LECTURE

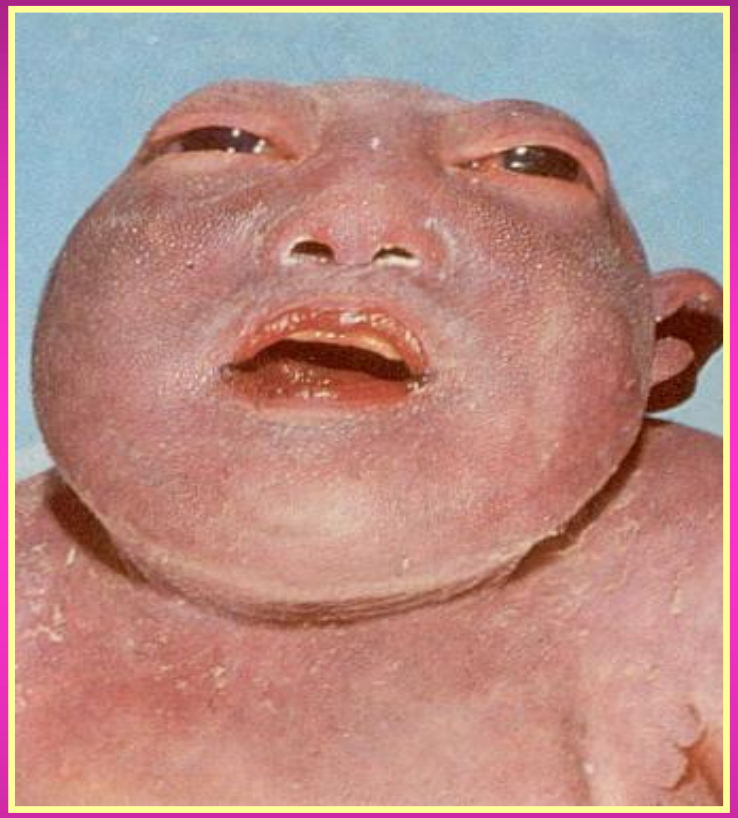
NERVOUS SYSTEM

CHARLES BELL (1774-1842)

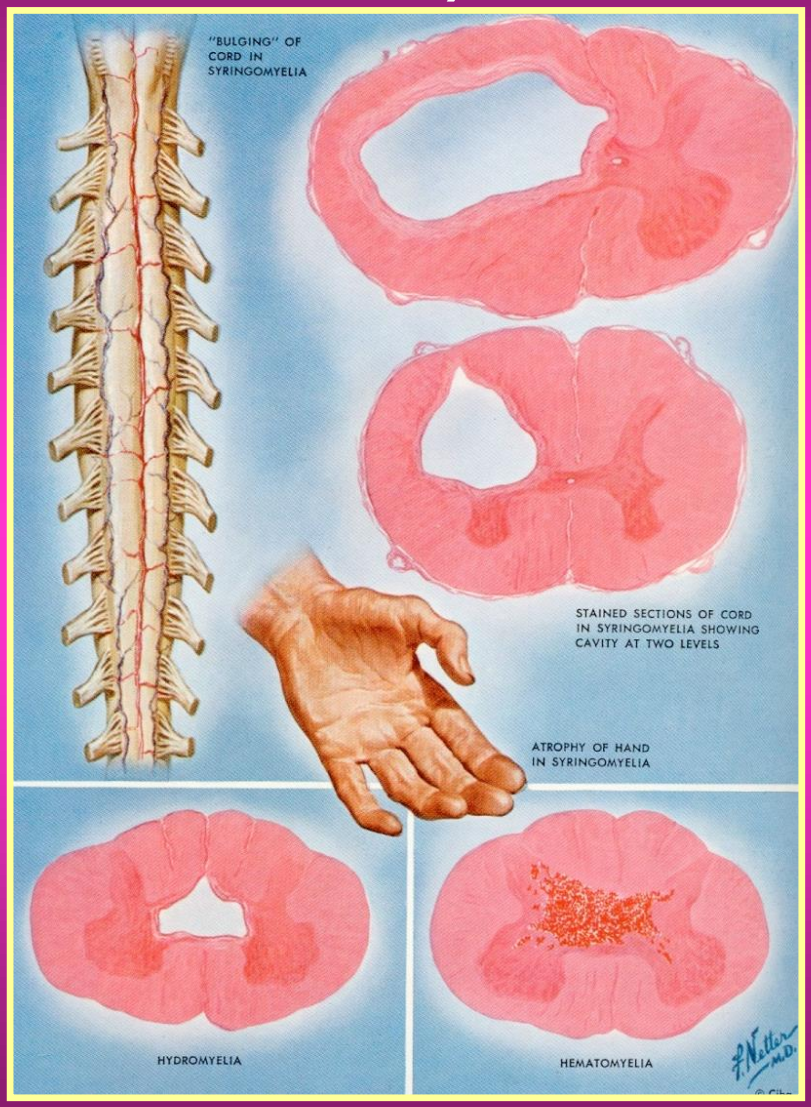
CENTRAL NERVOUS SYSTEM

PERIPHERAL NERVOUS SYSTEM

CONGENITAL DISORDERS OF CNS
(ETIOLOGY: VIRUSES, TOXINS, DRUGS)



ANENCEPHALIA



SYRINGOMYELIA

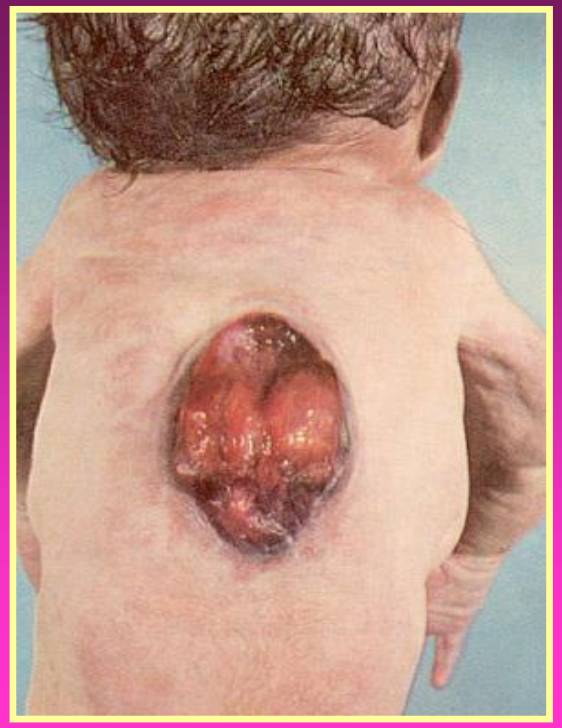
SYRINGOMYELIA

- Syringomyelia is the development of a fluid-filled cyst (syrinx) within spinal cord. Over time, the cyst may enlarge, damaging spinal cord and causing pain, weakness and stiffness, among other symptoms.

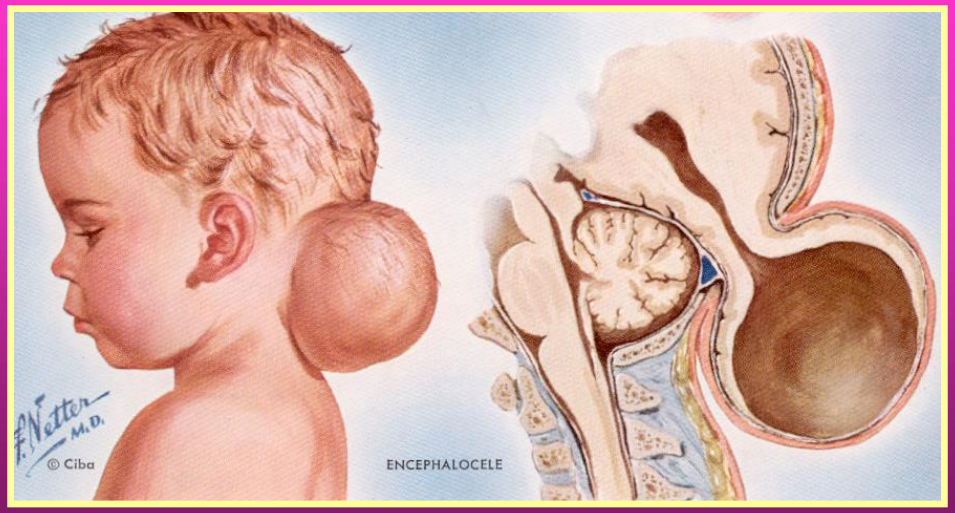
- Syringomyelia has several possible causes, though the majority of cases are associated with a condition in which brain tissue protrudes into spinal canal (Chiari malformation).

DYSRAPHIA

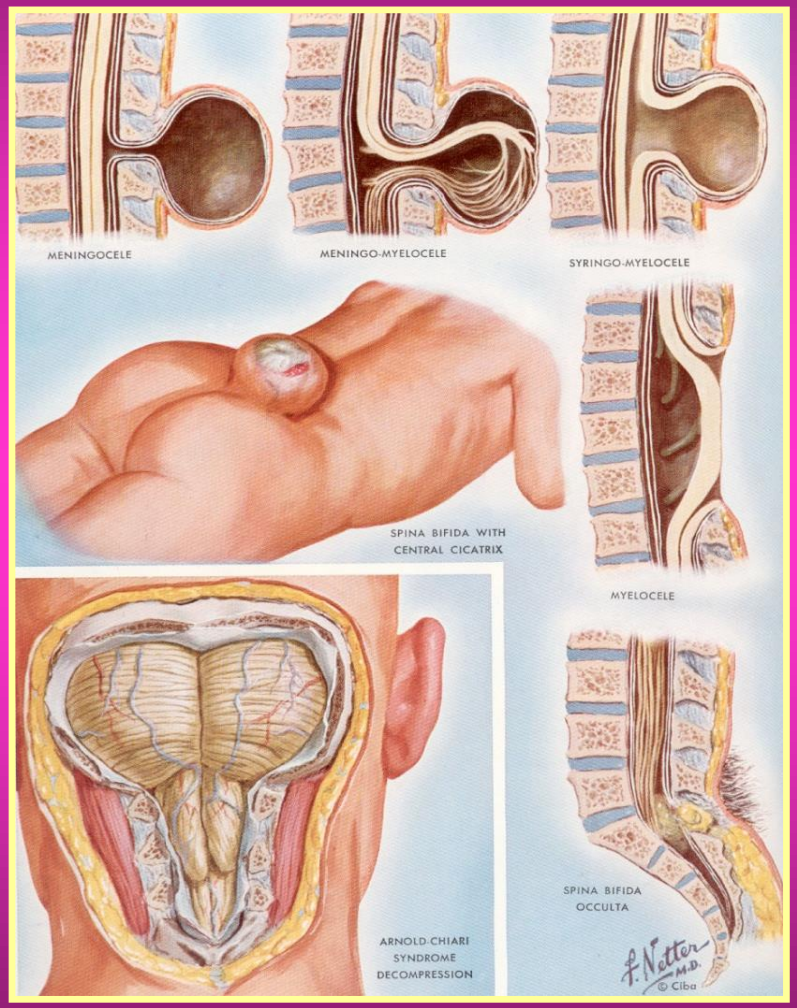
DISTURBANCES IN CLOSING THE NEURAL DUCT



MENINGOMYELOCELE AND RACHISCHISIS



ENCEPHALOCELE



MENINGOCELE AND MENINGOMYELOCELE

Arnold-Chiari Malformation

Chiari malformations, types I-IV, refer to a spectrum of congenital hindbrain abnormalities affecting the structural relationships between the brainstem, cerebellum, upper cervical cord and bony cranial base.

Hans Chiari, an Austrian pathologist, classified Chiari malformations into types I through III in 1891.

Chiari's German colleague, Julius Arnold, made additional contributions to the definition of Chiari II malformation.

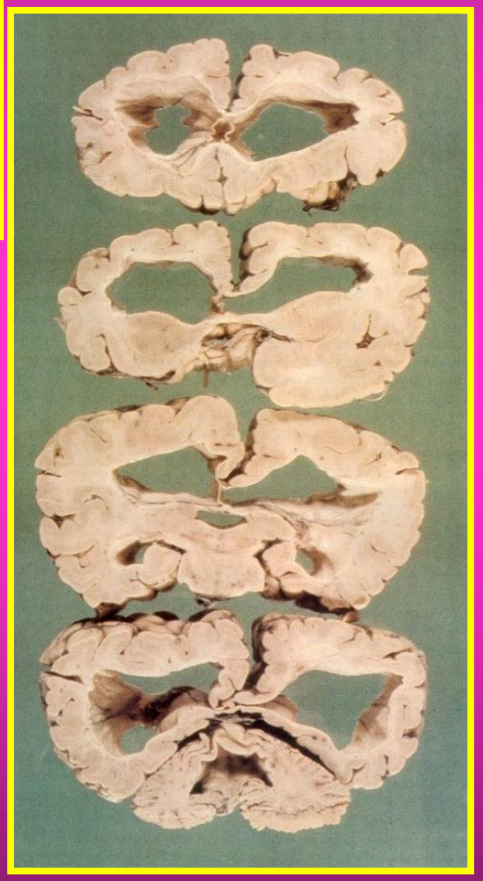
Therefore the type II malformation is commonly referred to as the Arnold-Chiari malformation.

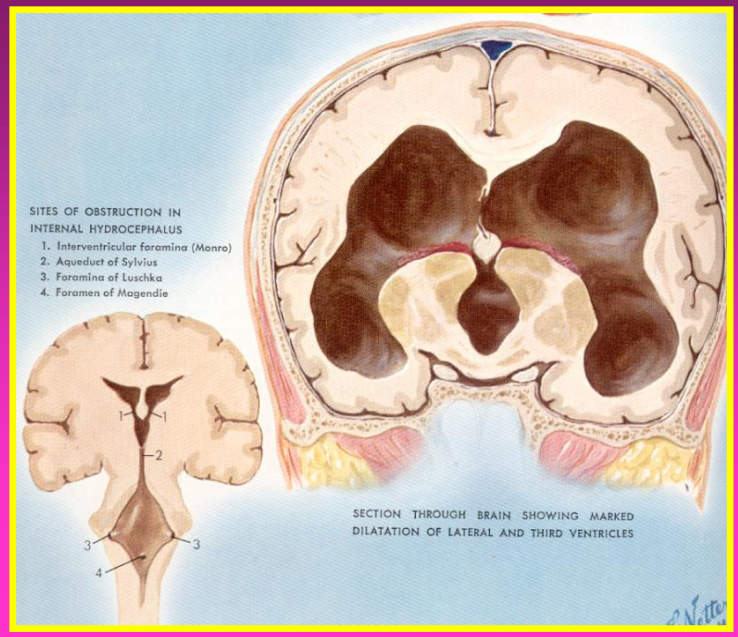
Later, other investigators added a fourth (Chiari IV) malformation

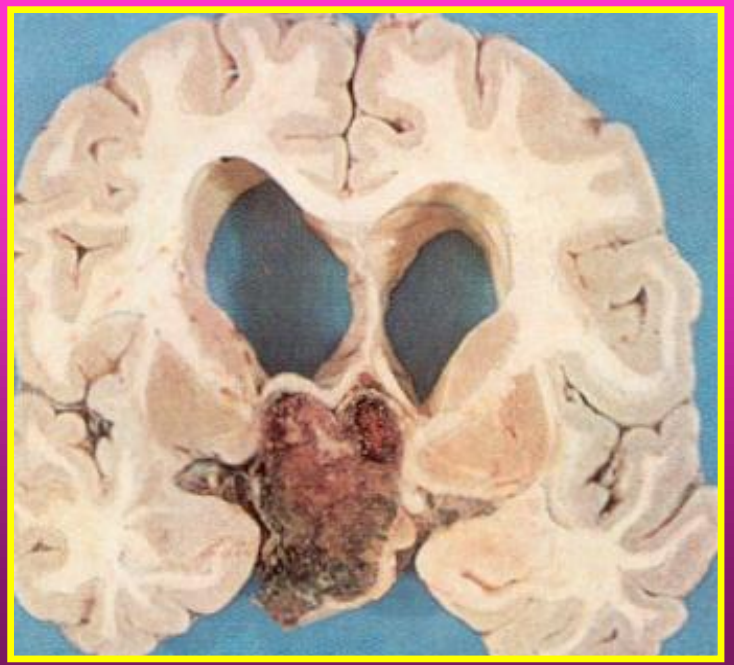
Arnold-Chiari Malformation

- Scale of severity is rated I - IV with IV being the most severe
- Chiari type I malformation: elongation of one or both cerebellar tonsils, which protrude through the foramen magnum of the spinal canal and may become sclerotic;
- Chiari type II malformation: most common cause of congenital hydrocephalus; cerebellar tonsils extend far down into the spinal canal, accompanied by an elongated fourth ventricle
- Lower limb muscles show varying degrees of denervation atrophy
- Chiari type III malformation: further herniation of the cerebellum below the foramen magnum forming an encephalocele, in addition to spina bifida, syringomyelia and hydrocephalus
- Chiari type IV malformation: hypoplasia or aplasia of the cerebellum in addition to other features

EXTERNAL AND INTERNAL HYDROCEPHALUS



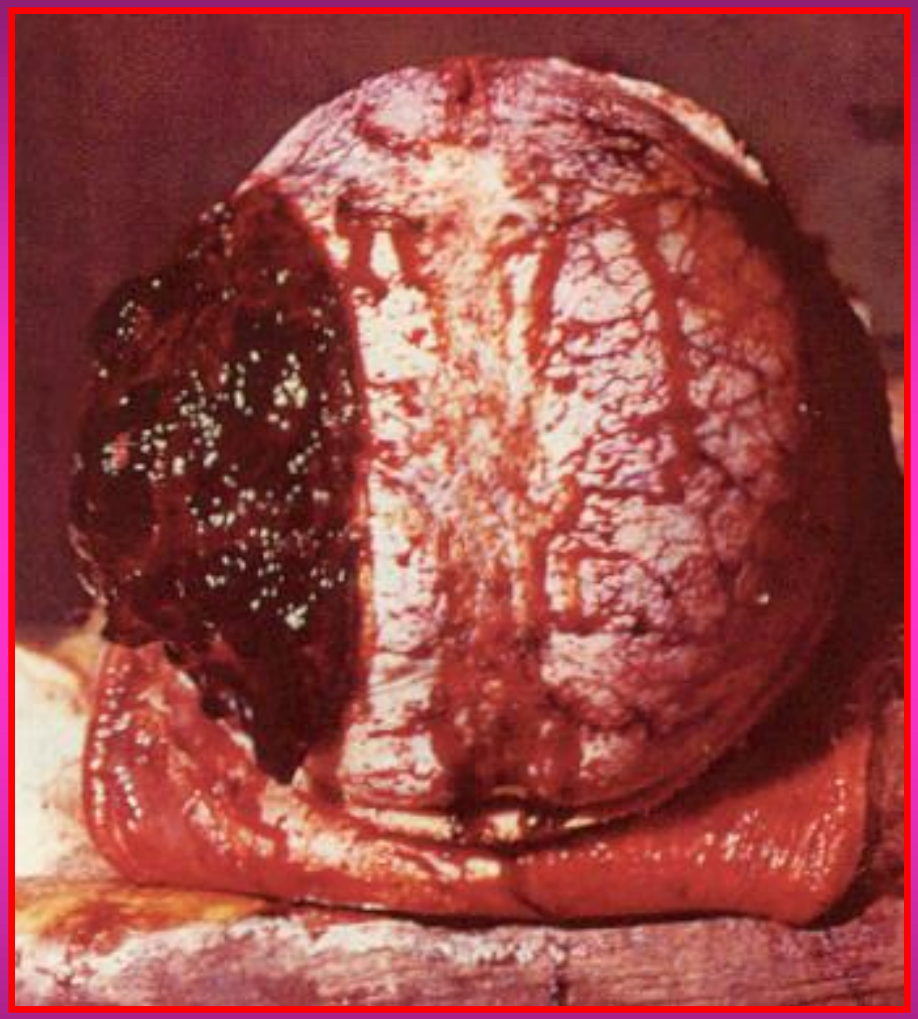


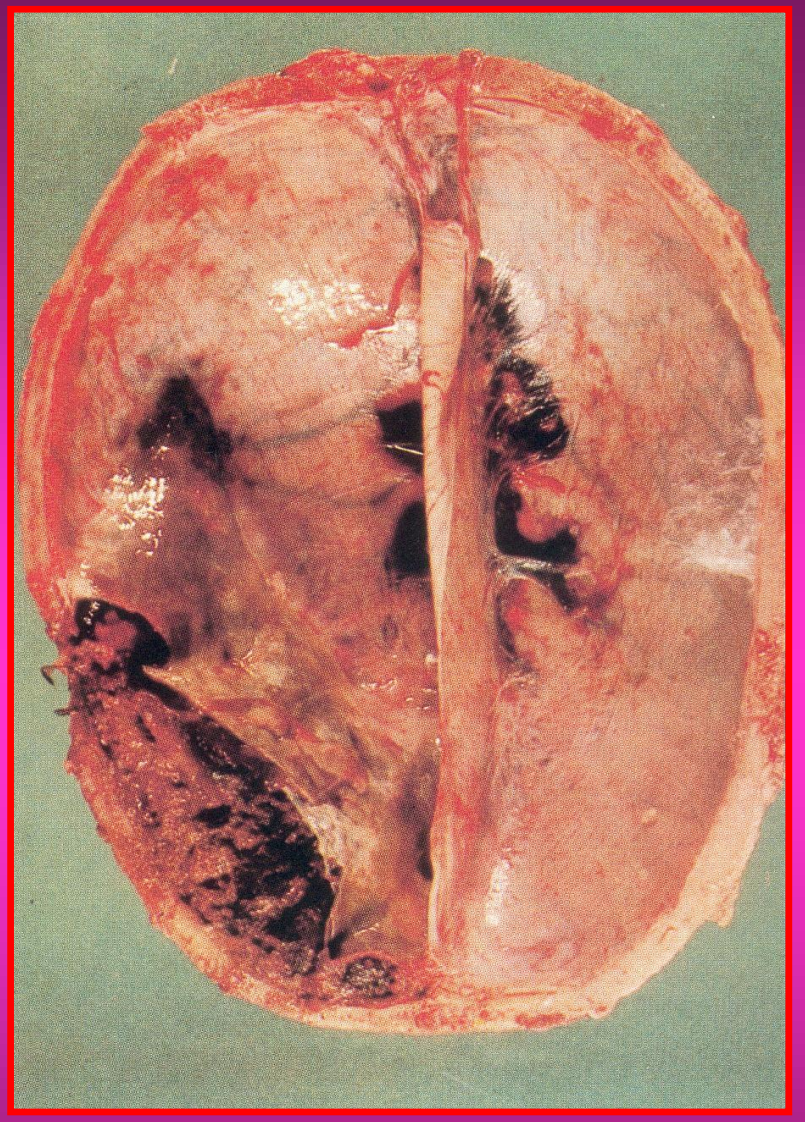


HEMATOMA IN NEWBORNS
CEPHALHEMATOMA

AFTER A TRAUMA DURING DELIVERY, SUBPERIOSTEAL

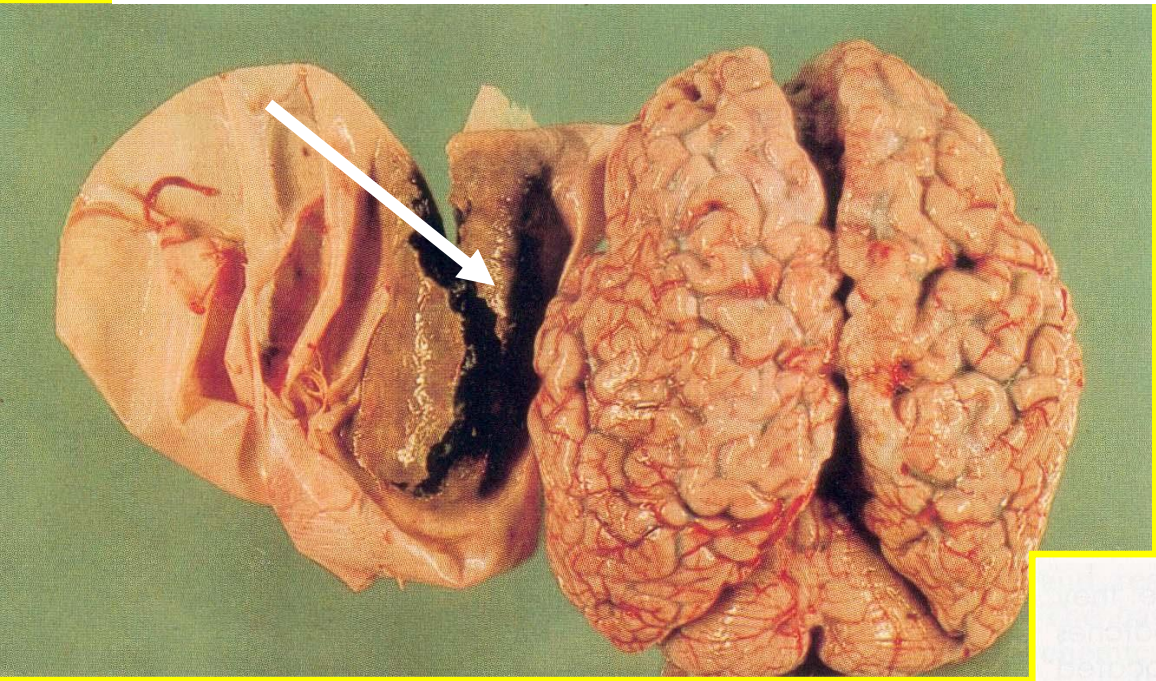
EPIDURAL HEMATOMA





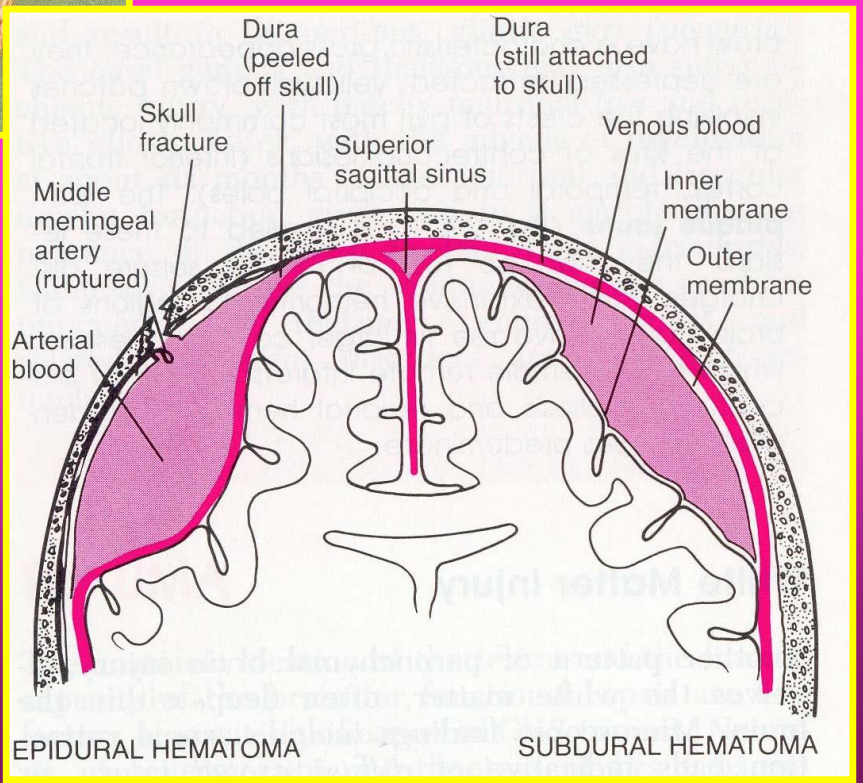
BETWEEN DURA MATER AND BONES, MAINLY IN ADULTS AFTER TRAUMA OF MENINGEAL ARTERIES

SUBDURAL HEMATOMA

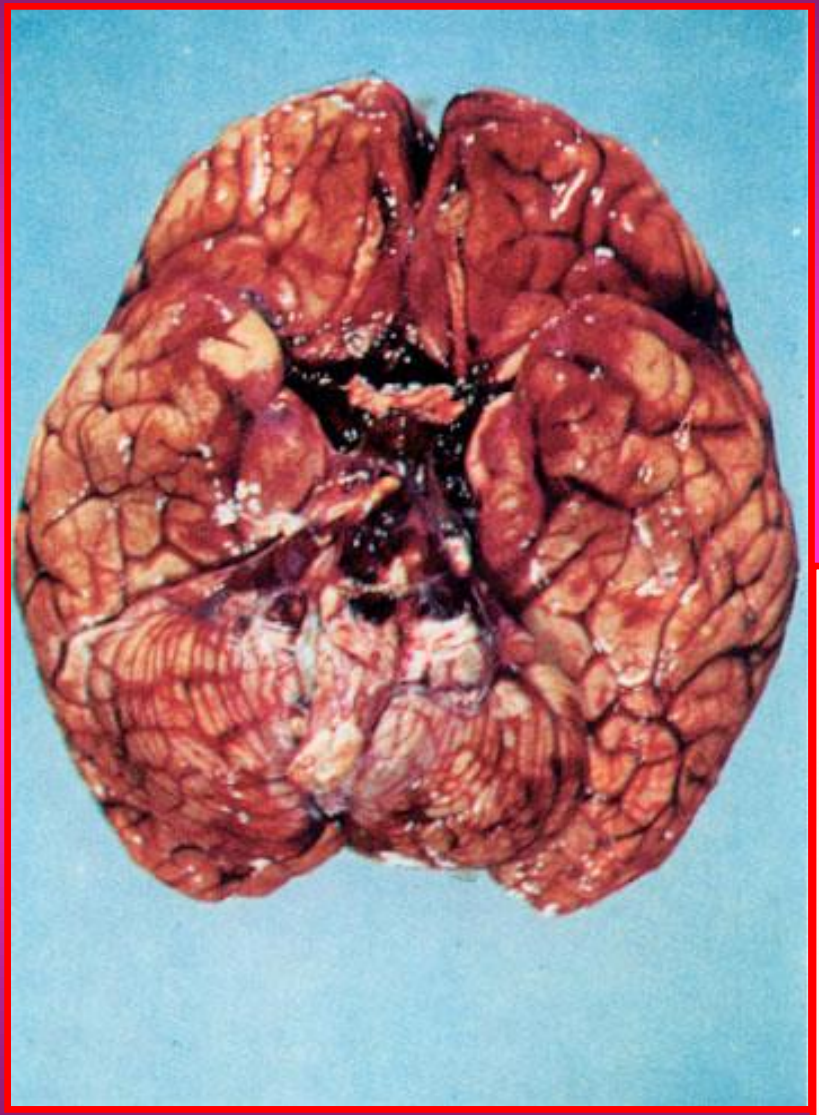


COMPRESSION OF LEFT HEMISPHERE

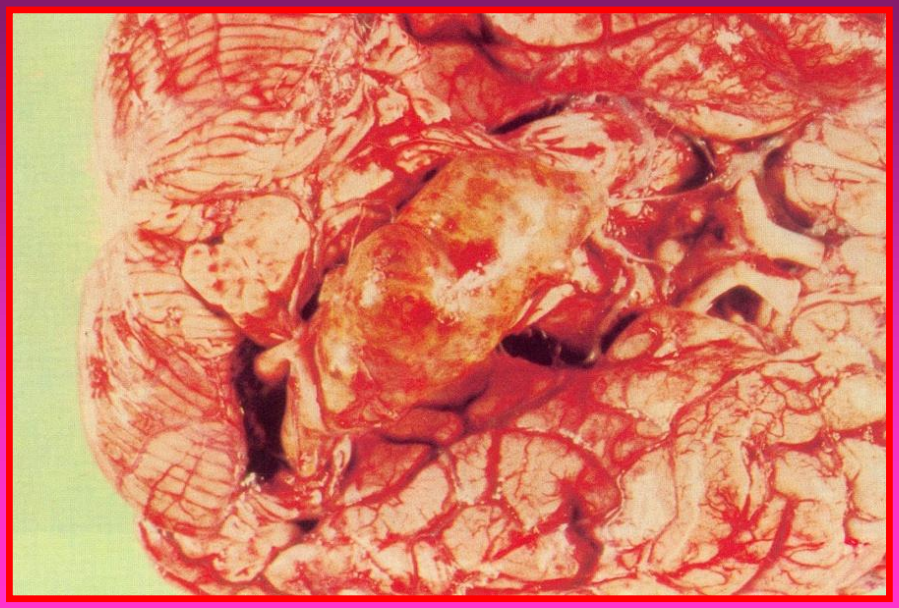
CAUSED BY TRAUMA OF VEINS AND VENOUS SINUSES

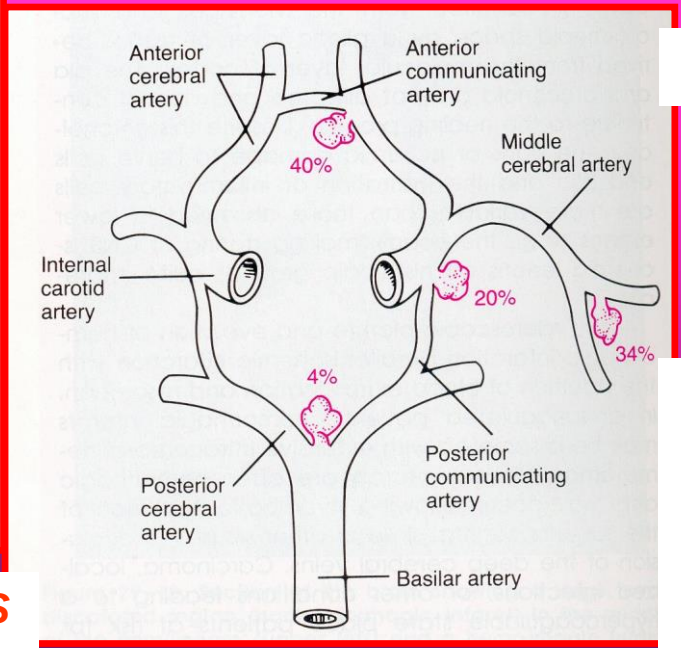


SUBARACHNOID HEMORRHAGE



HAEMORRHAGIA SUBARACHNOIDEALIS BASIS CEREBRI

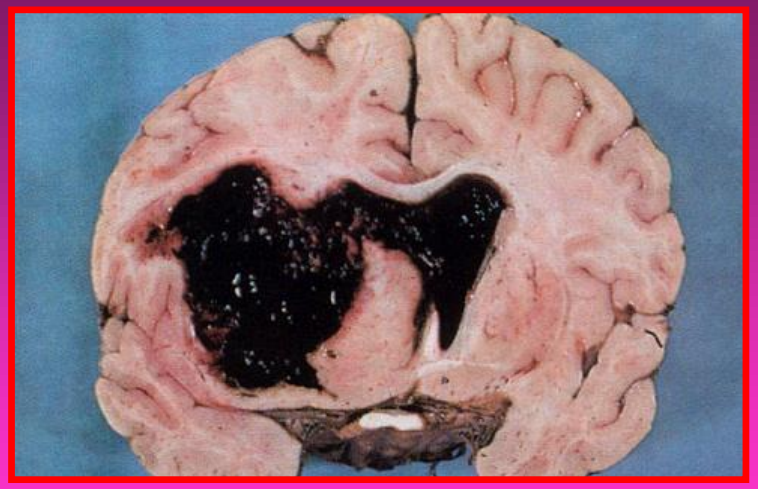




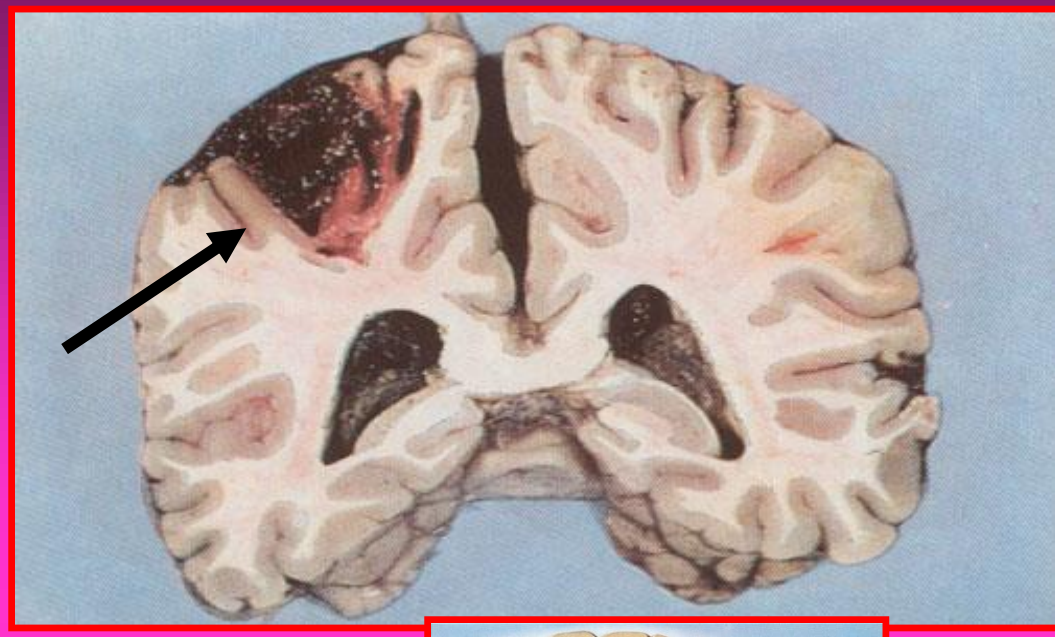
ANEURYSMS

RUPTURE OF AN ANEURYSM ON THE BASE OF BRAIN → SUBARACHNOID HEMORRHAGE

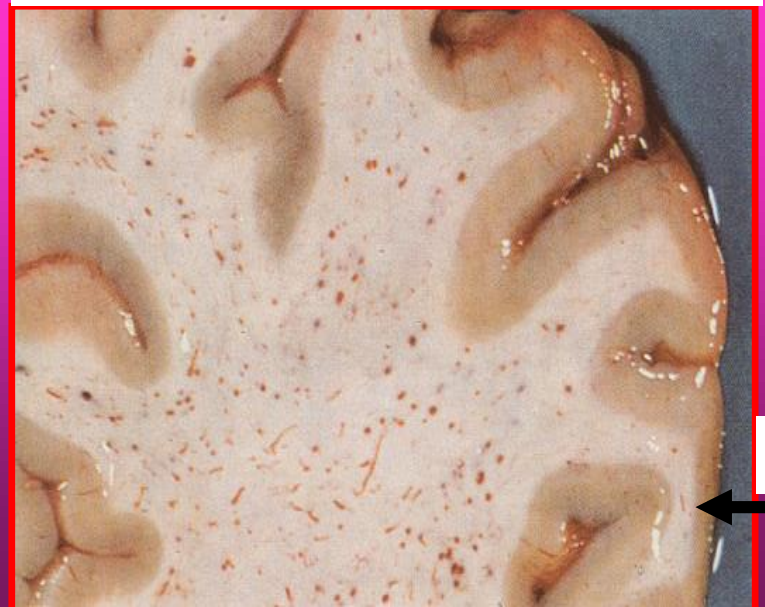
DIFFERENT FORMS OF BRAIN HEMORRHAGES



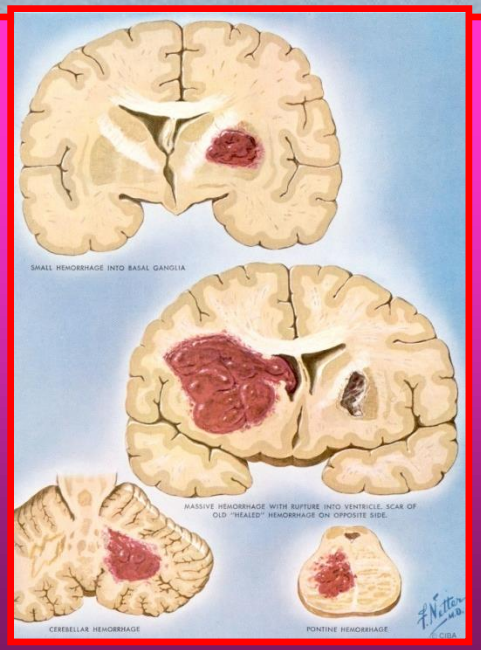
HYPOTHALAMIC NUCLEI HEMATOMA WITH PERFORATION TO VENTRICLE → HEMATOCEPHALUS



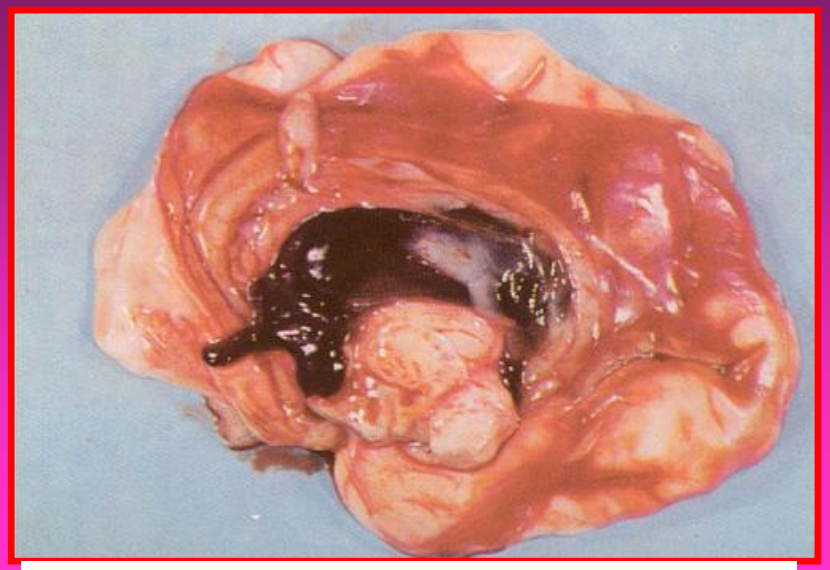
CORTICAL HEMATOMA



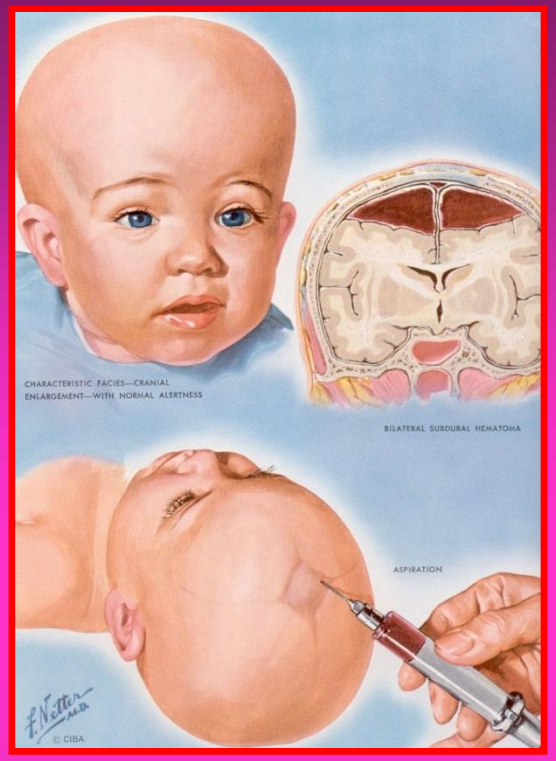
BRAIN PURPURA



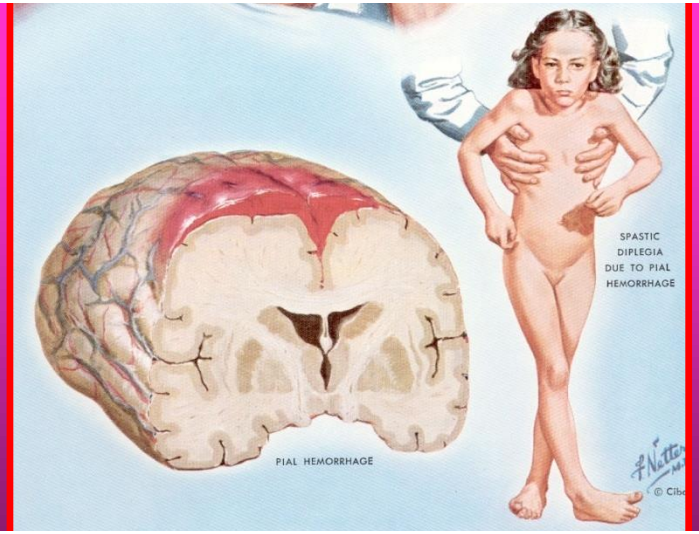
BRAIN HEMORRHAGES AFTER DELIVERY



INTERNAL HEMATOCEPHALUS



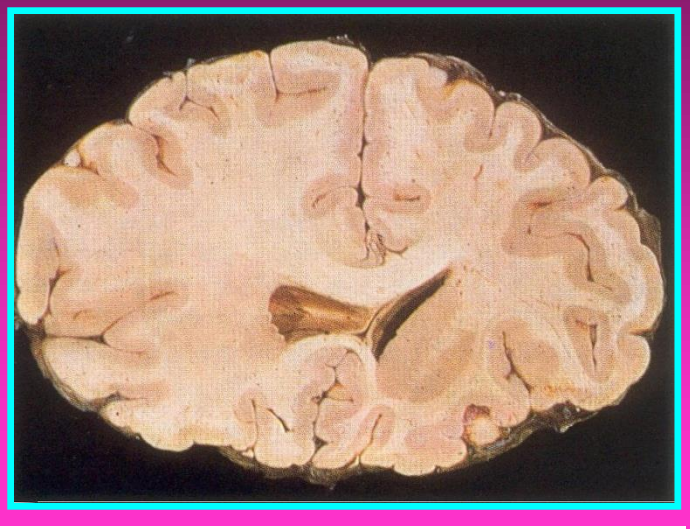
SUBDURAL HEMATOMA



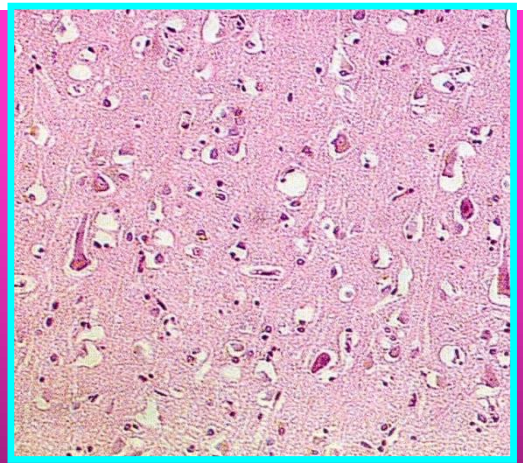
CEREBRAL PARALYSIS IN CHILDREN AFTER SUBARACHNOID HEMORRHAGE

BRAIN FALX, CEREBELLAR TENTORIUM OR CEREBRAL GREAT VEIN ARE MOSTLY AFFECTED !!!

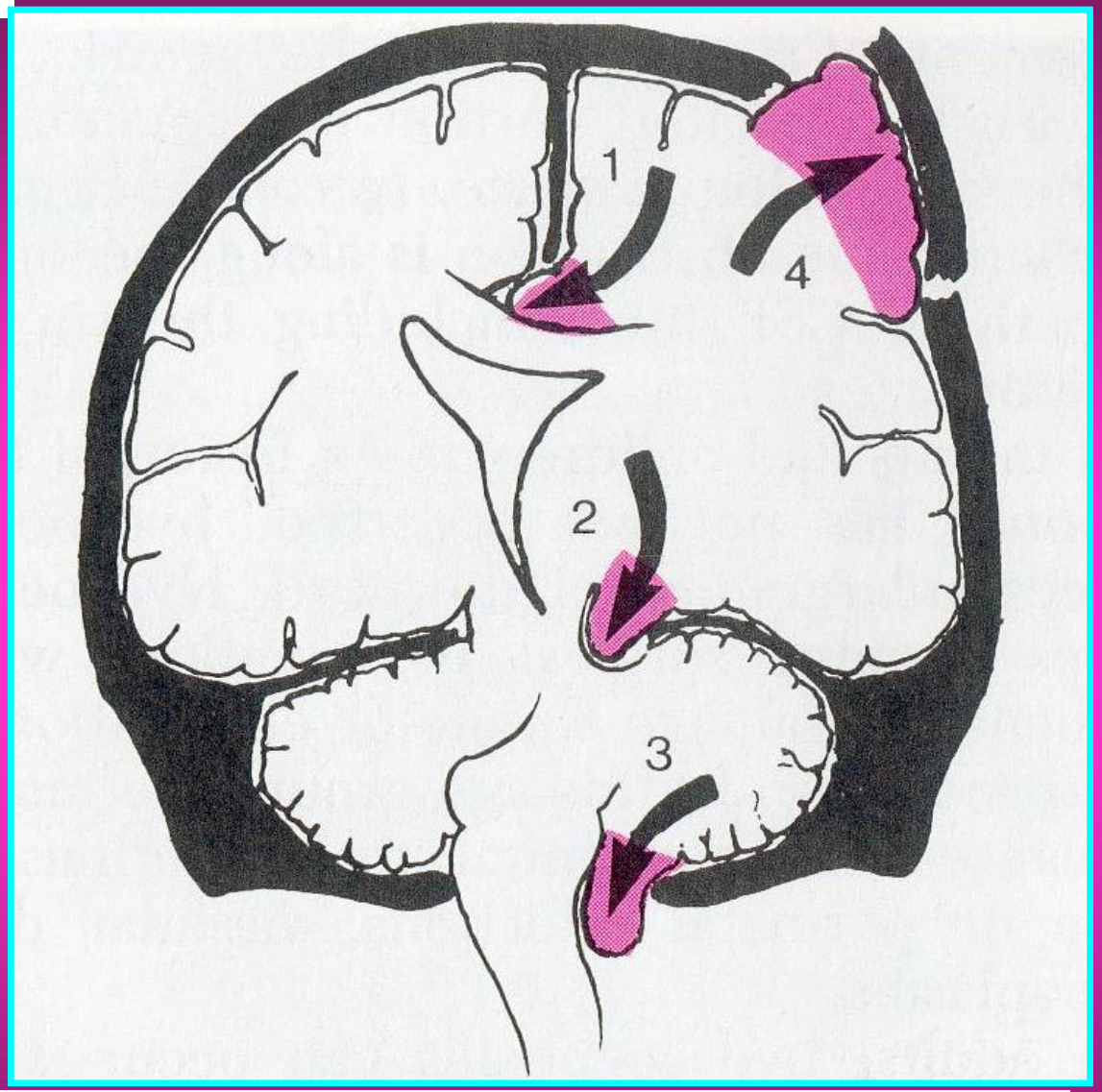
BRAIN EDEMA



BRAIN EDEMA



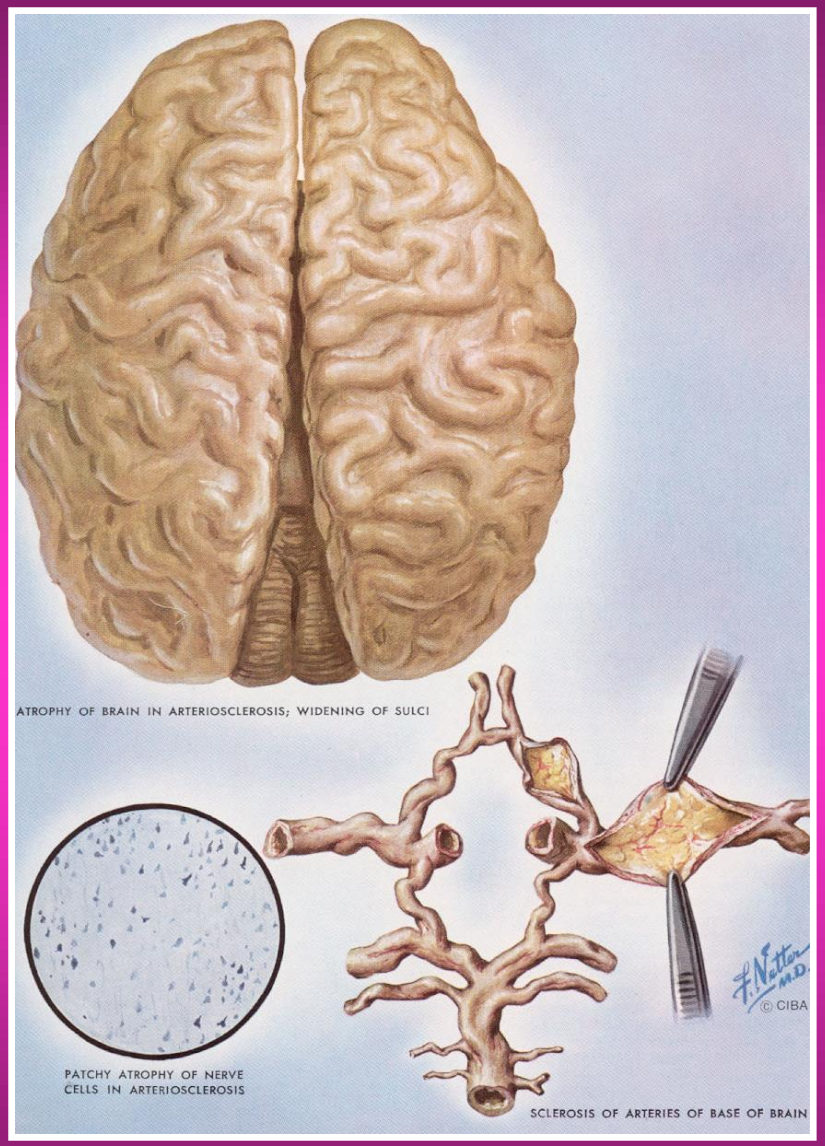
HISTOLOGICAL PATTERN – FLUID AROUND NEUROCYTES



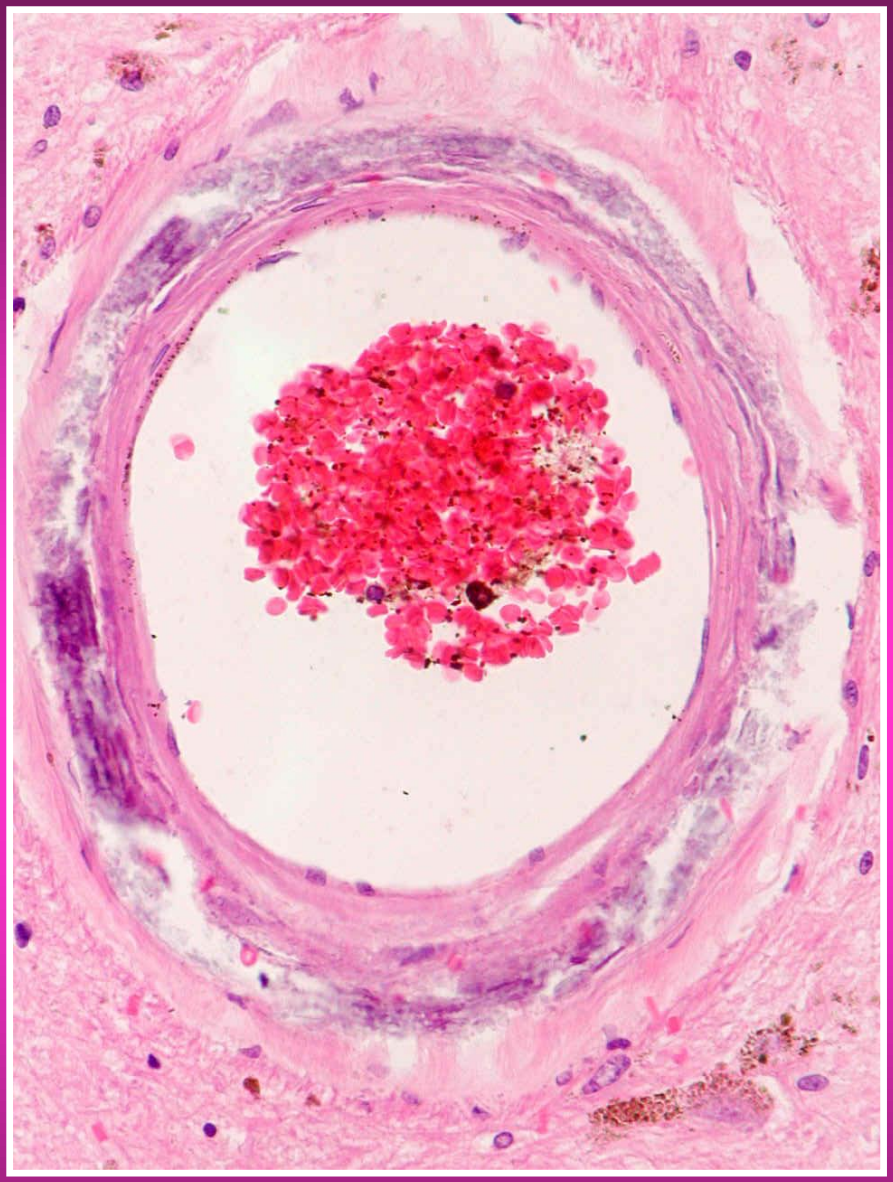
HERNIATIONS

1. CINGULATE, 2. TRANSTENTORIAL, 3. TONSILLAR, 4. IN DAMAGED BONES

BRAIN ATROPHY



ATHEROSCLEROTIC

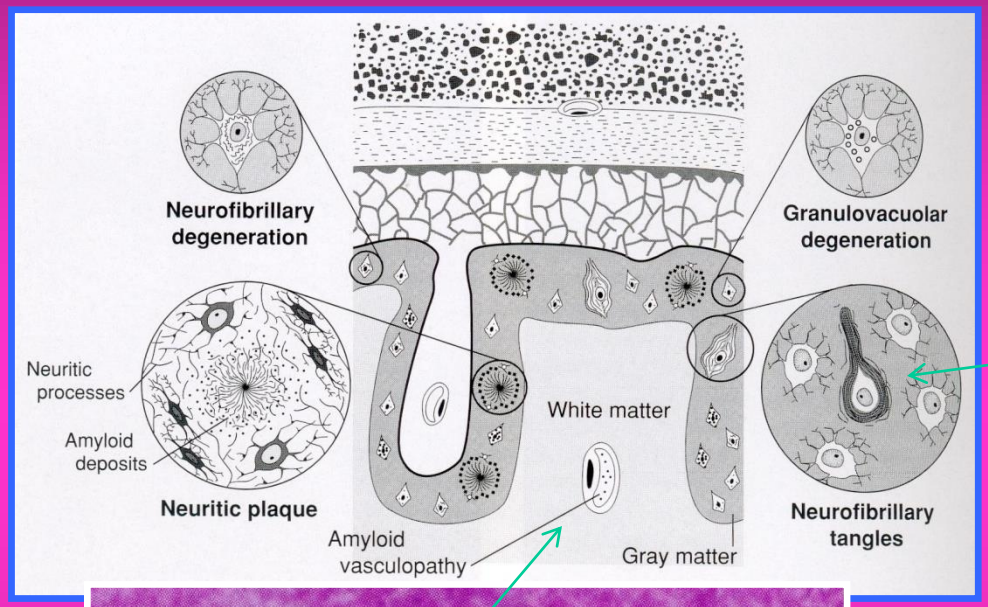


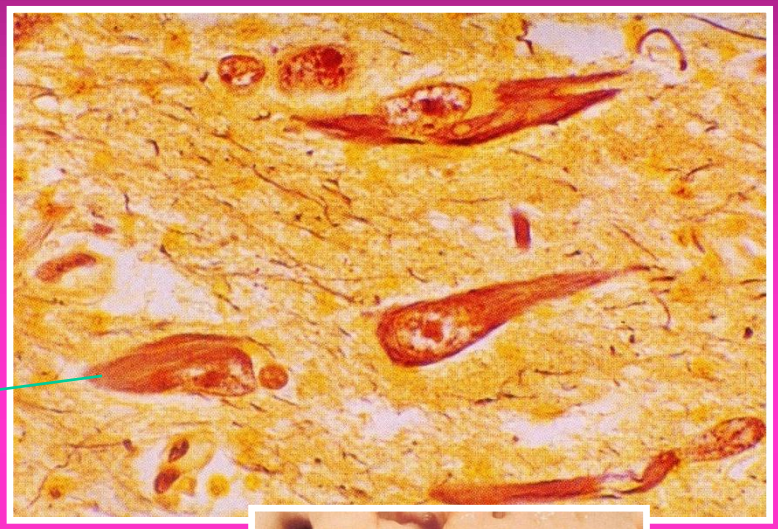
CALCIFICATION OF ARTERY

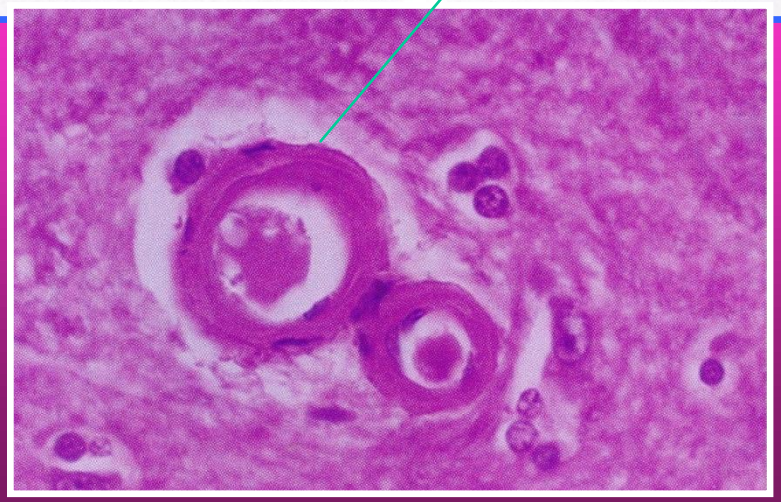
ITS EASY TO FORGET

ALZHEIMER DISEASE

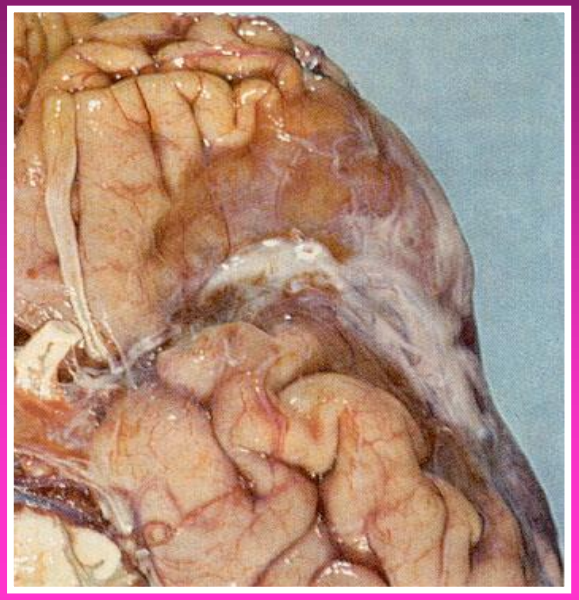
REGULAR INTELLECTUAL DEGRADATION OF PATIENTS, OVER 50 YEARS. MACROSCOPICALLY: ATROPHY OF CORTEX OF FRONTAL, PARIETAL AND TEMPORAL LOBI; MICROSCOPICALLY: NEUROFIBRILLARY TANGLES, NEURITIC PLAQUES (DEGENERATIONS); AMYLOID ANGIOPATHY



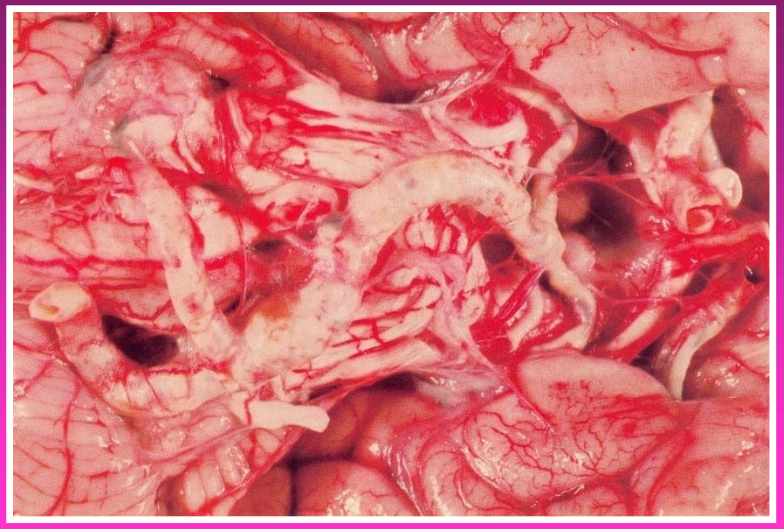




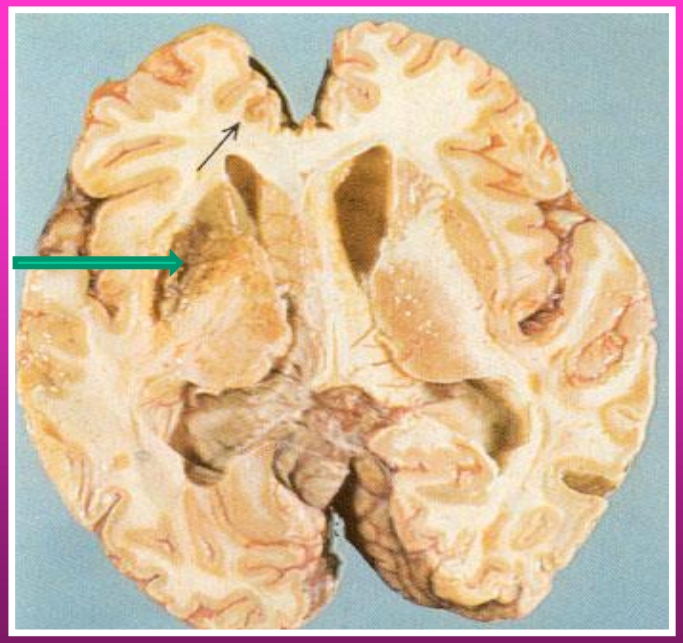
ARTERIOSCLEROSIS AND ENCEPHALOMALACIA



LACUNA
(A CAVITY)
POST
ENCEPHALOMA
-LACIAM

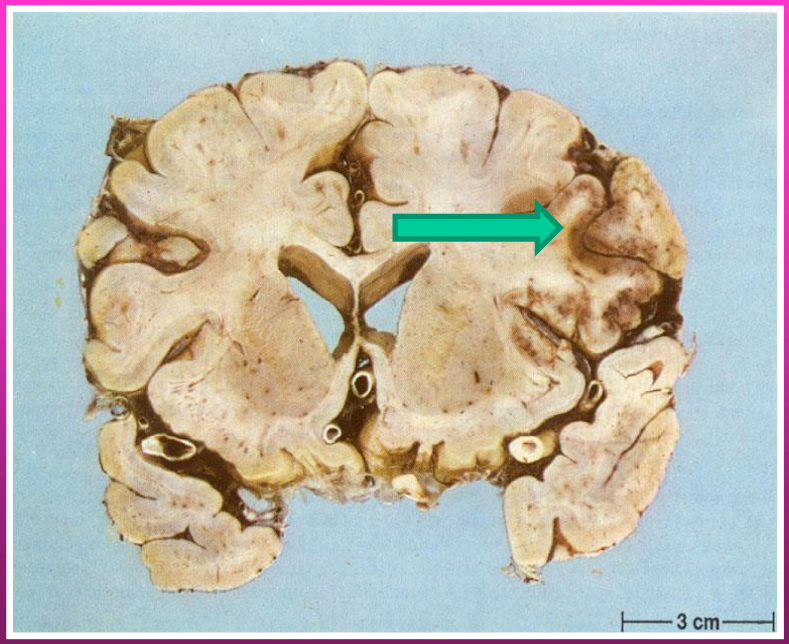


ATHEROSCLEROSIS OF BASAL ARTERIES



CHRONIC
ENCEPHALO
MALACIA

ACUTE
ENCEPHALO
MALACIA

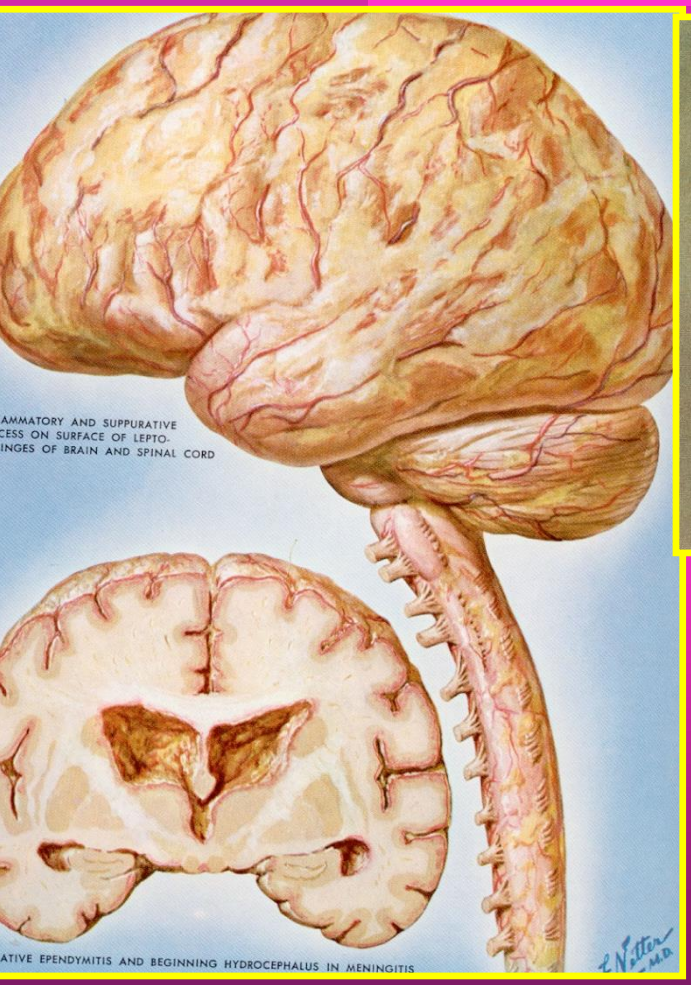


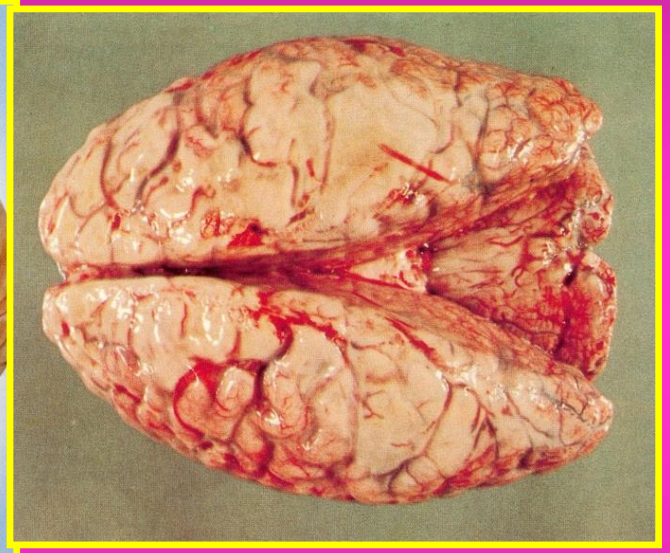
LEPTOMENINGITIS

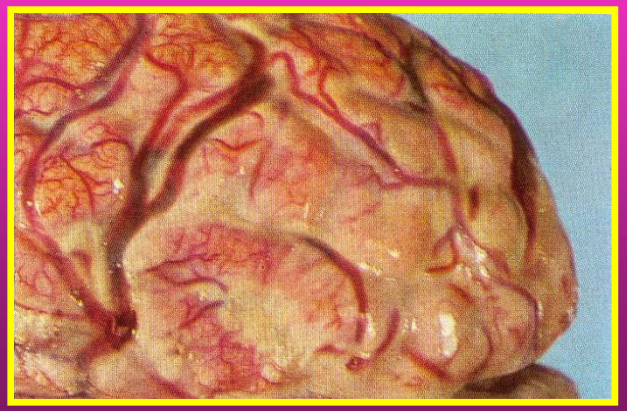
SEROUS

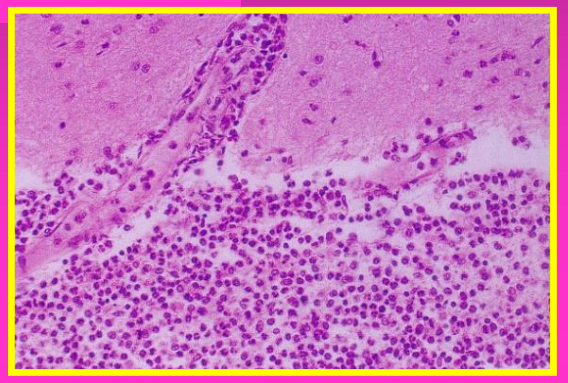
PURULENT

TUBERCULOUS
MYCOTIC





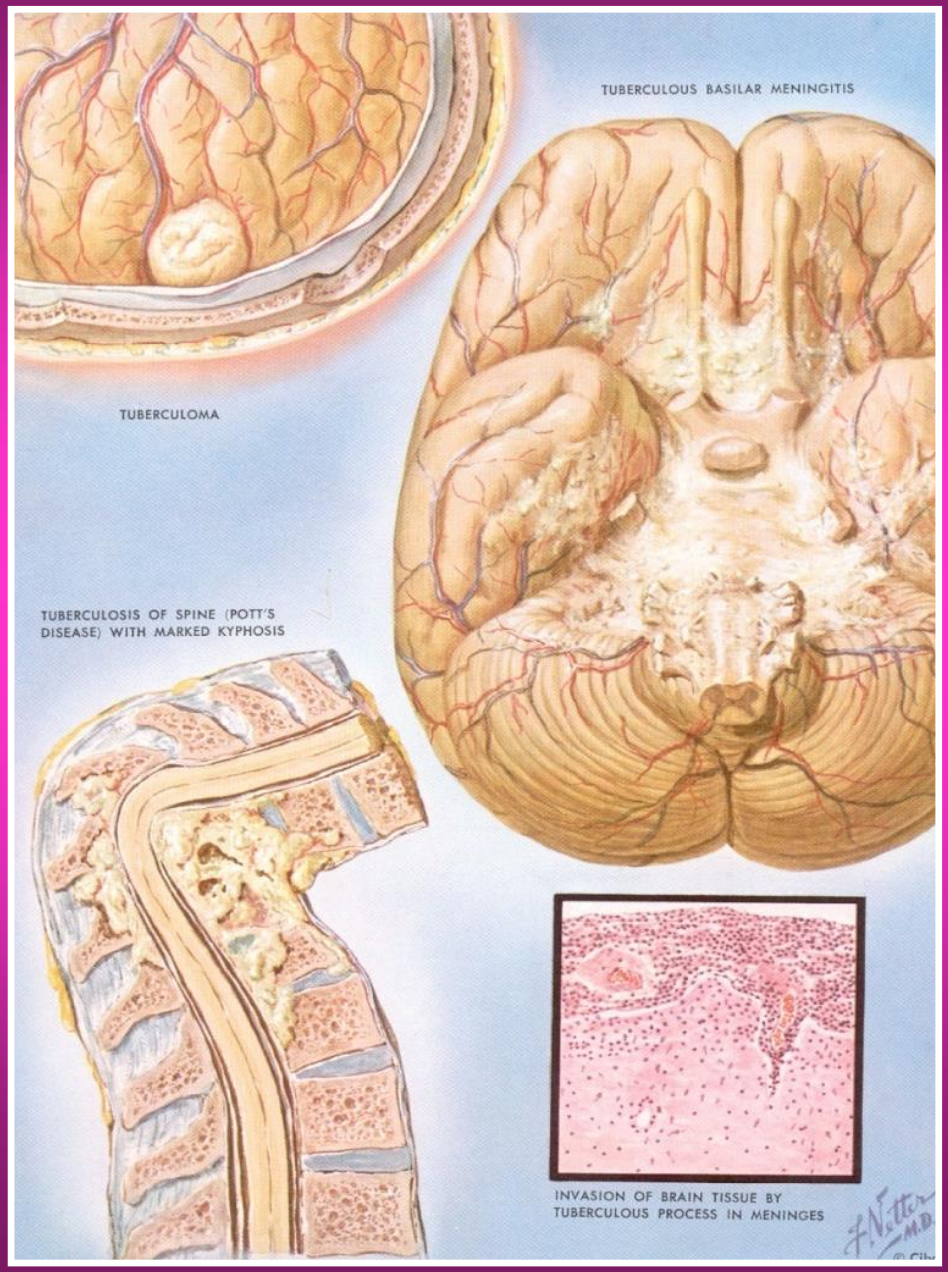




PURULENT LEPTOMENINGITIS

DIFFERENT BACTERIAL ETIOLOGY, HIGH LEUKOCYTOSIS IN CEREBROSPINAL FLUID, ACUTE HYDROCEPHALUS, LESS OFTEN – FIBROSIS OF MENINGES

TUBERCULOUS LEPTOMENINGITIS



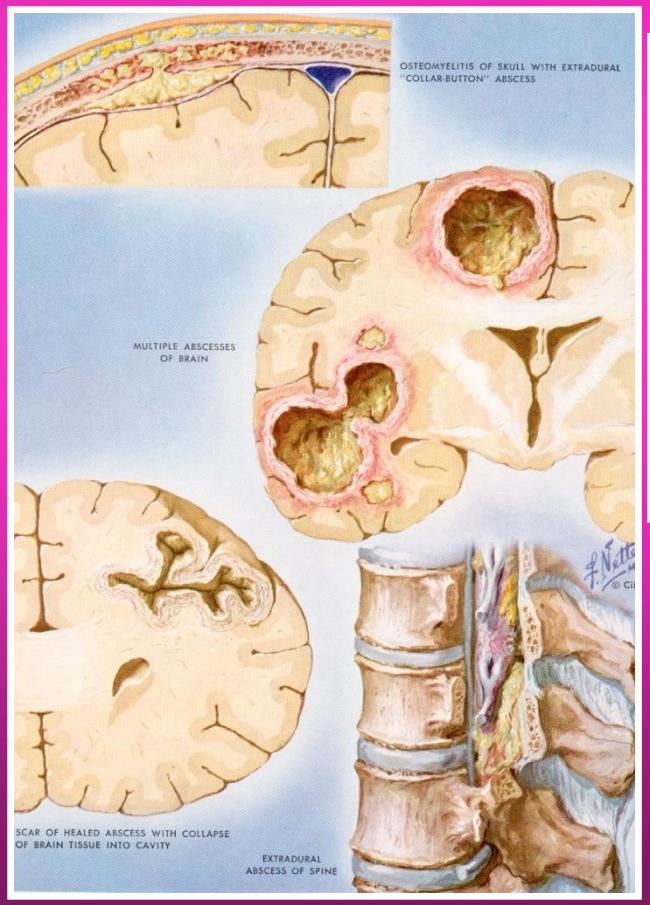
ENCEPHALITIS

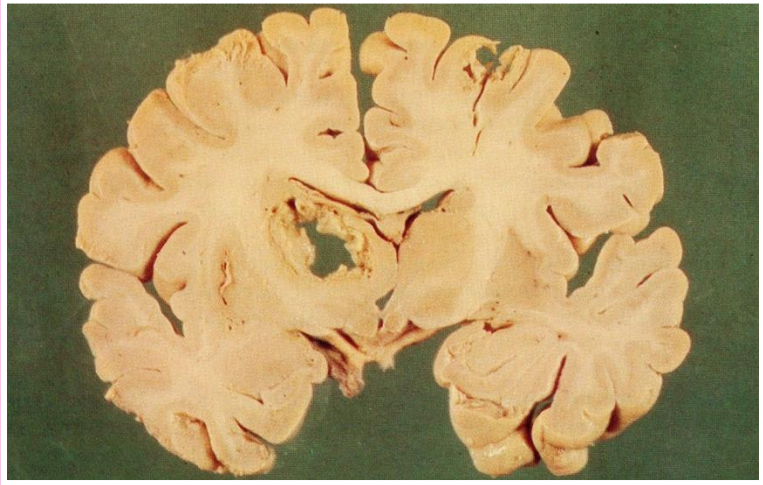
BACTERIAL

PURULENT ENCEPHALITIS

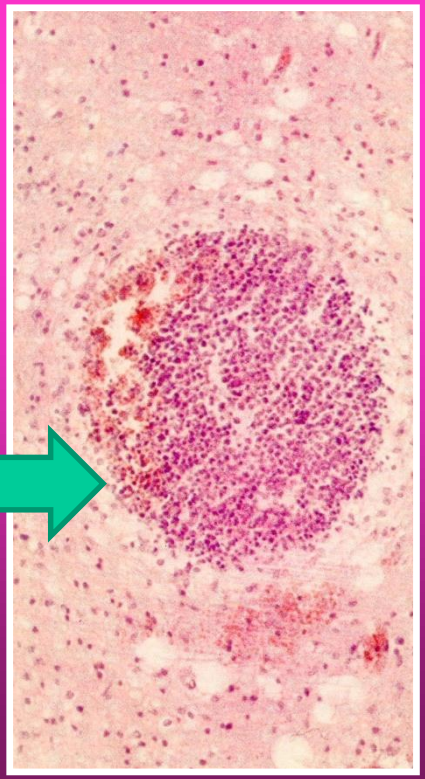
TUBERCULOUS ENCEPHALITIS

LUES OF CNS – LEPTOMENINGITIS, GUMMAS, PROGRESSIVE PARALYSIS, TABES DORSALIS





PURULENT ENCEPHALITIS



ENCEPHALITIS

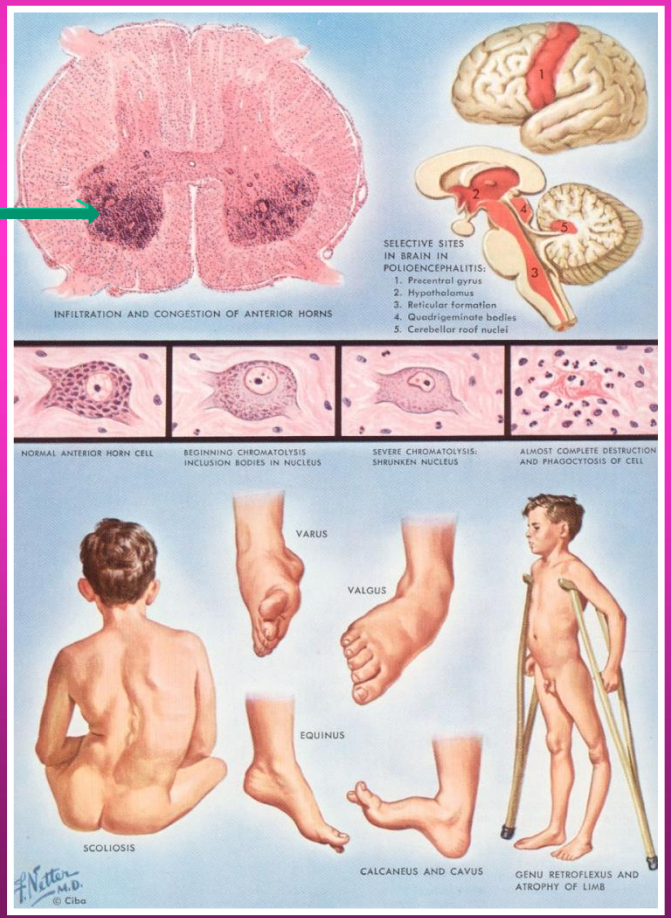
VIRAL ENCEPHALITIS

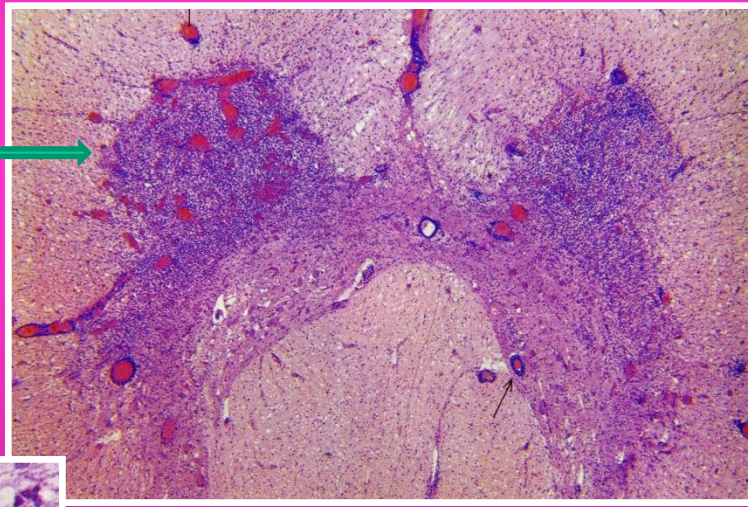
LETHARGIC ENCEPHALITIS

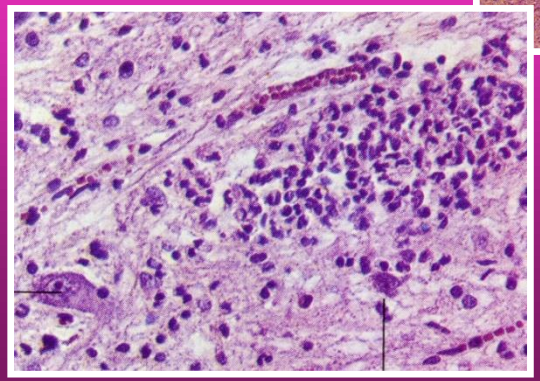
RHABIES (LYSSA)

VERNAL (TICK-BORNE)
ACUTE ANTERIOR POLIOMYELITIS (HEINE-MEDINA)

HIV ENCEPHALITIS



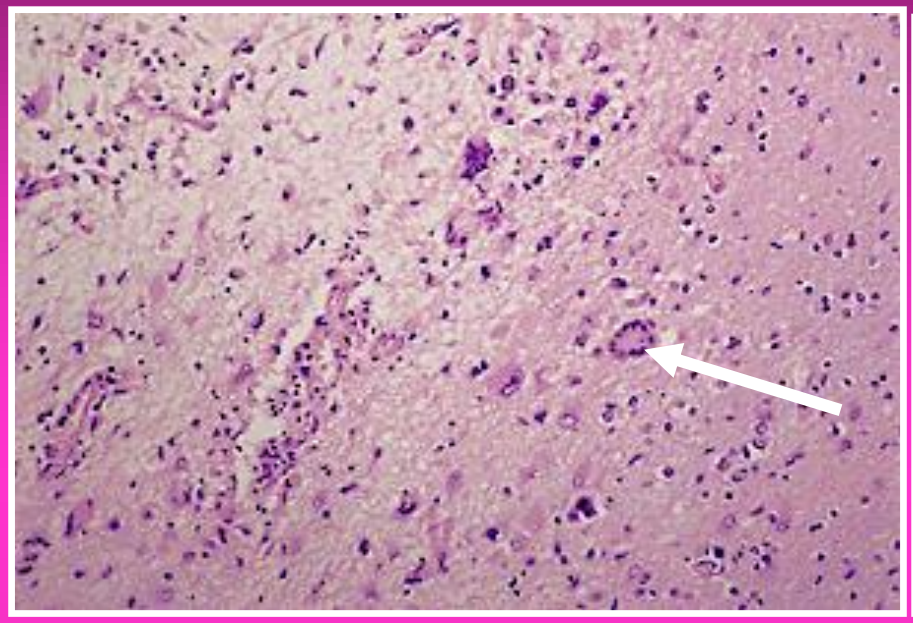




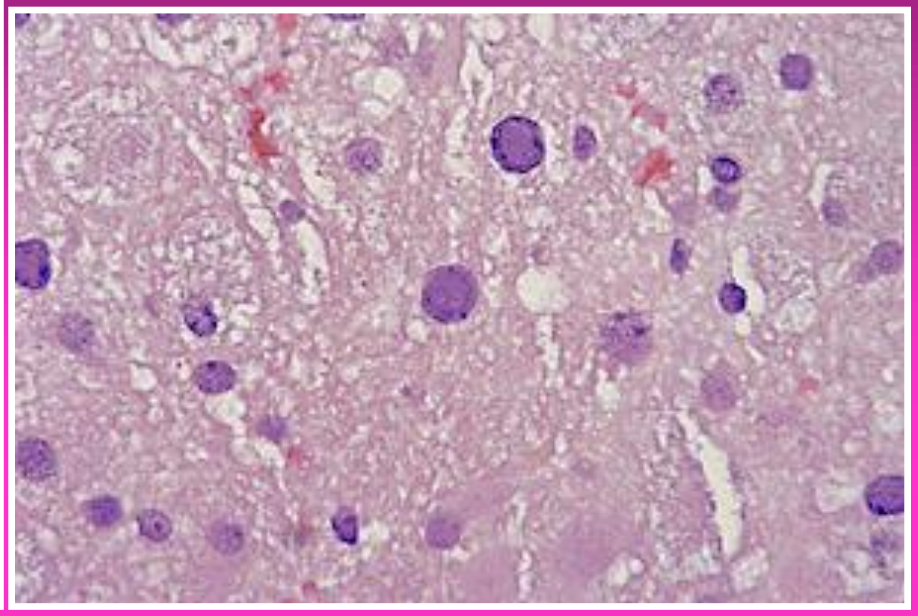
POLIOMYELITIS ANTERIOR ACUTA (ANTERIOR HORN DAMAGE IN MEDULLA, LESS OFTEN BRAIN STEM) → PARALYSIS

ENCEPHALITIS

HIV ENCEPHALITIS



GIANT CELLS IN HIV ENCEPHALITIS

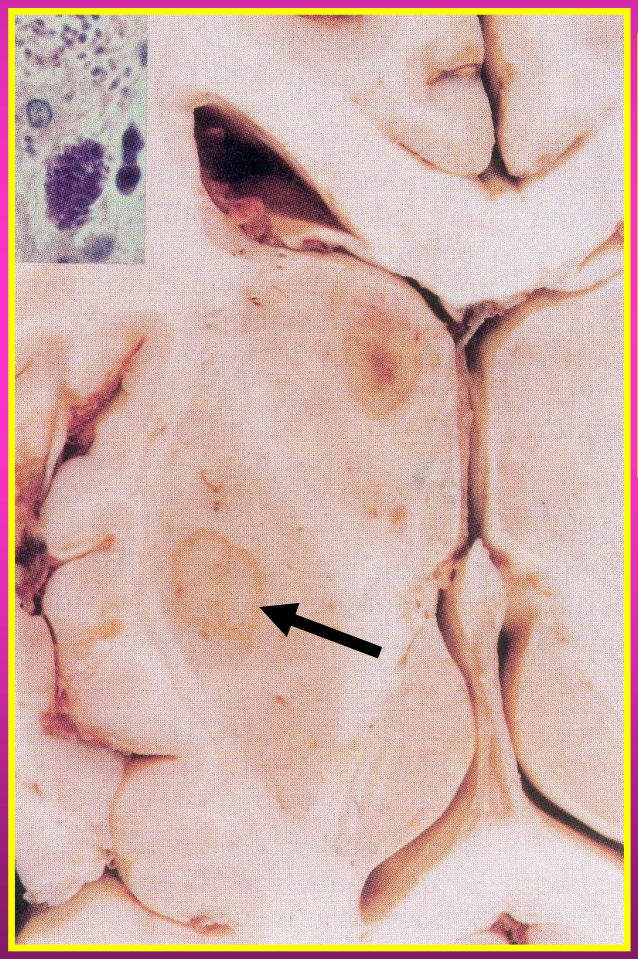


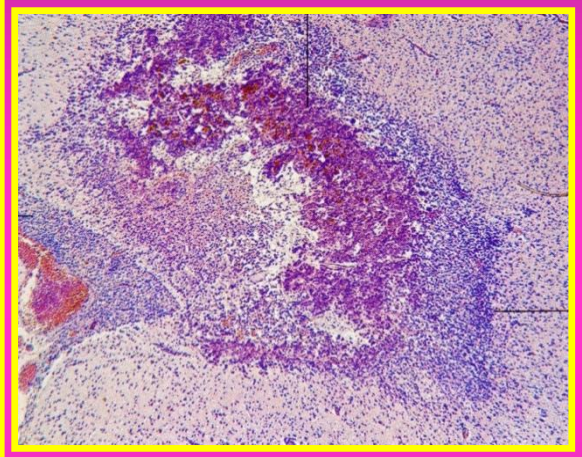
HIV NEUROPATHY.
REGRESSIVE CHANGES IN MICROGLIA

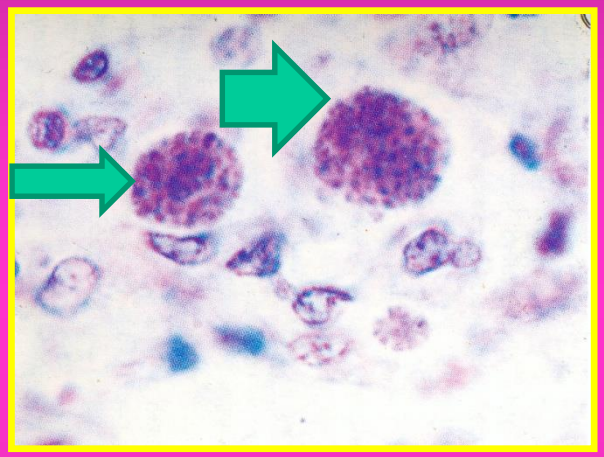
ENCEPHALITIS

PARASITIC

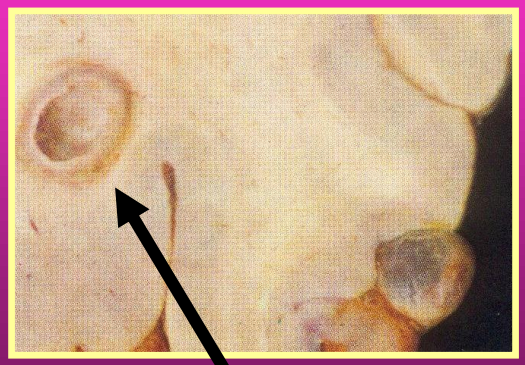
TOXOPLASMOSIS
AMEBIASIS, MALARIA, CYSTICERCOSIS







TOXOPLASMOSIS OF BRAIN – CYSTS

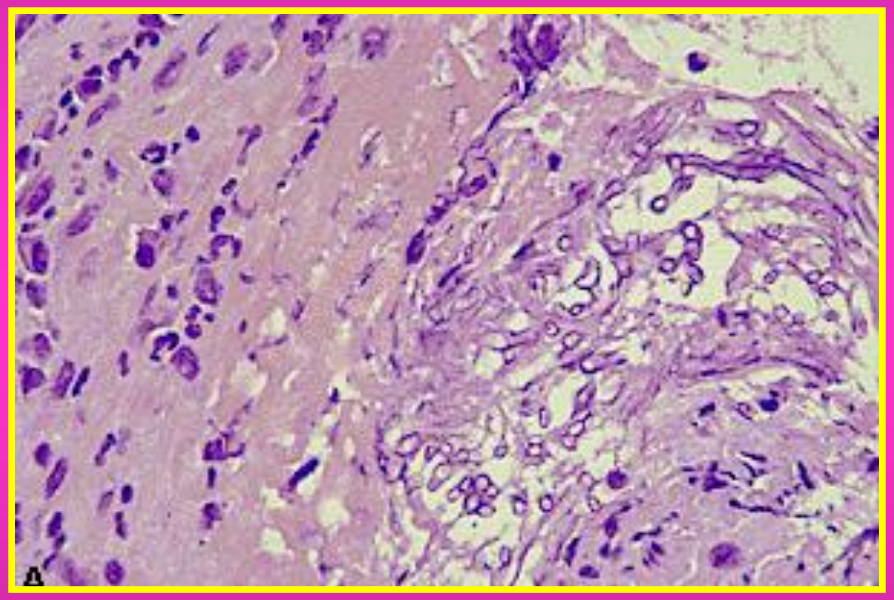


CYSTICERCOSIS

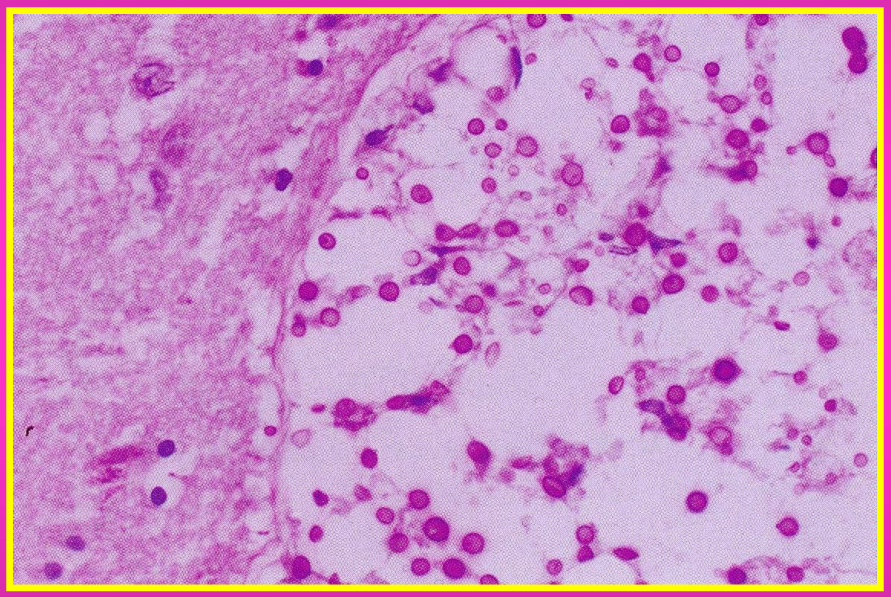
ENCEPHALITIS

MYCOTIC

CANDIDIASIS, CRYPTOCOCCOSIS, NOCARDIOSIS



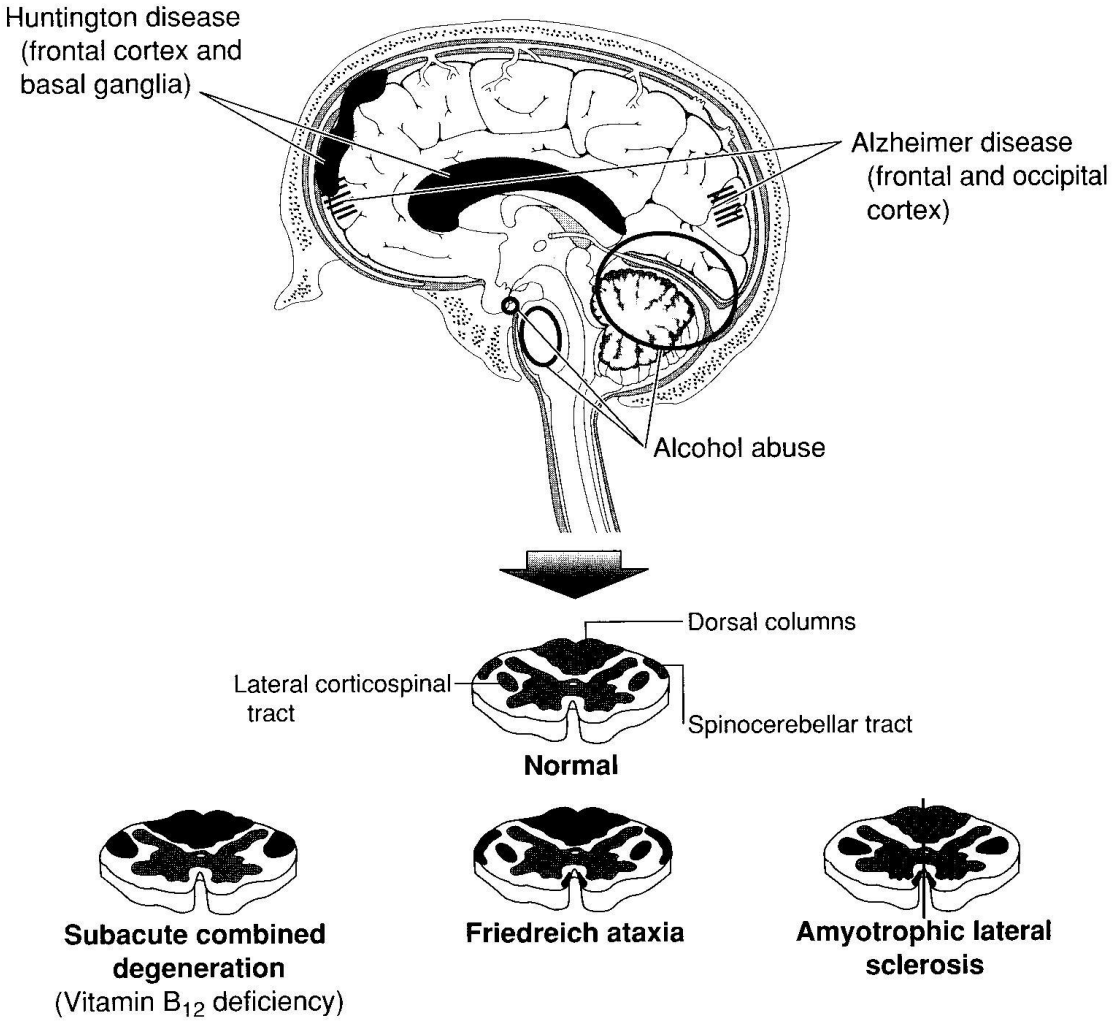
ASPERGILLOMA IN BRAIN



CRYPTOCOCCOSIS IN BRAIN

NEURODEGENERATIVE NUTRITIONAL AND TOXIC DISORDERS

Diagram 19.5. Neurodegenerative nutritional and toxic disorders. Huntington and Alzheimer disease affect the cerebrum. Alcohol abuse combined with nutritional deficiencies affects mammillary bodies and cerebellum. Central pontine myelinolysis is an iatrogenic lesion caused by rapid correction of hyponatremia in chronic alcoholics. Subacute combined degeneration, Friedreich ataxia, and amyotrophic lateral sclerosis affect predominantly the spinal cord and cause demyelination of ascending or descending columns.



Friedreich's ataxia (FRDA or FA)

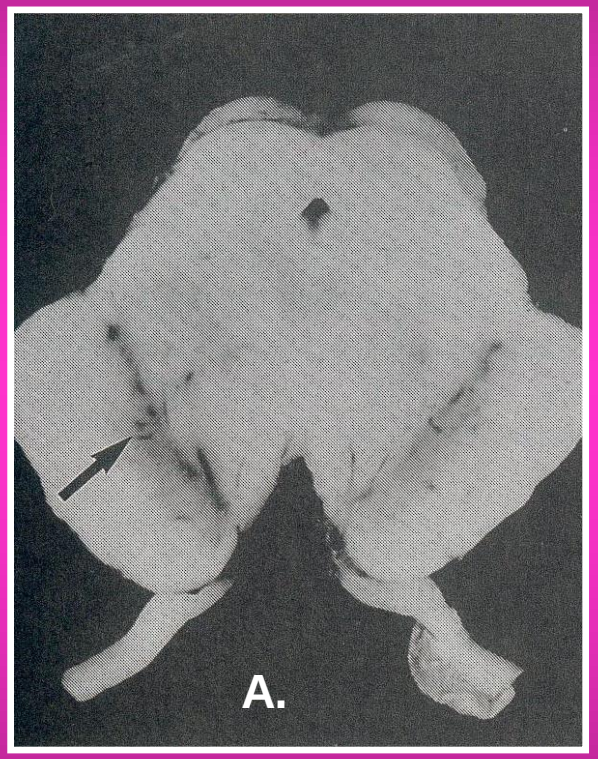
- Autosomal recessive genetic disease that causes difficulty walking, a loss of sensation in the arms and legs and impaired speech that worsens over time. Many people also have a form of heart disease called hypertrophic cardiomyopathy. Symptoms typically start between 5 and 15 years of age. Most young people diagnosed with FRDA require a mobility aid such as a cane, walker or wheelchair by their teens. As the disease progresses, people lose their sight and hearing. Other complications include scoliosis and diabetes mellitus.

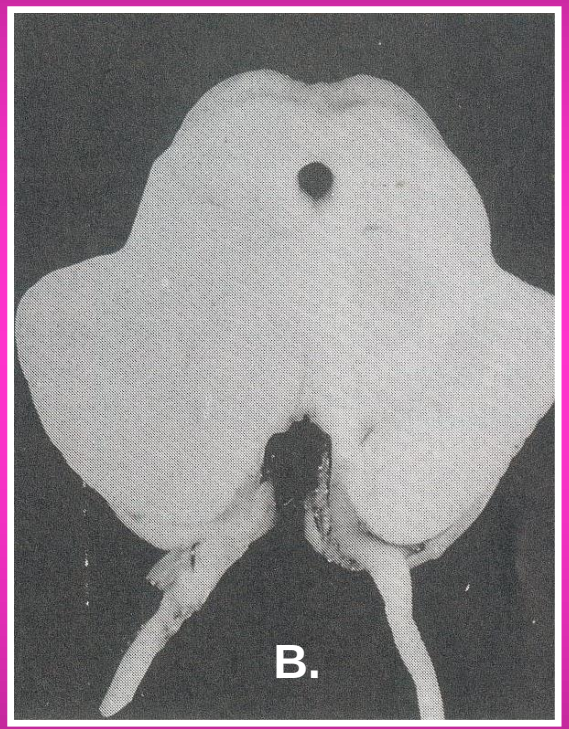
Amyotrophic lateral sclerosis (ALS)

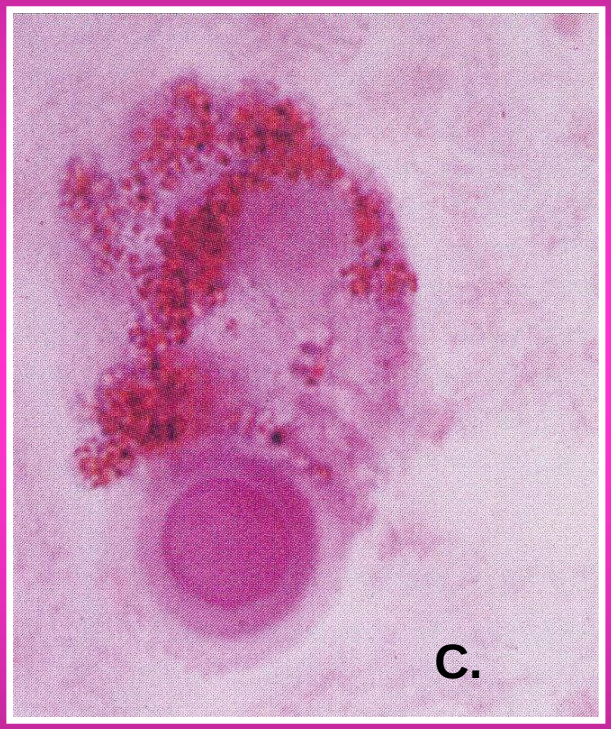
- Motor neurone disease (MND) or Lou Gehrig's disease, a specific disease that causes the death of neurons controlling voluntary muscles. Some also use the term motor neuron disease for group of conditions of which ALS is the most common. ALS is characterized by stiff muscles, muscle twitching, and gradually worsening weakness due to muscles decreasing in size. It may begin with weakness in the arms or legs, or with difficulty speaking or swallowing. About half of the people affected develop at least mild difficulties with thinking and behavior and most people experience pain. Most eventually lose the ability to walk, use their hands, speak, swallow, and breathe.

PARKINSON DISEASE

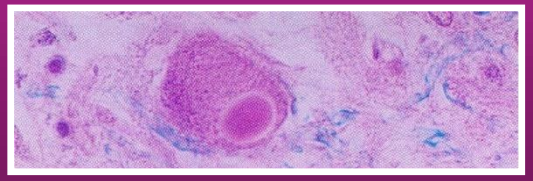
LOSS OF LOWER MOTOR NEURONS (ATROPHY OF MUSCLES, FIBRILLARY THRILLS, WEAKNESS) AND UPPER MOTOR NEURONS LOSS (HYPERREFLEXIA, SPASTIC PARALYSIS). MAINLY IN 5TH DECADE OF LIFE, DEATH BECAUSE OF RESPIRATION COMPLICATIONS



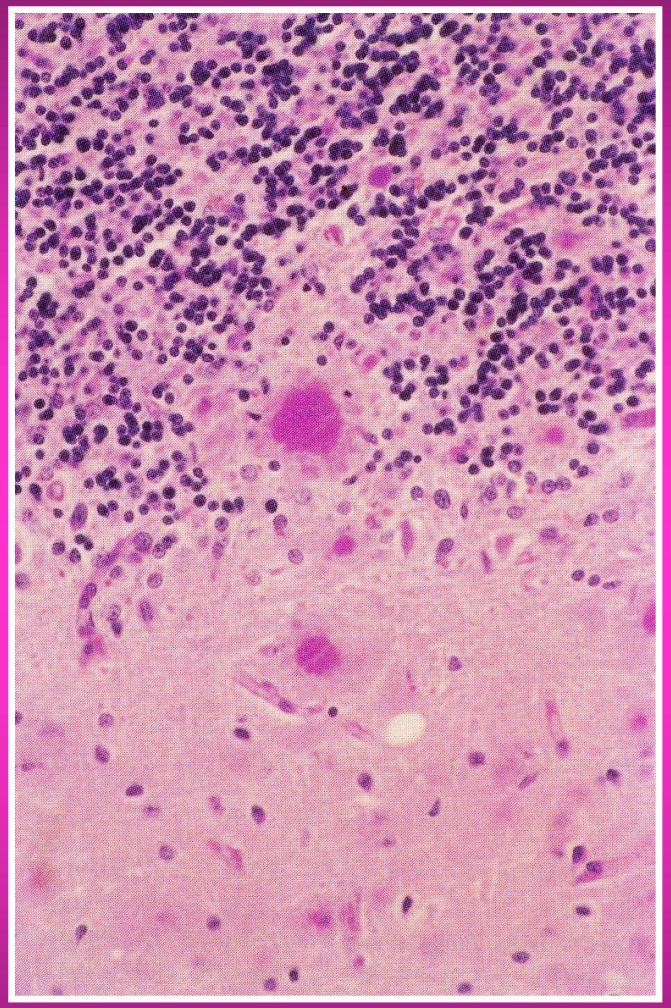


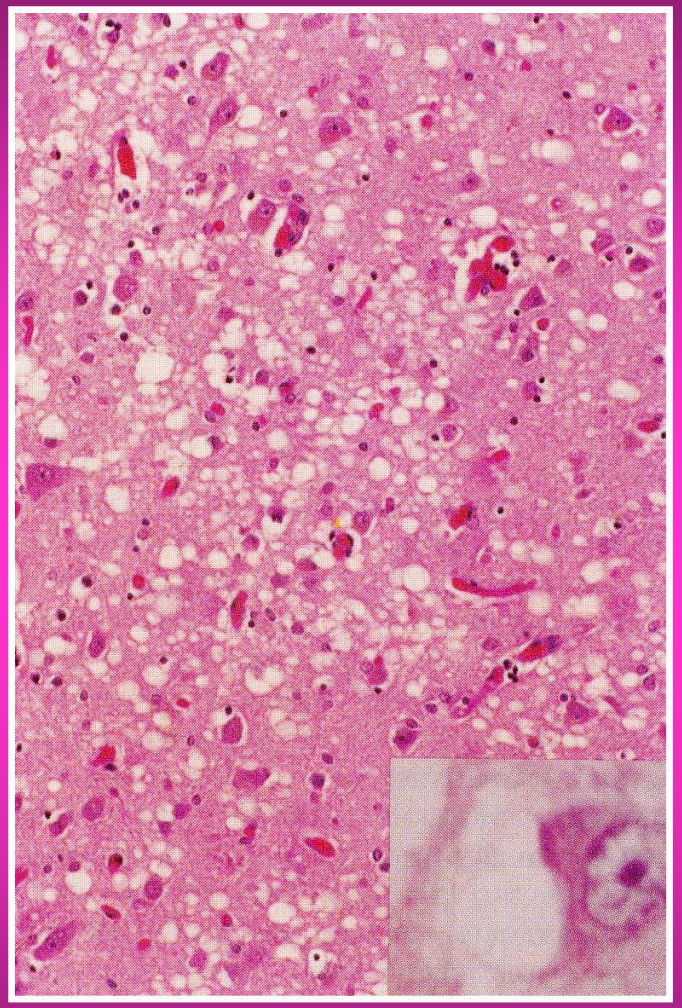


A. *SUBSTANTIA NIGRA* - NORMAL. B. *SUBSTANTIA NIGRA* IN PARKINSON.
C. LEWY BODIES IN NEURONS OF *SUBSTANTIA NIGRA* IN PARKINSON.



CREUTZFELD – JACOB DISEASE (BSE)





BELONGS TO SPONGIODYSTROPHIES (SPONGINESS IN GREY MATTER). THE ROLE OF PRIONS. OTHER DISEASES IN THIS GROUP: KURU, SCRAPIE (SHEEP)

TUMORS OF CNS

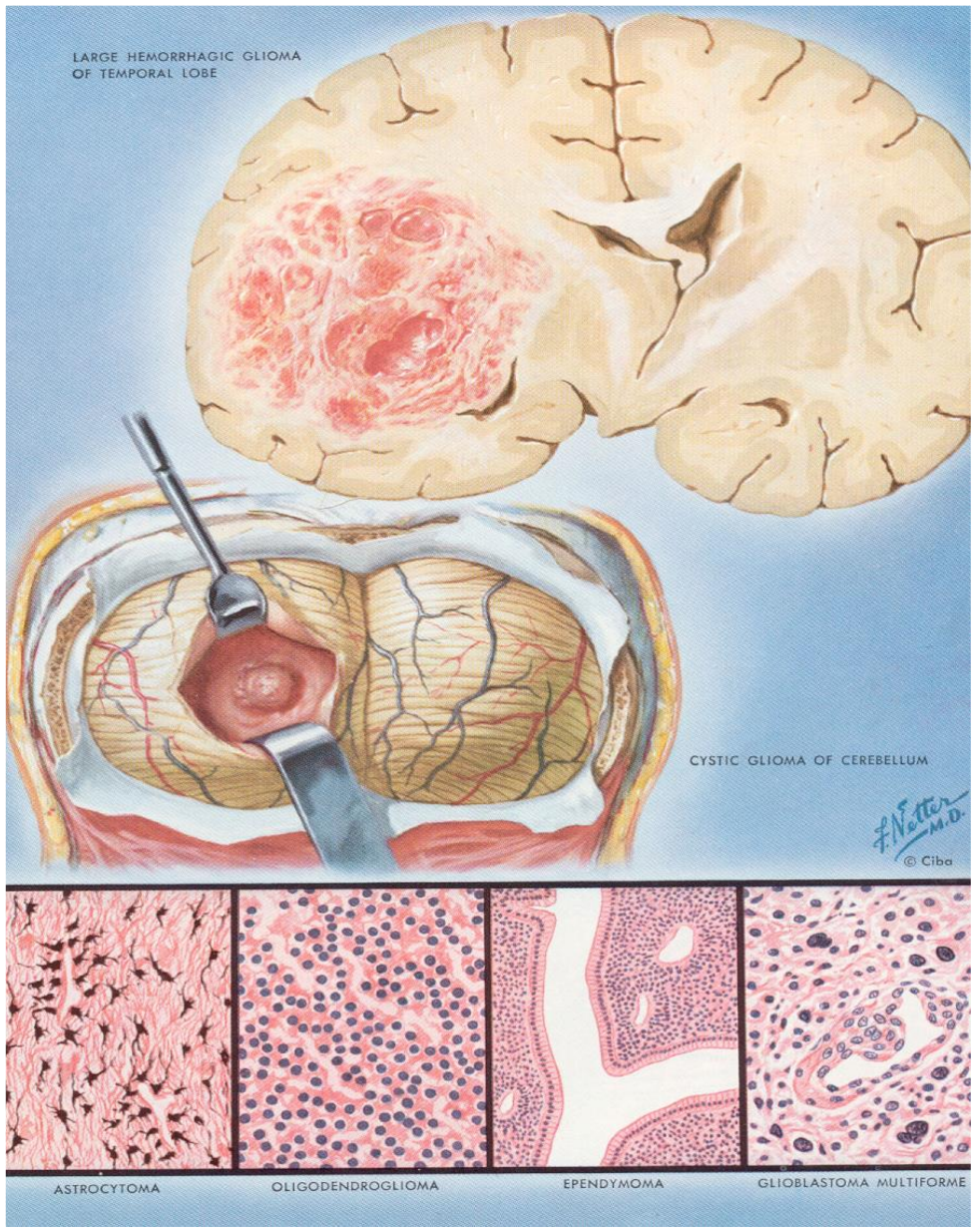
APPROX. 50% OF ALL PRIMARY TUMORS OF CNS ARE GLIOMAS

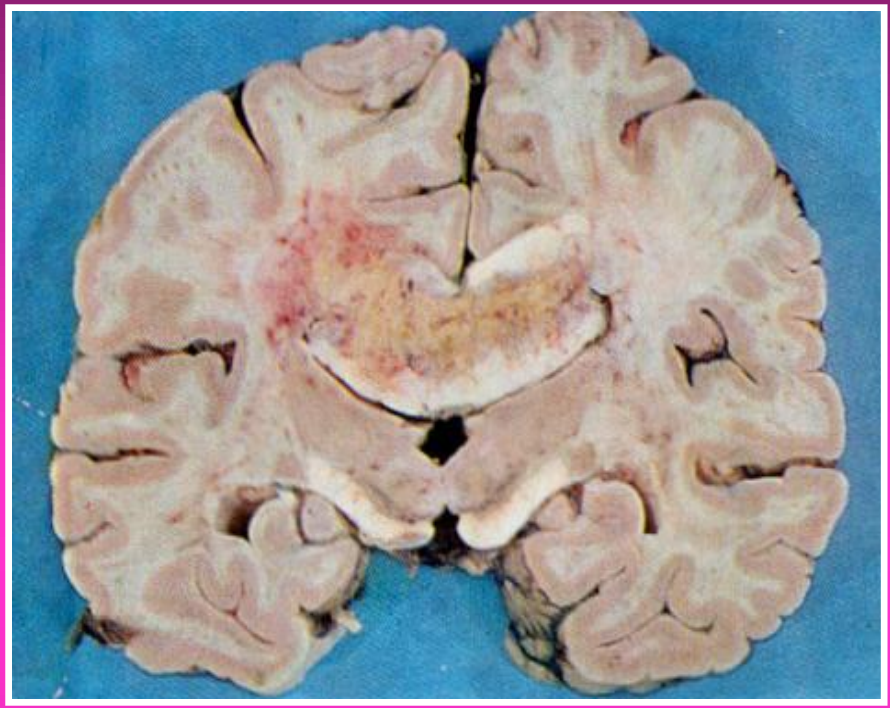
PRIMARY TUMORS OF CNS IN CHILDREN GROW MAINLY SUBTENTORIALLY

PRIMARY TUMORS OF CNS IN ADULTS MAINLY IN HEMISPHERES

EXTRACRANIAL METASTASES ARE EXTREMELY RARE

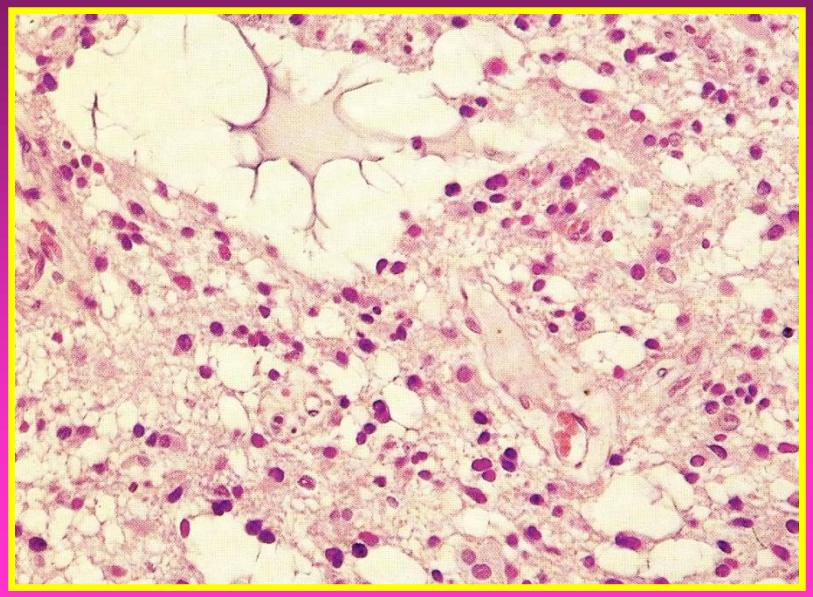
ASTROCYTOMAS



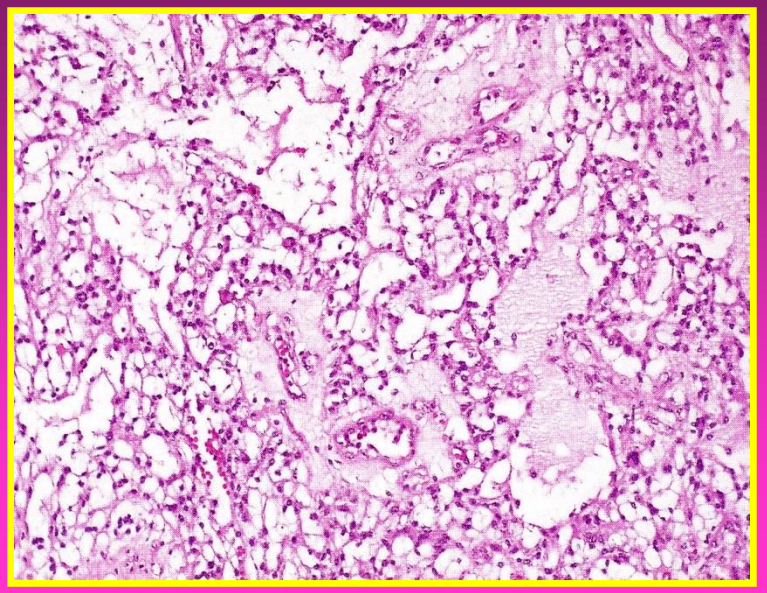


THEY BELONG TO THE MOST FREQUENT PRIMARY TUMORS IN CEREBRAL HEMISPHERES IN ADULTS.
THEY COMPRISE MORE AND LESS MALIGNANT TUMORS

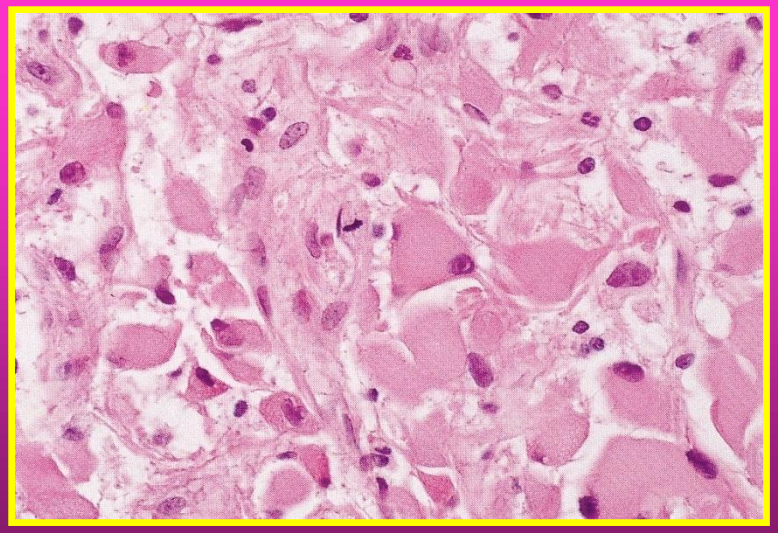
ASTROCYTOMAS



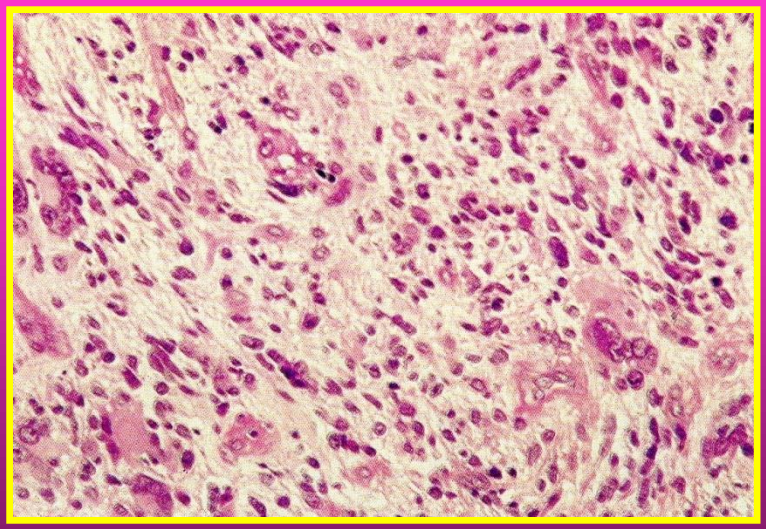
FIBRILLARY ASTROCYTOMA



PROTOPLASMIC ASTROCYTOMA



GEMISTOCYTIC ASTROCYTOMA



ANAPLASTIC ASTROCYTOMA

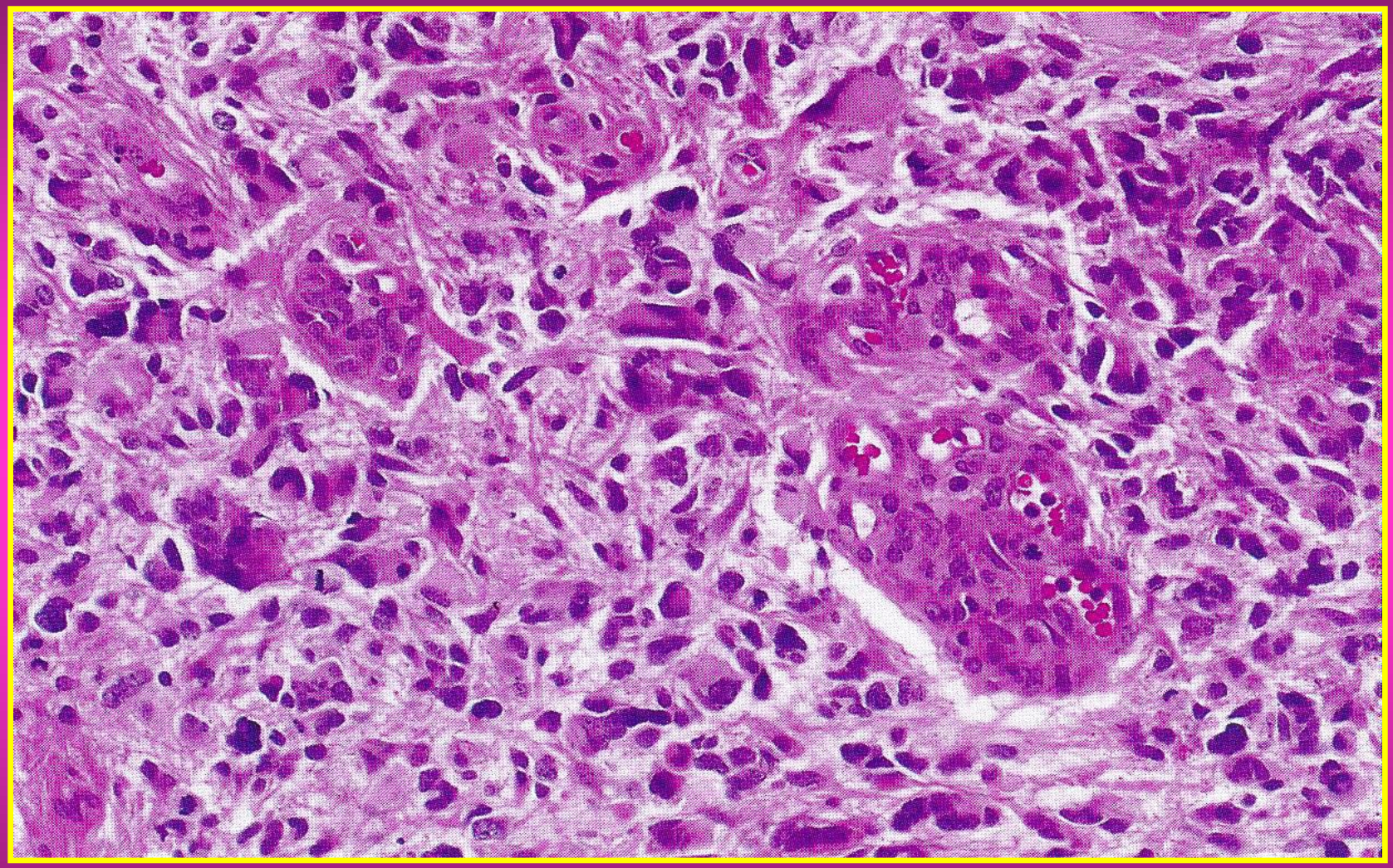
Glioblastoma multiforme

- **Malignant primary brain tumor with predominant astrocytic differentiation**
- **WHO grade IV**
- **"Multiforme" due to variegated gross appearance (firm white areas, yellow necrotic areas, hemorrhagic areas and cystic areas) as well as diverse histological features**

Glioblastoma multiforme

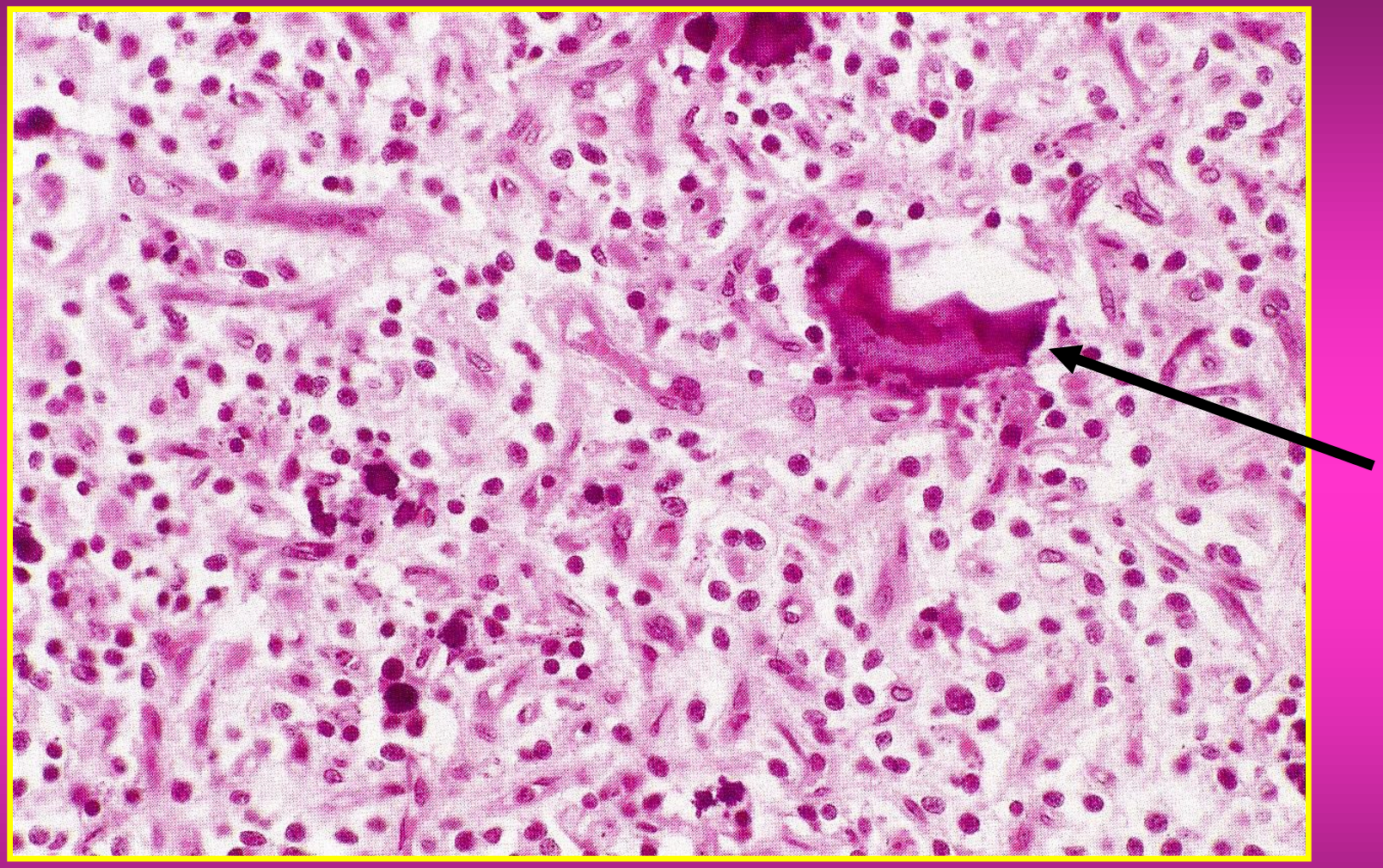
- Usually supratentorial; uncommon in cerebellum, rare in spinal cord
- Glioblastoma of brain stem is infrequent and often affects children
- 12 - 15% of adult intracranial tumors, 50 - 60% of astrocytic neoplasms
- Either primary (denovo, without recognizable precursor lesions, with p53 mutation) or secondary (develops slowly from grade II or III astrocytoma, often with partial #10 deletion)
- May be under graded on small stereotactic biopsies due to regional heterogeneity; median survival is 1 year; 5 year survival < 5%;

MULTIFORM GLIOBLASTOMA



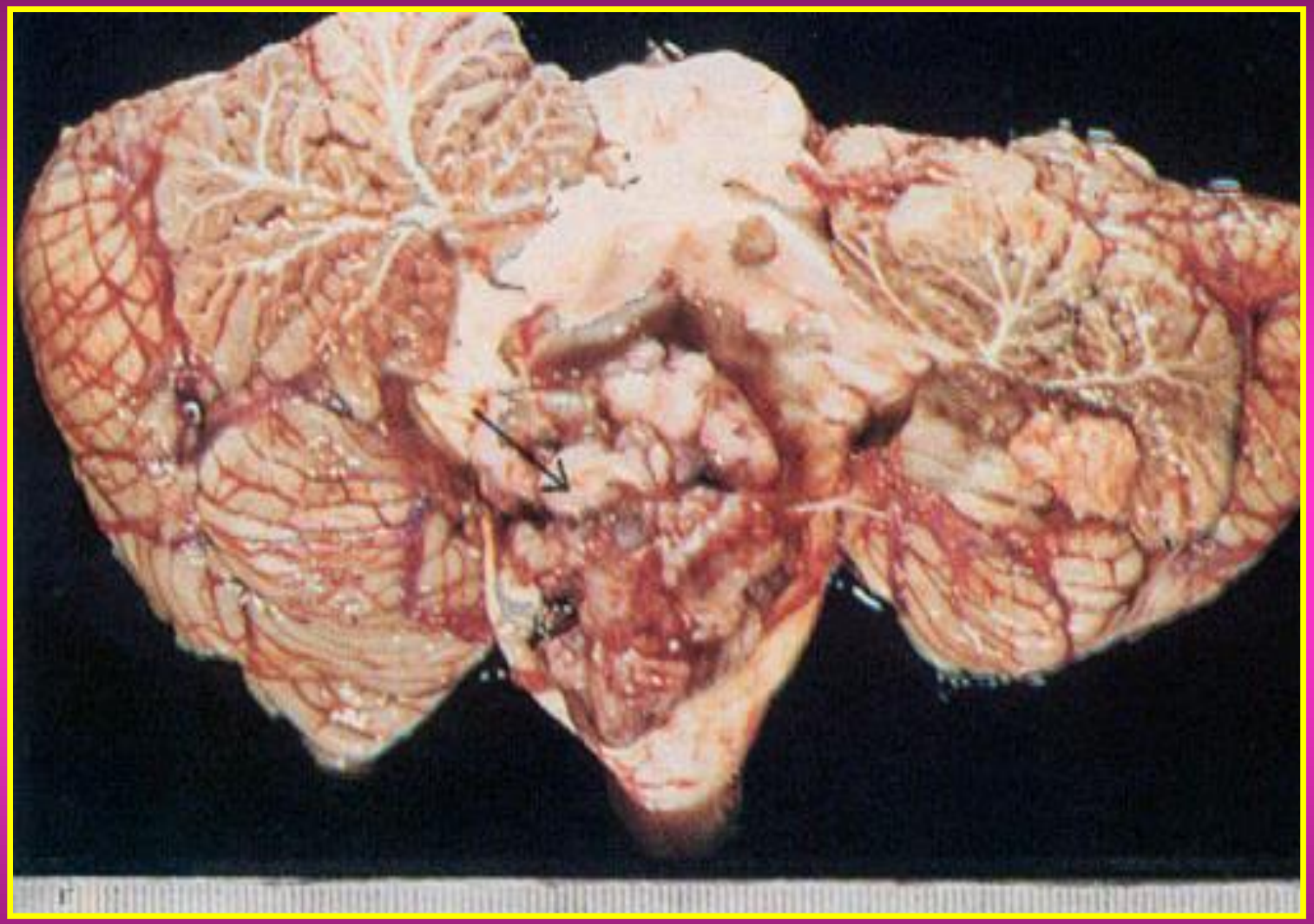
CELLULAR POLYMORPHISM AND PROLIFERATION OF BLOOD VESSELS

OLIGODENDROGLIOMA



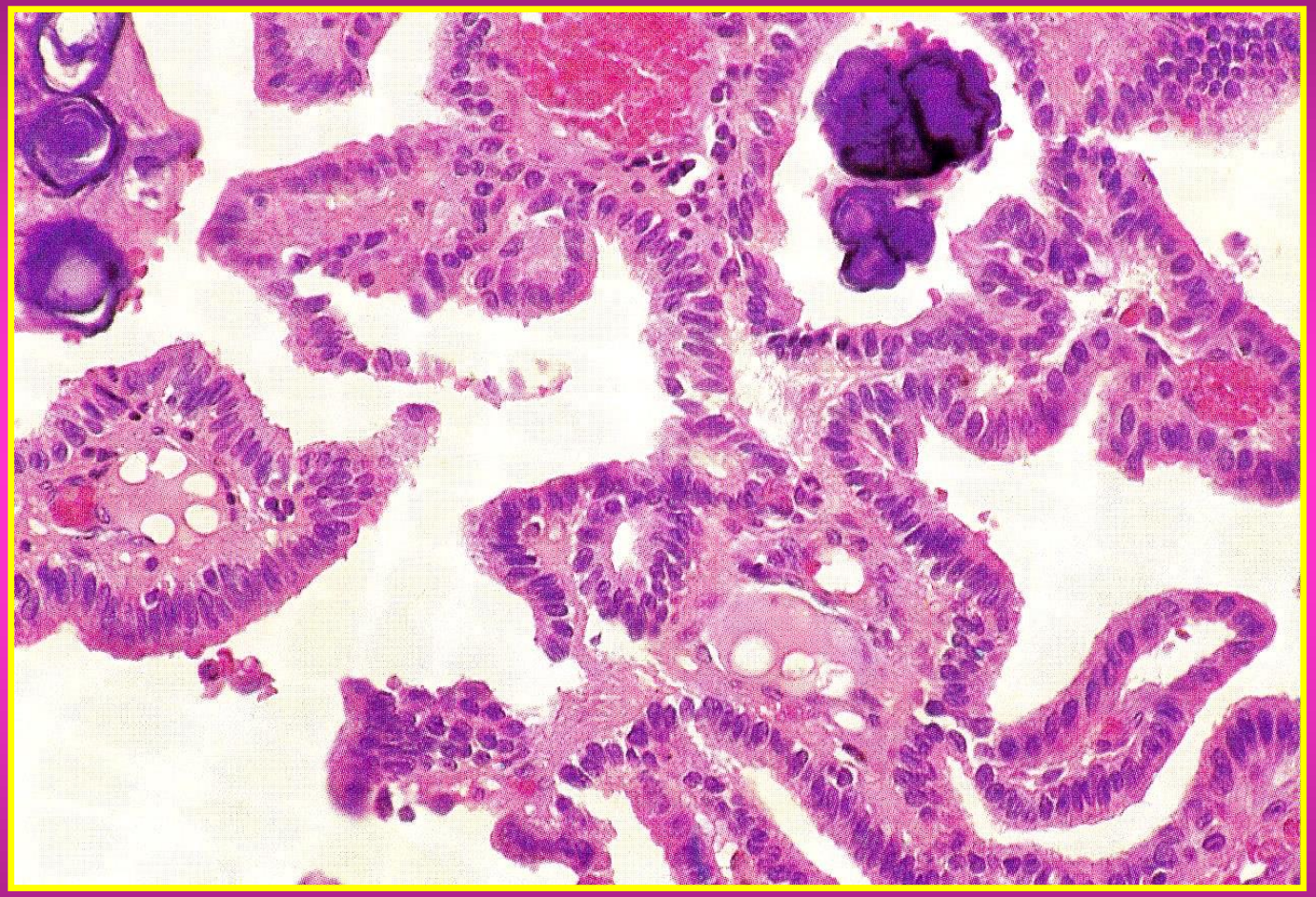
FROG-SPAWN LIKE STRUCTURE WITH SMALL CALCIFICATIONS (→)

EPENDYMOMA



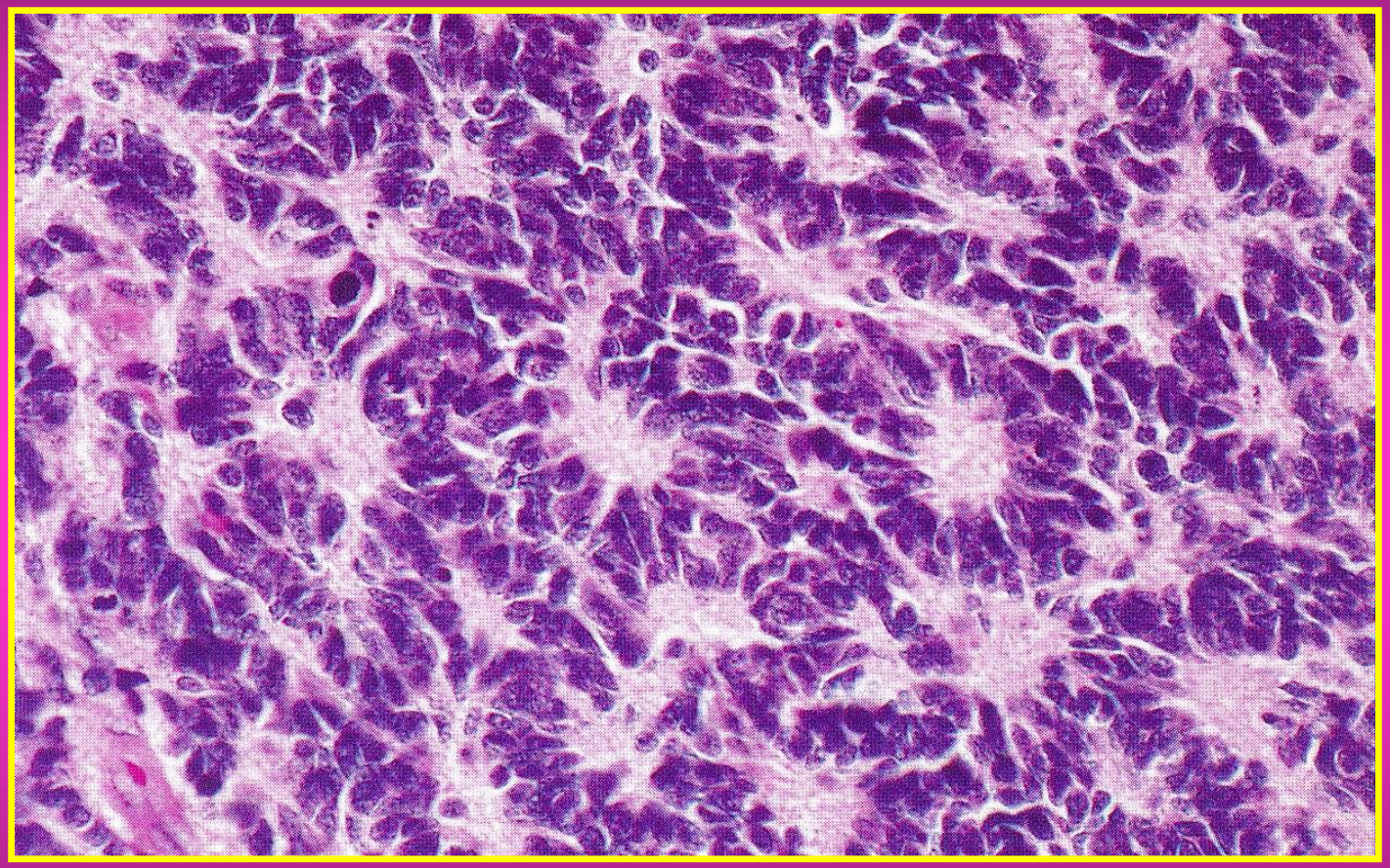
IN THE 4TH VENTRICLE, OF DIFFERENT MALIGNANCY AND OF DIFFERENT HISTOLOGICAL STRUCTURE

CHOROID PLEXUS PAPILLOMA



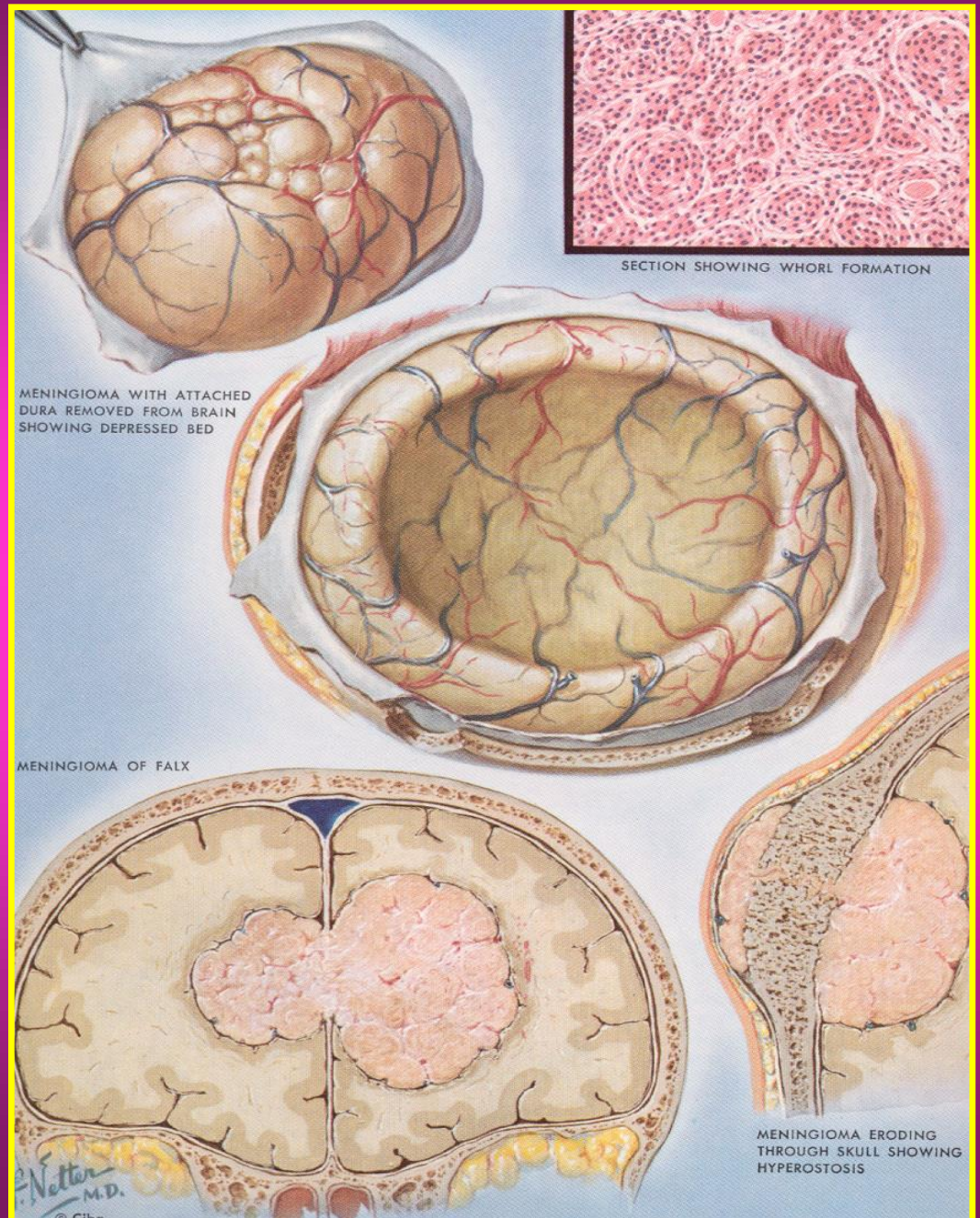
RATHER UNCOMMON PAPILLARY TUMOR, OFTEN WITH PSAMMOMA BODIES, MAY LEAD TO HYDROCEPHALUS BECAUSE OF OVERPRODUCTION OF CEREBROSPINAL FLUID

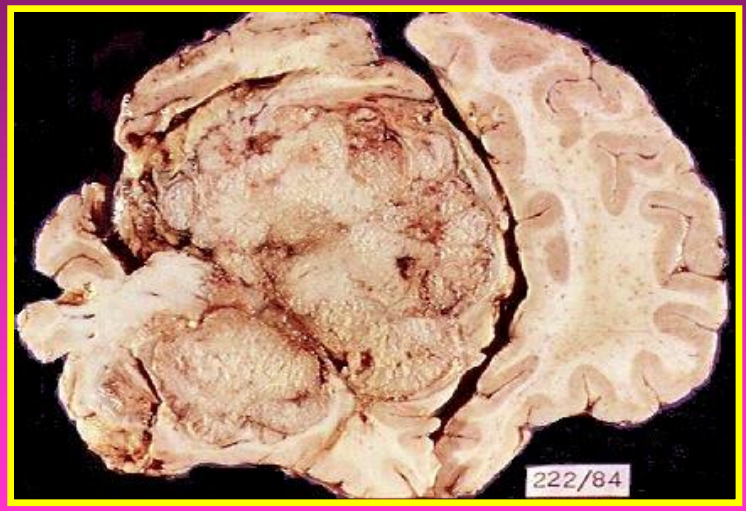
MEDULLOBLASTOMA

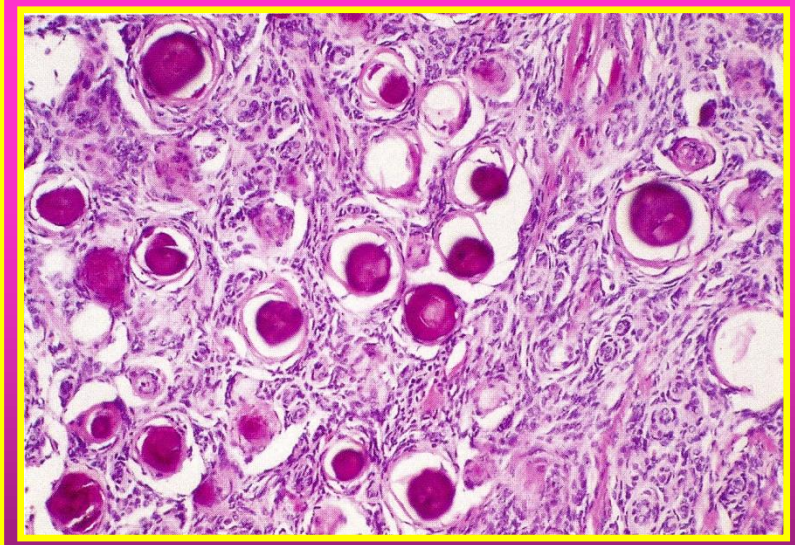


CHILDREN, GROWS IN NEIGHBOURHOOD OF VERMIS, HIGHLY MALIGNANT WITH TYPICAL ROSETTES

MENINGIOMAS

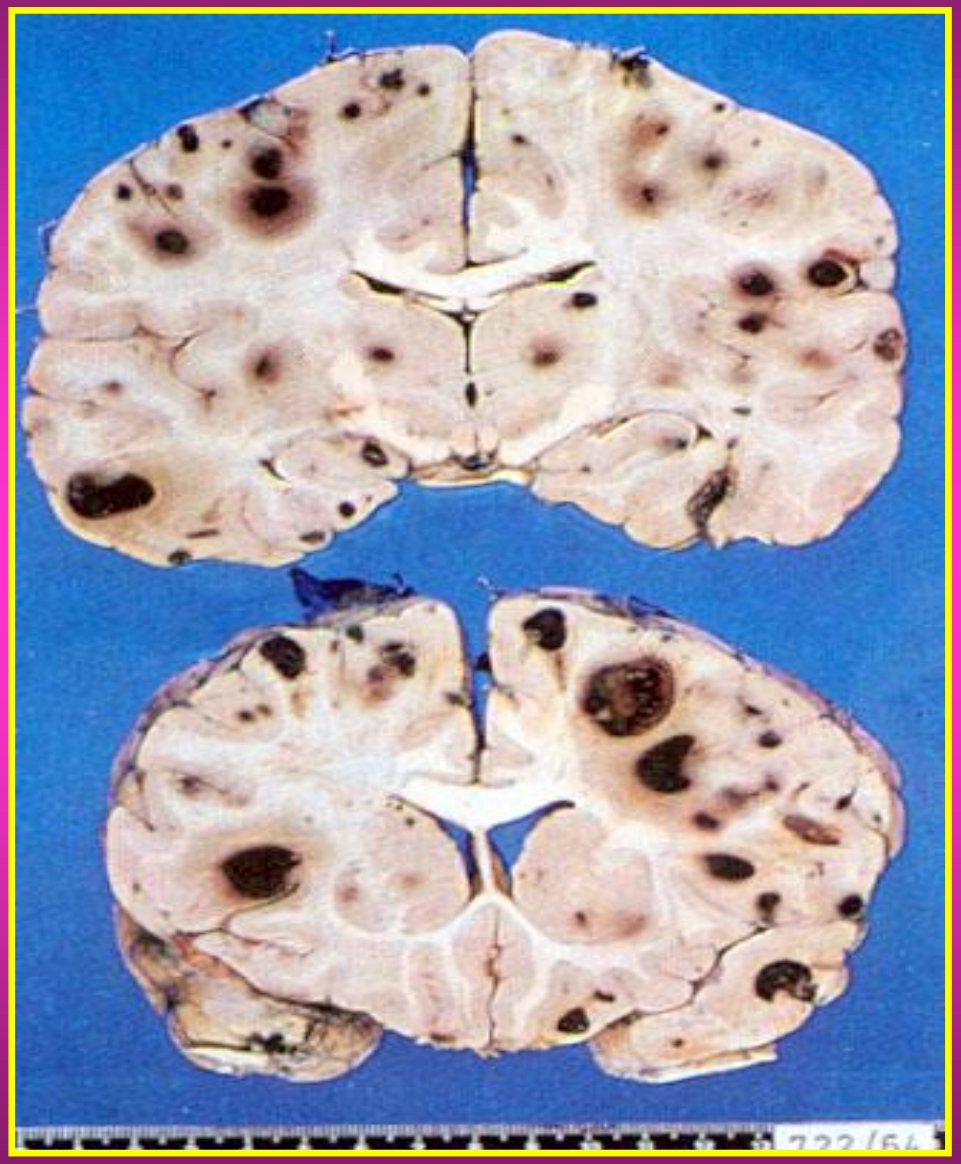




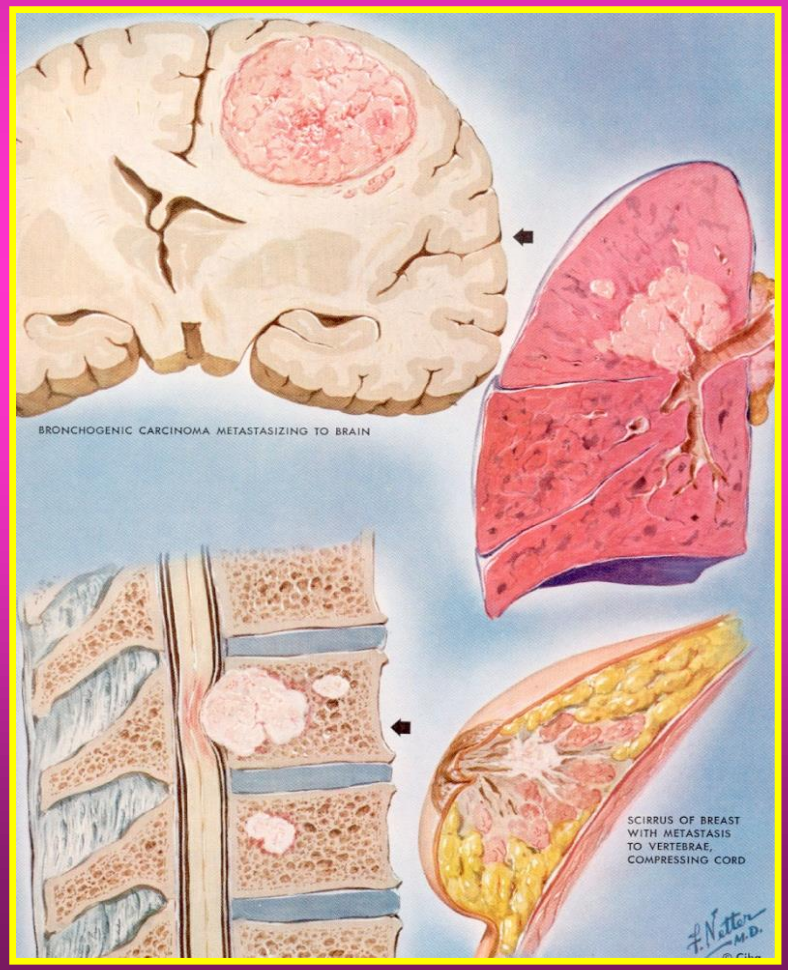


BENIGN, SLOW GROWTH AND PSAMMOMA BODIES

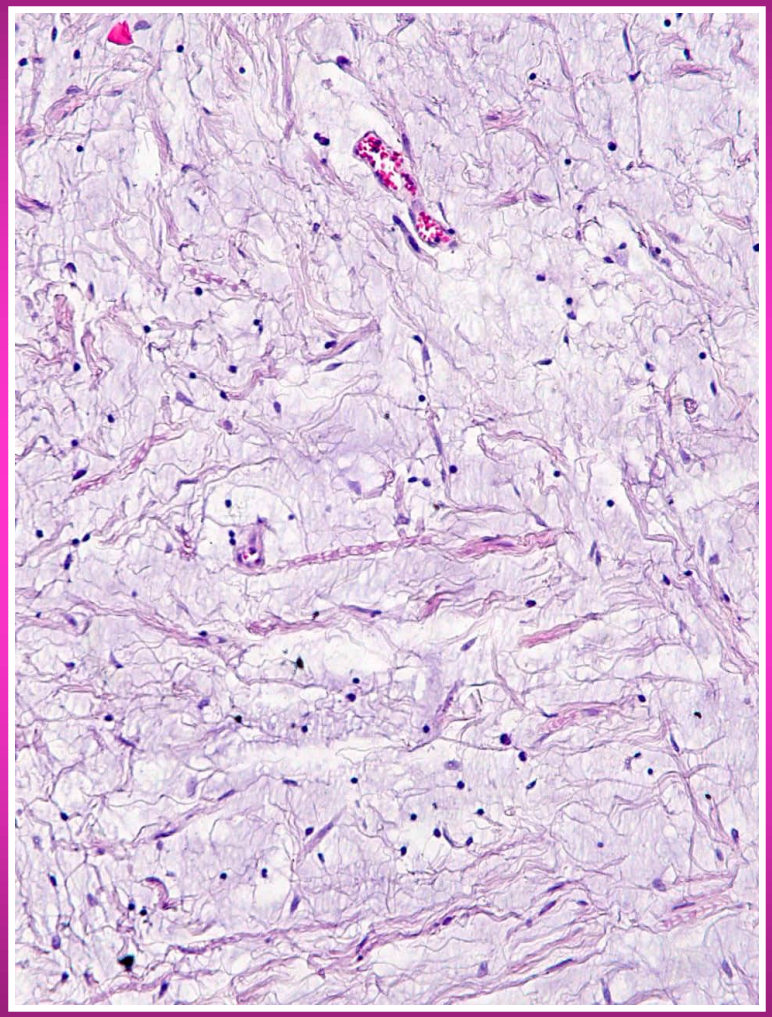
METASTATIC TUMORS



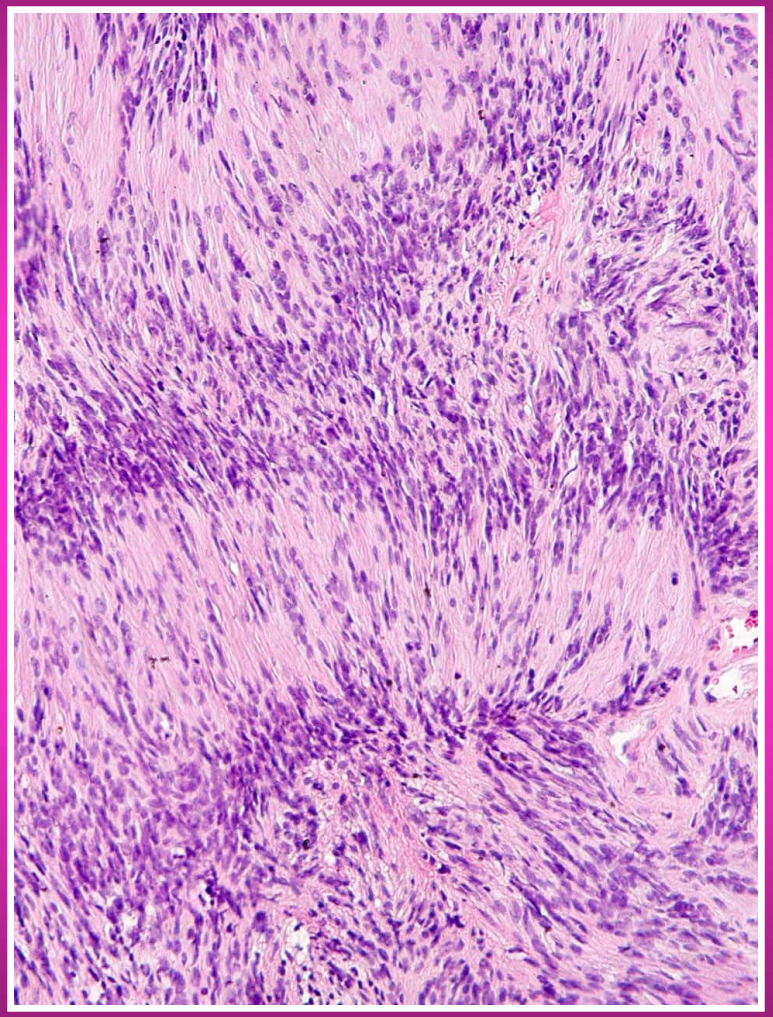
APPROX 50% OF ALL CNS TUMORS (MAINLY FROM BRONCHI AND BREAST)



PERIPHERAL NERVOUS SYSTEM TUMORS

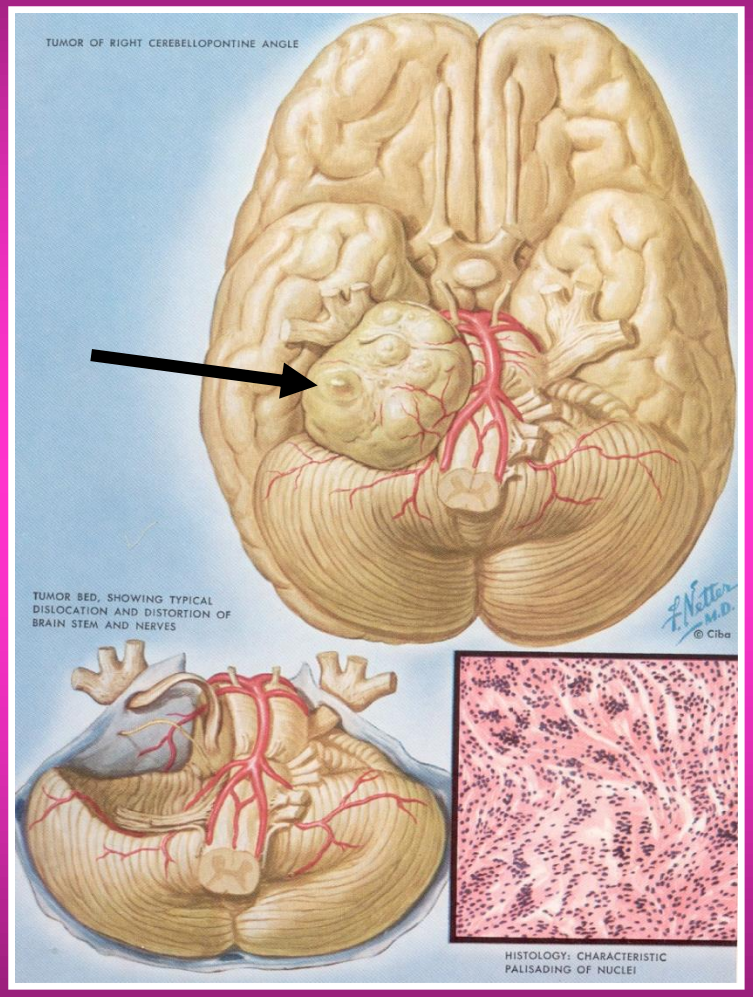


NEUROFIBROMA

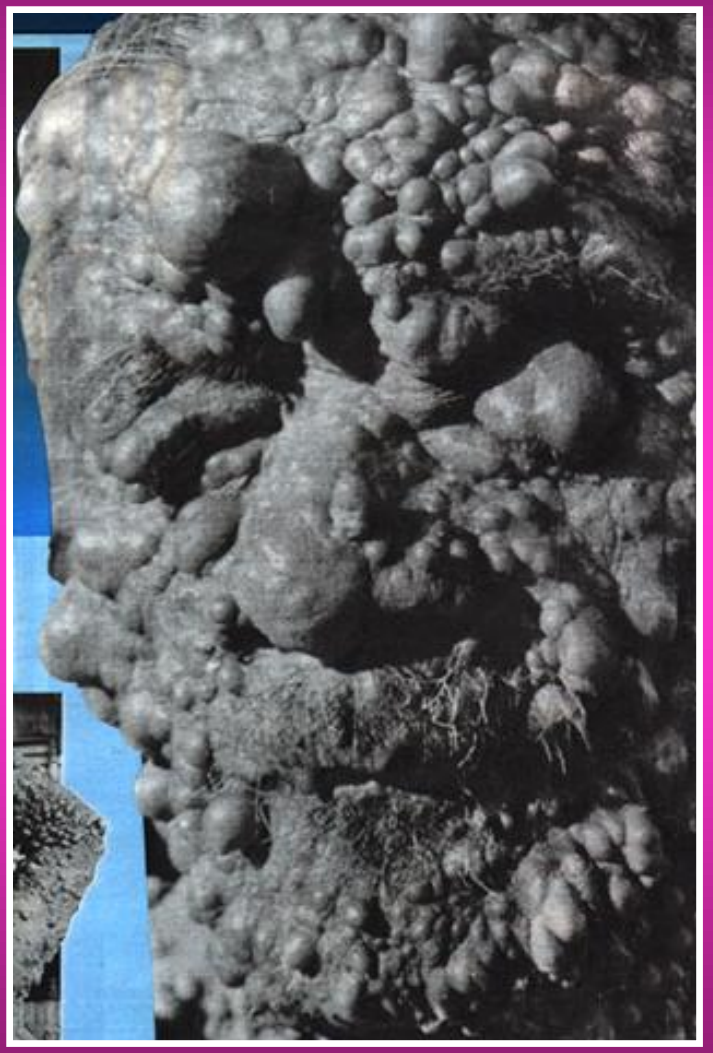


NEURILEMMOMA (SCHWANNOMA)

PERIPHERAL NERVOUS SYSTEM TUMORS

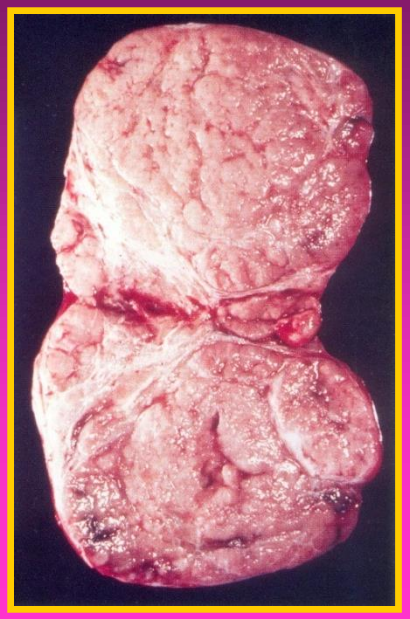


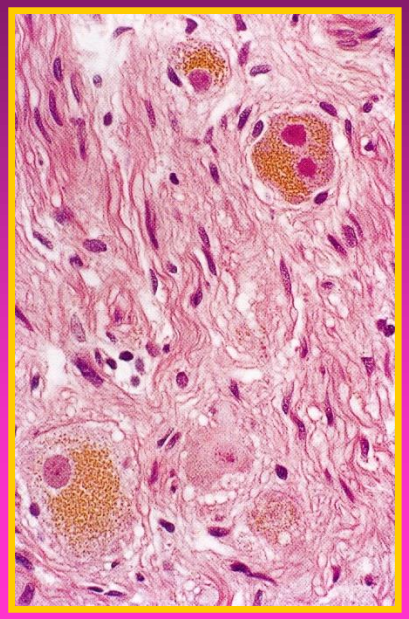
NEURILEMMOMA OF ACOUSTIC NERVE



NEUROFIBROMATOSIS UNIVERSALIS
(MORBUS RECKLINGHAUSEN)

GANGLIOMAS

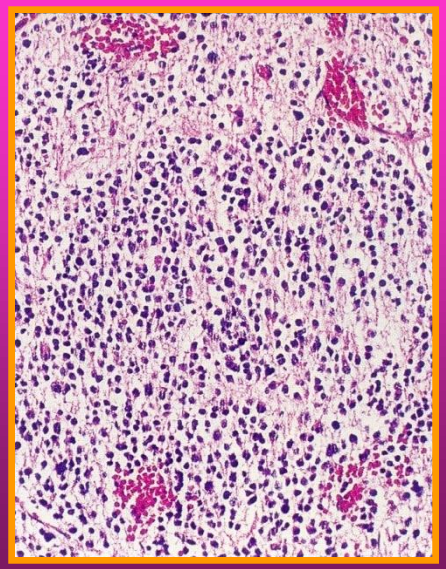


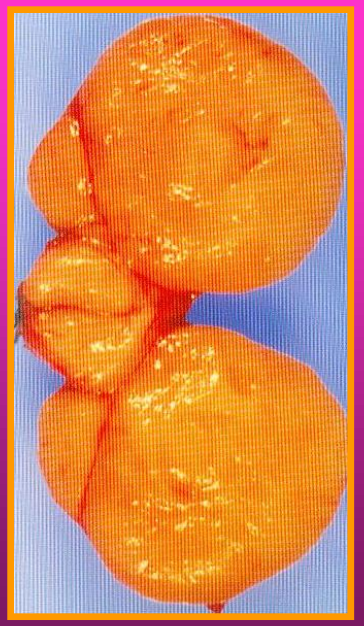


BENIGN TUMORS GROWING IN GANGLIA AND MEDULLA OF SUPRARENAL GLANDS

NEUROBLASTOMA

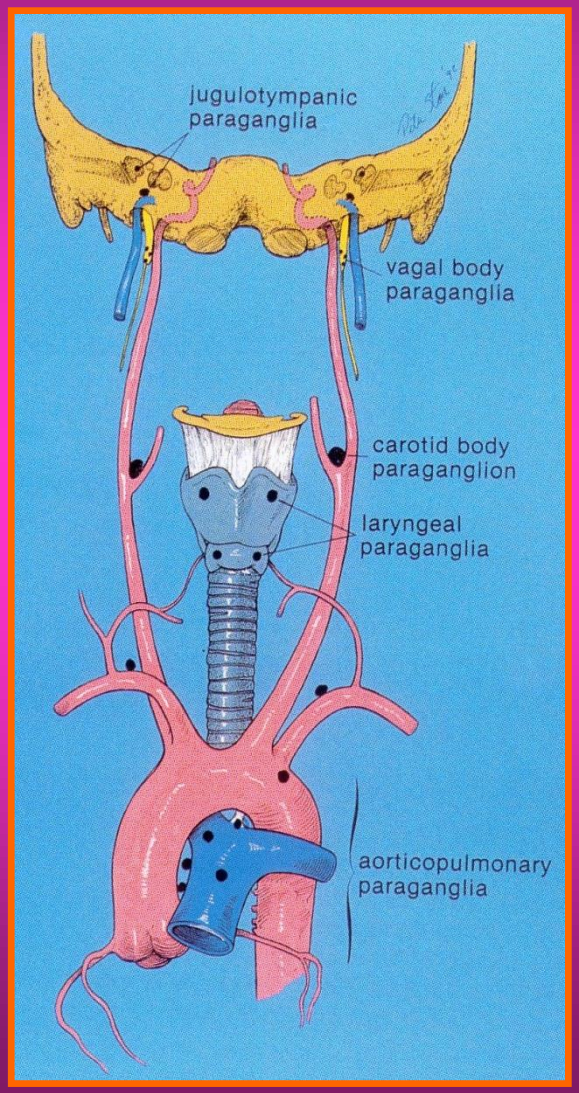
MALIGNANT, IN CHILDREN. MOST OFTEN IN MEDIASTINUM, RETROPERITONEAL SPACE AND MEDULLA OF SUPRARENAL GLAND. METASTASES TO LIVER AND BONES

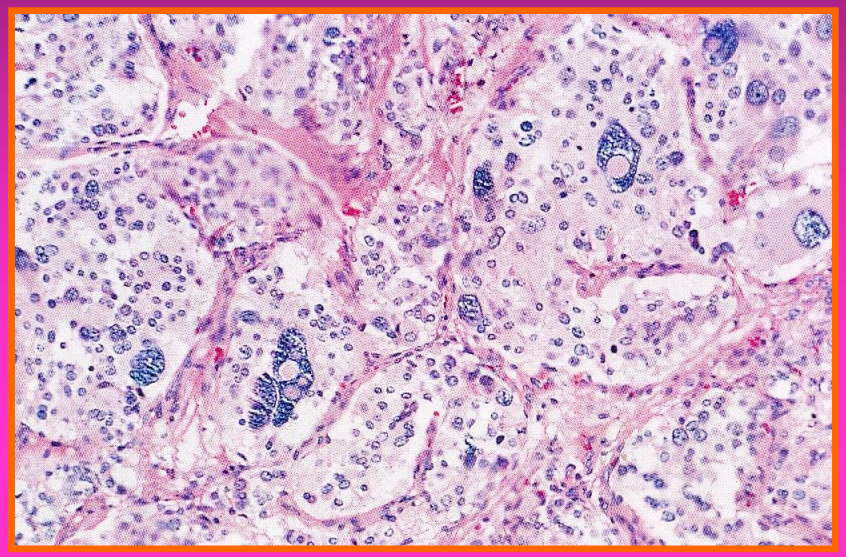


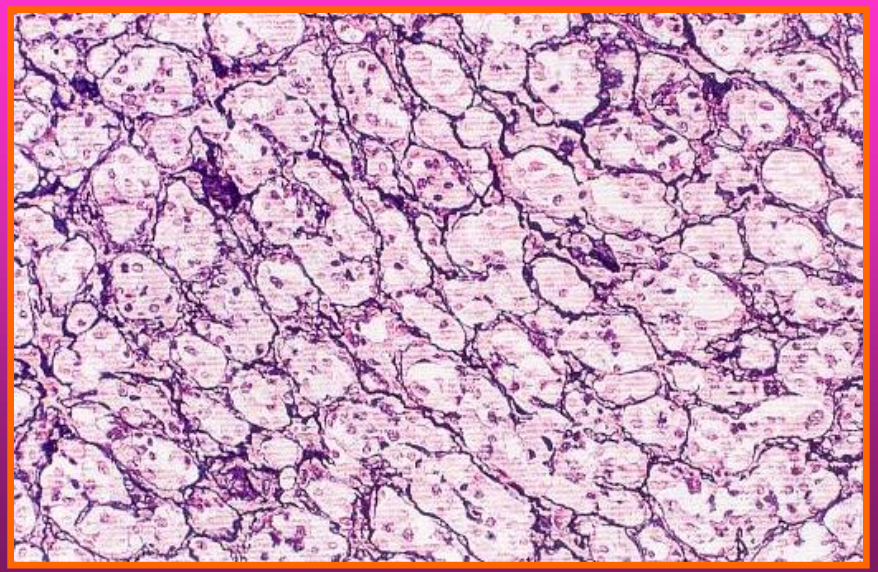


PARAGANGLIOMAS

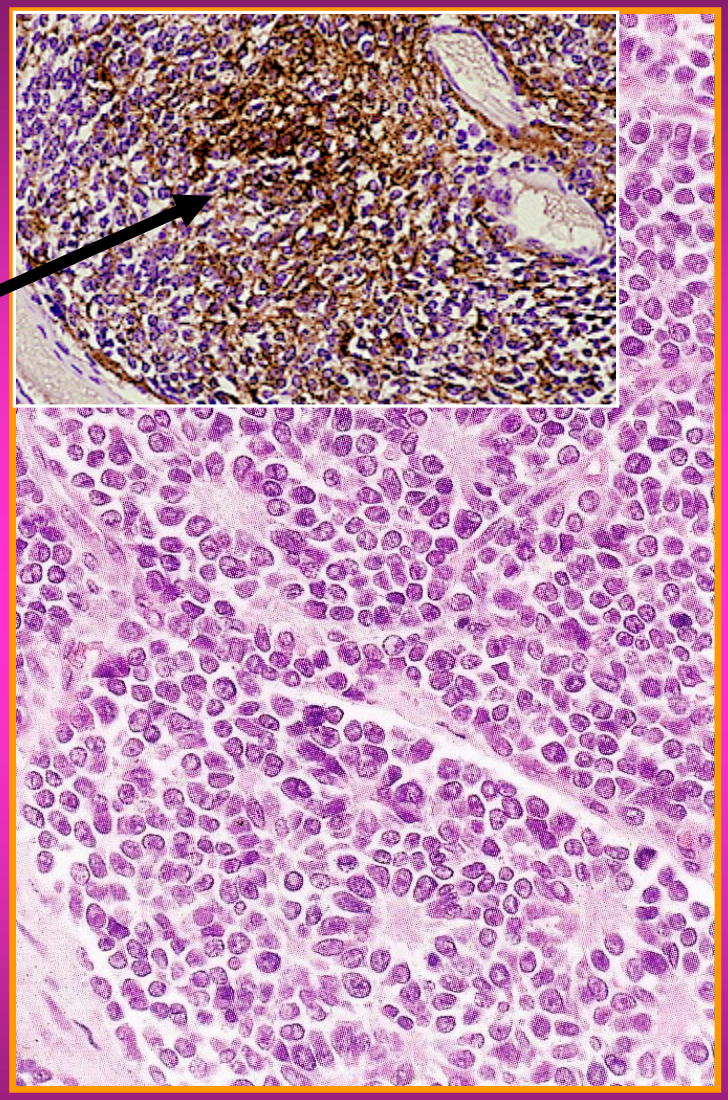
WELL VASCULARIZED TUMORS WITH LATE METASTASES.



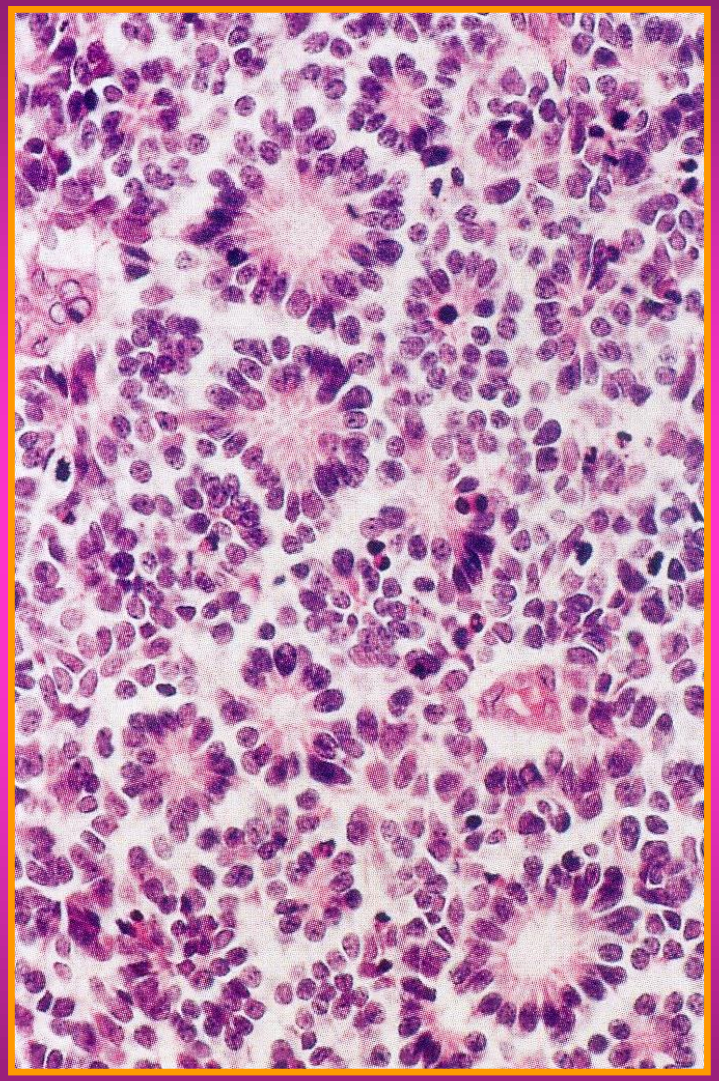




OTHER PRIMITIVE NEUROGENIC TUMORS

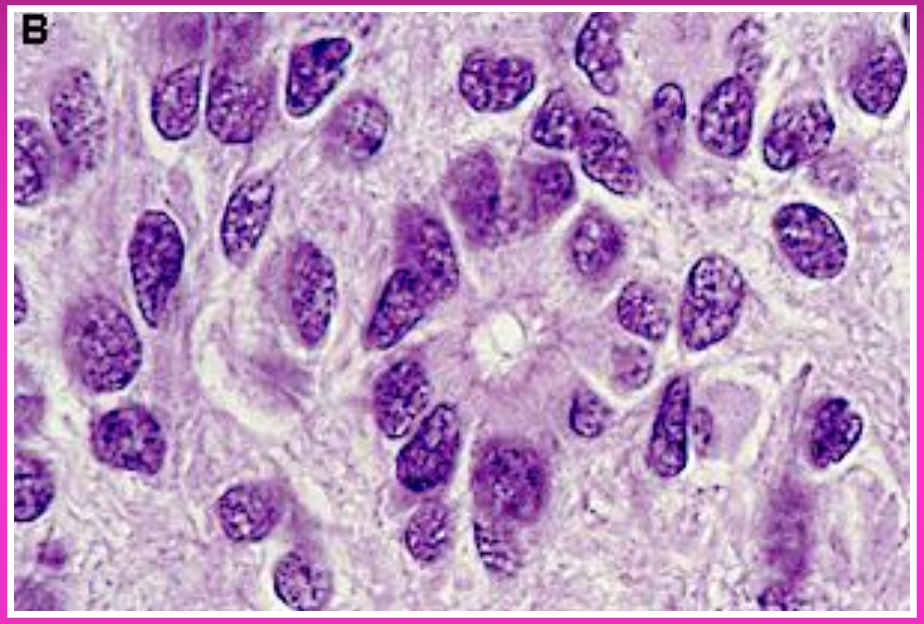


PERIPHERAL PRIMITIVE NEUROECTODERMAL TUMOR (PPNET)
SYNAPTOPHYSIN EXPRESSION

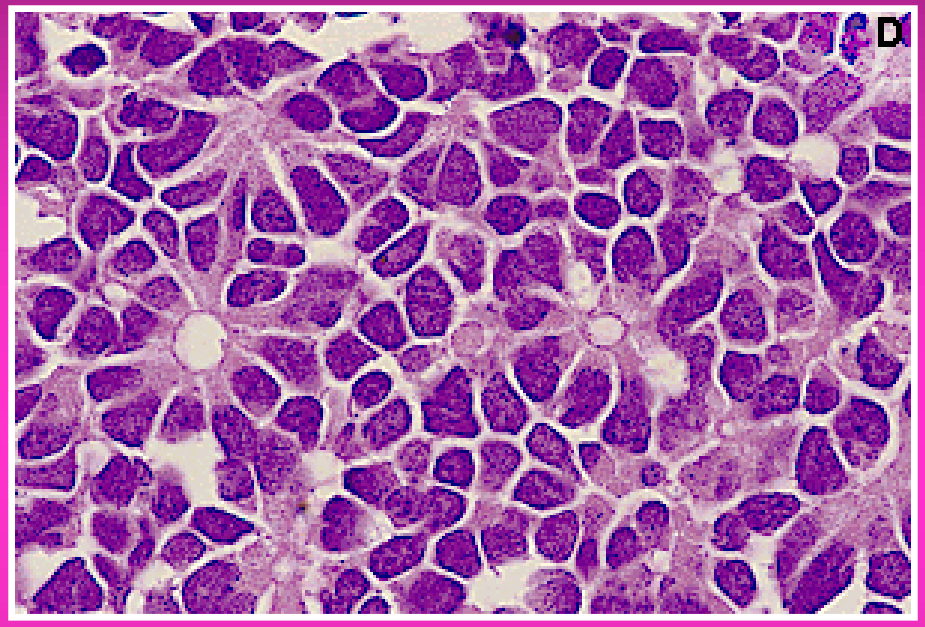


RETINOBLASTOMA (GENETICALLY CONDITIONED TUMOR)

ROSETTES



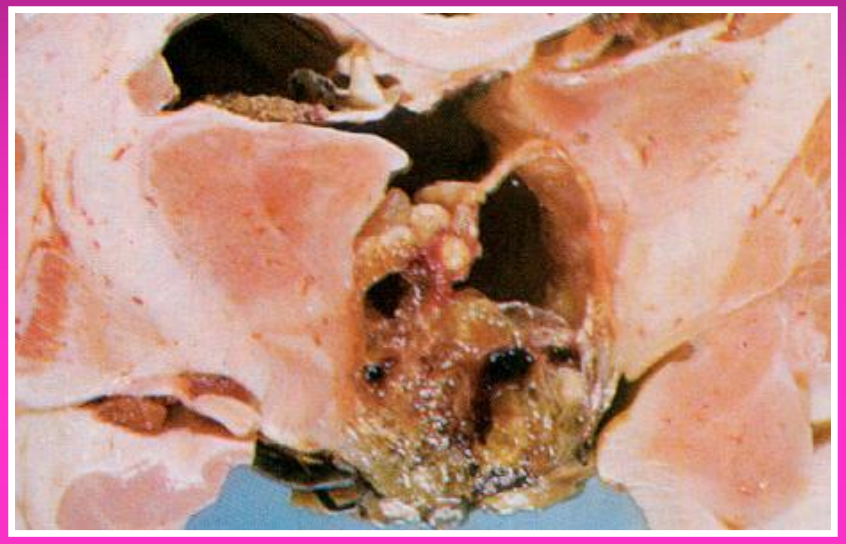
EPENDYMOMA

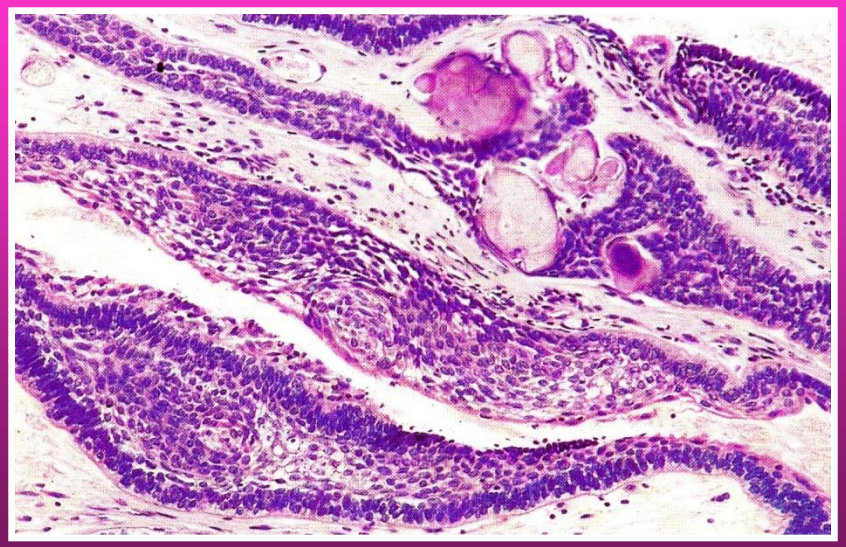


RETINOBLASTOMA

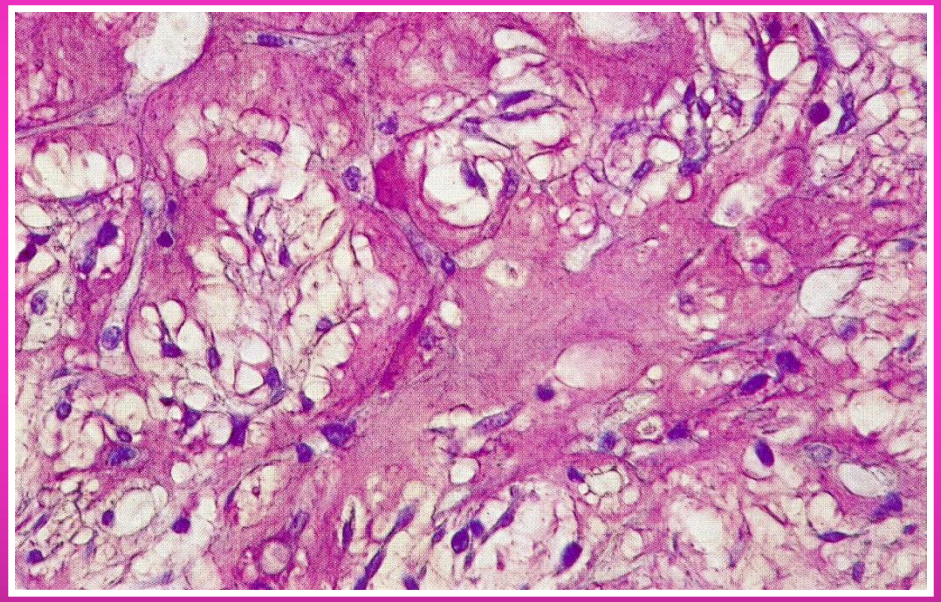
TUMORS OF THE SELLAR REGION

CRANIOPHARYNGEOMA
RARE TUMOR FROM RATHKE POUCH





CHORDOMA: RARE TUMOR FROM CHORDA DORSALIS IN CLIVUS AND COCCYGEAL BONE



THANK YOU