

Cranial Nerves

I Olfactory

VII Facial

II Optic

VIII Vestibulo-cochlear

III Oculomotor

IX Glossopharyngeal

IV Trochlear

X Vagus

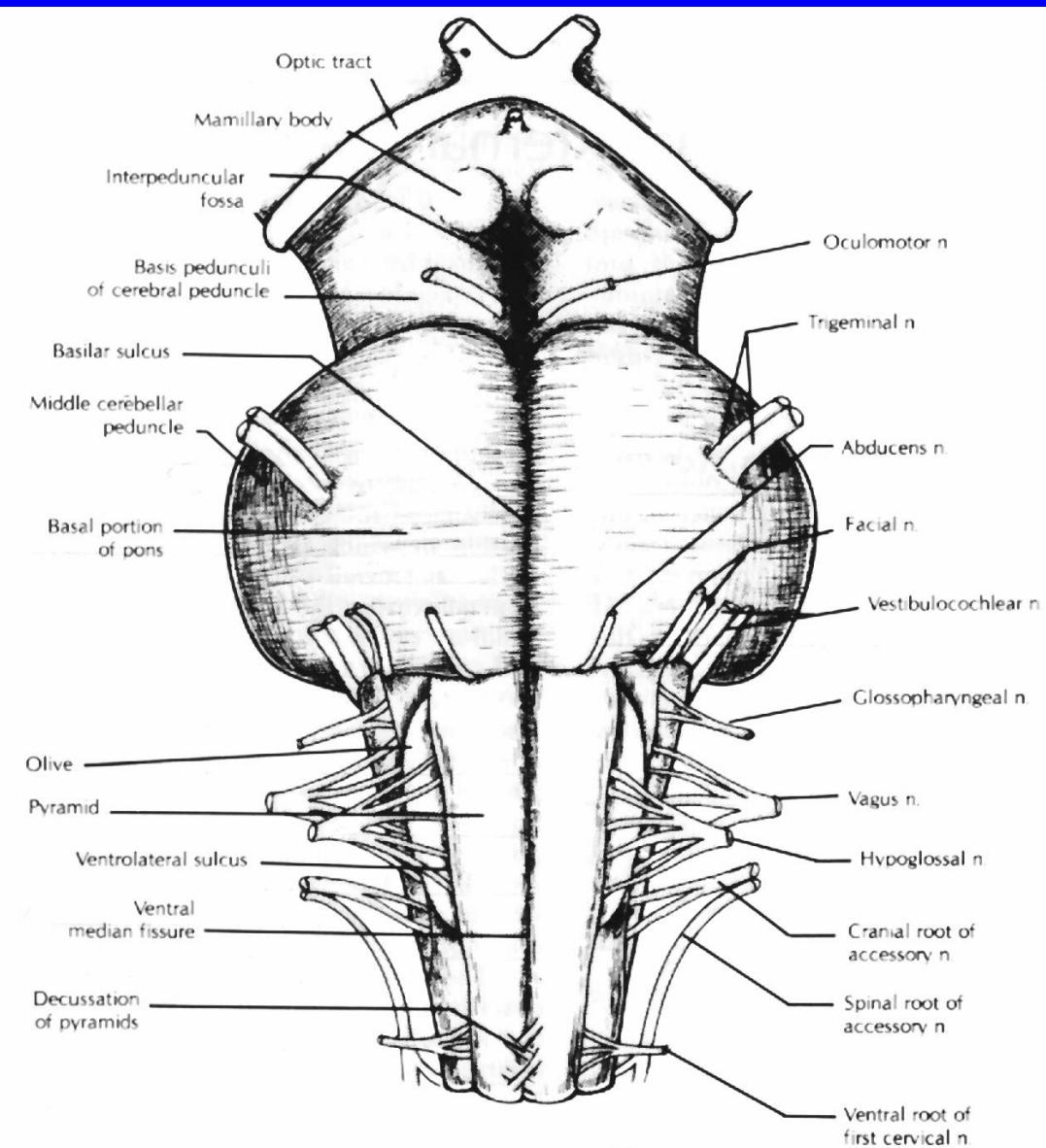
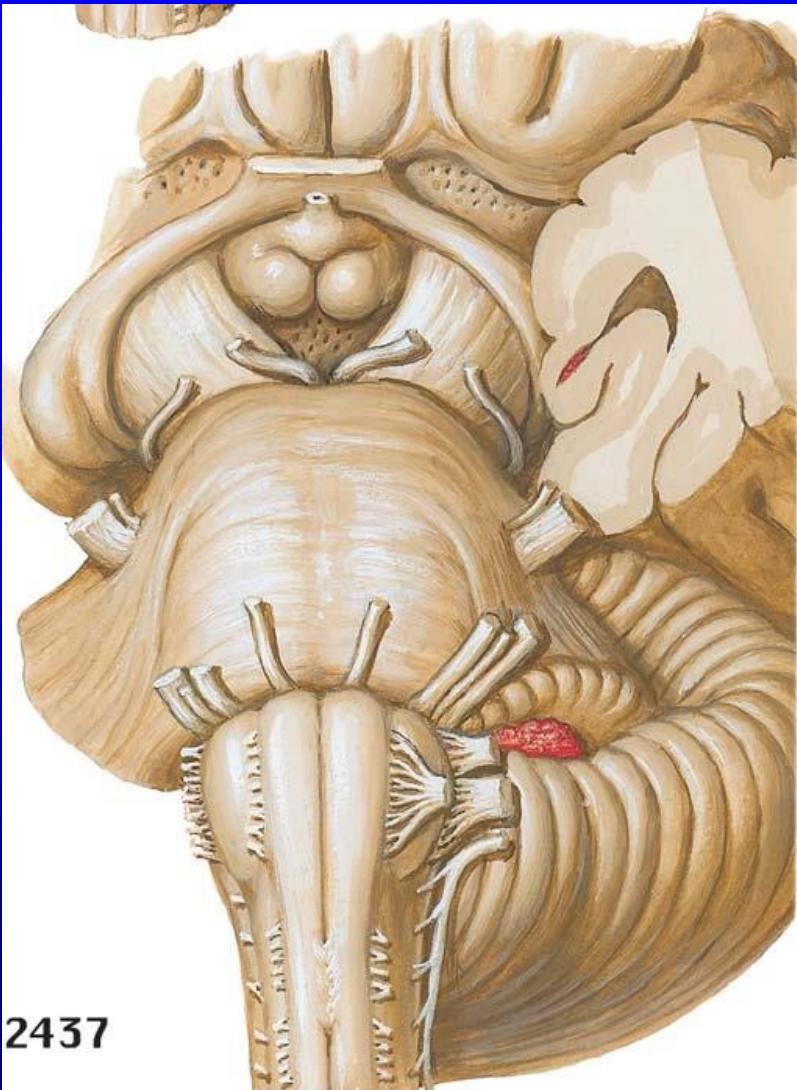
V Trigeminal

XI Accessory

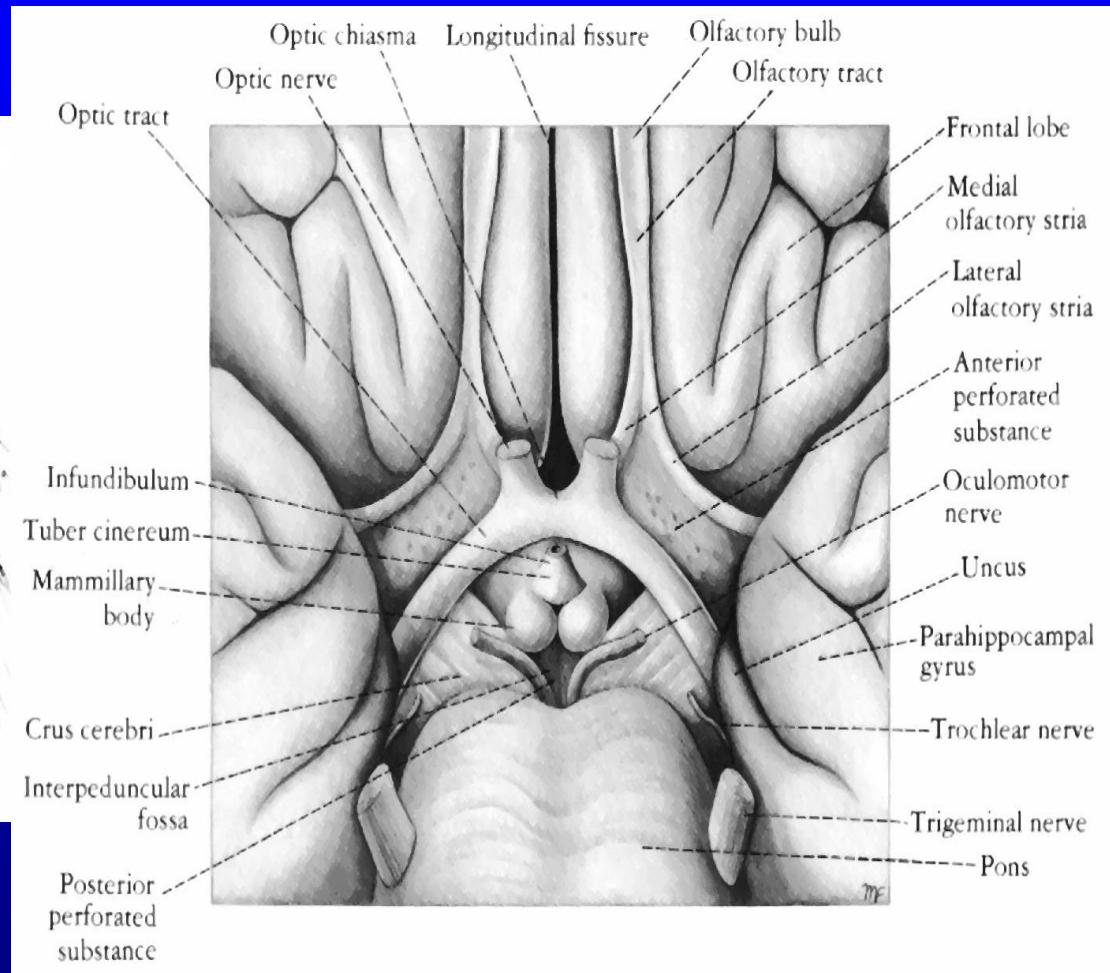
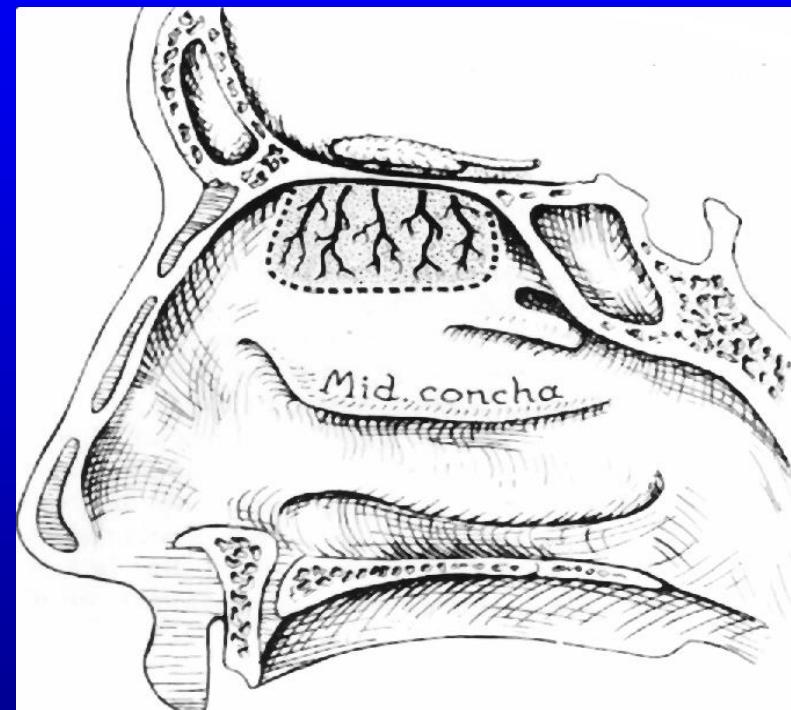
VI Abducent

XII Hypoglossal

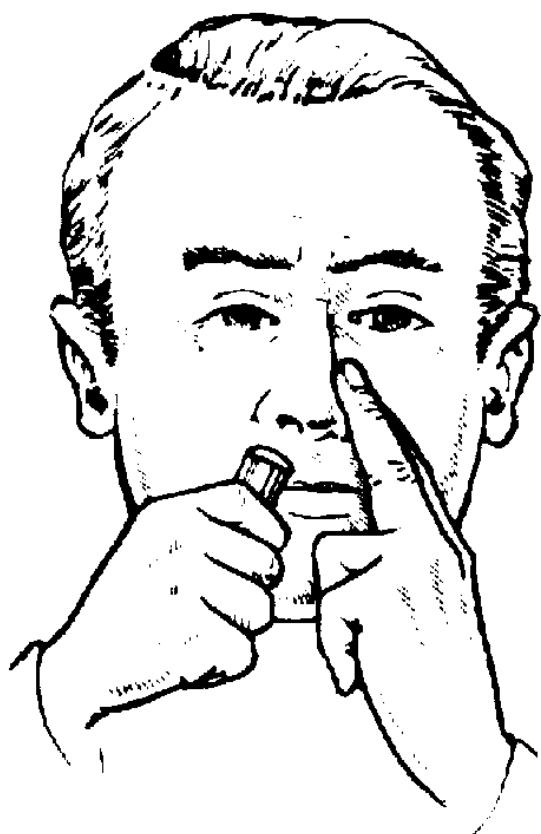
Ventral View of Brain Stem Showing Exits of Cranial Nerves



Olfactory Nerve (I)



Olfactory Nerve (I)



- Test perception & identification of smell
- Test each nostril in turn
- Use aromatic but non-irritant materials, e.g. alcohol swab

Optic Nerve (II) - Visual Acuity

- Does patient need glasses ?
- Can patient see light ?
- Can patient see hand movements ?
- Can patient count fingers ?
- Quantitative testing

Optic Nerve (II)

Visual acuity

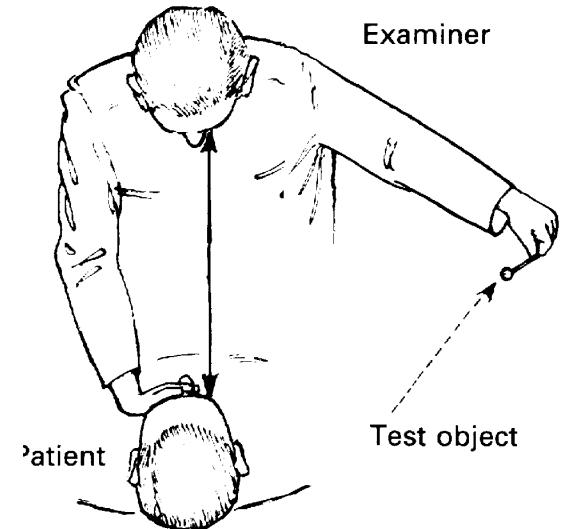
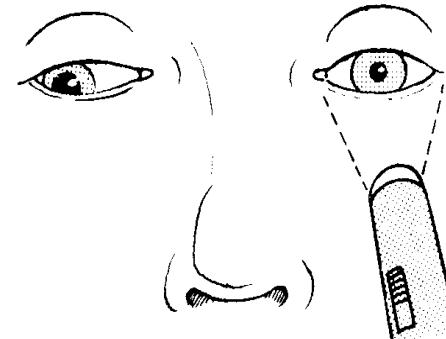
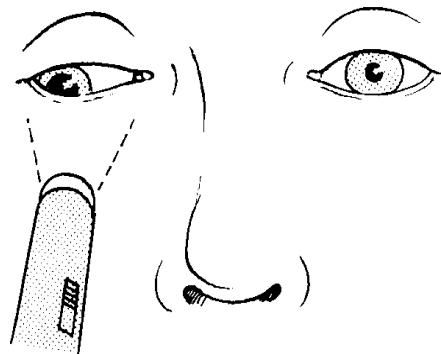
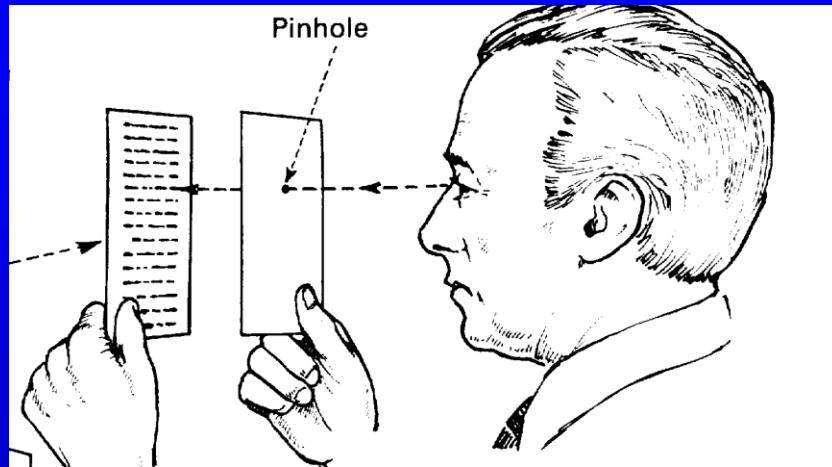
Visual field

Direct light reflex

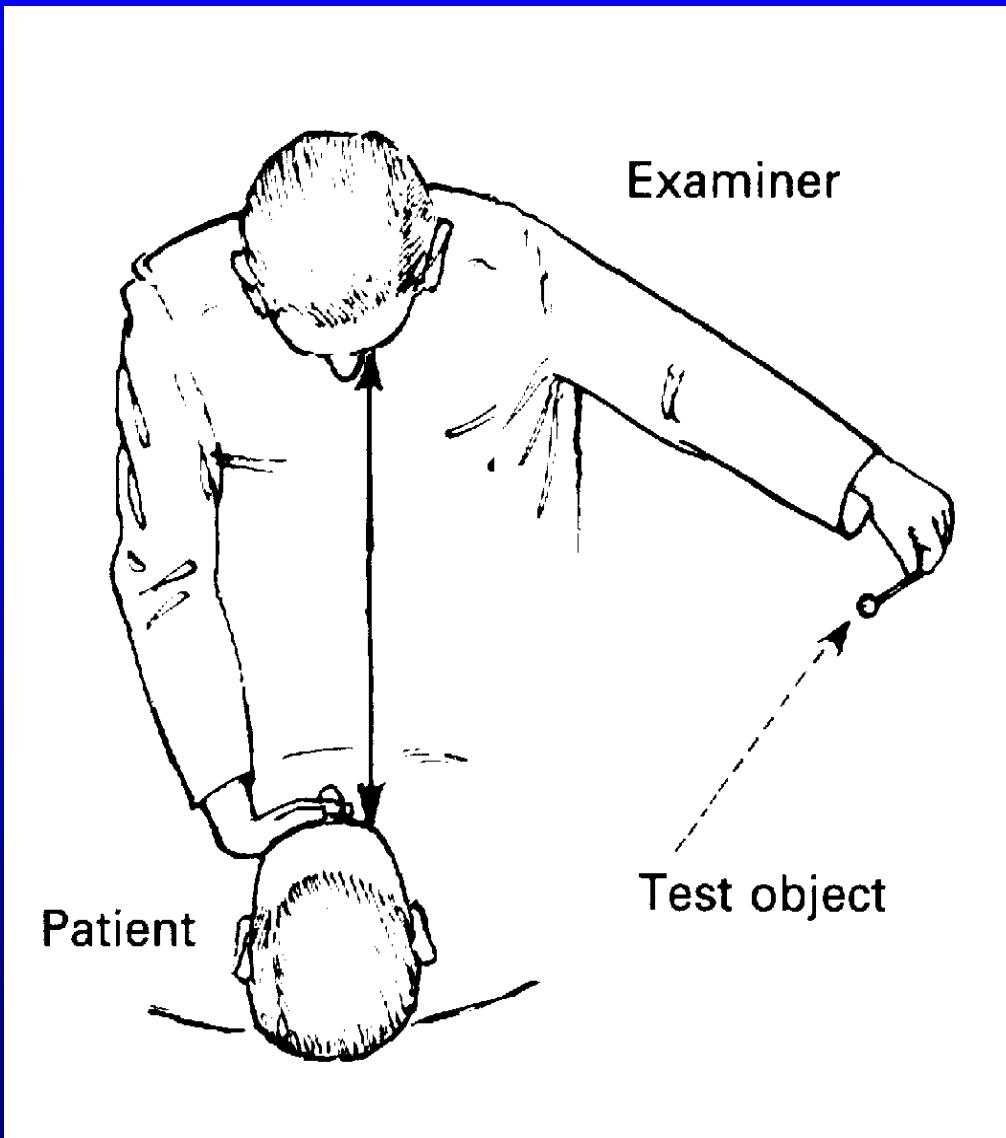
Consensual light reflex

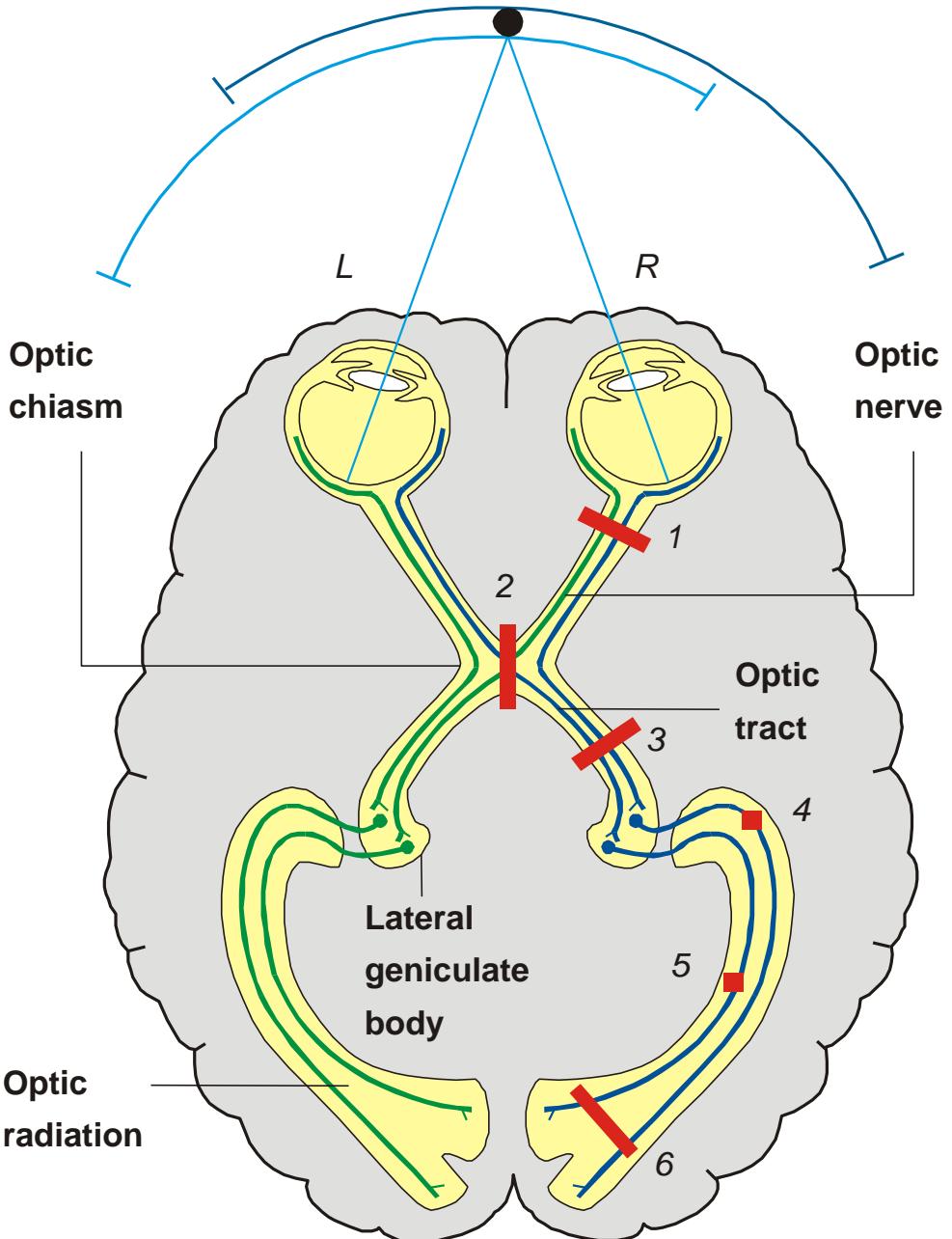
Accommodation reflex

Fundus

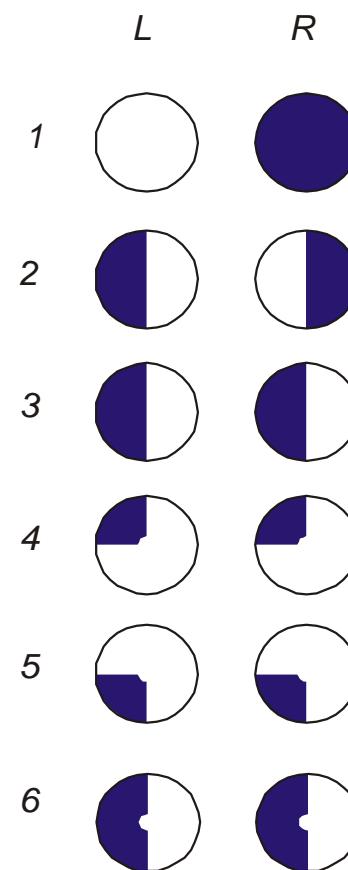


Visual Field - Confrontation





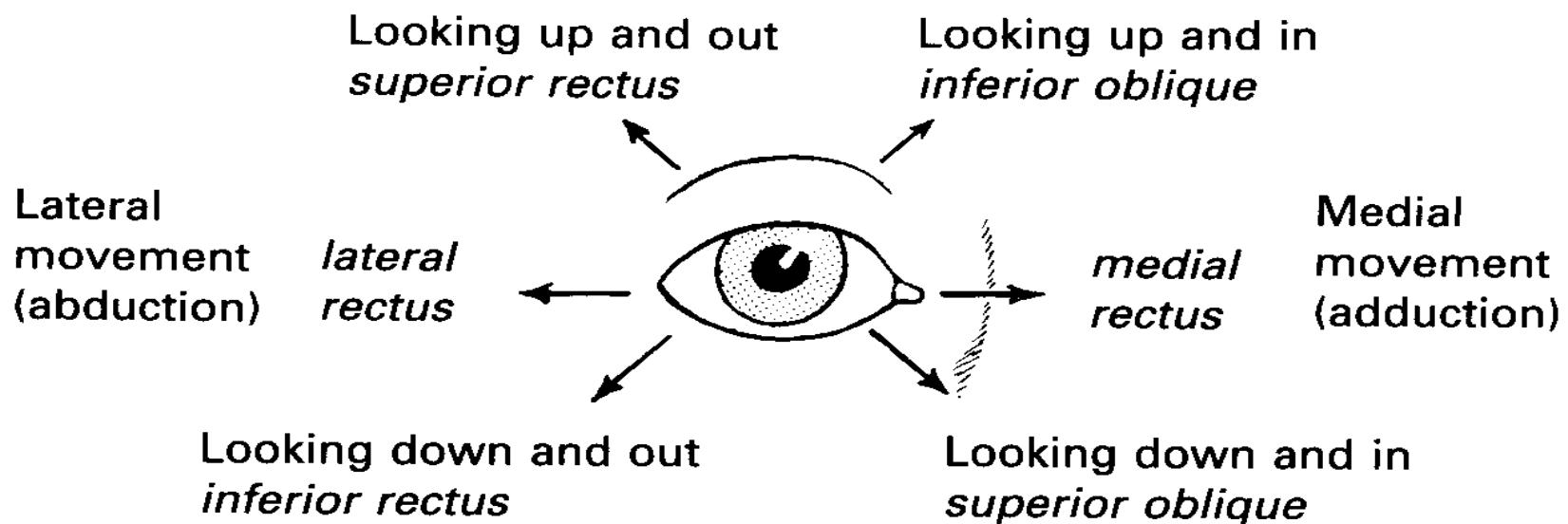
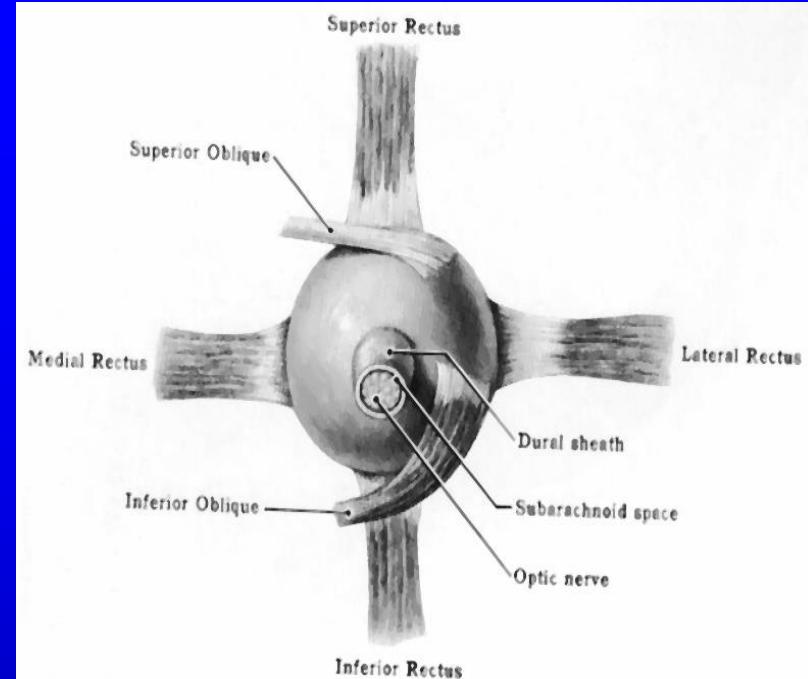
Defects in visual field



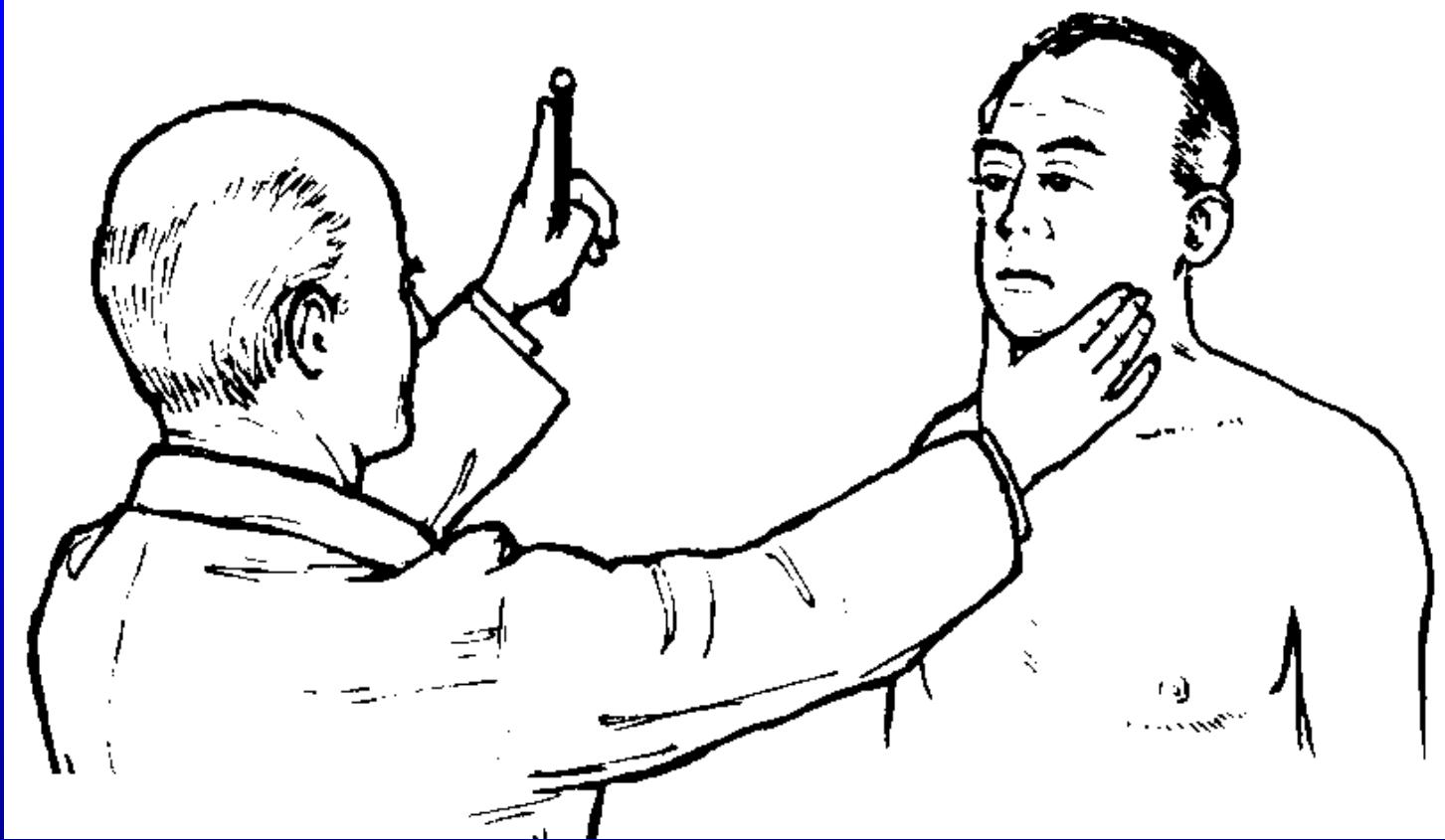
Pupils

- Size (1-6mm)
- Shape (regular or irregular)
- Symmetry
- Direct light reflex
- Consensual reflex
- Accommodation reflex

Ocular Movements (III, IV, VI)



Test for Ocular Movements



Ask about Diplopia

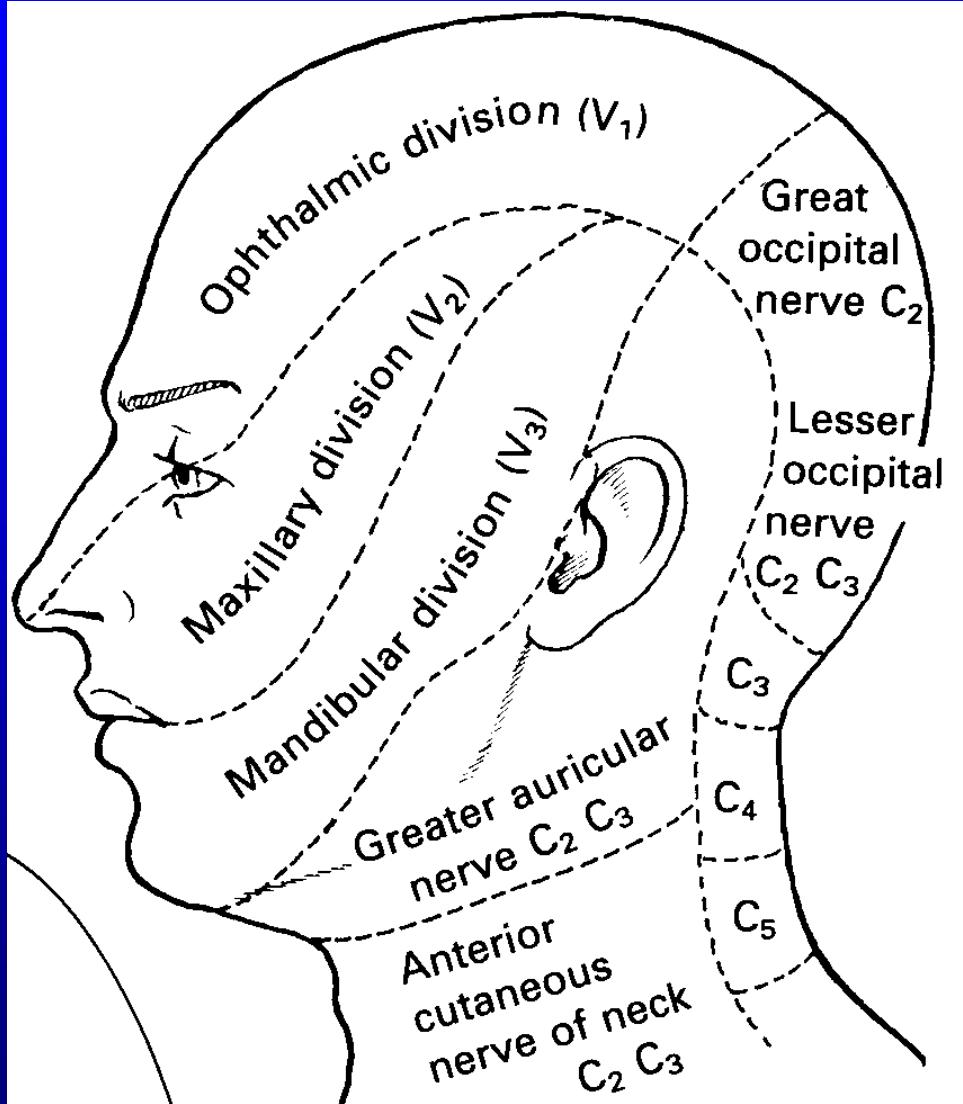
Direction of maximal displacement of images

Note any nystagmus

Trigeminal Nerve (V)

- Muscles of mastication
- Sensory - Three divisions
- Jaw jerk
- Corneal reflex
 - ❖ Afferent - Ophthalmic division of V
 - ❖ Efferent - Facial nerve (VII)

Trigeminal Nerve Sensory Pattern



Ophthalmic Division

- **forehead, nose,
upper eyelid**

Maxillary Division

- **cheek, lower eyelid, upper
lip**

Mandibular Division

- **lower lip, lower face and
jaw**

Facial Nerve (VII)

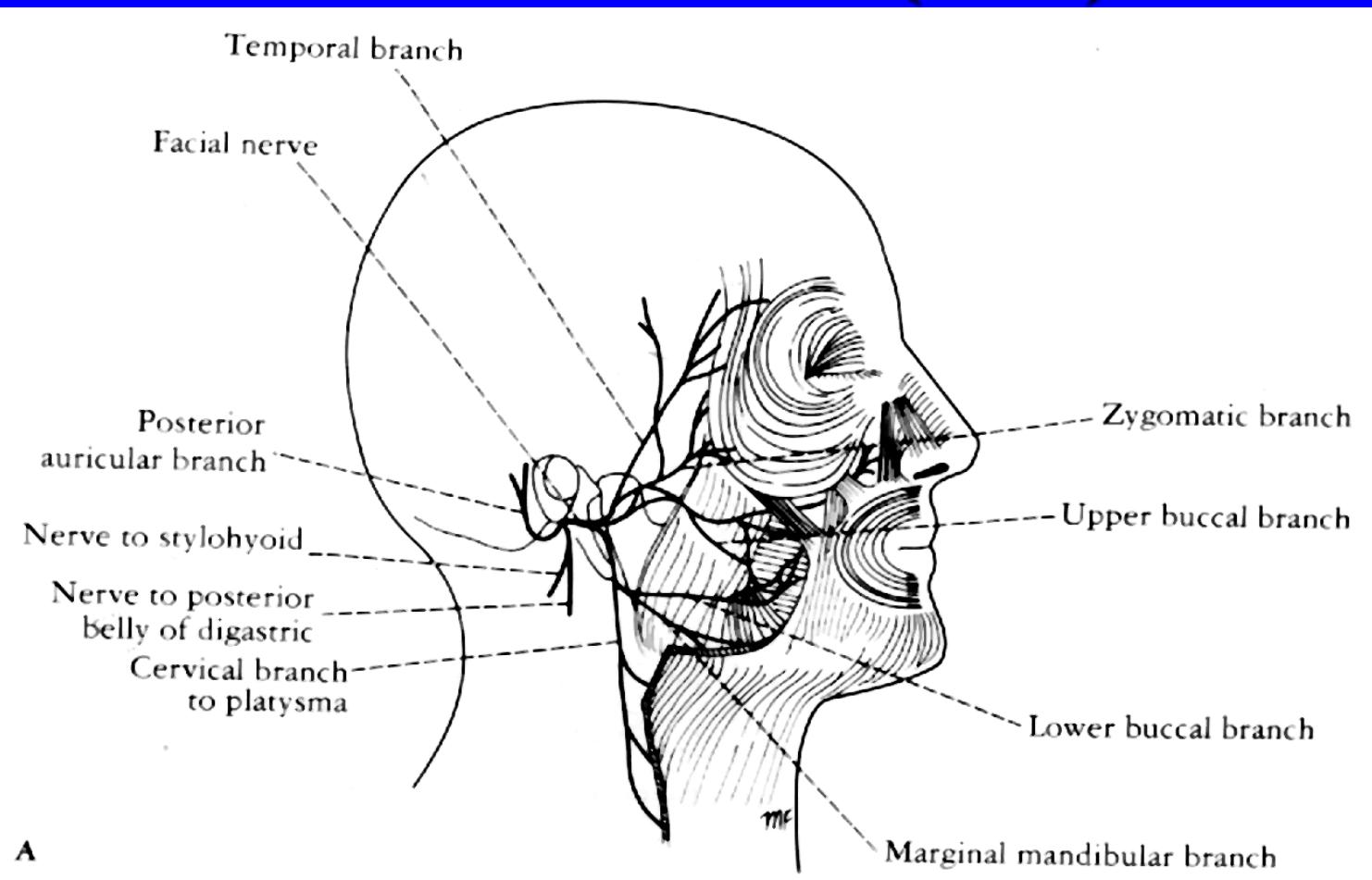
Muscles of facial expression

- frowning (upper face)
- blowing cheek (lower face)

Taste of anterior 2/3 of tongue

Salivary secretion

Facial Nerve (VII)



A

Muscles of facial expression

Upper face - bilateral supply

Lower face - unilateral supply

Facial Nerve (VII)

Upper Motor Neurone Lesion

- **weakness of the contralateral lower face only**
- **forehead has bilateral innervation**

Lower Motor Neurone Lesion

- **whole of ipsilateral face weak**

Deafness (VIII)

Conductive Deafness

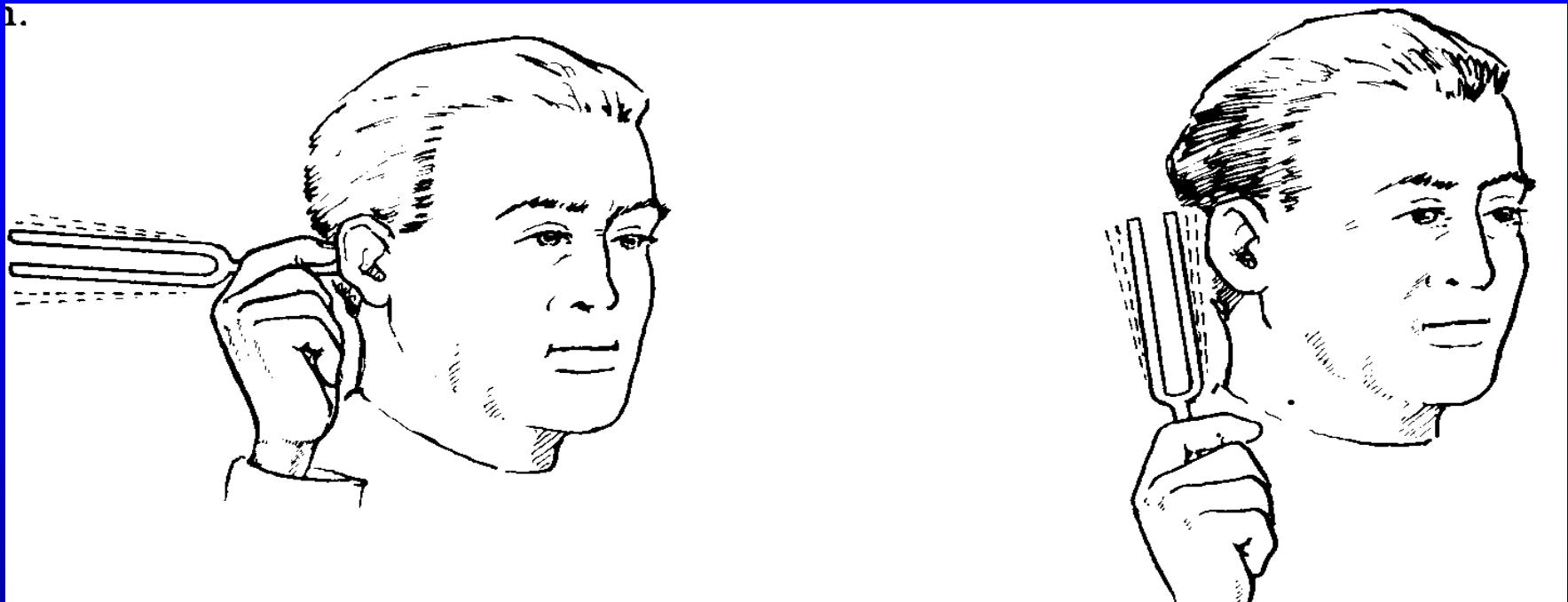
- Sound not transmitted to the cochlear
- e.g. ear wax, middle ear damage

Sensorineural Deafness

- Sound transmitted to the cochlear but sensation affected
- e.g. VIII nerve injury, tumour

Rinne's Test

1.

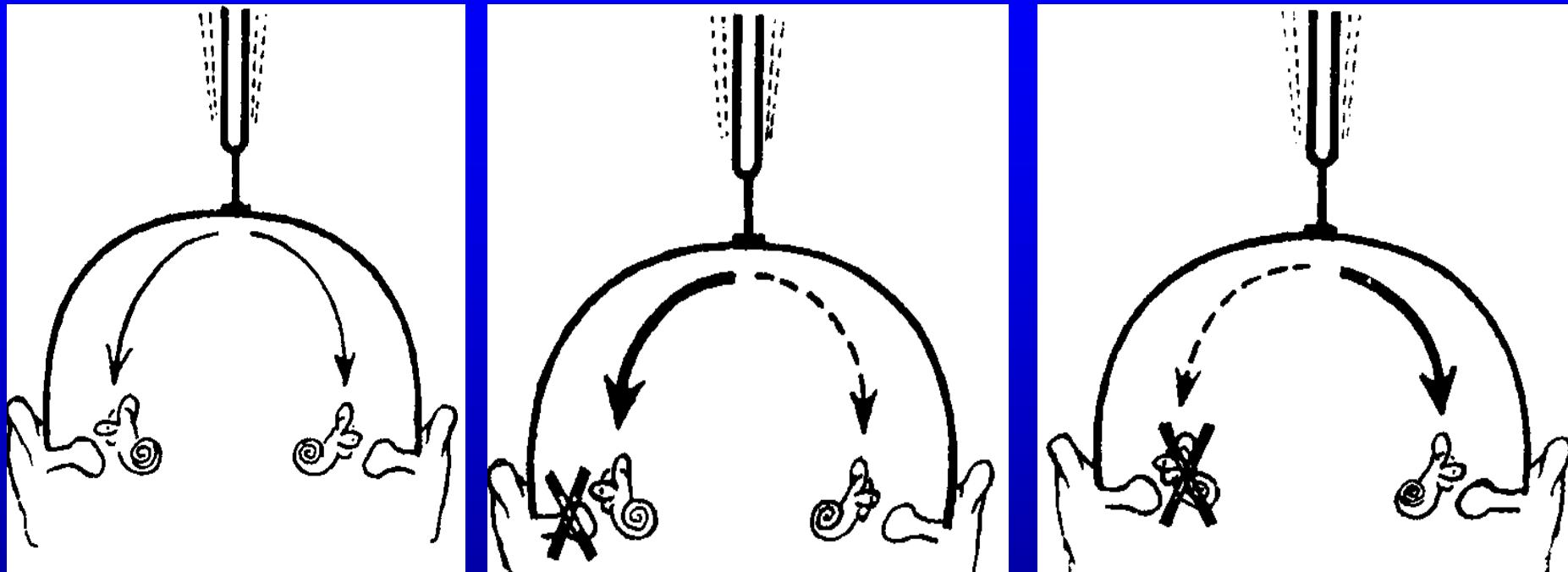


Normal: Air conduction >> Bone conduction

Conductive Deafness: Bone conduction >> Air conduction

Neural Deafness: Both diminished

Weber's Test



Normal:
sound equal

Conductive Deafness:
sound louder on affected side as external distraction is reduced

Neural Deafness:
sound louder in normal ear

Glossopharyngeal Nerve (IX)

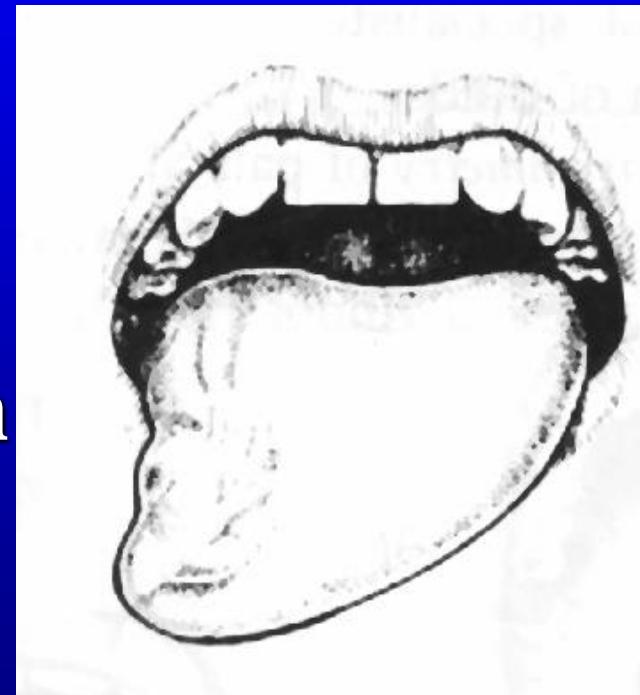
- Soft palate
- Pharynx
- Ear canal
- Mainly sensory
- Salivation
- Taste & sensations of posterior third of tongue
- Test: position & movements of soft palate & uvula; gag reflex

Vagus Nerve (X)

- Pharynx
- Larynx
- Viscera
- Somatic
- Autonomic
- Motor
- Sensory
- Test: gag reflex (afferent IX; efferent X)

Hypoglossal Nerve (XII)

- Motor to intrinsic & extrinsic tongue muscle
- Test :
 - ❖ Atrophy
 - ❖ Fibrillation
 - ❖ Deviate on protrusion
 - ❖ Tongue movements
 - ❖ Power



Right XII palsy

Accessory Nerve XI

Sternocleidomastoid muscle

➤ **Rotate head to the opposite side**

Trapezius muscle

➤ **Shrug shoulders against resistance**

Examination of Upper Limbs

Appearance

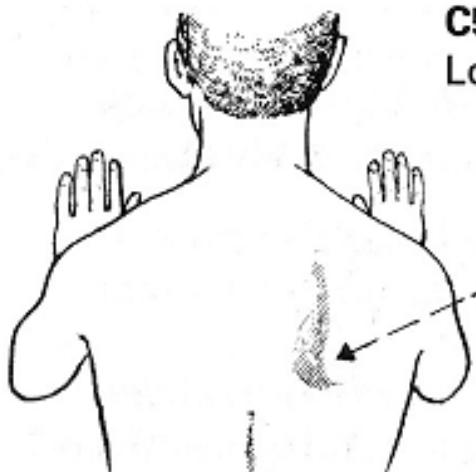
- Any asymmetry or deformity
- Muscle wasting
- Muscle hypertrophy
- Muscle fasciculation

Tone

- Relaxed patient
- Alternately flexing and extending the elbow or wrist
- Decreased tone
- Increased tone (clasp-knife, lead-pipe, cog-wheel)

Examination of Upper Limbs

Test for *Serratus anterior*:

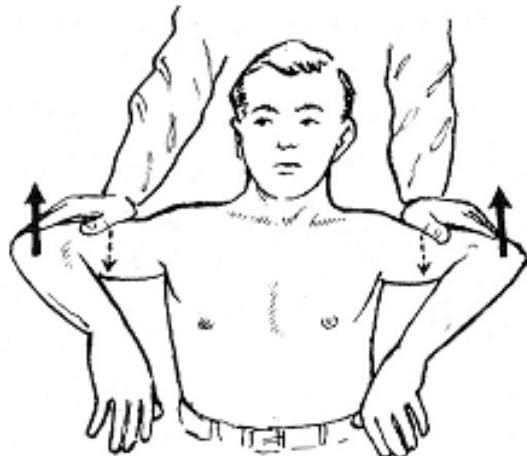


C5, C6, C7 roots
Long thoracic nerve

Patient presses
arms against wall

Look for winging
of scapula i.e.
rises from chest
wall

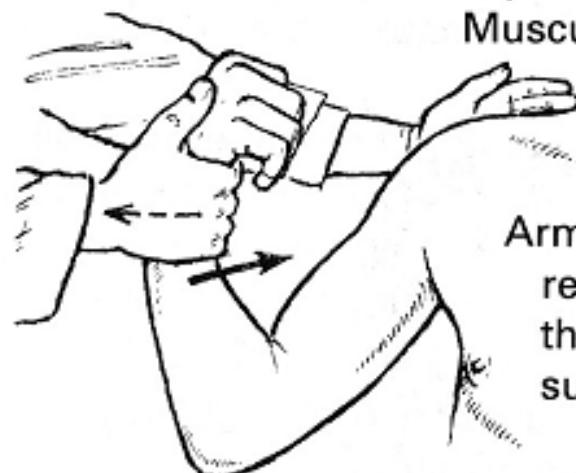
Shoulder abduction



Deltoid:
C5, C6 roots
Axillary nerve

Arm (at more
than 15° from
the vertical)
abducts against
resistance

Elbow flexion



Biceps: **C5, C6 roots**
Musculocutaneous
nerve

Arm flexed against
resistance with
the hand fully
supinated



Brachioradialis: **C5, C6 roots.**
Radial nerve

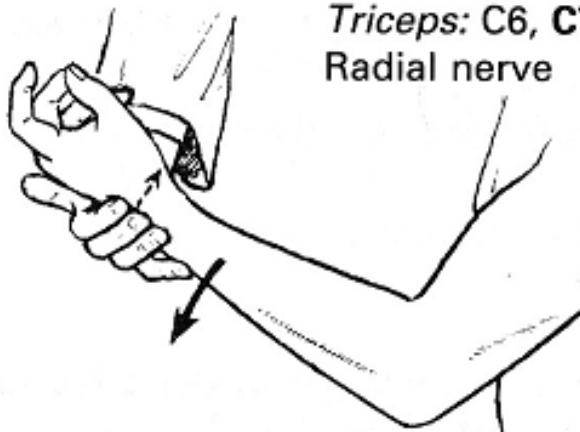
Arm flexed against
resistance with hand
in mid-position
between pronation
and supination

Examination of Upper Limbs

Elbow extension

Triceps: C6, C7, C8 roots

Radial nerve



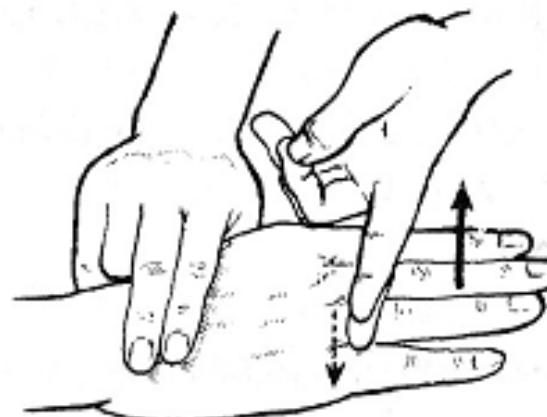
Patient extends arm against resistance

Finger extension

Extensor digitorum:

C7, C8 roots

Posterior interosseous nerve



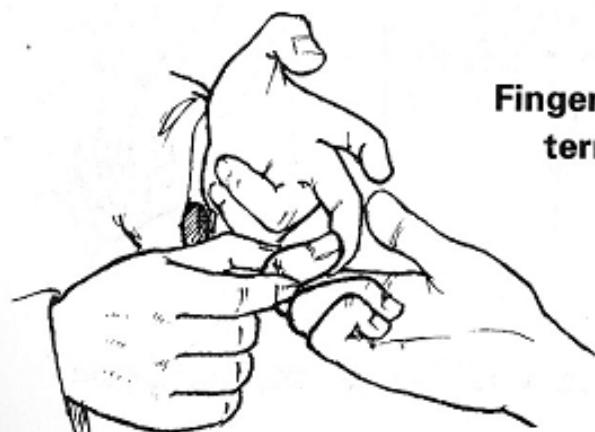
Patient extends fingers against resistance

Thumb extension – terminal phalanx

Extensor pollicis longus and brevis: C7, C8 roots

Posterior interosseous nerve

Thumb is extended against resistance



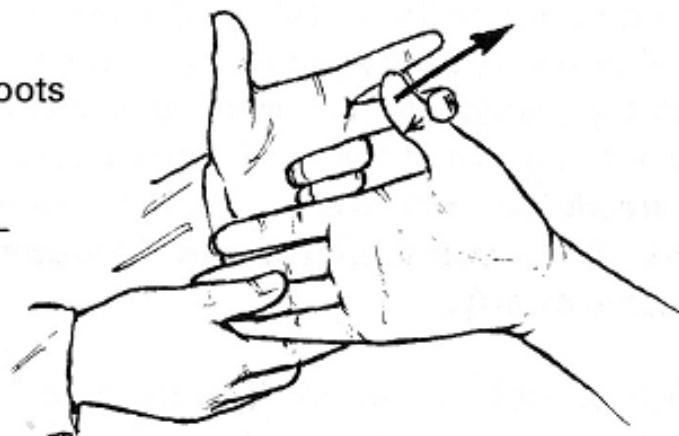
Finger flexion – terminal phalanx

Flexor digitorum profundus I and II: C7, C8 roots

Median nerve

Flexor digitorum profundus III and IV: C7, C8 roots

Ulnar nerve

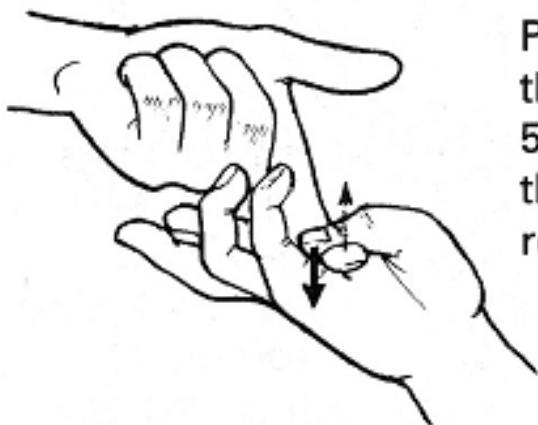


Examiner tries to extend patient's flexed terminal phalanges

Motor Examination of Upper Limbs

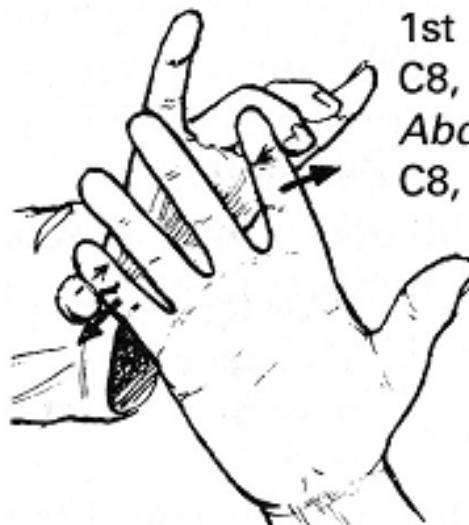
Thumb opposition

Opponens pollicis: C8, T1 roots. Median nerve



Patient tries to touch
the base of the
5th finger with
thumb against
resistance

Finger abduction



1st dorsal interosseus:
C8, T1 roots. Ulnar nerve
Abductor digiti minimi:
C8, T1 roots. Ulnar nerve

Fingers abducted
against resistance

Examination of Upper Limbs

Biceps jerk C5, C6 roots. Musculocutaneous nerve



Ensure patient's arm is relaxed and slightly flexed. Palpate the biceps tendon with the thumb and strike with tendon hammer. Look for elbow flexion and biceps contraction.

Supinator jerk C6, C7 roots. Radial nerve



Strike the lower end of the radius with the hammer and watch for elbow and finger flexion.

Examination of Upper Limbs

Triceps jerk



C6, C7, C8 roots.

Radial nerve.

Strike the patient's elbow a few inches above the olecranon process. Look for elbow extension and triceps contraction.

Hoffman reflex C7, C8



Flick the patient's terminal phalanx, suddenly stretching the flexor tendon on release. Thumb flexion indicates hyperreflexia. (May be present in normal subjects with brisk tendon reflexes.)

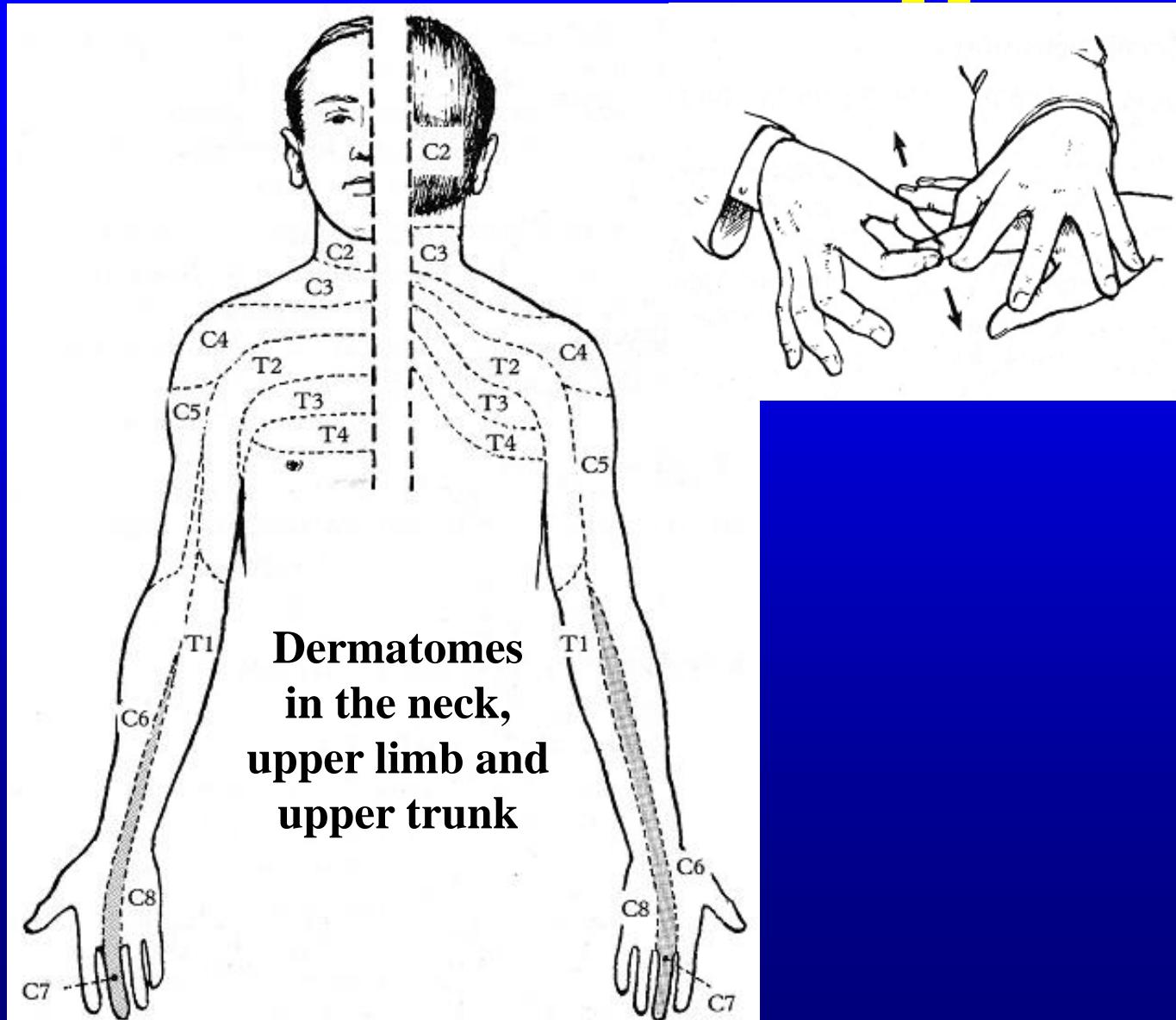
Reflex Enhancement: when reflexes are difficult to elicit, enhancement can be achieved by “clenching the teeth” or “pulling the hands apart”

Examination of Upper Limbs

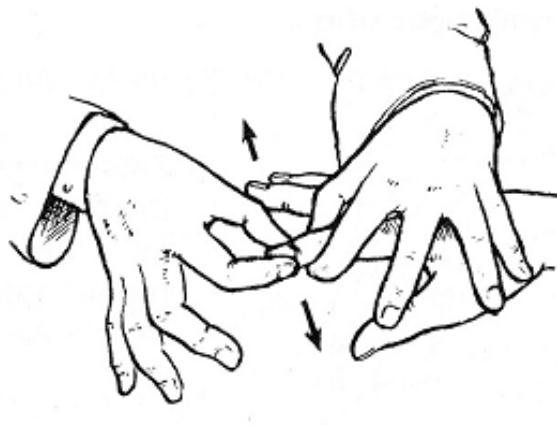
Sensations

- Consider root (segmental) or peripheral nerve (individual nerve, or glove & stocking) in distribution
- Consider the affected modalities
- Pain: pin prick for “sharp” or “dull” feeling (spinothalamic)
- Temperature: cold or hot (spinothalamic)

Examination of Upper Limbs



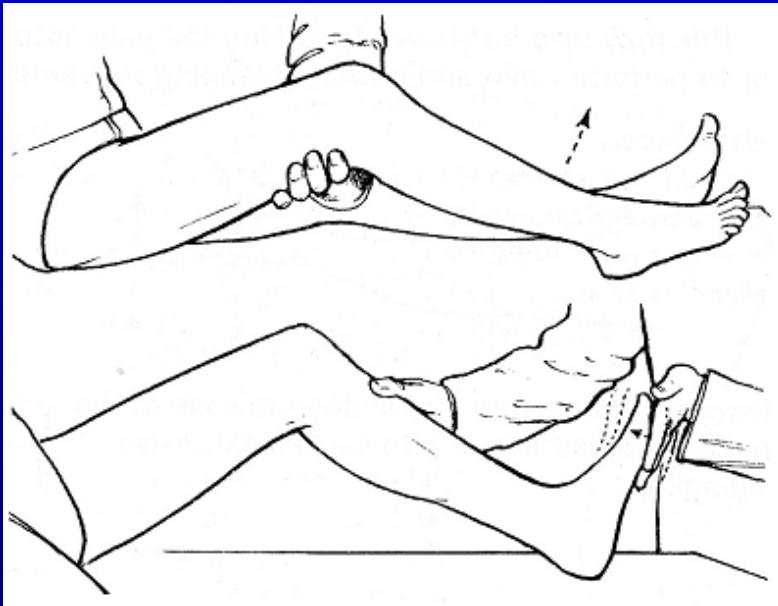
**Joint
position
sense (dorsal
column)**



Examination of Lower Limbs

Appearance

- any asymmetry or deformity
- muscle wasting
- muscle hypertrophy
- muscle fasciculation



Tone

- relaxed patient
- alternately flexing and extending the knee and hip; rolling from side to side
- decreased tone
- increased tone (ankle and knee clonus)

Source: Kenneth W. Lindsay, Ian Bone, Robin Callander. Neurology and Neurosurgery Illustrated, 3rd Ed., 1997, Churchill Livingstone.

Examination of Lower Limbs

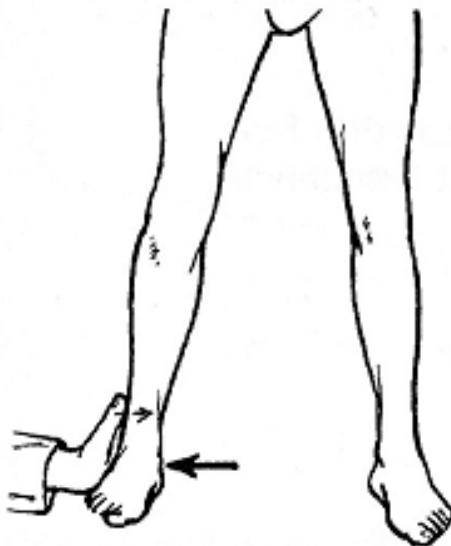
Hip flexion



Ilio-psoas: L1, L2, L3 roots. Femoral nerve

Hip flexed against resistance

Hip abduction



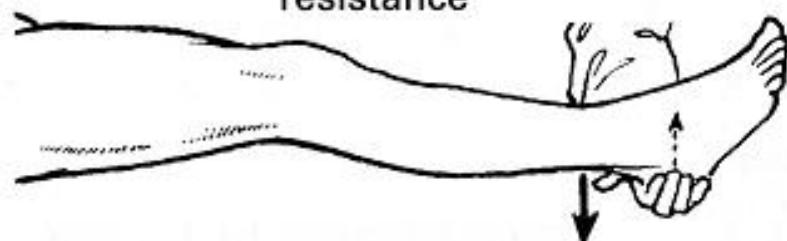
*Gluteus medius and minimus and tensor fasciae latae: L4, L5, S1 roots.
Superior gluteal nerve*

Patient lying on back tries to abduct the leg against resistance

Hip extension

*Gluteus maximus: L5, S1, S2 roots.
Inferior gluteal nerve*

Patient attempts to keep heel on bed against resistance



Hip adduction



*Adductors: L2, L3, L4 roots.
Obturator nerve*

Patient lying on back tries to pull knees together against resistance

Examination of Lower Limbs

Knee flexion



*Hamstrings
L5, S1, S2 roots.
Sciatic nerve*

Patient pulls heel towards the buttock and tries to maintain this position against resistance.

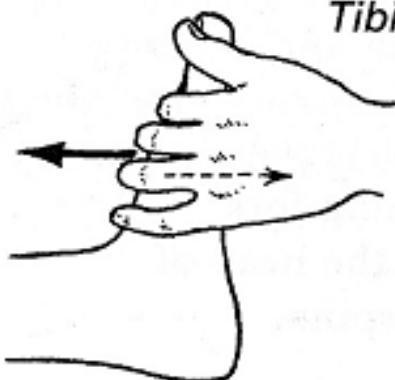
Knee extension



Quadriceps: L2, L3, L4 roots. Femoral nerve

Patient tries to extend knee against resistance

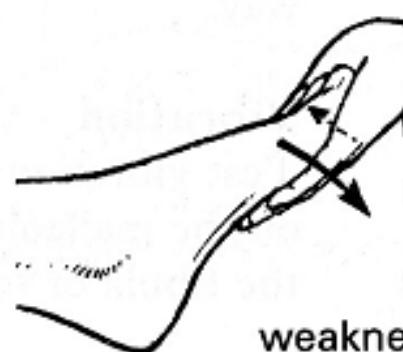
Dorsiflexion



*Tibialis anterior: L4, L5 root
Deep peroneal nerve*

Patient dorsiflexes the ankle against resistance
May have difficulty in walking on heels

Plantarflexion



*Gastrocnemius, soleus:
S1, S2, roots. Tibial nerve.*

Patient plantarflexes the ankle against resistance
May have difficulty in walking on toes before weakness can be directly detected

Examination of Lower Limbs

Toe extension



Inversion

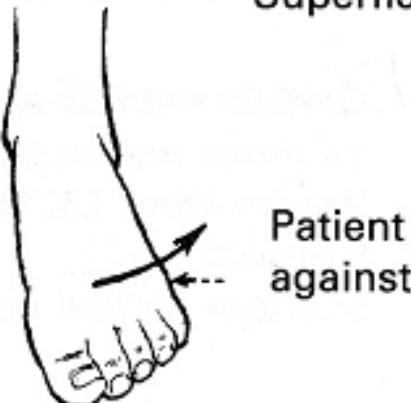


*Tibialis posterior: L4, L5 root.
Tibial nerve*

Patient inverts foot
against resistance

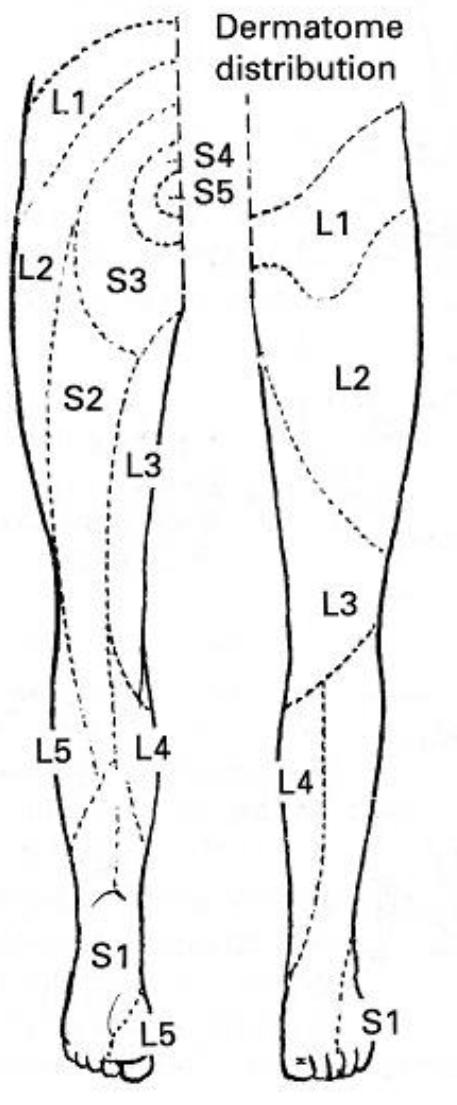
Eversion

*Peroneus longus and brevis: L5, S1 roots.
Superficial peroneal nerve*



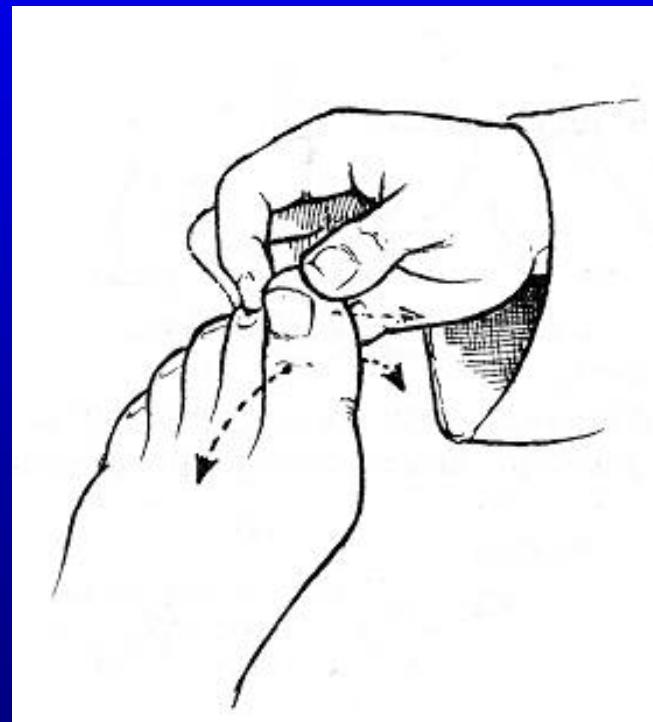
Patient everts foot
against resistance

Examination of Lower Limbs



**Joint position
sense (dorsal
column)**

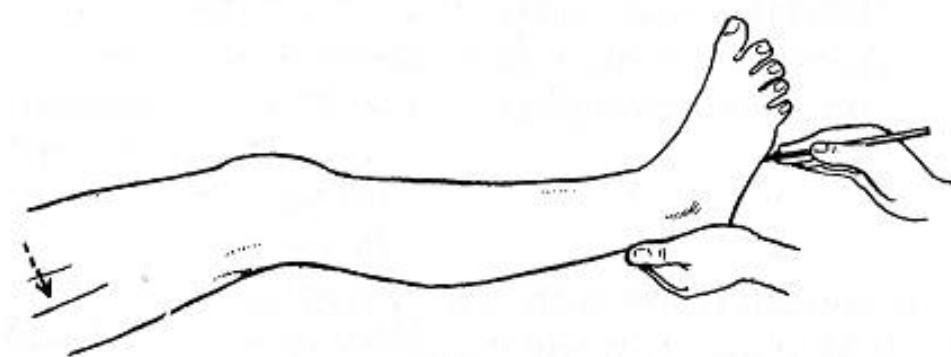
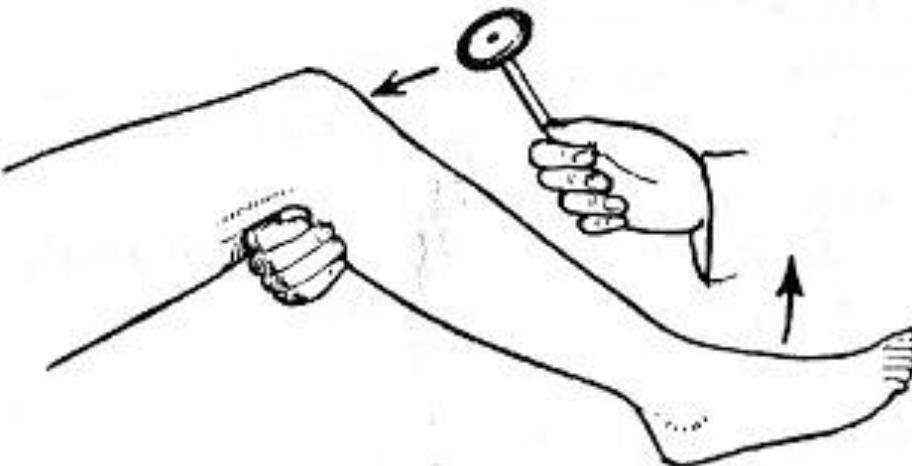
**Vibration (dorsal column)
Sensory inattention
(cortical)**



Source: Kenneth W. Lindsay, Ian Bone, Robin Callander. Neurology and Neurosurgery Illustrated, 3rd Ed., 1997, Churchill Livingstone.

Examination of Lower Limbs

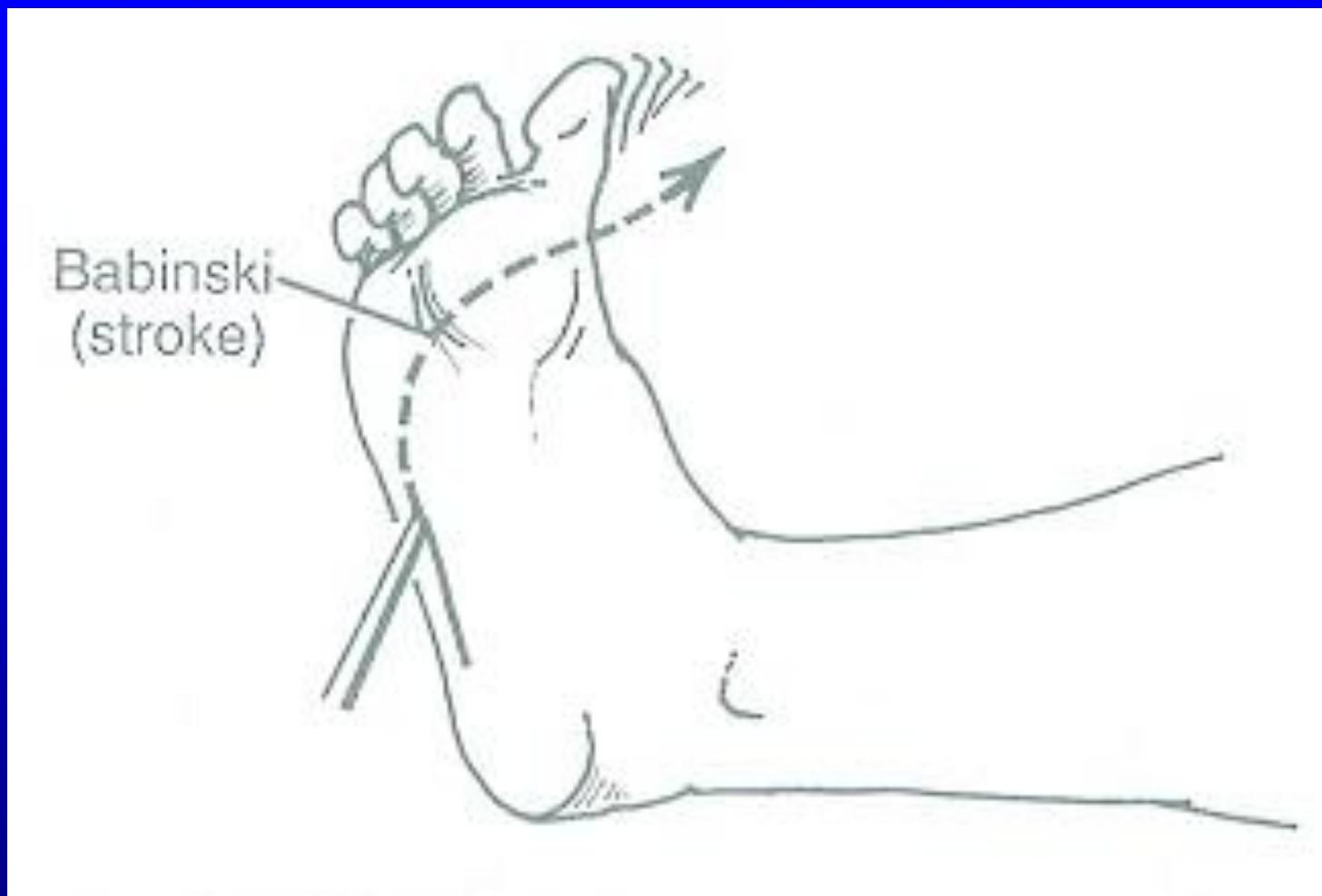
Ankle jerk: S1, S2 roots.



Plantar Response

Reflex Enhancement: when reflexes are difficult to elicit, enhancement can be achieved by “clenching the teeth” or “pulling apart the clasped hands (Jendressik’s manoeuvre)”.

Motor Examination of Lower Limbs



Testing the plantar response