

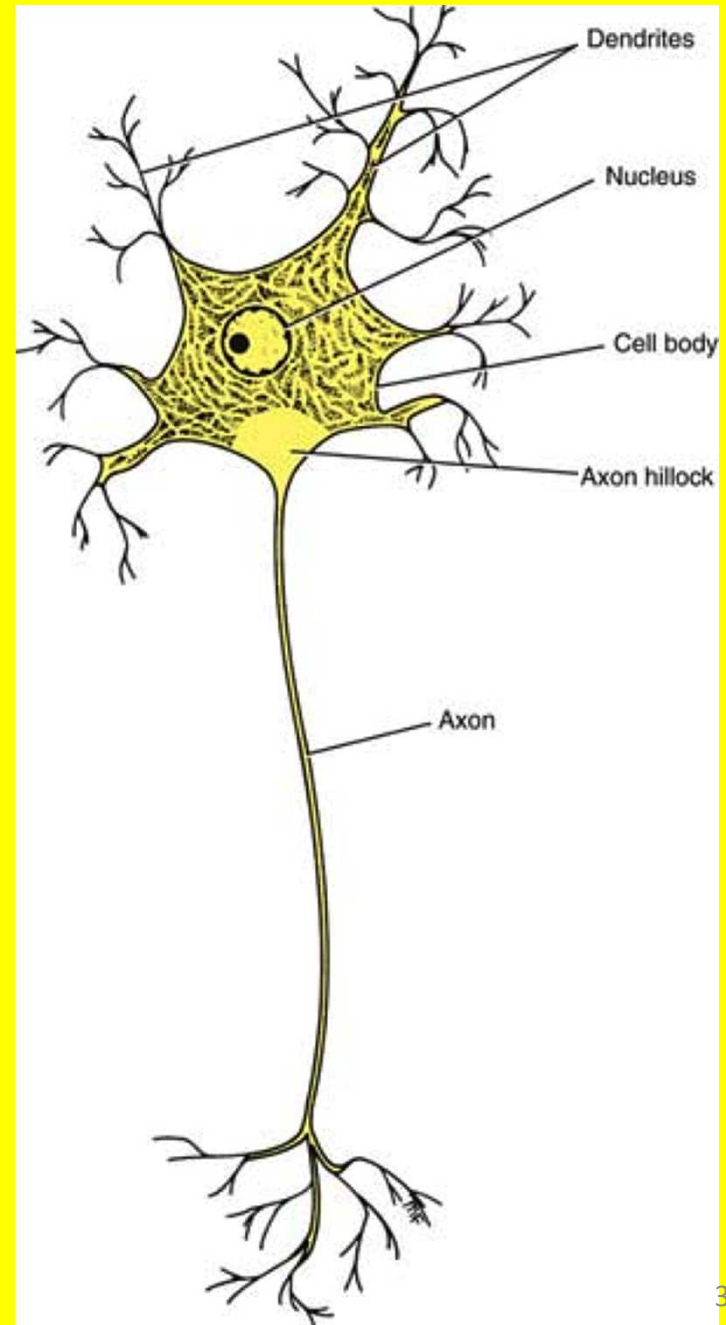
# ANATOMICAL LOCATION OF BRAIN AND SPINAL TUMORS AND CLINICAL CONSIDERATIONS

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- Introduction
- Neuroglial cells
- Peripheral nerve tumors
- Tumors of spinal cord
- Tumors of brainstem
- Tumors of Cerebellar hemisphere
- Tumors of cerebrum
- Pituitary tumors
- Rare tumors

# INTRODUCTION

- Neurons - structural and functional units of the nervous system.
- Specialized for reception, integration and onward transmission of information.



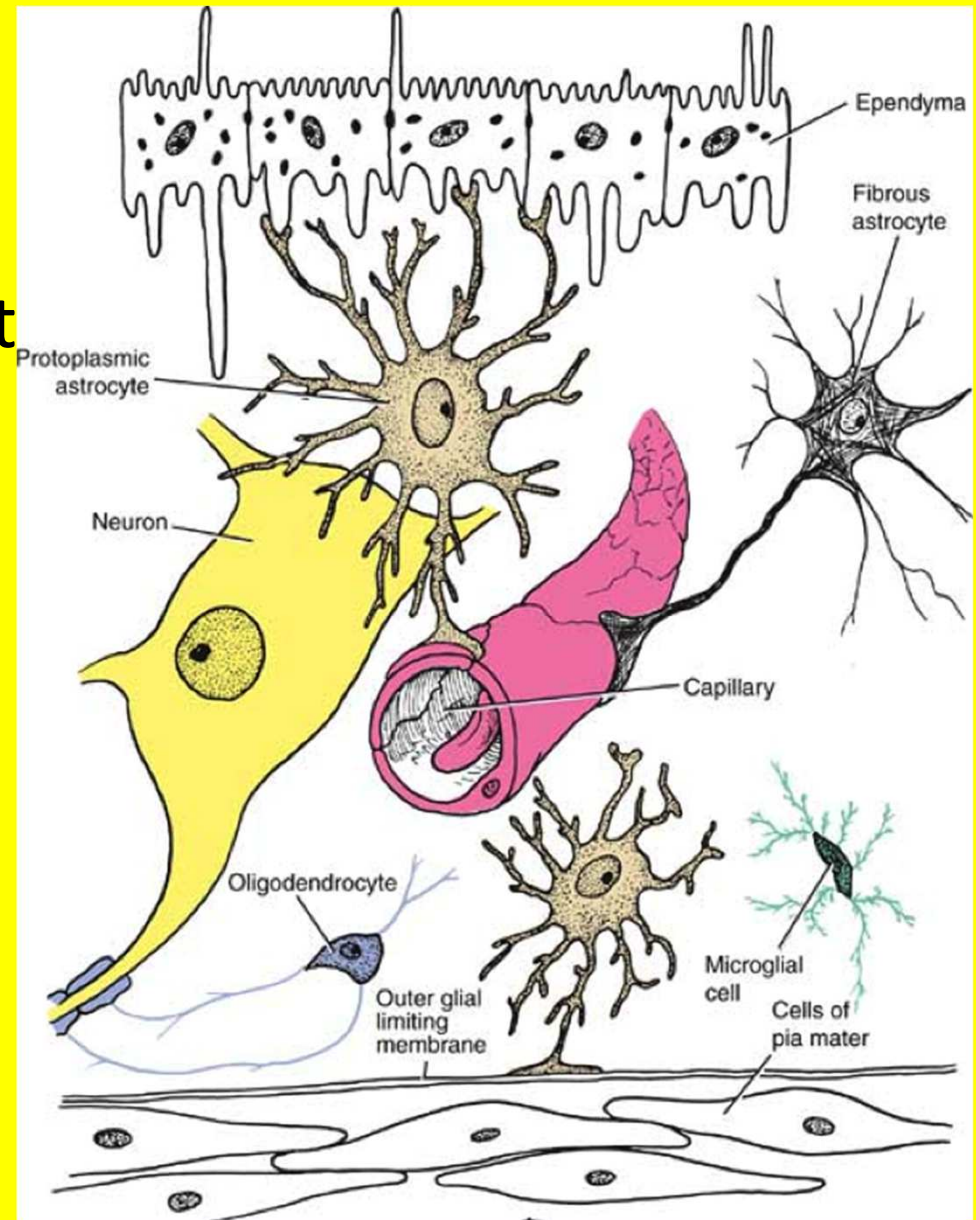
# NEUROGLIAL CELLS

- Supporting , nonexcitable cells
- Four types –
  - ✓ Astrocytes –
  - ✓ Oligodendrocytes
  - ✓ Microglia
  - ✓ Ependyma
- Tumours of neuroglia - 40% to 50%.

# ASTROCYTES

Small cell bodies with branching processes that extend in all directions

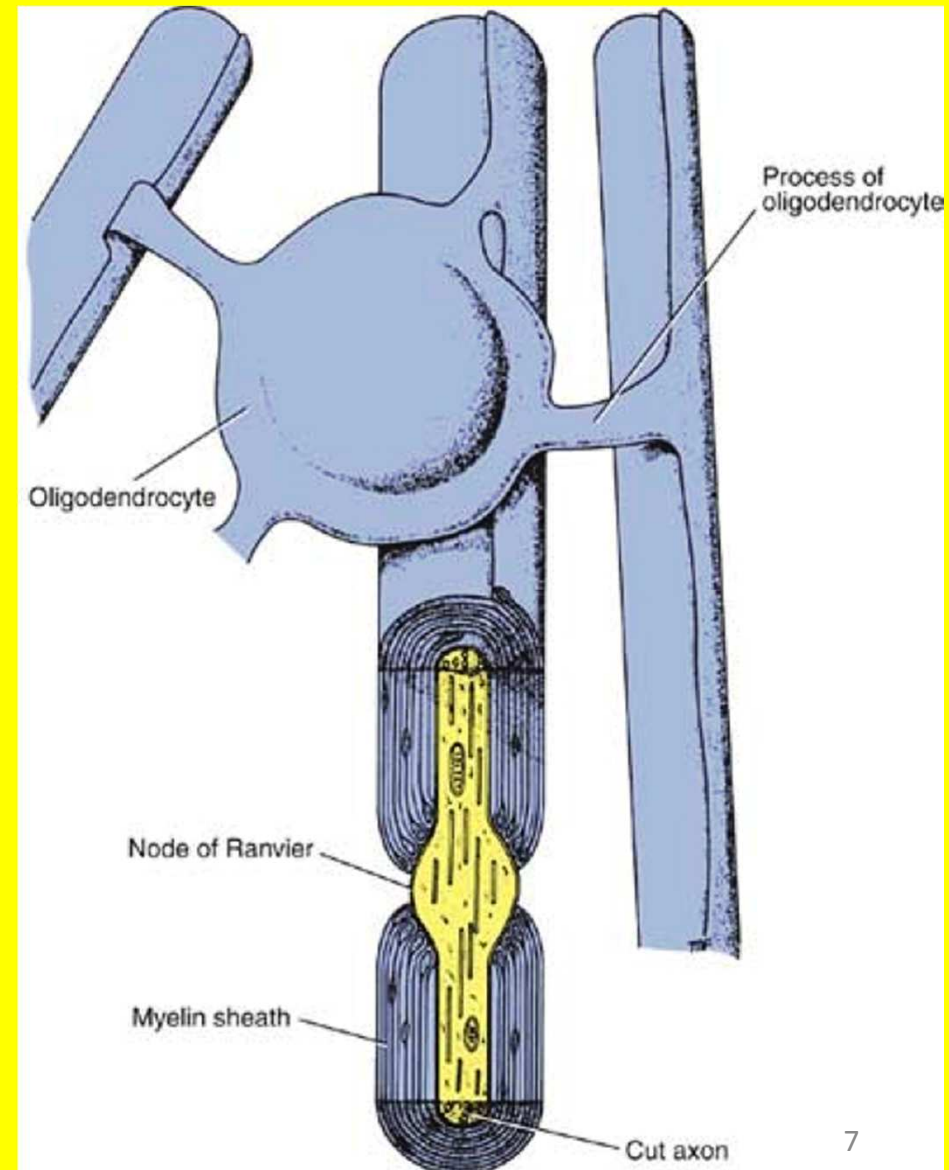
- ✓ Fibrous astrocytes – found mainly in the white matter
- ✓ Protoplasmic astrocytes – found mainly in the gray matter



- Form a supporting framework for the nerve cells and nerve fibres.
- May serve as phagocytes by taking up degenerating synaptic axon terminals
- Tumors of astrocytes are more common and include astrocytoma and glioblastomas

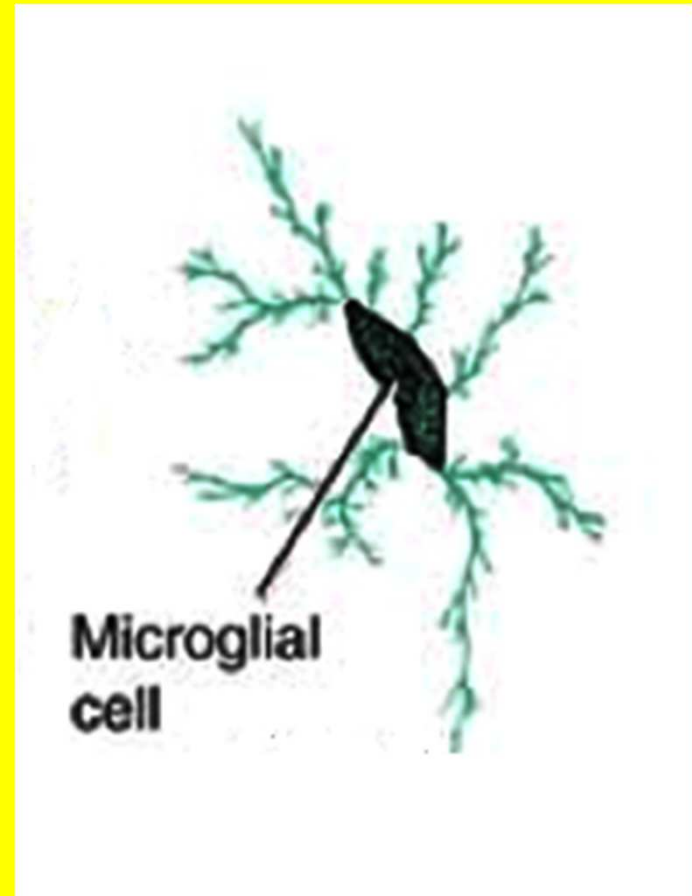
# OLIGODENDROCYTES

- Have small bodies and few delicate processes
- Responsible for the formation of the myelin sheath of nerve fibres in the central nervous system
- Gliomas arise from astrocytes or oligodendrocytes .



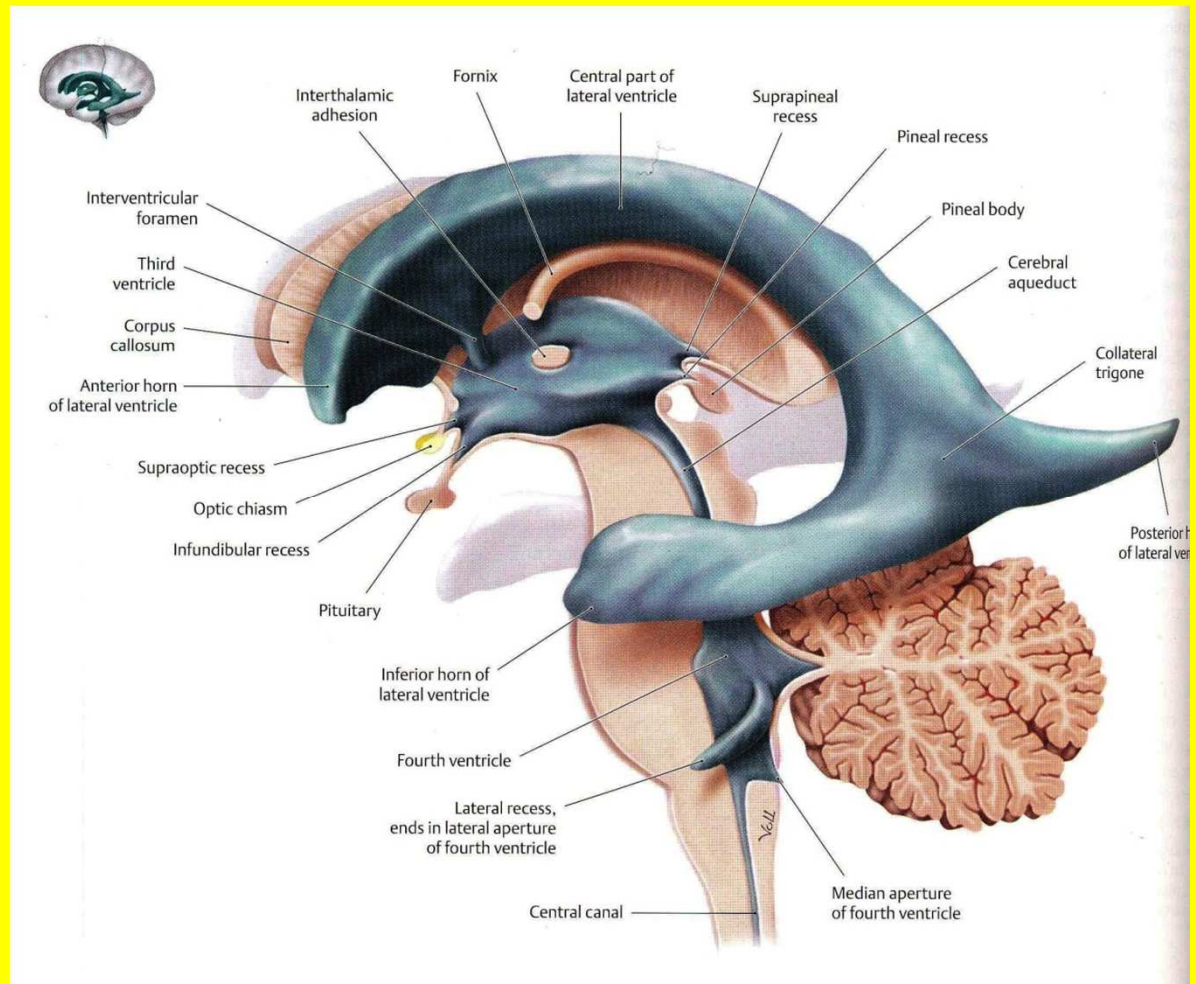
# MICROGLIA

- Smallest
- Wavy branches with spines
- Scattered throughout CNS
- Enlarge and become phagocytic in areas of inflammation and cell destruction





# EPENDYMA



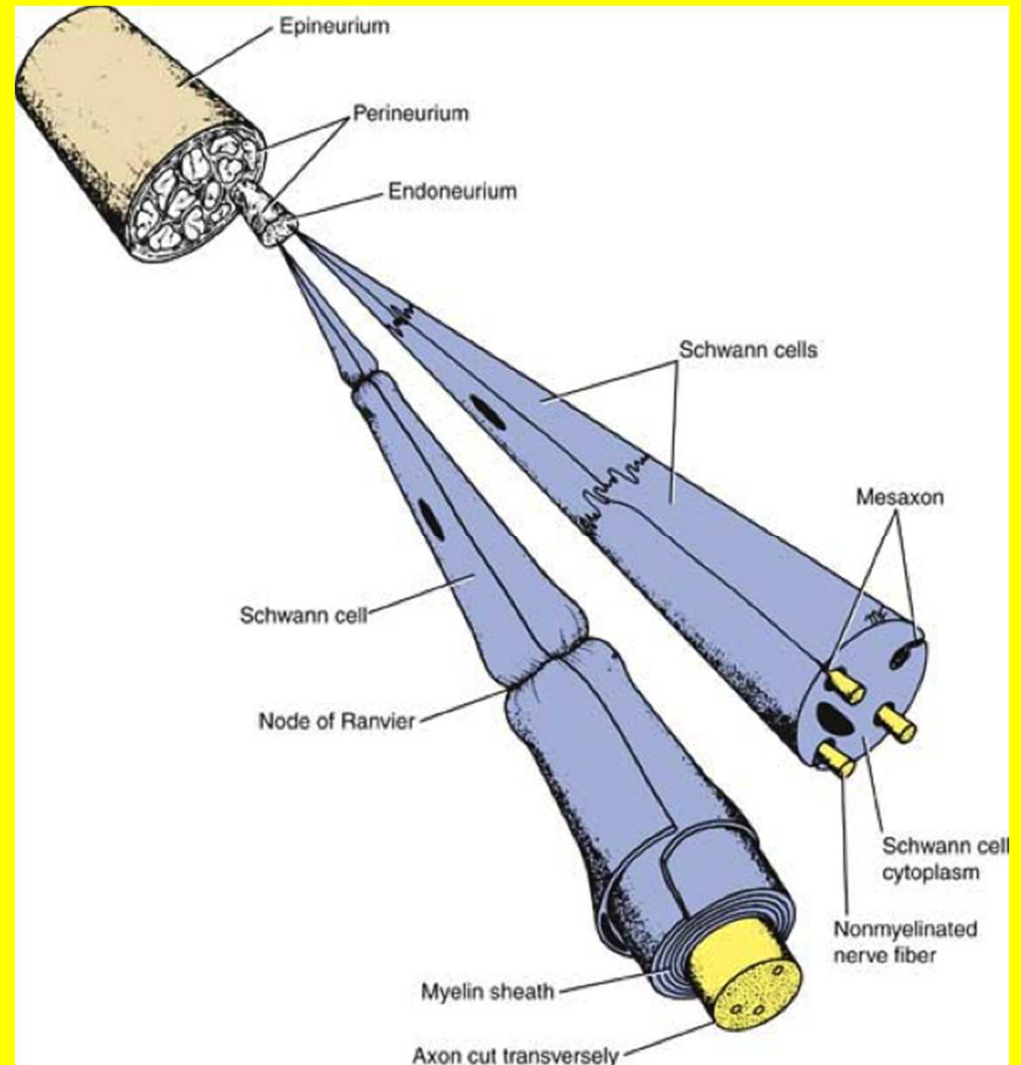
- Line the cavities of the brain and the central canal of the spinal cord.
- Are of three types –
  - ✓ Ependymocytes – line ventricles, central canal, circulate CSF, absorb CSF
  - ✓ Tanocytes – line floor of third ventricle, transport substances from CSF to hypophyseal system
  - ✓ Choroidal epithelial cells – cover surfaces of choroid plexuses, produce and secrete CSF

Tumors of the neuroglia are

- ✓ Highly invasive - difficulty in achieving complete surgical removal and of recurrence after surgery.
- ✓ As these tumour infiltrate -without interfering with the function of neighbouring neurons. The tumour often larger than the symptoms and signs .

# PERIPHERAL NERVE

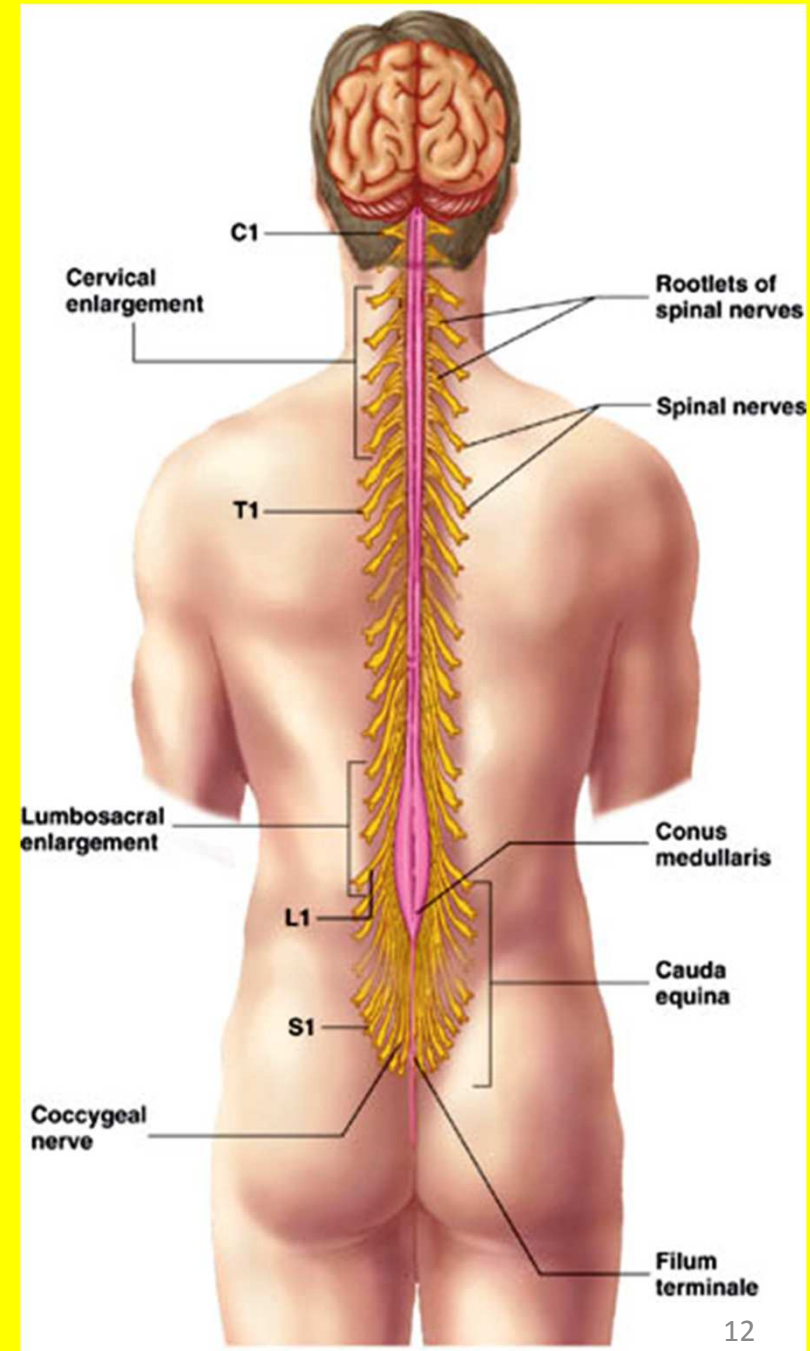
- Benign fibroma or malignant sarcoma – arise in the connective tissue of the nerve
- Neurilemmomas arise from schwann cells



# TUMORS OF SPINAL CORD

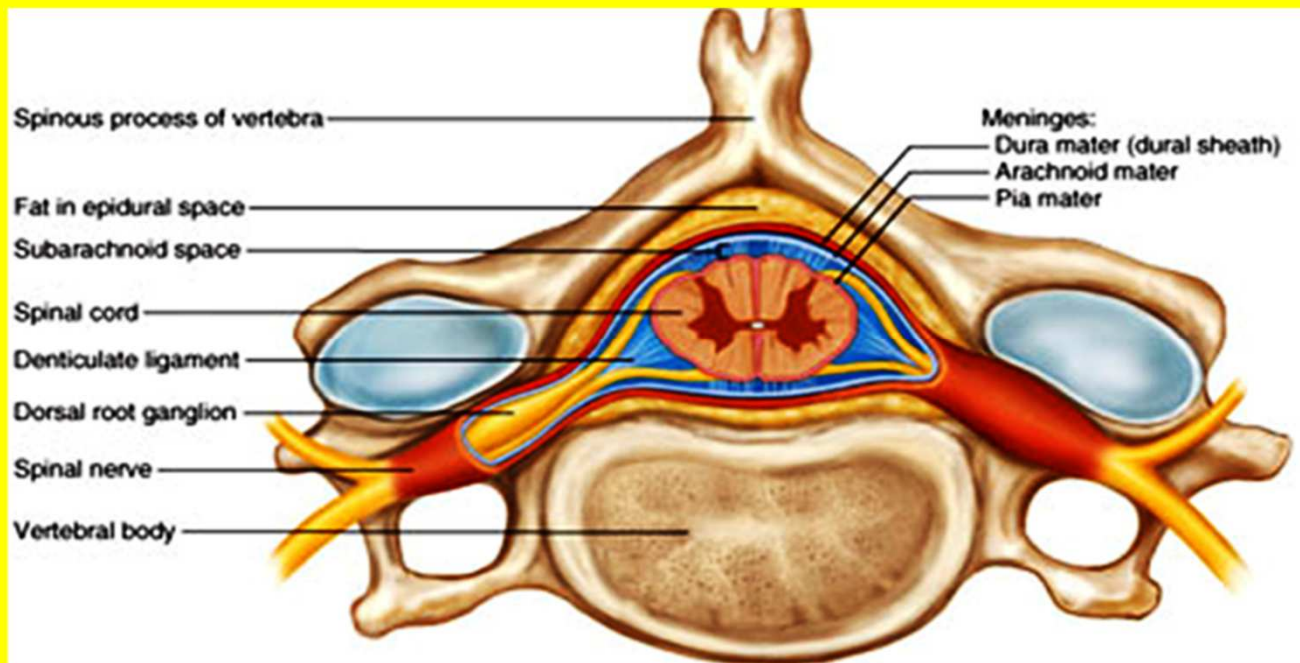
## CHORDOMAS

- Start in the bone at the base of skull or at the lower end of the spine
- Injure the nearby brain or spinal cord by pressing on it

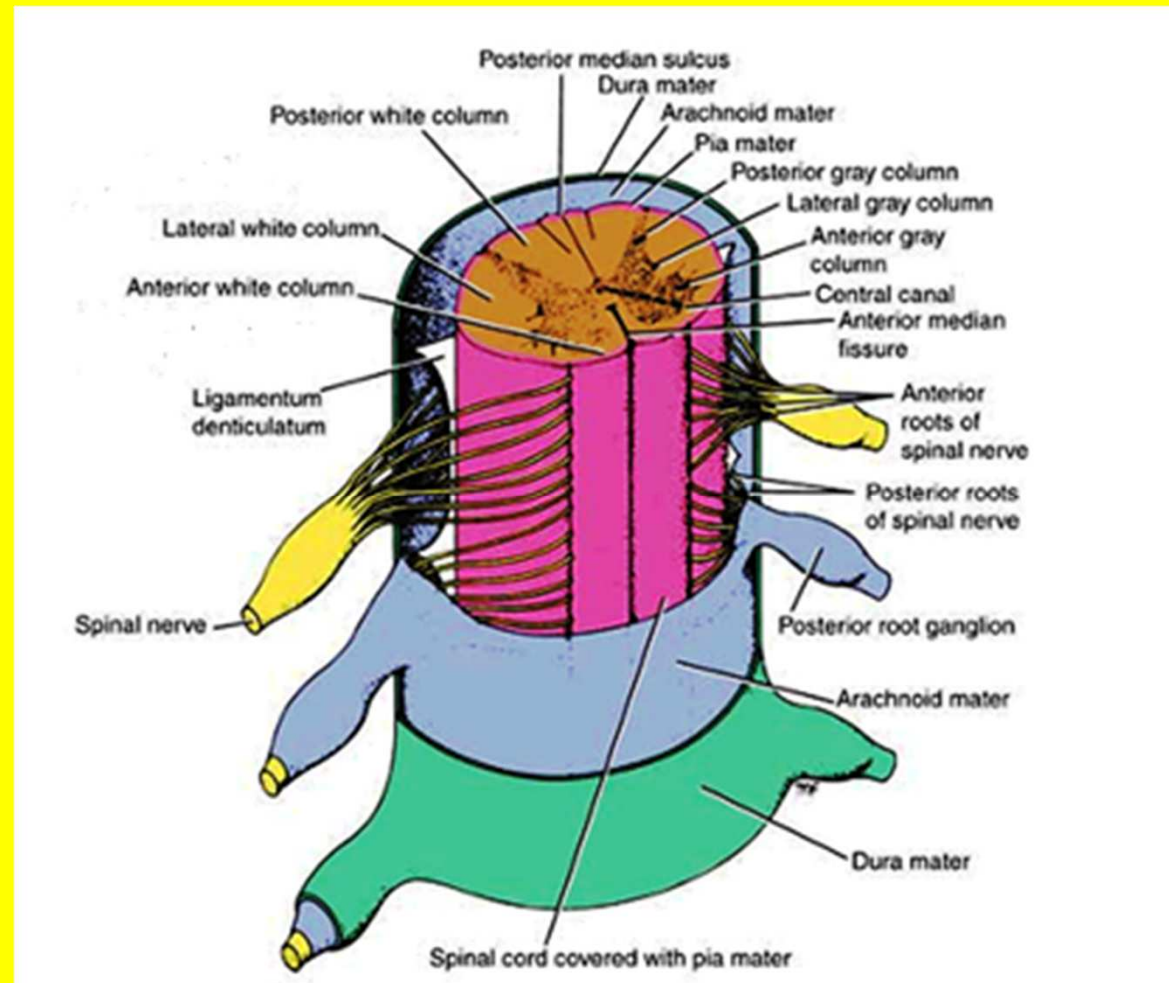


Chronic compression of the spinal cord may be caused by

- Extradural
- Intradural



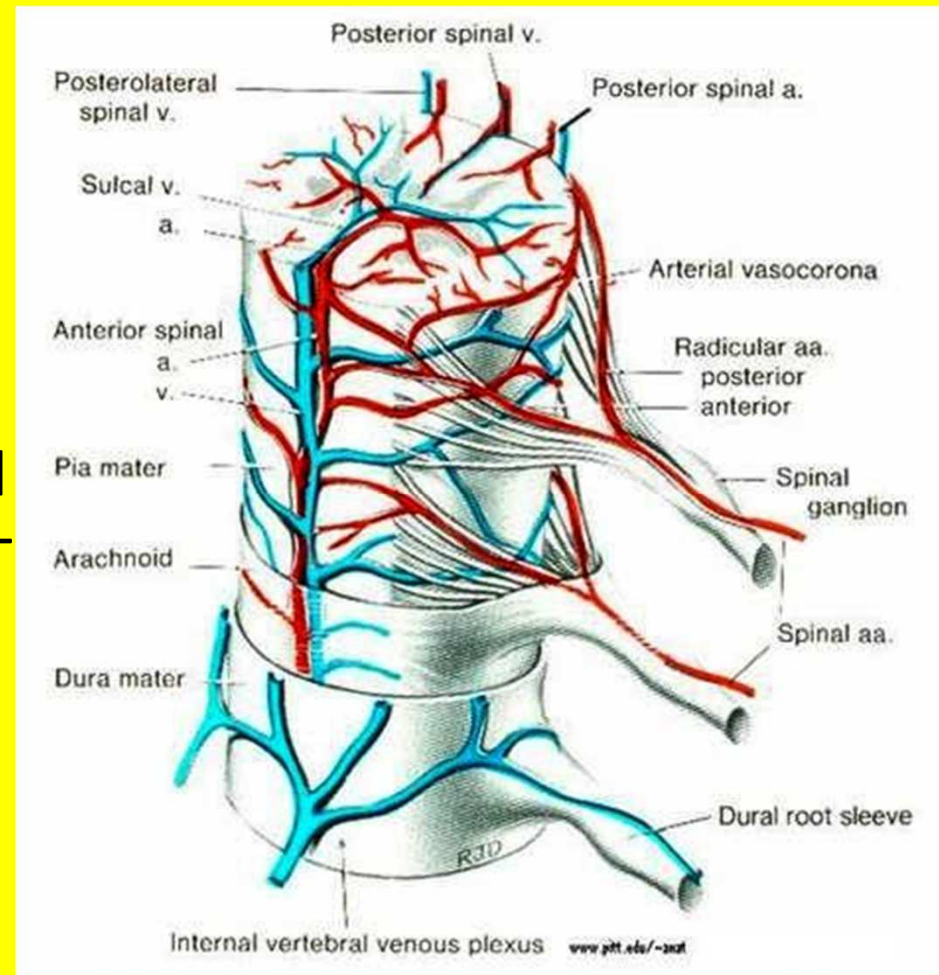


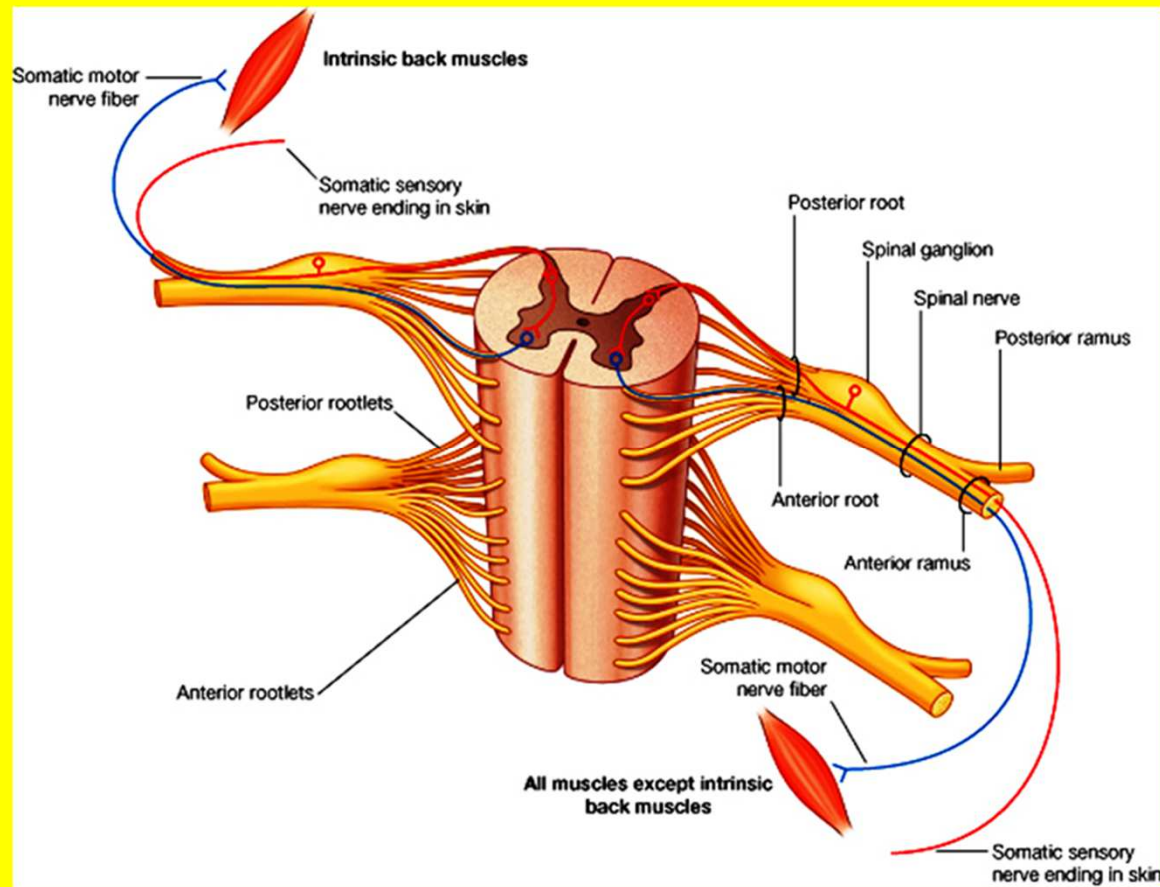


## Intradural

- ✓ Extramedullary – meningiomas and nerve fibromas
- ✓ Intramedullary – primary tumors of the spinal cord, such as gliomas

- Pressure on the spinal arteries – ischemia of the spinal cord
- Pressure on the spinal veins – edema of the spinal cord
- Direct pressure on the white and gray matter of the spinal cord and spinal nerve roots – interfere with nerve conduction
- Circulation of CSF is obstructed





Primary or secondary vertebral tumour, vertebral destruction by tumor – can press on the anterior/posterior nerve roots in the intervertebral foramina



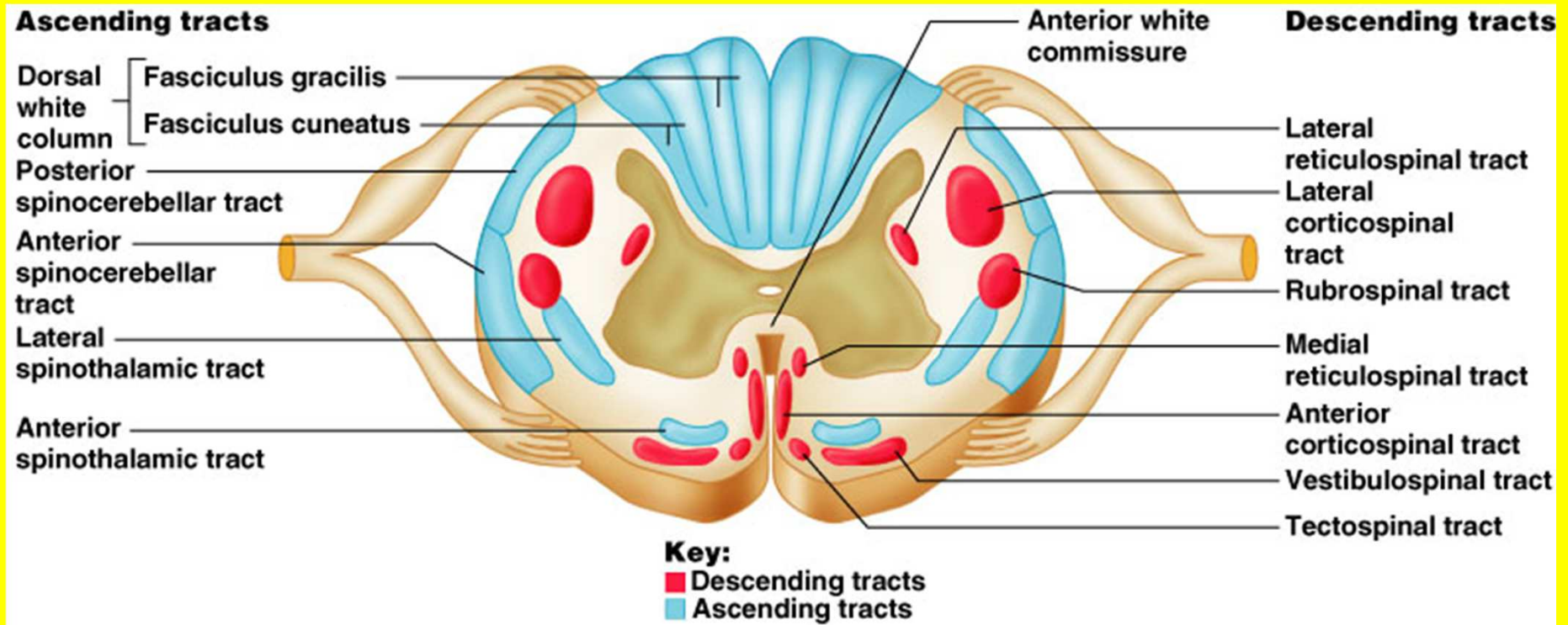
# COMPRESSION OF NERVE ROOTS

## Posterior nerve root

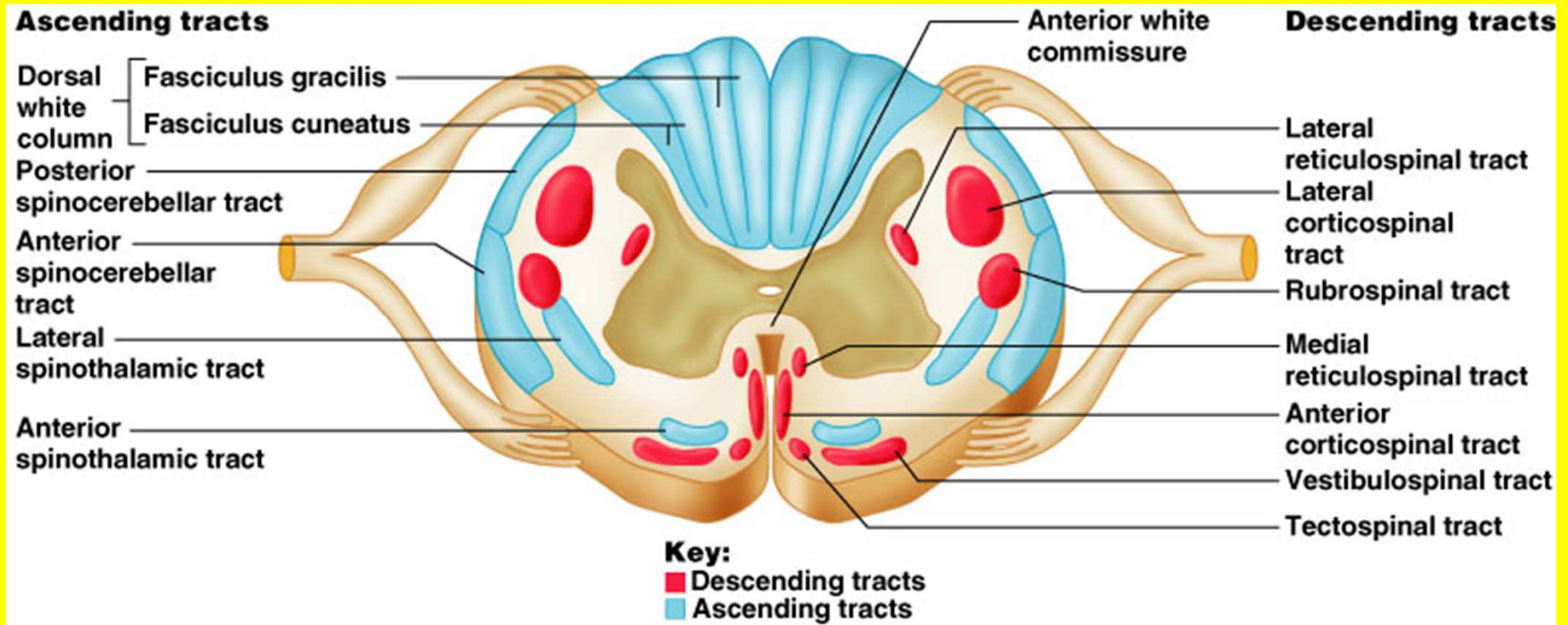
- Earliest sign is pain
- ✓ area of skin innervated by that root
- ✓ Muscles that receive their sensory supply from that root
- ✓ Hyperalgesia & hyperesthesia before there is actual loss of sensation in the dermatome

## Anterior nerve root

- ✓ Paralysis/partial paralysis of the muscle that is supplied exclusively by that root
- ✓ Fasciculation and muscle atrophy may occur



Early involvement of the corticospinal and descending tract produces muscular weakness, increased muscle tone, increased tendon reflexes below the level of lesion, and extensor plantar response.



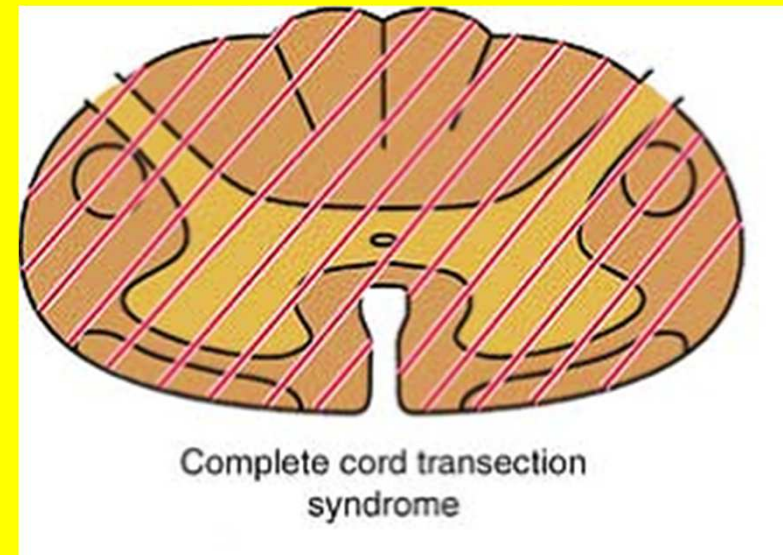
- Lesion of posterior white column – loss of muscle joint sense (proprioception), vibration sense, and tactile discrimination below the level of lesion on the same side
- Involvement of the lateral spinothalamic tract – loss of pain, heat and cold sensation on the opposite side of the body below the level of lesion

# DESTRUCTIVE SPINAL CORD SYNDROME

- Caused by expanding tumour may be categorized into following types
  - ✓ Complete cord transection syndrome
  - ✓ Hemisection of the cord / Brown-Sequard Syndrome

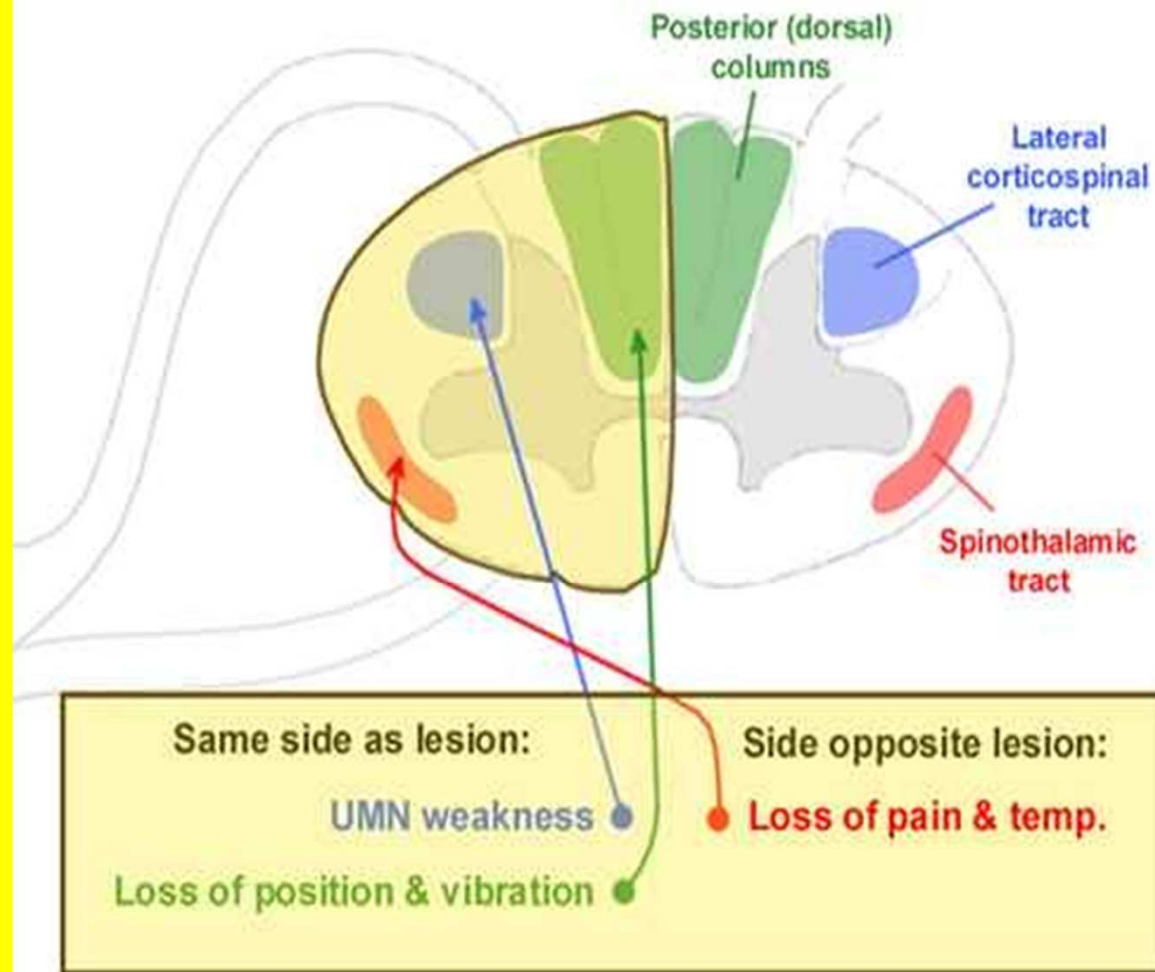
# COMPLETE CORD TRANSECTION

- Damage to anterior gray column
  - bilateral LMN paralysis and muscular atrophy in the segment of lesion
- Interruption of the corticospinal tracts on both sides of the cord
  - bilateral spastic paralysis below the level of lesion, bilateral babinski sign, bilateral loss of superficial abdominal and cremastic reflexes



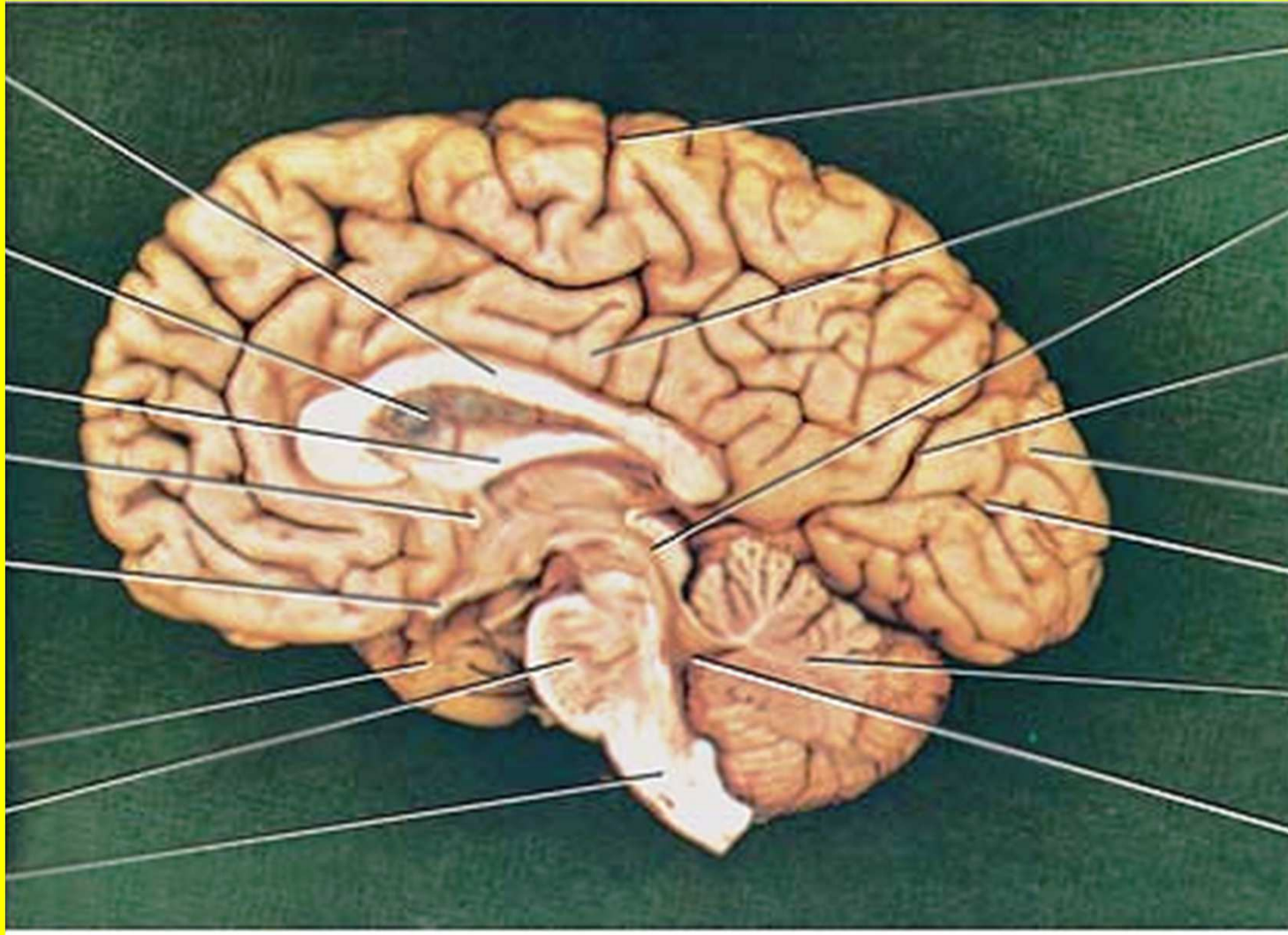
- Bilateral destruction of ascending tracts in the posterior white column
- Section of lateral and anterior spinothalamic tracts
- Descending autonomic fibres destroyed

## Brown-Sequard Syndrome of Spinal Cord Hemisection



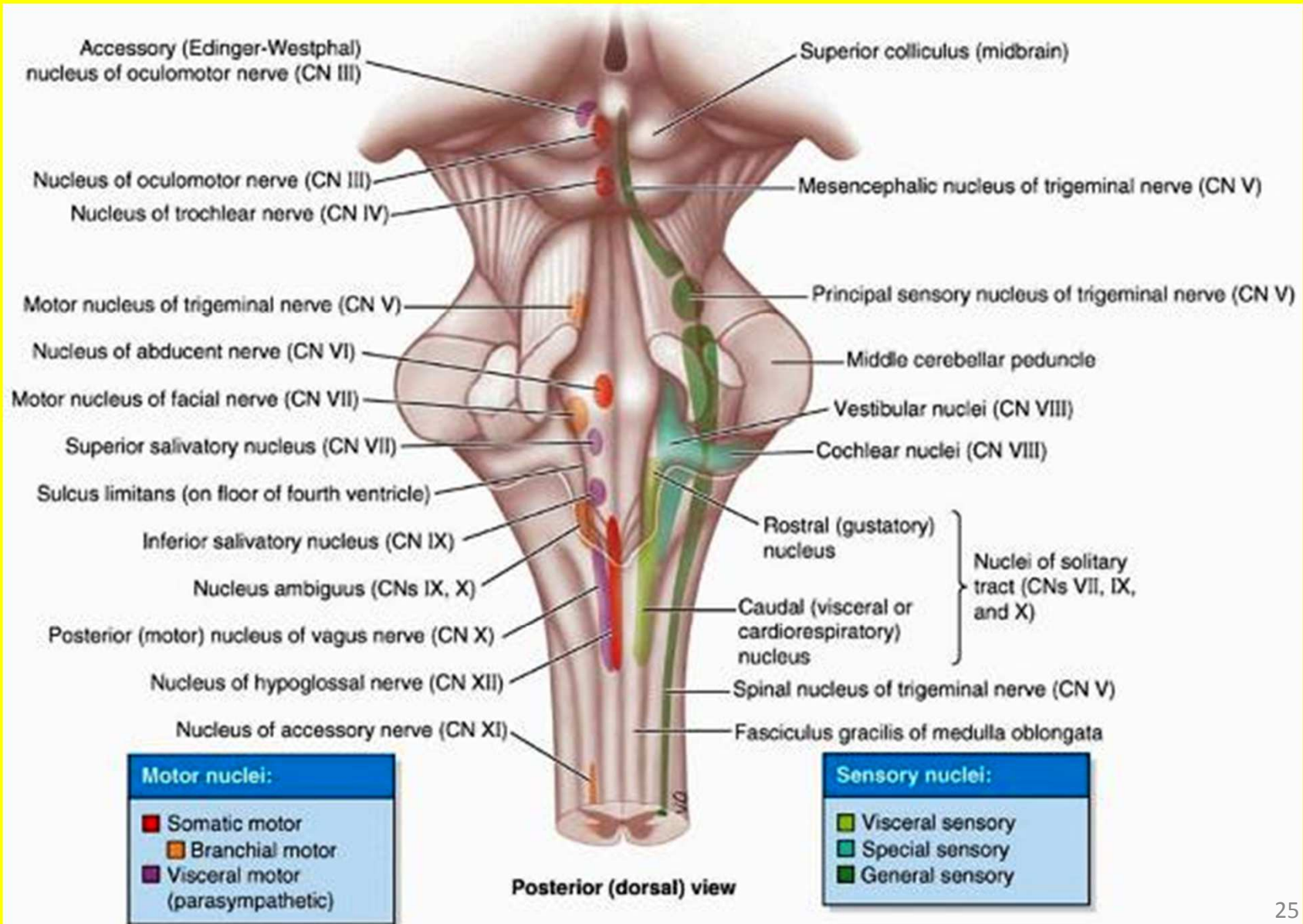


# TUMORS OF BRAINSTEM

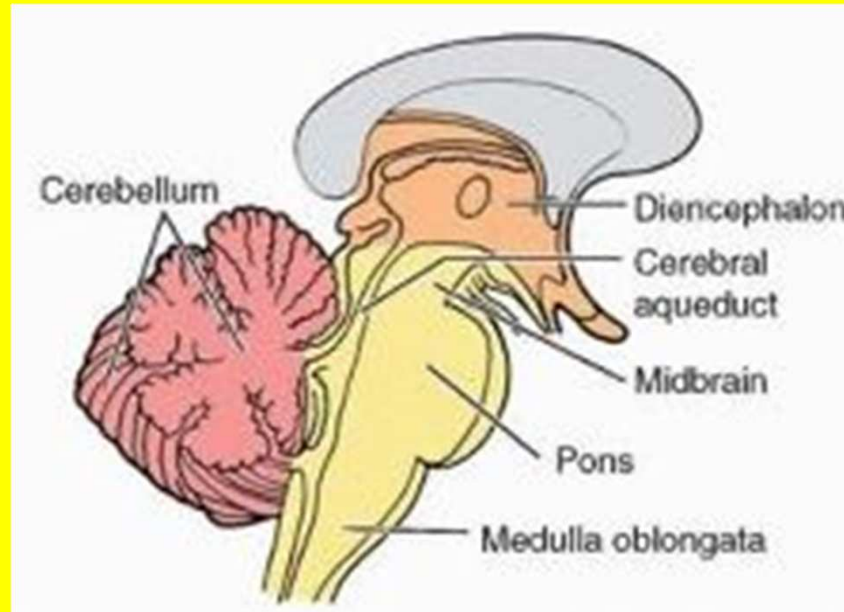




# NUCLEI OF CRANIAL NERVES



# MEDULLA OBLONGATA

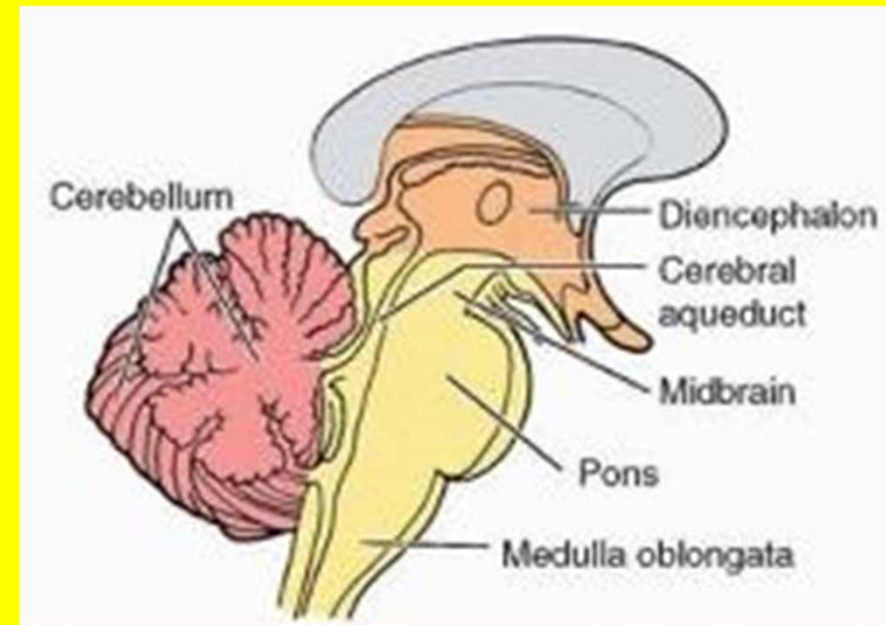


- ✓ Tumors of the posterior cranial fossa like Medulloblastoma is common – intracranial pressure is raised
- ✓ Cerebellum and medulla tends to be pushed downward through foramen magnum
- ✓ which results in paralysis of the glossopharyngeal, vagus, accessory, and hypoglossal nerves owing to traction

CN IX	Loss of taste on posterior third of tongue; loss of sensation on affected side of soft palate
CN X	Sagging of soft palate; deviation of uvula to normal side; hoarseness owing to paralysis of vocal fold
CN XI	Paralysis of sternocleidomastoid and superior fibers of trapezius; drooping of shoulder
CN XII	Protruded tongue deviates toward affected side; moderate dysarthria (disturbance of articulation)

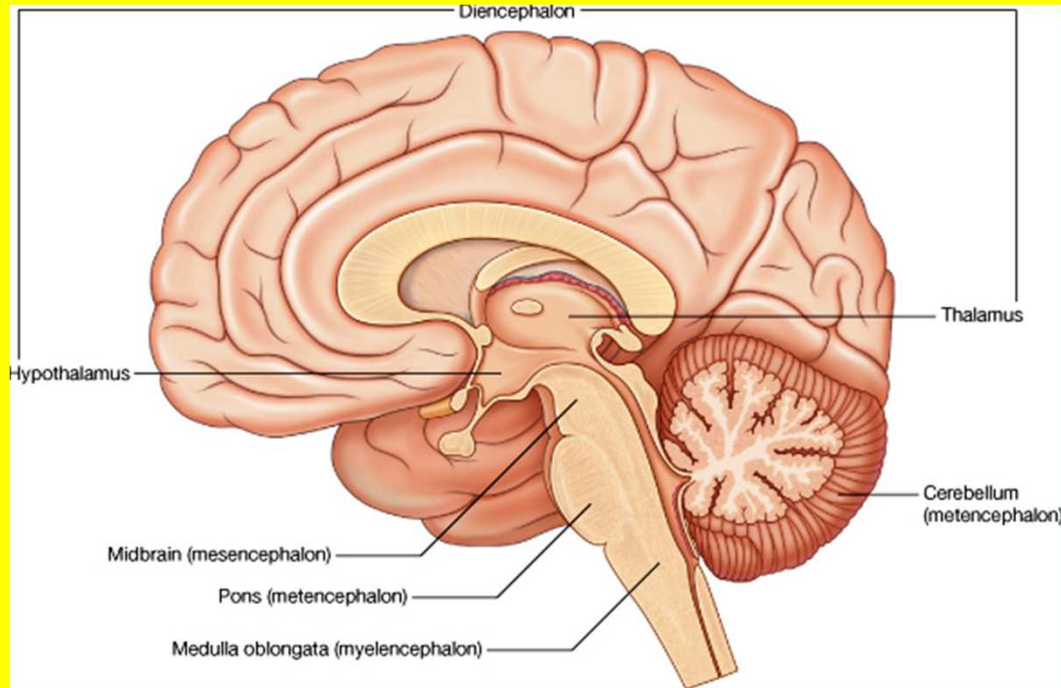
# PONS

- ✓ Astrocytoma of Pons  
most common tumor  
occurring in childhood
- ✓ Ipsilateral cranial nerve  
paralysis and  
contralateral  
hemiparesis
- ✓ Paralysis of cranial nerve  
(facial and abducent)  
occurs.



CN V	Injury to terminal branches (particularly CN V2) in roof of maxillary sinus; pathological processes affecting trigeminal ganglion Loss of pain and touch sensations; paraesthesia; masseter and temporalis muscles do not contract; deviation of mandible to side of lesion when mouth is opened
CN VI	Eye fails to move laterally; diplopia on lateral gaze
CN VII	Paralysis of facial muscles; eye remains open; angle of mouth droops; forehead does not wrinkle
CN VIII	Tumor of nerve (acoustic neuroma) Progressive unilateral hearing loss; tinnitus (noises in ear)

# MIDBRAIN



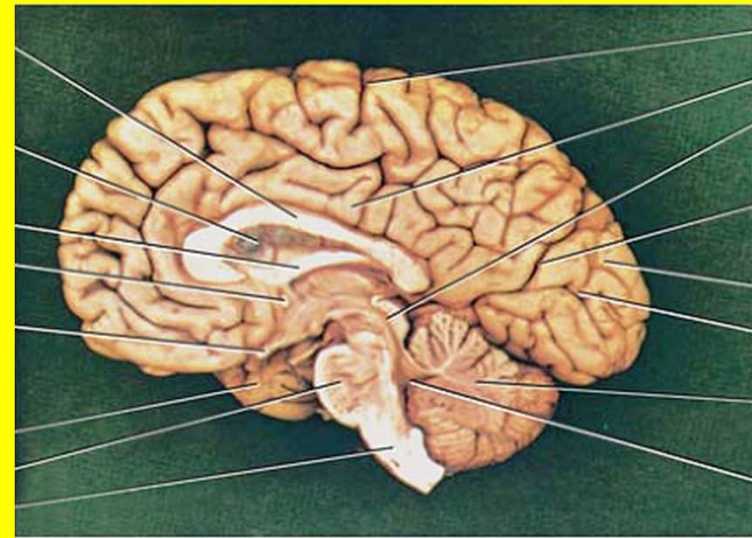
- ✓ Compress /block the aqueduct
- ✓ CSF may accumulate within third & lateral ventricle (hydrocephalus)
- ✓ Oculomotor & trochlear nuclei , corticospinal & corticonuclear tracts will be affected



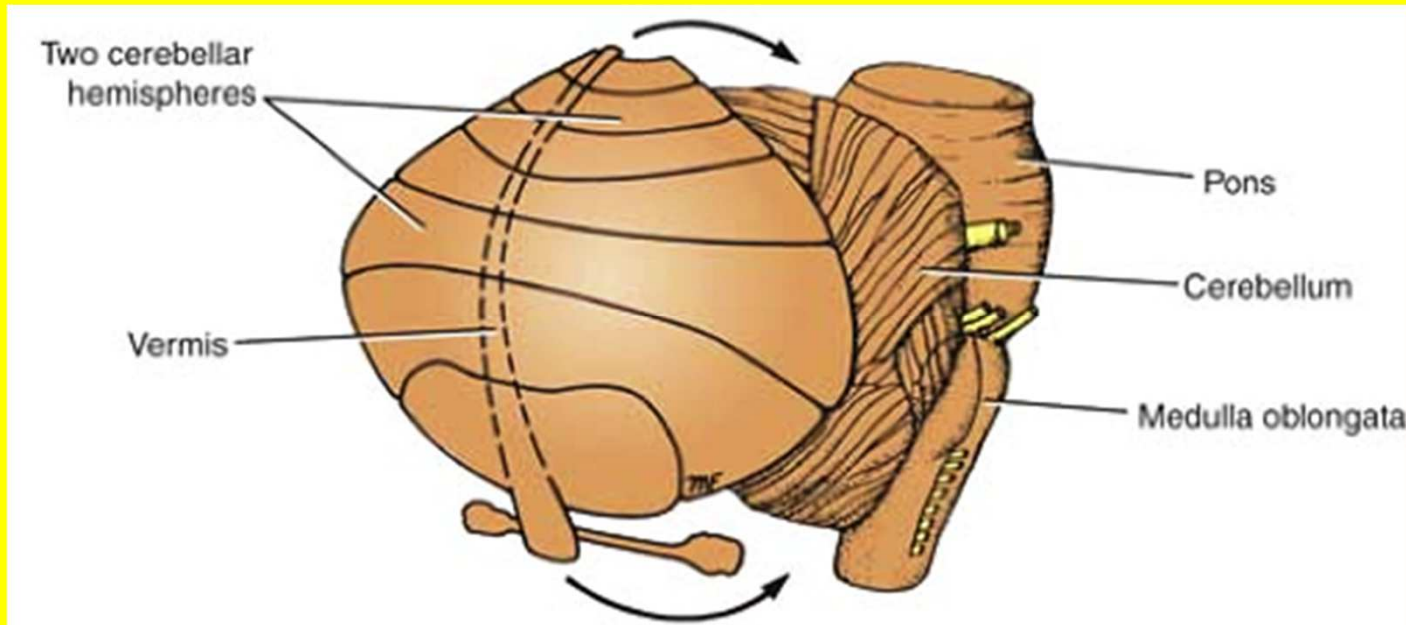
CN III	Pressure from herniating uncus on nerve Dilated pupil; ptosis; eye turns down and out; pupillary reflex on side of lesion will be lost
CN IV	Stretching of nerve during its course around brainstem (Inability to look down when eye is adducted)

# TUMORS OF CEREBELLAR HEMISPHERE

- Develop from neuroectodermal cells (primitive nerve cells) in the cerebellum
- Symptoms are unilateral and involve muscles on the side of the diseased cerebellar hemisphere
- Movements of limbs, especially arms are disturbed
- Swaying and falling to the side of lesion
- Dysarthria and nystagmus

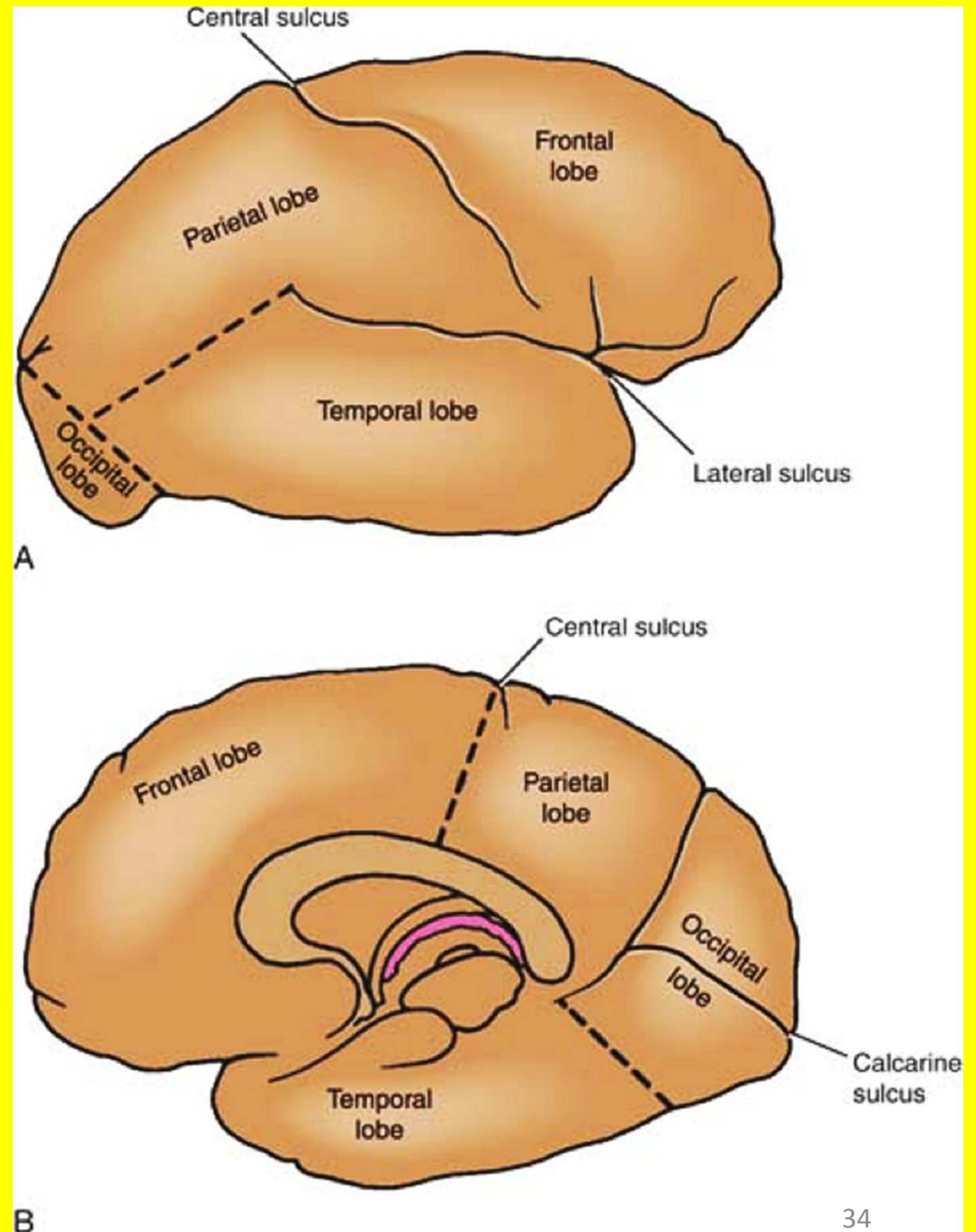


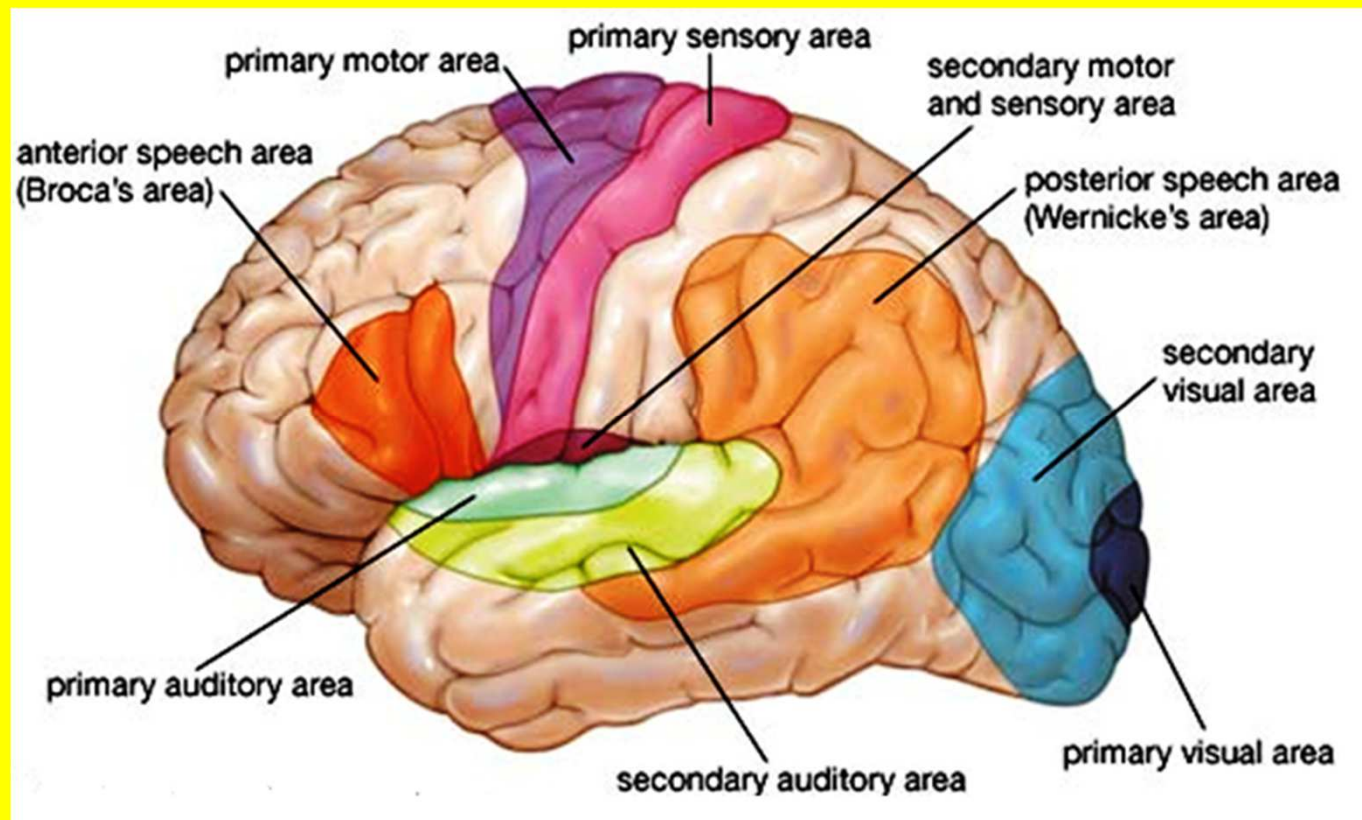




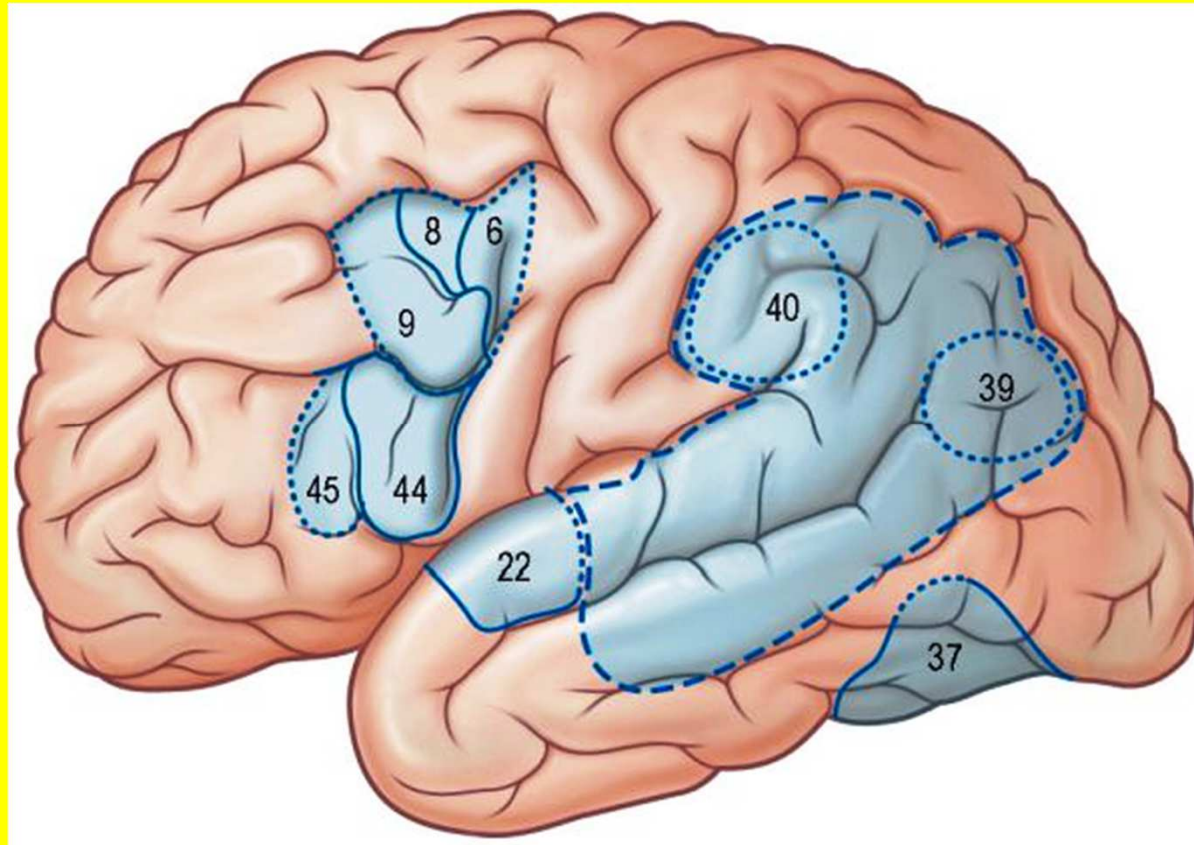
- Medulloblastoma - involves vermis in children
- Vermis is unpaired, and influence midline structure therefore muscle incoordination involves the head and trunk and not the limbs
- involvement of flocculonodular lobe result in signs and symptoms related to vestibular system

# TUMORS OF BRAIN



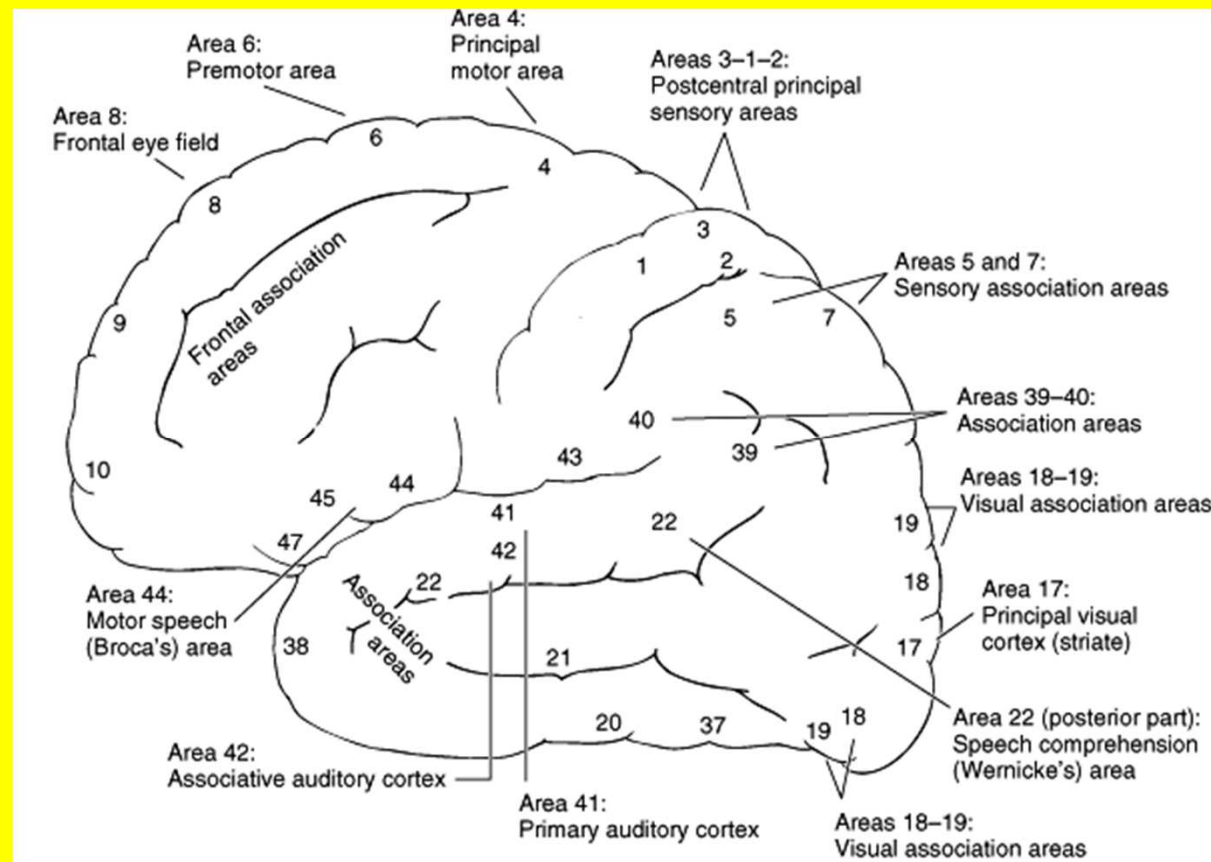


- Frontal lobe
  - ✓ Primary motor area - Lesion produces flaccid paralysis of opposite half of the body
  - ✓ Premotor area - difficulty in the performance of skilled movements



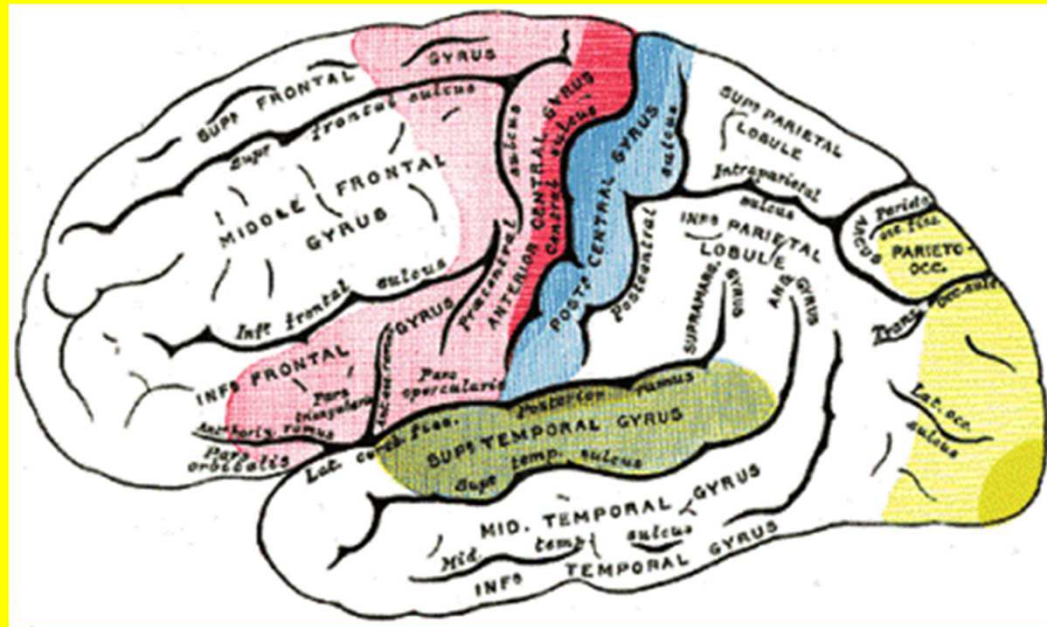
- Frontal eye field – both eyes deviate to the side of lesion
- Motor speech area of Broca – loss of ability to produce speech (expressive aphasia)
- Prefrontal area – profound change in personality



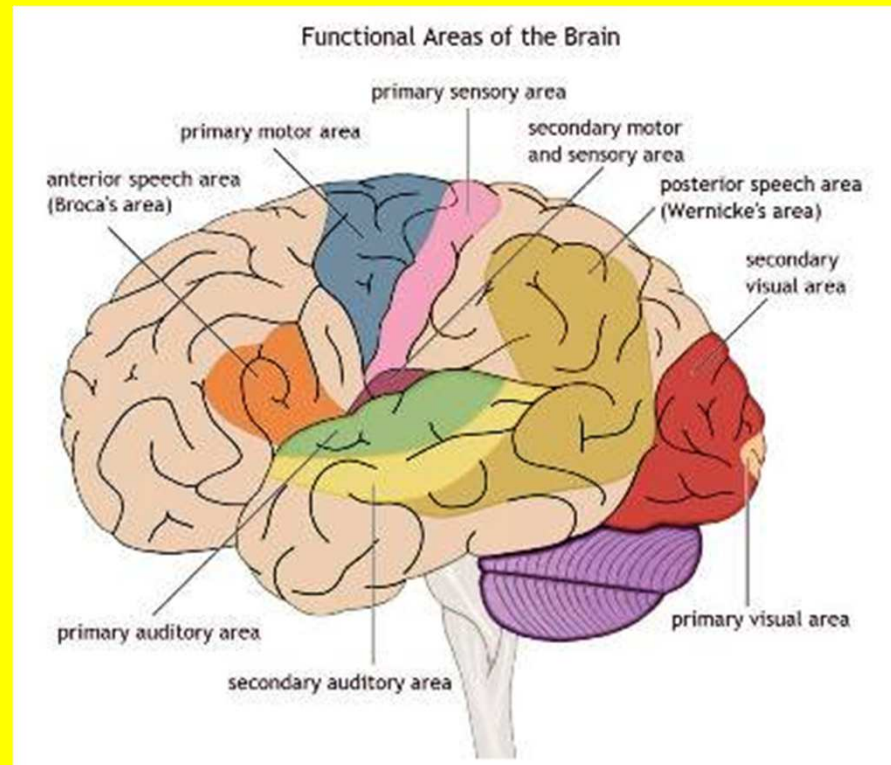


- Primary sensory area – loss of appreciation of exteroceptive and proprioceptive sensations from opposite half of the body
- Sensory association area – inability to recognize an object with its feel

- Lesion of sensory speech area of Wernicke – loss of ability to understand the spoken and written language (receptive aphasia)
- Frontal lobe tumours of anterior cranial fossa can produce anosmia by pressing on the olfactory bulb or tract



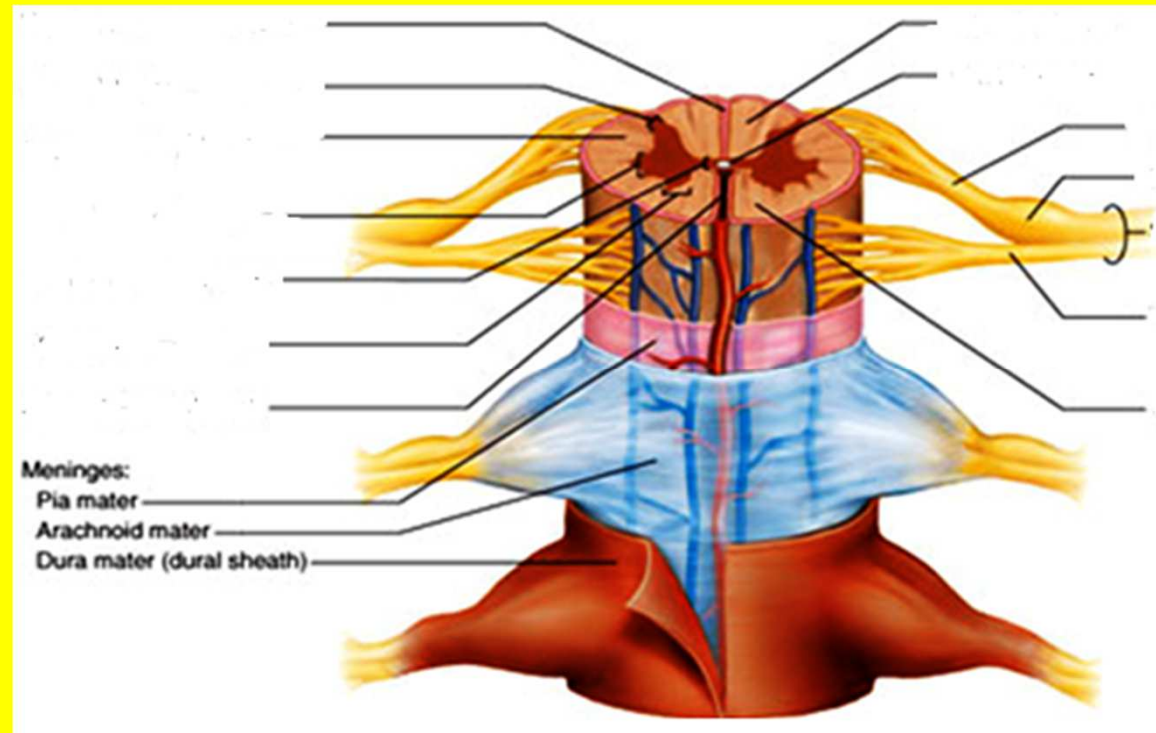
- Primary auditory area on one side – slight bilateral loss of hearing
- Primary auditory area on both sides – complete deafness
- Lesion of secondary auditory area – inability to interpret the meaning of the sounds heard



- Lesion of primary visual area – loss of vision in the opposite visual field (crossed homonymous hemianopia)
- Lesion of secondary visual area – loss of ability to recognize objects (visual agnosia)



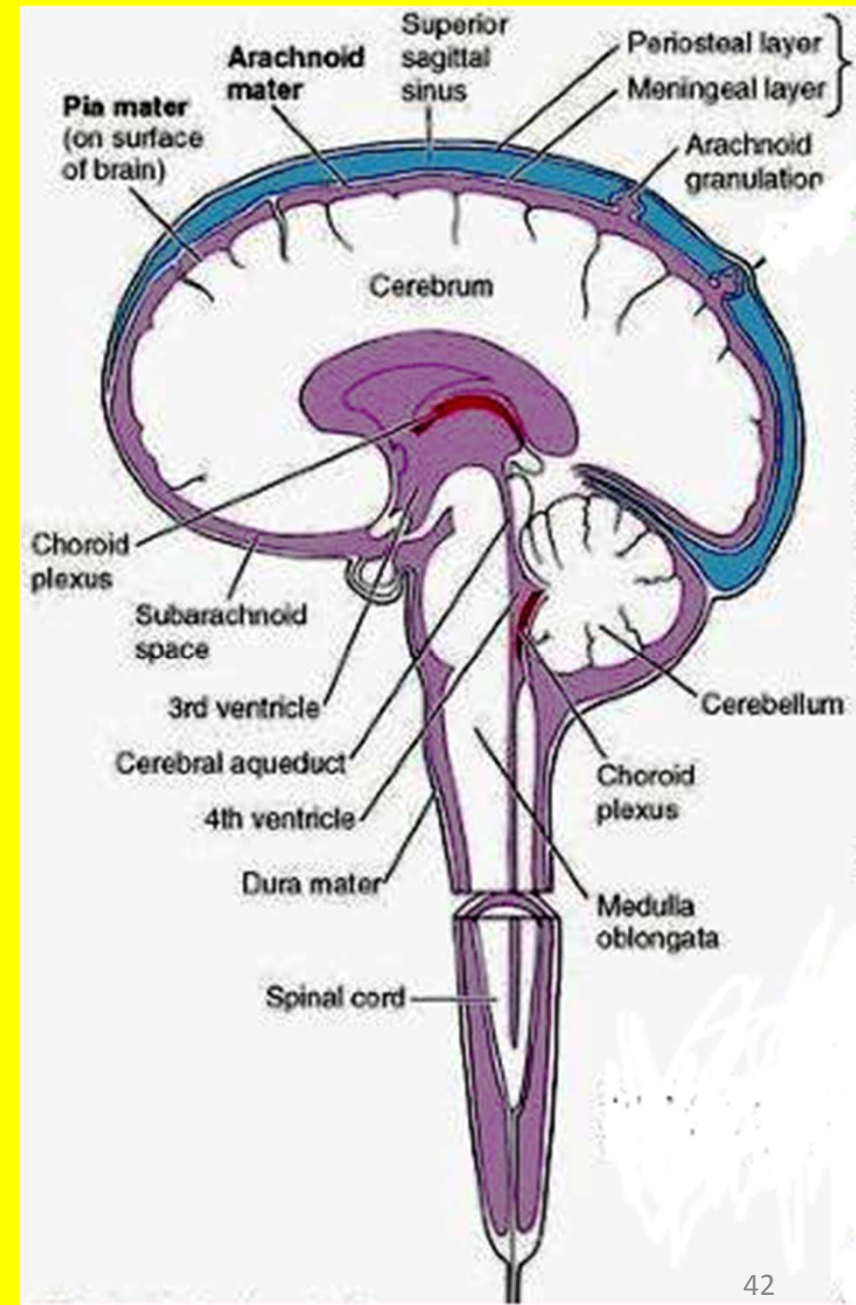
# MENINGES



- Meninges of the brain and spinal cord form three concentric membranous coverings
- DURAMATER – outermost, tough serve to protect the underlying nervous tissue
- ARACHNOID MATER- much thinner impermeable membrane that loosely covers the brain.
- PIAMATER – vascular membrane that closely invests and support the brain and spinal cord.

# MENINGIOMAS

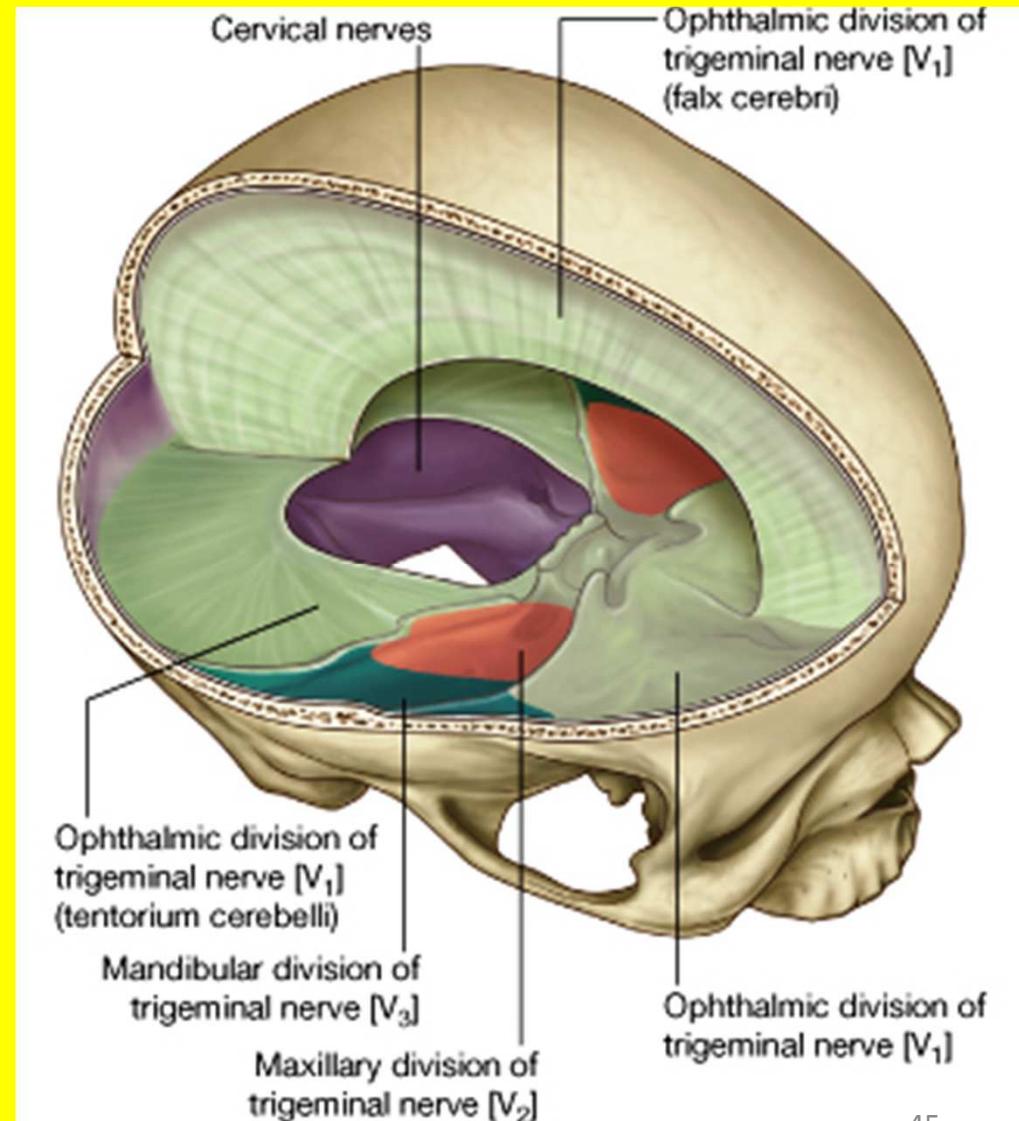
- Tumour arising from the meninges
- Mainly arises from arachnoid villi & most commonly occur along the superior sagittal sinus



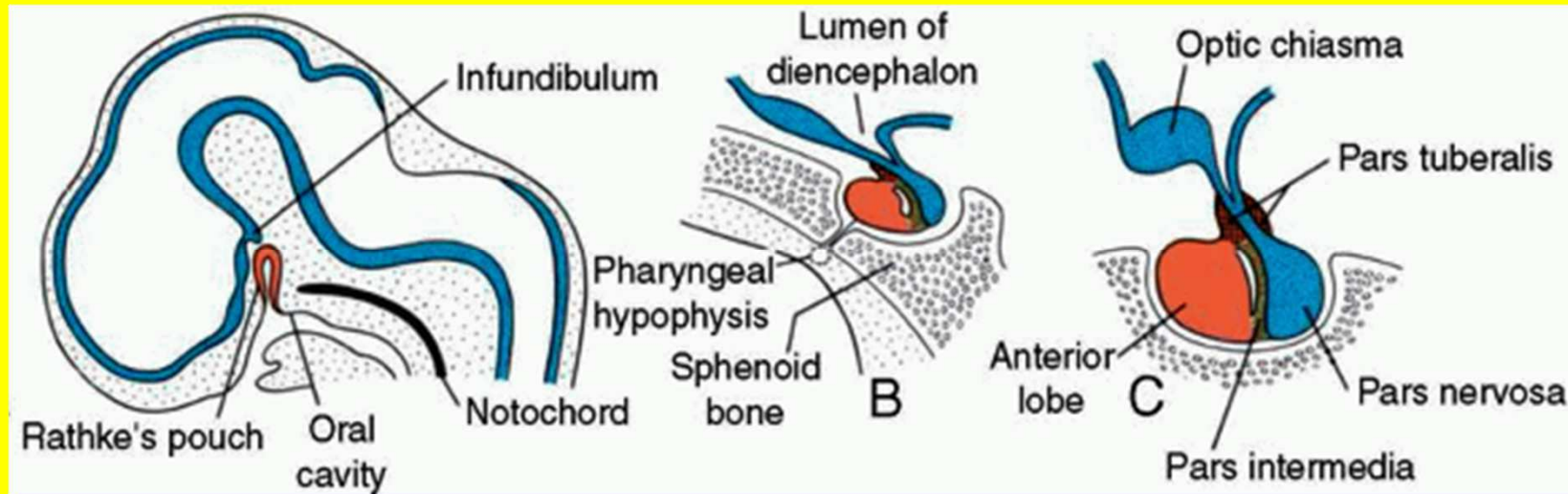
- Meningiomas in the floor of anterior cranial fossa – compress the olfactory bulb and tract – loss of smell to the same side

- ✓ Brain itself insensitive to pain. Headaches are due to stimulation of receptors outside the brain.
- ✓ Meningeal headaches caused by tumors
- ✓ Duramater receives its sensory supply from the trigeminal and the first three cervical nerves.

- Dura above the tentorium - trigeminal nerve, and the headache is referred to the forehead and face
- Dura below the tentorium -by the cervical nerves, and the headache is referred to the back of head and neck



# PITUITARY GLAND



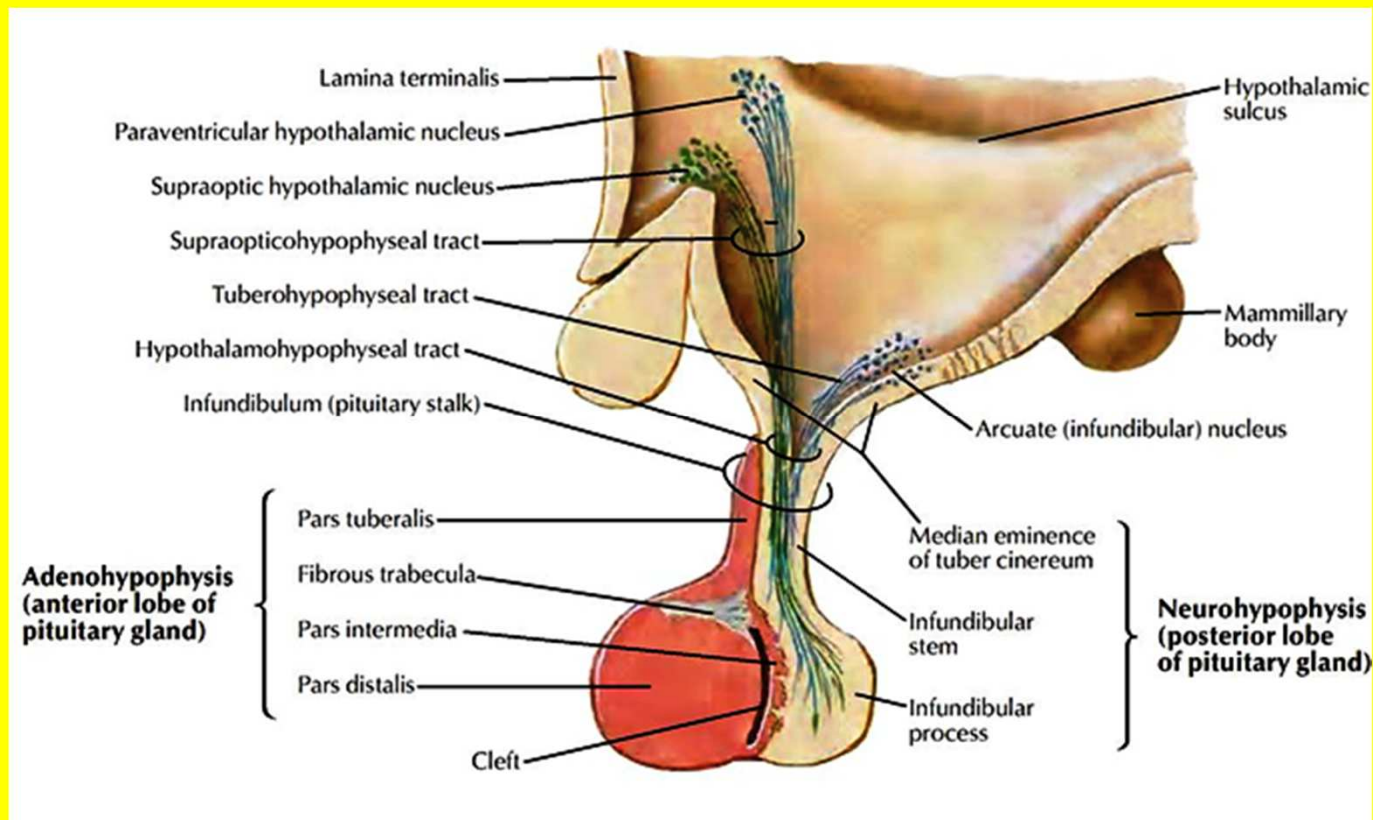
- During the development small portion of Rathke's pouch persists in the roof of the pharynx as pharyngeal hypophysis.
- Craniopharyngiomas arise from remnants Rathke's pouch.



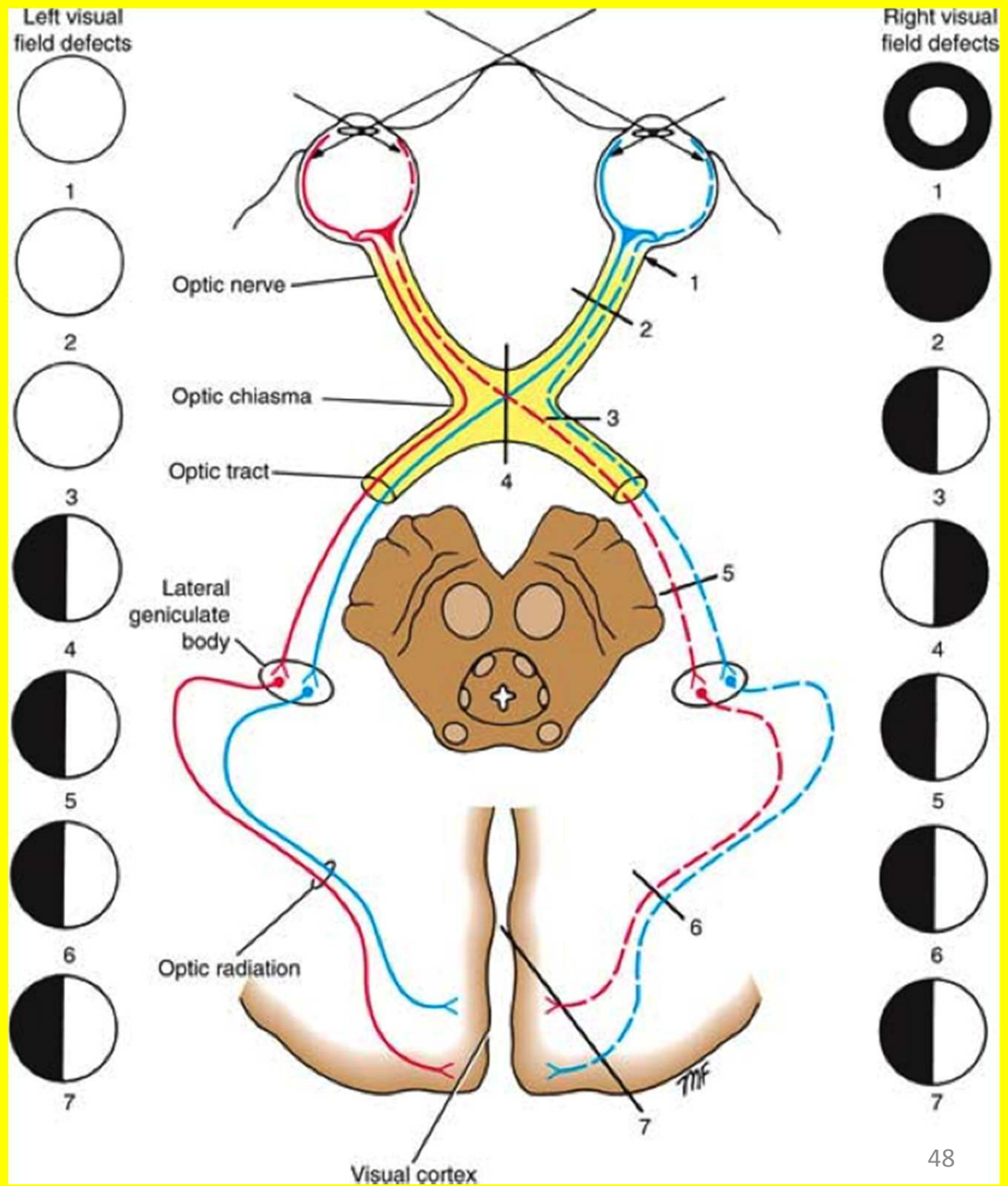
# PITUITARY TUMORS

May extend superiorly through the aperture in the diaphragma sellae or cause it to bulge

- ✓ resulting in visual symptoms
- ✓ producing disturbances in endocrine function early or late



# LESIONS OF VISUAL PATHWAY

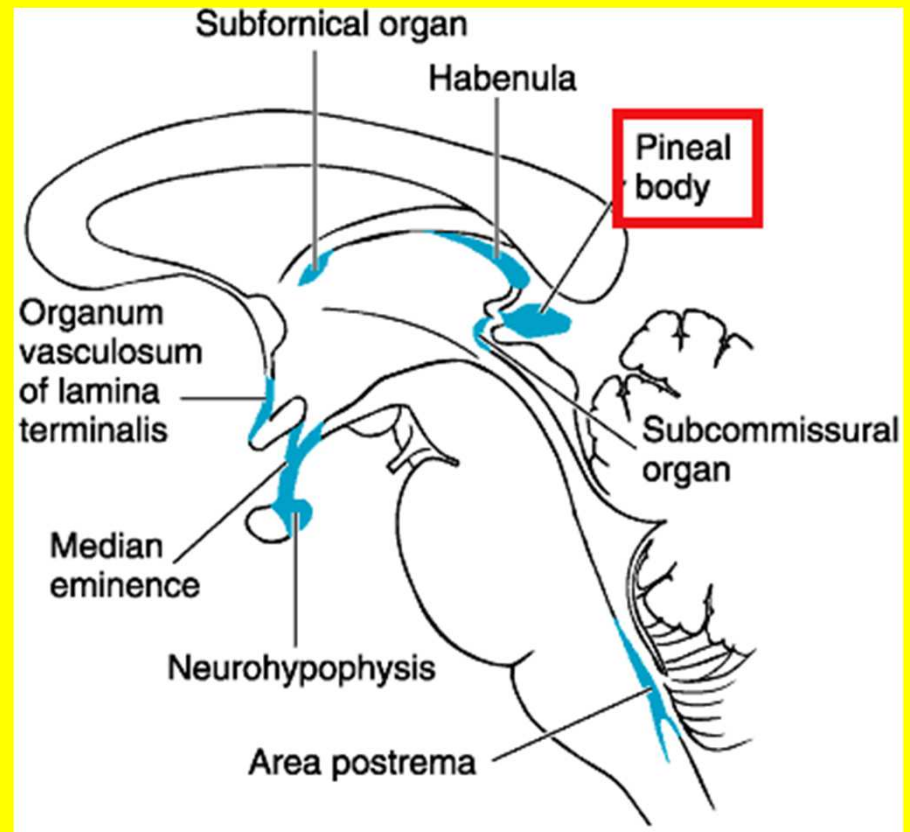


# RARE TUMOURS

## RARE TUMOURS

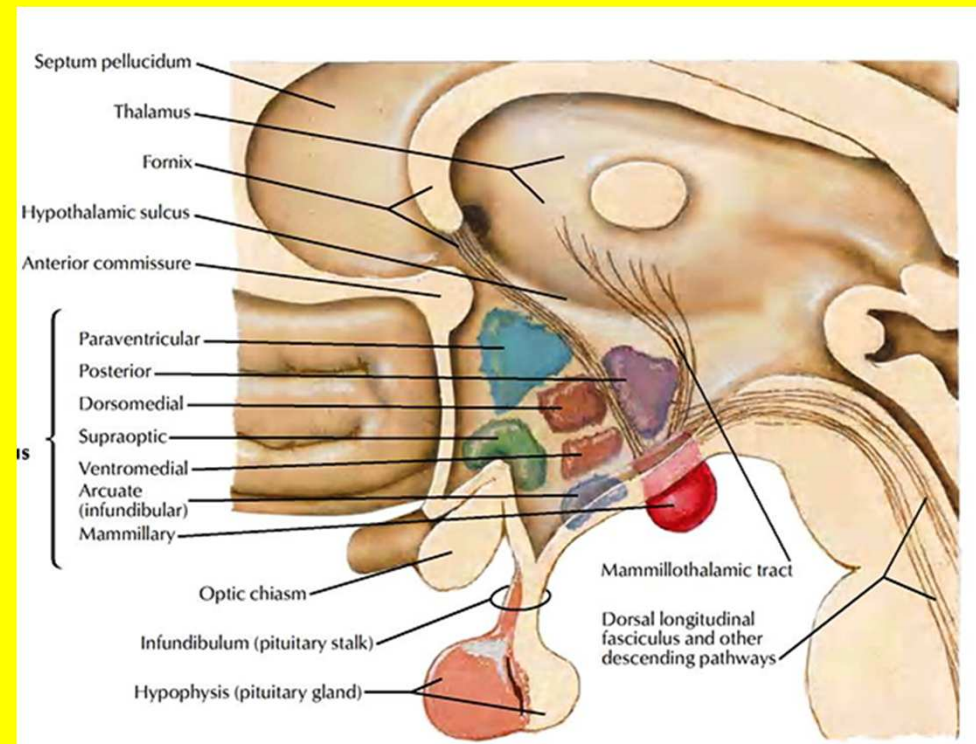
# PINEAL GLAND

- Pineal tumors / tumors of neighboring areas of nervous tissue may press on pineal gland causing alteration of reproductive function.
- May obstruct cerebral aqueduct



# HYPOTHALAMUS

- Pituitary & pineal tumors may interfere with function of the hypothalamus.
- Tumor may result in
  - ✓ Obesity and wasting
  - ✓ Sexual disorders
  - ✓ Hyperthermia and hypothermia
  - ✓ Diabetes insipidus
  - ✓ Disturbances of sleep
  - ✓ Emotional disorders



# QUESTIONNAIRE

- A 60 year- old woman was seen as an outpatient because she had suddenly developed double vision. She was watching her favorites television program the day before when it suddenly occurred. She had no other symptoms. After a complete physical examination, it was found that her right eye, when at rest, was turned medially, and she was unable to turn it laterally. Which cranial nerve is involved.



- A 20-year-old man was seen by a neurologist because he had a 3- month history of double vision. On examination of the patient, both eyes at rest were turned downward and laterally. The patient was unable to move the eyes upward or medially. Both upper lids were drooping. Examination of both pupils showed them to dilated.

- A 10-year-old girl was taken to a physician because her mother had noticed that the right half of her face was weak. It was noted also that her mouth was pulled to the left when she was tired. On questioning, the patient admitted that food tended to stick inside her right cheek. On examination, there was definite weakness of the facial muscles on the right side. On testing of ocular movements, there was evidence of slight weakness of the lateral rectus muscle on the right side.

- A 37-year-old man visited his physician because he had noticed clumsiness of his right arm. He also noticed that his right hand had a tremor when he attempted fine movements .When he walked, he noticed that now & again he tended to reel over to the right, “as if he had too much alcohol to drink”. On physical exam., the face was tilted slightly to the left,& the right shoulder was held lower than the left. Passive movements of the arms & legs revealed hypotonia & looseness on the right side. What is your diagnosis?

- A 3-year-old child had been referred to the children's hospital because the circumference of his head exceeded the normal limit for his age. After a careful history had been taken & a detailed physical examination had been performed, a diagnosis of hydrocephalus was made. What may be the cause of hydrocephalus in young children.

