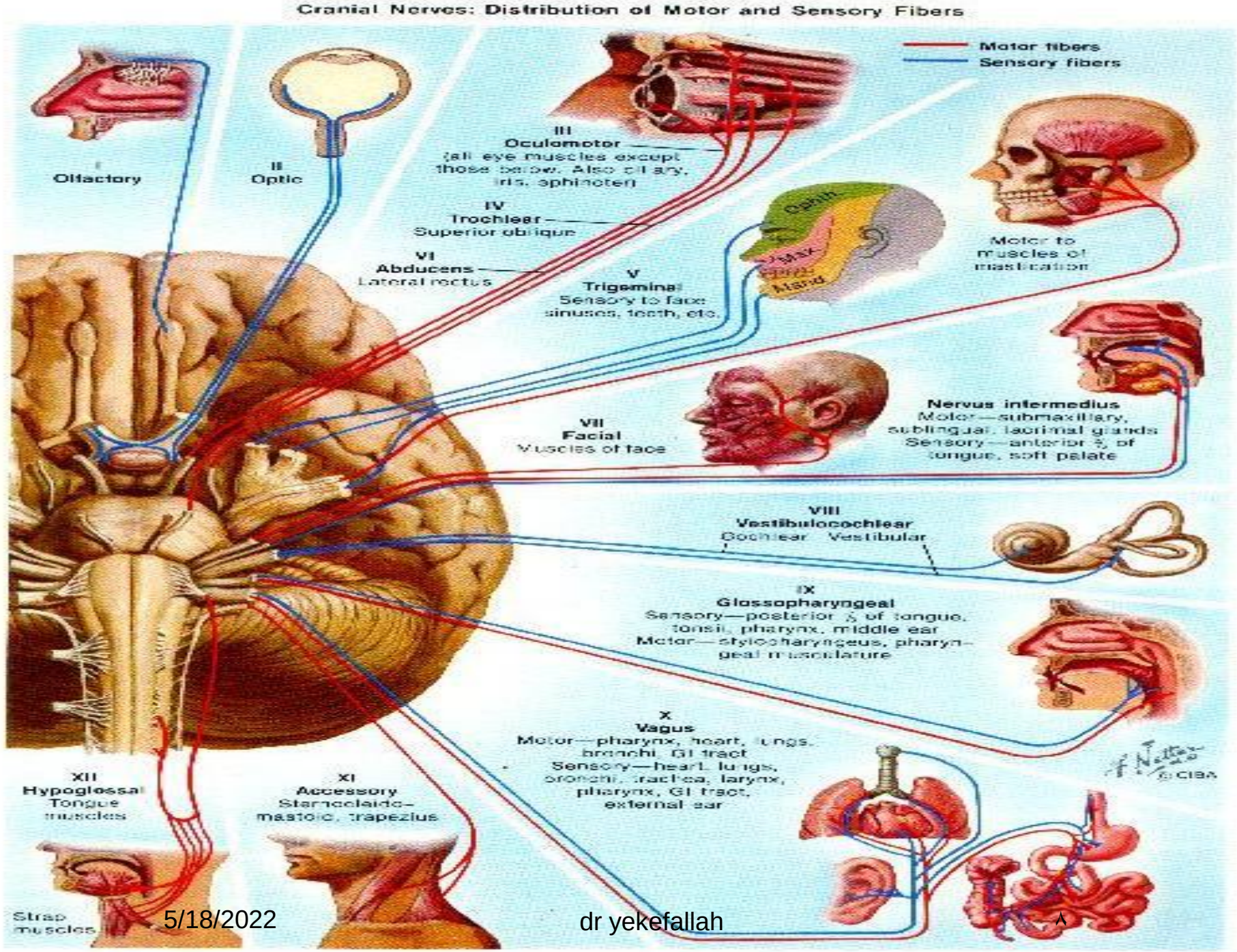
Cranial Nerves: Distribution of Motor and Sensory Fibers
Motor fibers
Sensory fibers
I
Olfactory
II
Optic
III
Oculomotor
(all eye muscles except those below. Also ciliary, iris, sphincter)
IV
Trochlear
Superior obliquus
VI
Abducens
Lateral rectus
V
Trigeminal
Sensory to face: sinuses, teeth, etc.
Ophth.
Max.
Mand.
Motor to muscles of mastication
VII
Facial
Muscles of face
Nervus intermedius
Motor—submaxillary, sublingual, lacrimal glands
Sensory—anterior ⅔ of tongue, soft palate
VIII
Vestibulocochlear
Cochlear
Vestibular
IX
Glossopharyngeal
Sensory—posterior ⅓ of tongue, tonsil, pharynx, middle ear
Motor—stylopharyngeus, pharyngeal musculature
X
Vagus
Motor—pharynx, heart, lungs, bronchi, GI tract
Sensory—heart, lungs, bronchi, trachea, larynx, pharynx, GI tract, external ear
XII
Hypoglossal
Tongue muscles
XI
Accessory
Sternocleido-mastoid, trapezius
Strap muscles
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Motor

Sensory

Temporalis (clench teeth)

Masseter (move jaw side-side)

Ophthalmic (V1)

Maxillary (V2)

Mandibular (V3)

Equipments

- Safety pin
- Cotton
- Tunning fork
- Reflex hummer
- Flashlight
- Ophthalmoscope
- Vision screeners
- Gloves
- Coffee

A-Mental Status

Level of consciousness .

The single most valuable indicator of neurological function is the individual's level of consciousness.

- *You can legally describe the patient's condition in the nursing notes by saying, "appears to be" alert or lethargic or so forth.*
- ***Alert.*** *The patient is awake and verbally and motorally responsive .*
- ***Lethargic****. The patient is sleepy or drowsy and will awaken and respond appropriately to command .*
- ***Stupor.*** *The patient becomes unconscious spontaneously and is very hard to awaken .*
- ***Semi coma****. The patient is not awake but will respond purposefully to deep pain .*
- ***Coma.*** *The patient is completely unresponsive .*

The Glasgow coma scale (GCS)

- **ASSESS GRADES OF BEST MOTOR RESPONSE** (Max score 6)
- **6** Carrying out request ('obeying command')
- **5** Localizing response to pain.
- **4** Withdrawal to pain - pulls limb away from painful stimulus.
- **3** Flexor response to pain - pressure on nail bed causes abnormal flexion of limbs
- **2** Extensor posturing to pain - stimulus causes limb extension
- **1** No response to pain.

Cont

- **ASSESS GRADES OF BEST VERBAL RESPONSE** (Max score 5)
- **5** Oriented - patient knows who & where they are, and why, and the year, season & month.
- **4** Confused conversation - patient responds in conversational manner, with some disorientation and confusion.
- **3** Inappropriate speech - random or exclamatory speech, no conversational exchange.
- **2** Incomprehensible speech - no words uttered, only moaning.
- **1** No verbal response.
-

Conti

- **EYE OPENING** (Max score 4)
- **4** Spontaneous eye opening.
- **3** Eye opening in response to speech - that is, any speech or shout.
- **2** Eye opening in response to pain.
- **1** No eye opening.
- **TOTAL SCORE ..... / 15 RECORD YOUR FINDINGS**
  You may record you findings on a specific ‘CNS’ chart. Otherwise record in the following fashion:

Calculations in basic mathematics

- *Ask the patient to do some simple arithmetic problems without using paper and pencil. For example, ask him to add 7s or to subtract 3s backwards.*
- *It should take the patient of average intelligence about one minute to complete the calculations with few errors.*

Affect/mood

- *.During the physical part of the examination, note the patient's mood and emotional expressions which you can observe by his verbal and nonverbal behavior.*
- *Notice if he has mood swings or behaves as though he is anxious or depressed.*
- *Notice whether or not the patient's feelings are appropriate for the situation.*
- *Disturbances in mood, affect, and feelings may be indicated by a patient who exhibits unresponsiveness, hopelessness, agitation, euphoria, irritability, or wide mood swings.*

Memory (recent and remote)

- Ask the patient his social security number, the city he is in, the building number, the state, and the names of two or three past kings of Saudi Arabia
- **Orientation**

  If the patient oriented by :place ,person and time or not

(Knowledge (normal intellect)

- *Ask the patient to name five large cities, major rivers, etc. Another way to test this area is to ask the patient to tell you the meaning of proverb, or metaphor. For example, explain:*
- *Too many cooks spoil the soup .*
- *A penny saved is a penny earned .*
- *A stitch in time saves nine*

b .Cerebellar Functions

- These include tests for balance and coordination.
- The cerebellum controls the skeletal muscles and coordinates voluntary muscular movement.

Cranial Nerves .

- .Evaluating the cranial nerves is an important part of the neurological examination.
- Taste and smell are usually not checked unless a problem is suspected in those areas.

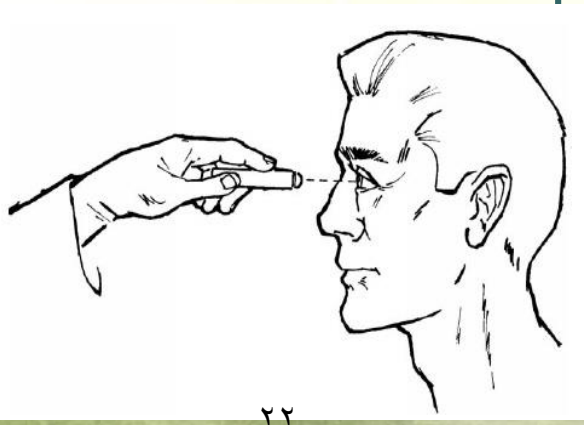
Cranial Nerve I, The Olfactory Nerve

- The olfactory nerve is not commonly tested during a screening physical exam but can be performed if damage secondary to trauma or intracranial mass is suspected.
- Each nostril should first be evaluated for potency by compressing one nostril and having the patient breath through the opposite.
- Each nostril should then be tested separately with a volatile, non-irritating substance such as cloves, coffee or vanilla. The patient should close his eyes, occlude one nostril and identify the substance placed under the open nostril .

Pupils: Reaction to Light

To examine cranial nerves II , III and mid-brain connections

- Have the patient look at a distant object
- Look at size, shape and symmetry of **pupils** .
- Shine a **light** into each eye and observe constriction of pupil .
- **Flash a light** **on one pupil** and watch it contract briskly .
- Flash the light again and watch the opposite pupil constrict) **consensual reflex** .(
- Repeat this procedure on the **opposite eye .**
- **Normal :**
- **Pupil size is 3-5 mm in diameter .**
- **They react briskly to light .**
- **Both pupils constrict consensually .**



Vision: Visual Acuity

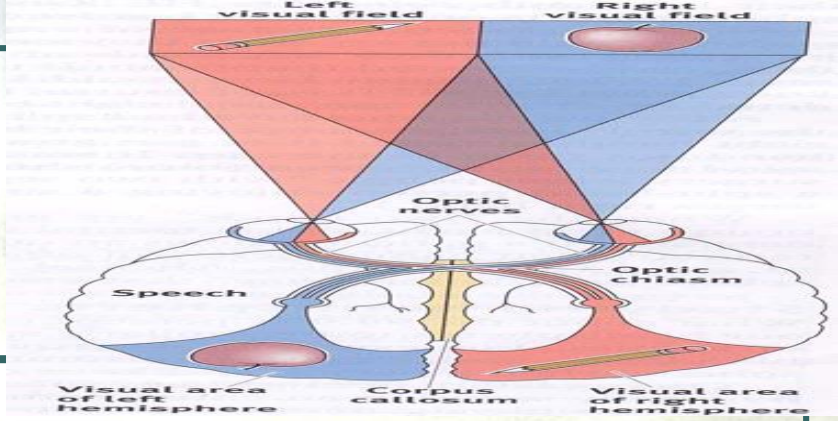
To examine cranial nerve II and ocular function

- Position yourself in front of the patient.
  Test the patient's visual acuity ,**each eye separately** covering one at a time .
- **Snellen's chart** is used by Ophthalmologists. Visual acuity is recorded as a fraction. The numerator indicates the distance (in feet) from the chart which the subject can read the line.

The denominator indicates the distance at which a normal eye can read the line. Normal vision is 20/20 .

- A **pocket screener** is used at the bedside. Hold the **pocket screener** at a distance of 12-14 inches. At this distance the letters are equivalent to those on Snellen's chart .

Vision field



- **By confrontation**
  - Position yourself in front of the patient .
  - The nose normally cuts off the medial field of vision .
  - Hence, compare the patient's right eye to your left eye and vice versa .
  - Instruct the patient to look straight at you and not to move their eyes .
  - Compare your field of vision with the subject's .
  - Bring your finger from the right field of vision until it is recognized .
  - Test one quadrant at a time .
  - Wiggle your fingers to see whether the patient can recognize the movement .
  - Some like to have the patient count fingers, i.e., 1, 2 or 5 .
  - Test all four quadrants in a similar fashion .
  - When abnormality is detected , would require automated methods of testing in the lab

Extraocular Muscles
To examine cranial nerves III, IV and VI

- Inspect the eyes .
- Look for symmetry of **eyelids** .
- Note the **alignment** of the eyes at rest .
- **Ductions :**Movement of one eye at a time
- **Versions :**Both eye movement
- Have the patient follow an object into each of the nine cardinal fields of **gaze** .
- Note that both eyes move together into each field .
- Eye movements should be smooth and without jerking .
- Eyelids should be gently lifted up by the examiner's fingers when testing downward gaze .
- Jerky, oscillatory eye movements) **nystagmus** (may be abnormal, especially if sustained or asymmetrical .

Trigeminal :CN V

- **Corneal reflex**: patient looks up and away.
  • Touch cotton wool to other side.
  • Look for blink in both eyes, ask if can sense it.
  • Repeat other side [tests V sensory, VII motor .[
- **Facial sensation**: sterile sharp item on forehead, cheek, jaw.
  • Repeat with dull object. Ask to report sharp or dull.
  • If abnormal, then temperature [heated/ water-cooled tuning fork], light touch [cotton .[
- **Motor**: pt opens mouth, clenches teeth (pterygoids).
  • Palpate temporal, masseter muscles as they clench.

Motor Function: Facial Muscles .To test cranial nerve VII

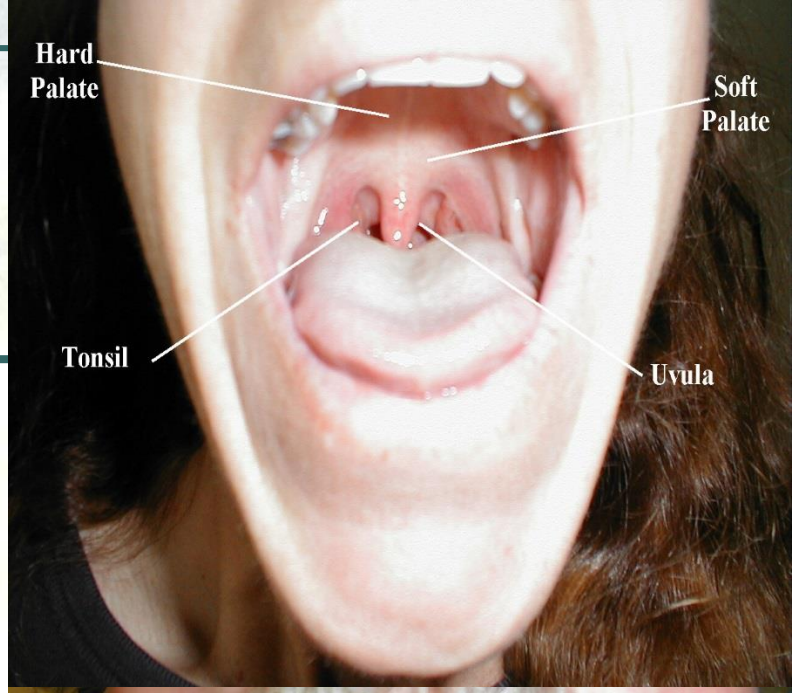
- Inspect the face. Look for **asymmetry at rest ,**during conversation and when testing various muscles .
- Ask the patient to wrinkle his forehead or raise his eyebrows, enabling you to test the upper face (frontalis .(
- Next, have the patient tightly close his eyes. Test the strength of the orbicularis oculi by gently trying to **pry open the patient's upper eyelid .**
- **Instruct him to puff out both cheeks .**Check tension by tapping his cheeks with your fingers .
- Have the patient smile broadly and show his teeth ,testing the lower face .
- **Normal:**
- No facial asymmetry.
  Wrinkling of the forehead and smiling are equal and symmetrical
- .

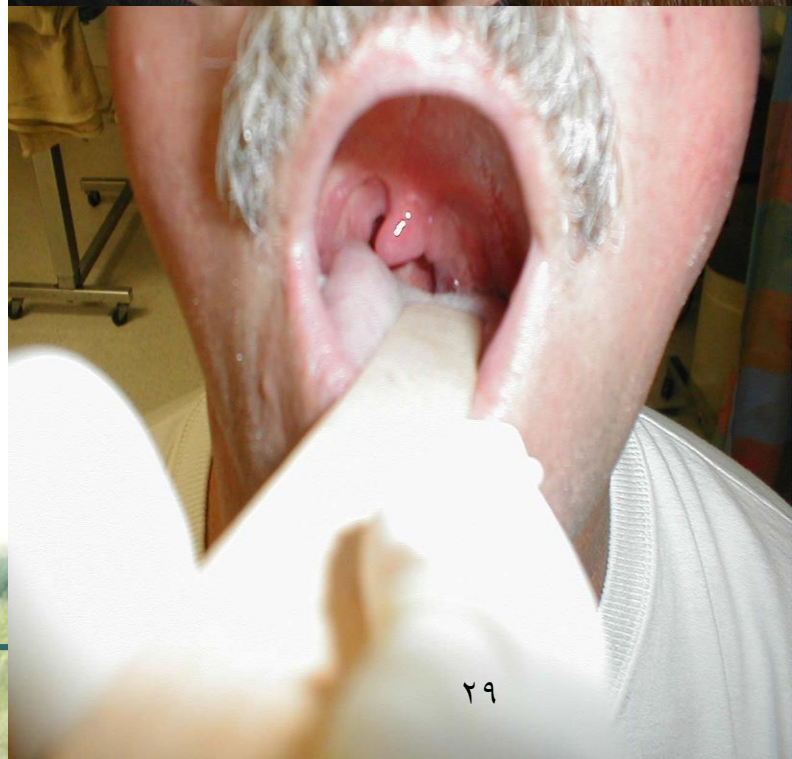
CNVIII: Hearing

- With eyes closed, the patient should be instructed to acknowledge hearing the gentle rubbing of the examiner's fingers approximately 3-4 inches away from his right and left ear .
- A watch ,which the examiner can hear at a specific distance from his ear, is placed next to the patient's ear. Ask him to note when the watch sound disappears. Note that the examiner has to have normal hearing to do this exam (in at least one ear)
- **Normal :**
- In a quiet room, the patient should be able to hear the physician's fingers rubbed lightly together 3-4 inches from his ear .

CN IX and X

- These tests will evaluate certain structures in the mouth.
- The nurse ask the patient to say "aah" and can detect abnormal positioning of certain structures such as the palatel-uvula.
- The examiner will also assess the sensation capabilities of the pharynx, by stimulating the area with a wooden tongue depressor, causing a gag reflex .



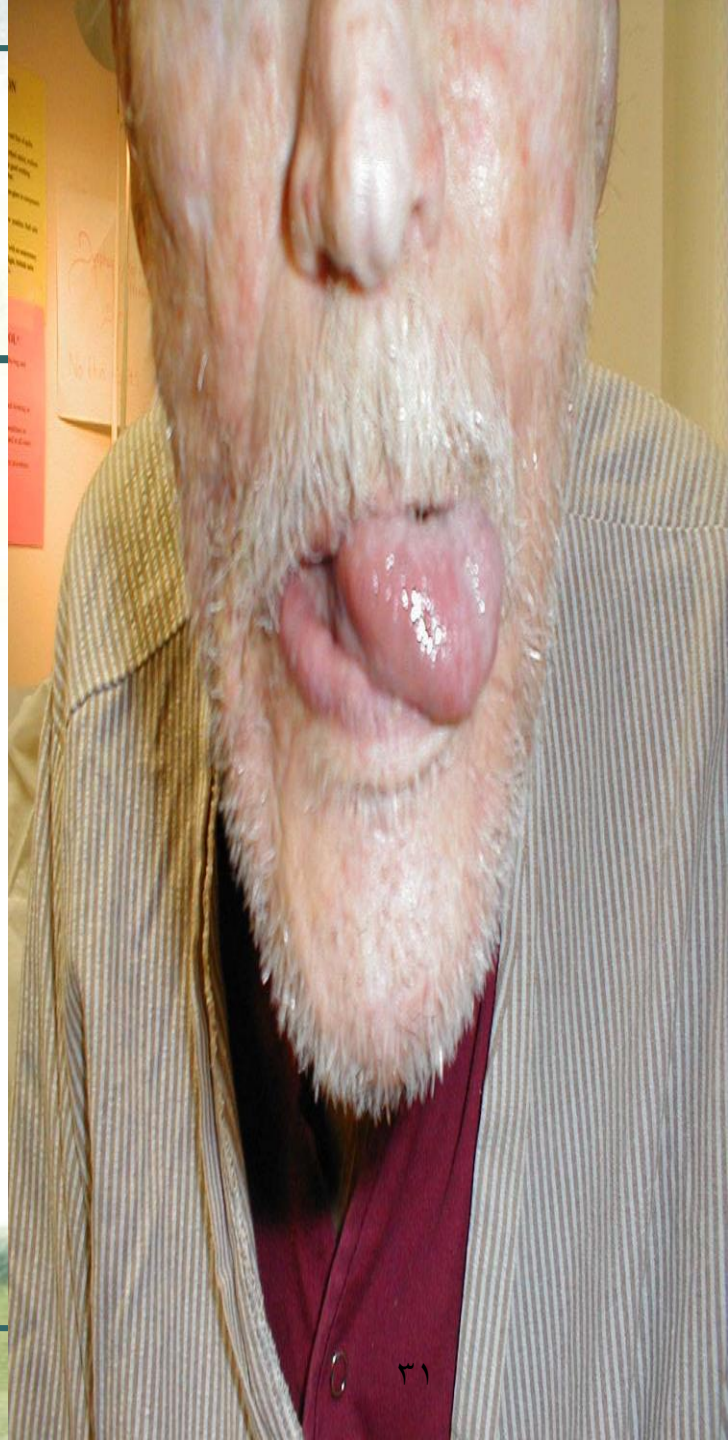


CNXI

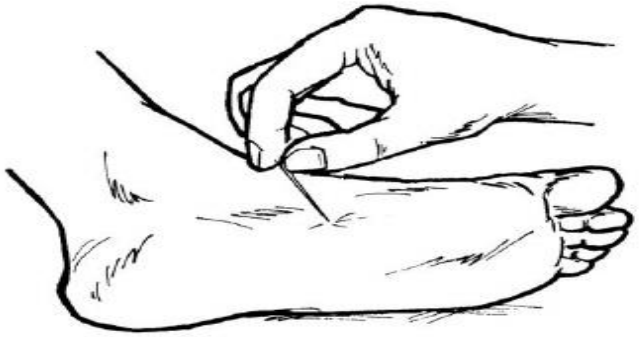
- Inspect Trapezius and Sternocleidomastoid muscles
  - Note muscle **size** (bulk).
  - Look for **asymmetry, atrophy and fasciculation**.
- Determine **muscle power** by gently trying to overpower contraction of each group of muscles.
  - Have patient shrug shoulder against resistance and evaluate strength of Trapezius muscle.
  - Have patient turn head to one side against resistance and evaluate strength and observe contracting sternomastoid muscle

CNXII

- This nerve tests the bulk and power of the tongue. The examiner looks for tongue protrusion and/or abnormal movements



CRANIAL NERVE		ASSESSMENT	FINDINGS
I	Olfactory	• Smell • Odor recognition	
II	Optic	• Visual acuity • Visual fields	
III	Oculomotor	• Raise eyelids • Extraocular eye movements	
IV	Trochlear	• Eye movement — inward and downward	
V	Trigeminal	• Chewing • Clenching teeth • Sensations on forehead	
VI	Abducens	• Lateral eye movements	
VII	Facial	• Facial expressions • Taste — anterior two-thirds of tongue • Secretion tears and saliva	
VIII	Acoustic	• Hearing • Equilibrium	
IX	Glossopharyngeal	• Swallowing • Gag reflex • Taste — posterior third of tongue • Salivary gland secretion	
X	Vagus	• Speech phonation • Swallowing • Sensation behind ear • Gag reflex	
XI	Spinal Accessory	• Turn head • Shrug shoulders	
XII	Hypoglossal	• Tongue movement	



Sensory Function

- **Testing for sensory function is the most difficult and the least reliable part of the examination. Perform two tests**.
- (١) *Test for pain* .Perform this test using pin pricks in the arms and legs. Ask the patient to say "sharp" or "dull" after each stimulus and to reply immediately.
- This is a test of the patient's response to superficial pain. Usually, a sterile needle with a sharp point and dull hub on the other end is the instrument used. In a nonpredictable pattern, touch the patient's skin with one or the other end of the needle.

Test for touch

Touch the skin with a cotton ball using light strokes. Do not press down on the skin or touch areas of the skin that have hair. Instruct the patient to point to the area you have touched or tell you when he feels the sensation of being touched. (Obviously, he will not be watching you touch his skin).

Temperature

- Testing for temperature sensation is often overlooked but it can be important.
- Tubes of hot and cold water may be used but an easier and more practical approach is often to touch the patient with a tuning fork as the metal feels cold.
- First touch the patient where sensation is thought to be normal and say, "Does that feel cold?" Then, when testing the limb, check that the patient is feeling the fork as cold and not just as pressure

Positioning

- Usually tested only on the great toes but it can be tested on the fingers too.
- Ask the patient to shut his eyes. Grasp the side of the toe between index finger and thumb. This prevents movement from being felt as pressure up or down. Move the digit up or down and ask the patient to tell you the direction of movement

Motor System

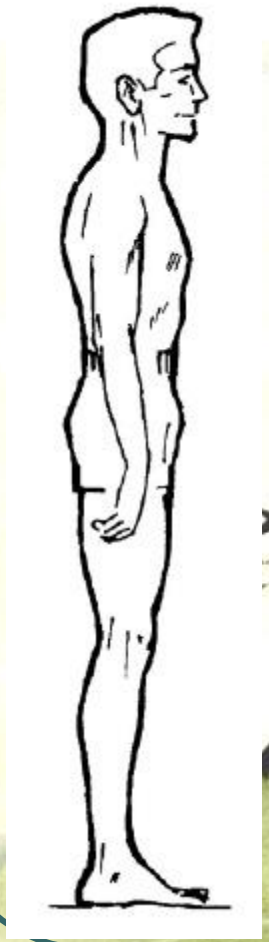
- **Inspection**
- Start by looking at the patient. Do muscles look wasted? Is there asymmetry?
- If the nurse strike the affected muscle with a jerk hammer, it may induce fasciculation.

Rapid alternating movements test

- *Seat the patient. Instruct him to pat his knees with his hands, palms down then palms up. Have him alternate palms down and palms up rapidly.*
- *Watch the patient to notice if his movements are stiff, slow, nonrhythmic, or jerky.*
- *The movements should be smooth and rhythmic as he does the task faster.*

- Ask the patient to walk back and forth across the room .
- Observe for e**quality of arm swing , balance** and rapidity and **ease of turning** .
- Next, ask the patient to walk on his **tiptoes ,**then on **heels** .
- Ask the patient to **tandem** walk .

Rom berg test



- *Instruct the patient to stand with his feet together and his arms at his side.*
- *Have the patient do this with his eyes open and then with his eyes closed. (Stand close to the patient to keep him upright if he starts to sway.)*
- *Expect the patient to sway slightly but not fall. This is a test of balance.*

A reflex .

- A reflex is defined as an immediate and involuntary response to a stimulus.
- Superficial reflexes.
- Stroke the skin with a hard object such as an applicator stick. What is felt is a superficial reflex
- •5 Ps
- –Pain
- –Pallor
- –Pulses
- –Paresthesia
- –Paralysis

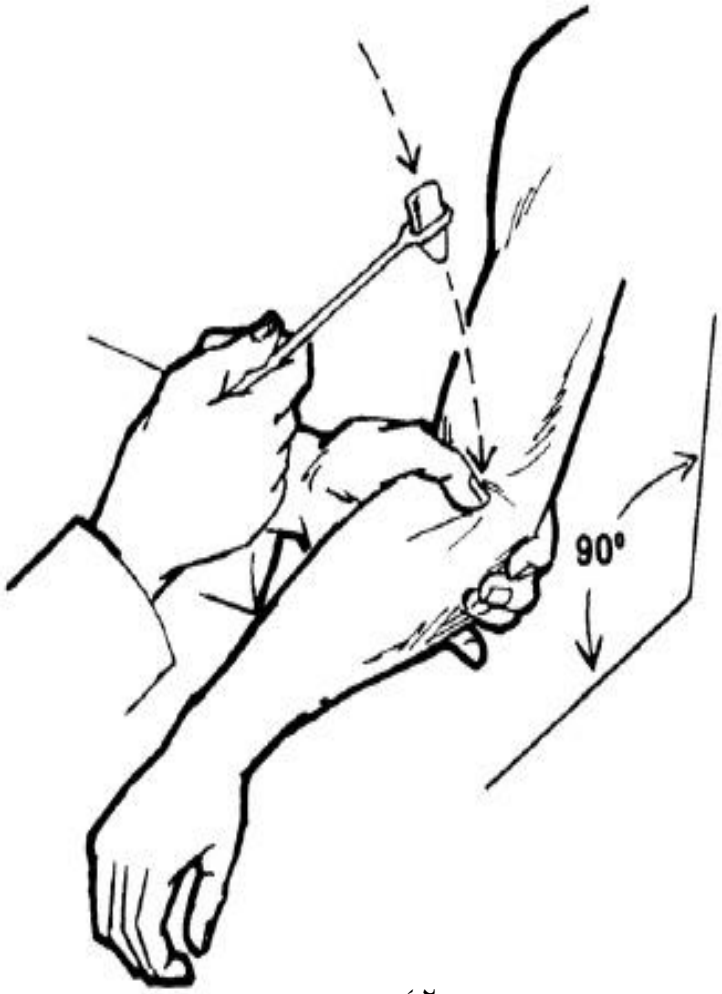
Biceps--deep tendon reflex

١- Have the patient's elbow at about a 90° angle of flexion with the arm slightly bent down as shown in figure 2-6 .

٢- Grasp the elbow with your left hand so the fingers are behind the elbow and your abductee thumb presses the biceps brachial tendon .

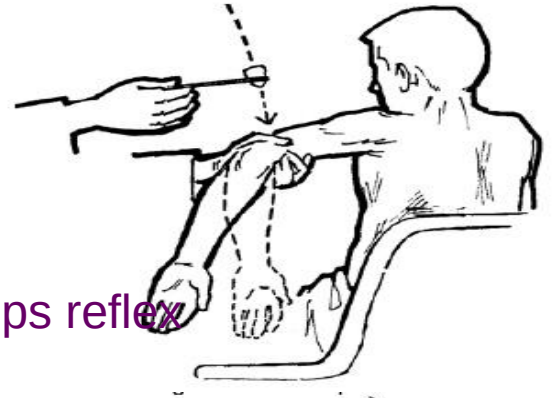
٣- Strike your thumb a series of blows with the rubber hammer, varying your thumb pressure with each blow until the most satisfactory response is obtained .

٤- Normal reflex is elbow flexion (bending)



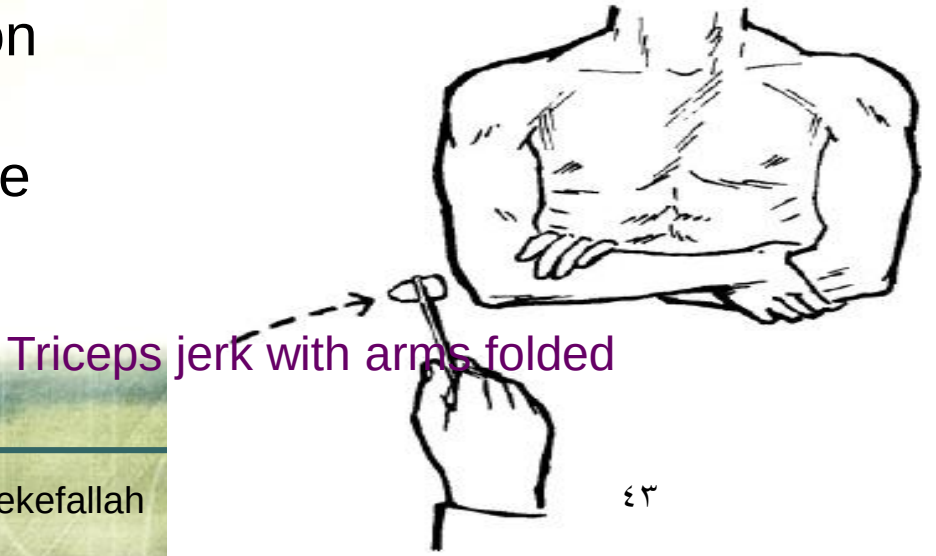
Triceps--deep tendon reflex

- Grasp the patient's wrist with your left hand and pull his arm across his chest so the elbow is flexed about 90° and the forearm is partially bent down .
- Tap the triceps brachial tendon directly above the olecranon process. The normal response is elbow extension .



Triceps reflex

Triceps jerk with one arm flexed



Triceps jerk with arms folded

Plantar (Babinski) reflex

- Lightly stimulate the outer margin of the sole of the foot to get this reflex. Perform the reflex check in this manner:
  - Grasp the ankle with your left hand .
  - Use a blunt point and moderate pressure and stroke the sole of the foot near its lateral border.
  - Stroke from the heel toward the ball of the foot where the course should curve across the ball of the foot to the medial side, following the bases of the toes .
  - A normal reflex is for the patient to have plantar flexion of all his toes .

Patellar reflex (knee jerk).

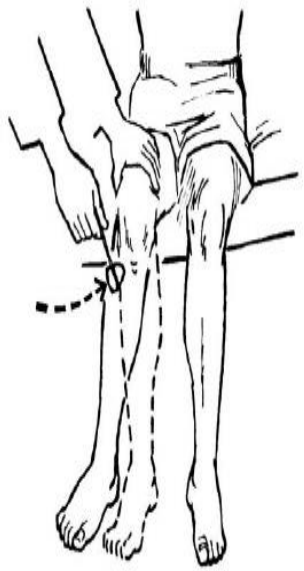
Test the reflex in this manner

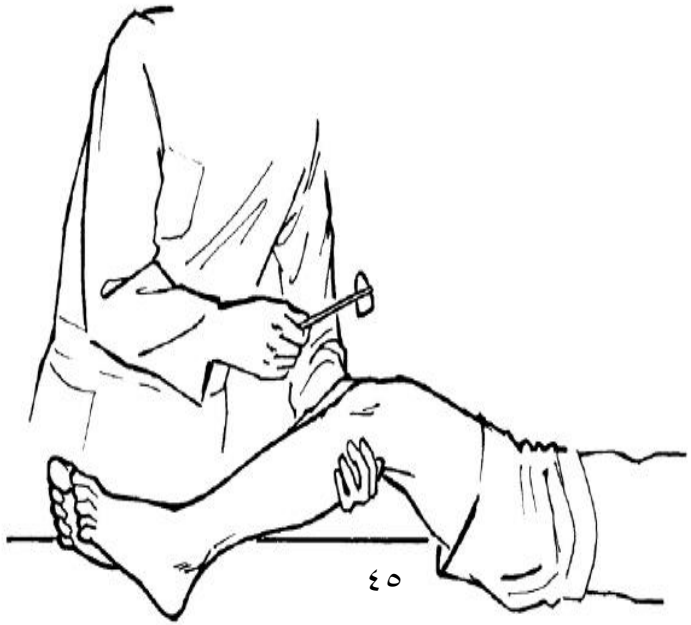
١ -Have the patient sit on a table or high bed to allow his legs to swing freely .

٢-Tap the patellar tendon directly with a rubber hammer .

٣ -Normally, the knee extends .

٤ -Conduct the reflex check as shown in this figure if the patient must be lying down. Put your hand under the popliteal fossa and lift the patient's knee from the table or bed. Tap the patellar tendon directly.





Achilles reflex (ankle jerk

- Tap the Achilles tendon and the foot should extend from the contraction of the gastrocnemius and soleus muscles responding to that tap. Perform the reflex test in this manner:
  - Have the patient sit on a table or bed so that his legs dangle .
  - With your left hand, grasp the patient's foot and pull it in dorsiflexion (upward). Find the degree of stretching upward of the Achilles tendon that produces the optimal response .
  - Tap the tendon directly .
  - Normal response is contraction of the gastrocnemius and plantar flexion of the foot .

Deep tendon reflexes should be graded on a scale of 0-4

- as follows:
  - ٠ =absent despite reinforcement
  - ١ =present only with reinforcement
  - ٢ =normal
  - ٣ =increased but normal
  - ٤ =markedly hyperactive, with clonus

Abnormal posturing

Decorticate posturing

Legs and feet extendedwith planter flexion and arms rotatedand flexed on chest

Decerebrate posturing

Arms stiffly extended and hands turned outward and flexed,leg also extended with planter flexion

Decorticate posture may progress to decerebrate posture, or the two may alternate. The posturing may occur on one or both sides of the body .