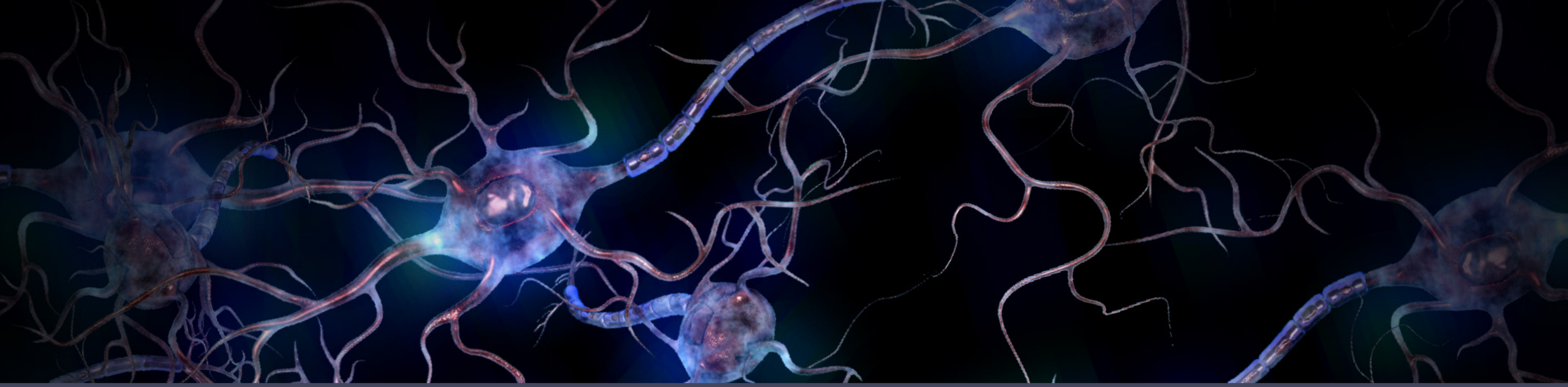


YU - Medicine

Passion Academic Team

Sheet# 1 - Pathology

Lec. Title : Tumors of CNS (I)

Written By : Mesk N Alsouqi

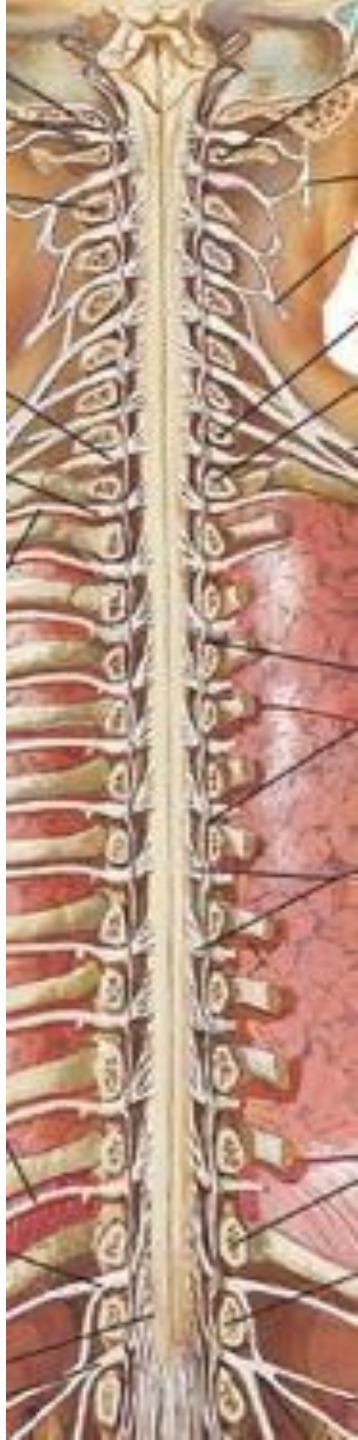
PERIPHERAL NERVOUS SYSTEM

If you come by any mistake , please kindly report it to shaghafbatch@gmail.com

TUMORS

of

CNS



Primary CNS Tumours

Age: Double peak; 1st & 6th decades.

Tumors in childhood differ from those in adults both in histologic subtype & location.

- بيصيب الأشخاص (اقل من 10 سنين واكثر من 60 سنة).
- دائما بيكون malignant ويندرج من ١ ل٤ درجات .
- في الأطفال بكون أكثر عرضة للوفاة اذا صاب ال MIDBRAIN.

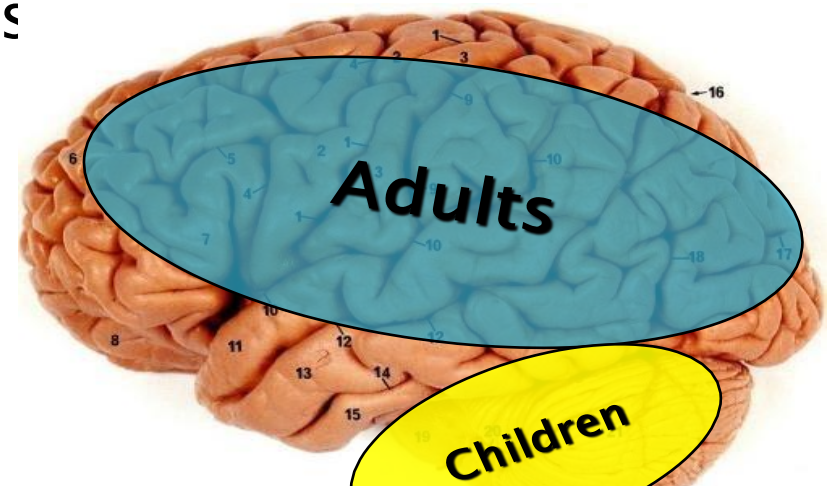
Generally:

- The annual incidence of CNS tumors ranges from 10- 17 / 100,000 persons for intracranial tumors and 1 - 2 / 100,000 persons for intraspinal tumors

- ½ - ¾ are primary tumors, and the rest are metastatic.
  - In children: 20% of all pediatric tumors. 70% are infratentorial and usually primary.

- ((usually found in the cerebellum))

  - In adults: 70% are supratentorial (posterior fossa) & are primary OR metastasis

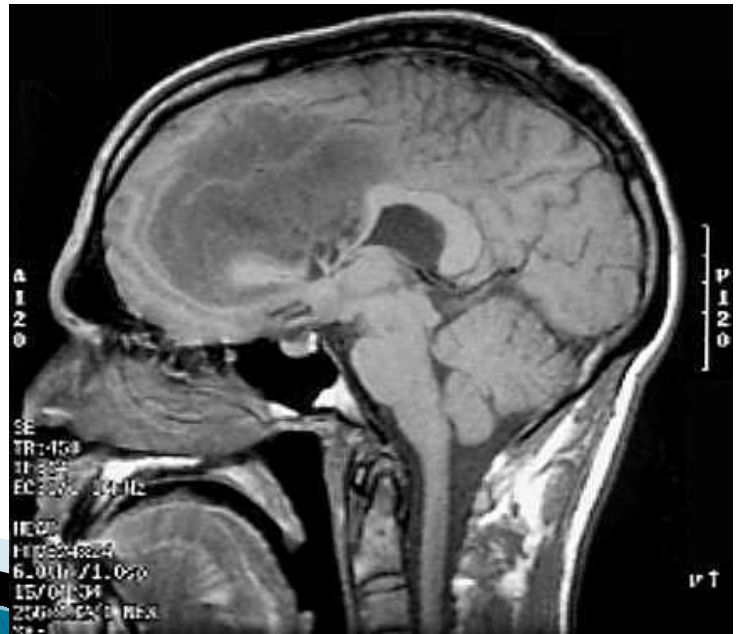


Characteristic features of brain tumors

NO premalignant or in situ stages.

Large area of INVASION (even low-grade tumors) leading to:

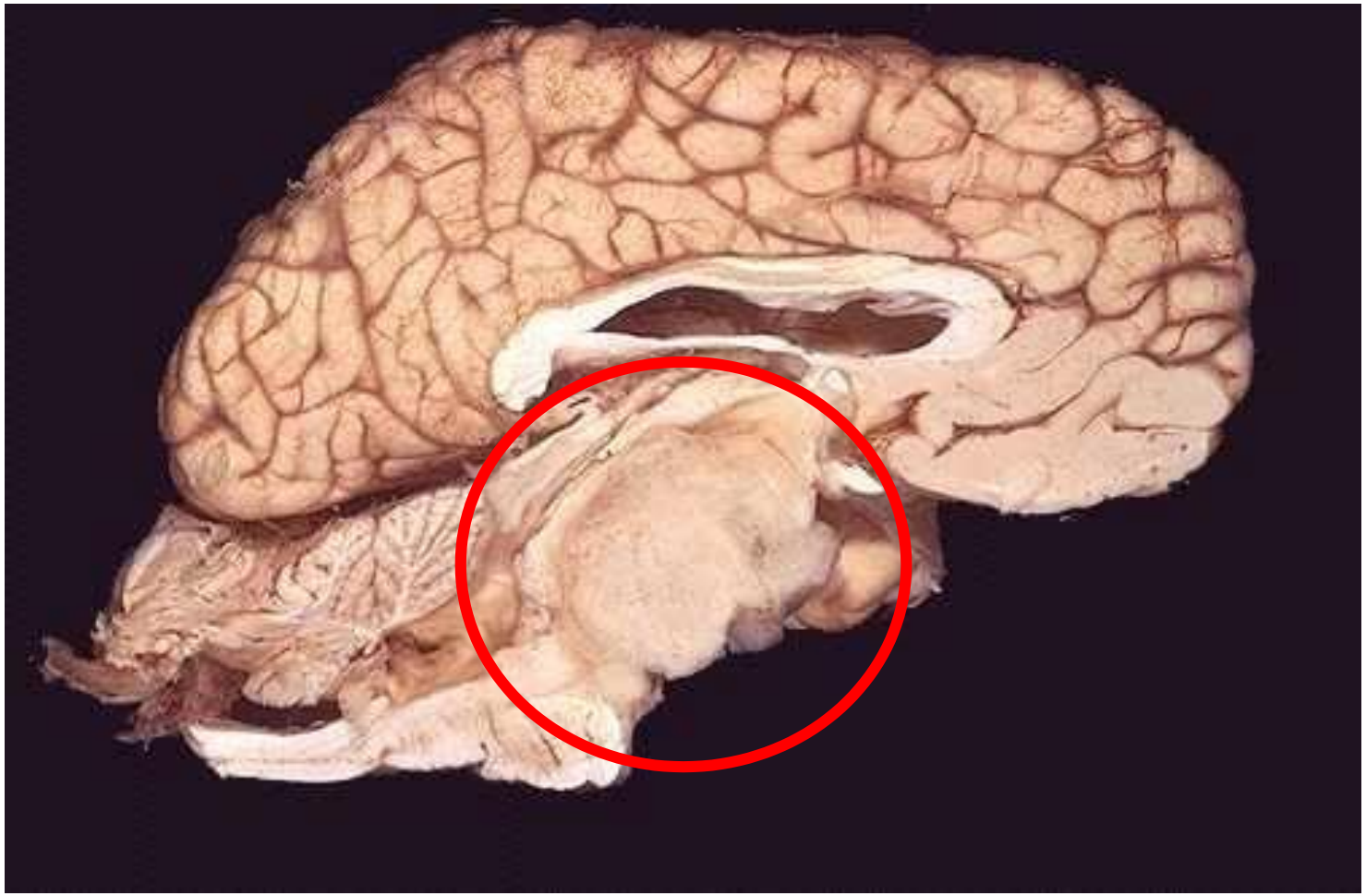
→Serious clinical deficits*, non-resectability & poor prognosis.



Characteristic features of brain tumors

The anatomic site of the neoplasm can influence OUTCOME regardless the tumor type, due to local effects (as benign meningioma*) OR non-resectability (as brain stem gliomas).

Rarely spread (metastasized) outside of the CNS (even highly malignant gliomas); BUT, some can spread to other sites through subarachnoid space along the neuroaxis.

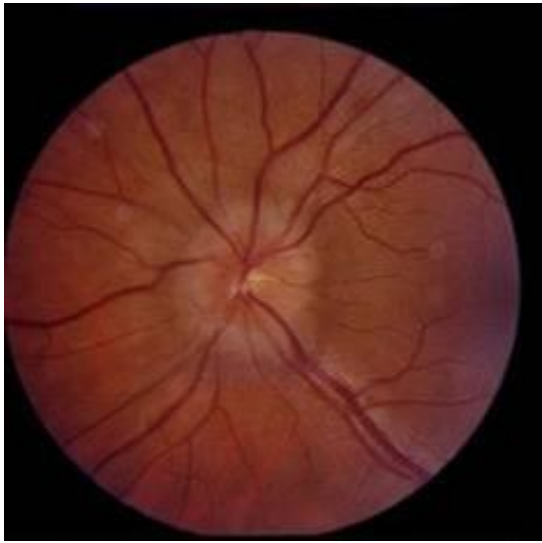


Clinical presentation*

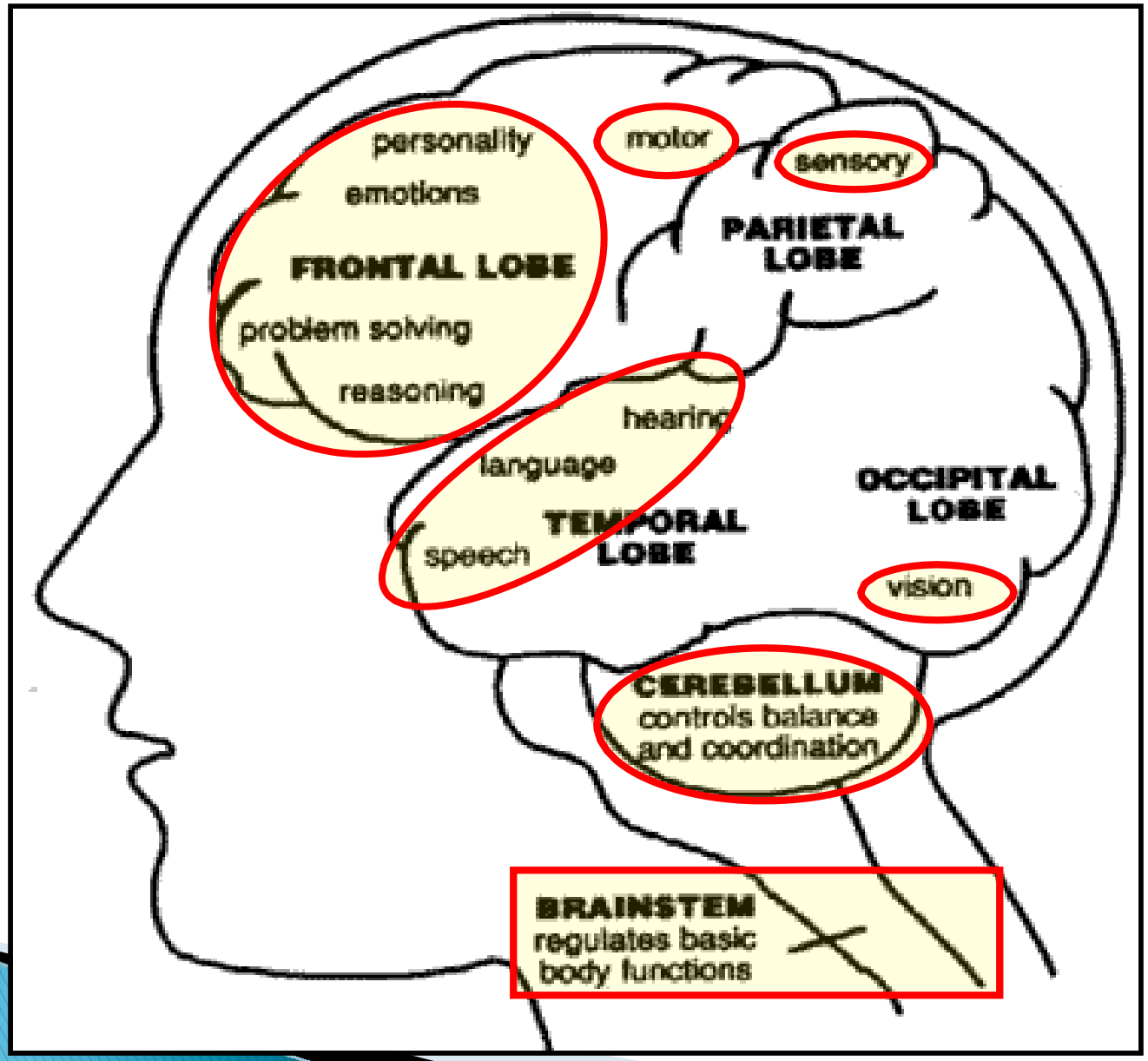
Related to:

- Localizing signs: Nerve & tract deficits, seizures, paralysis … etc.

- ± ↑ ICP: Headache (morning), vomiting, slow pulse, papilloedema …



CNS Anatomy – Clinical presentation

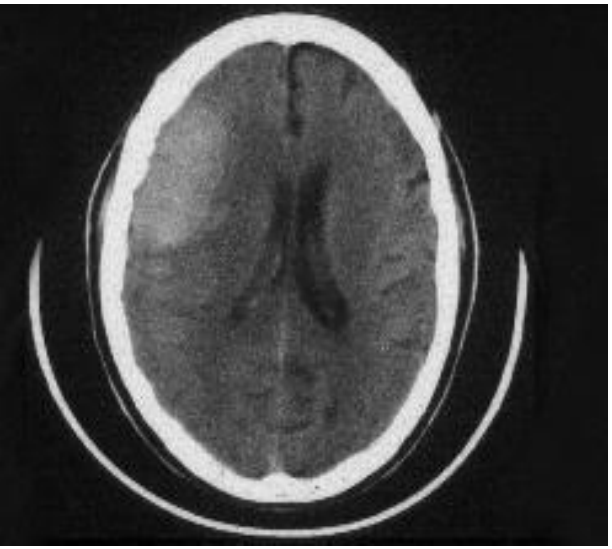


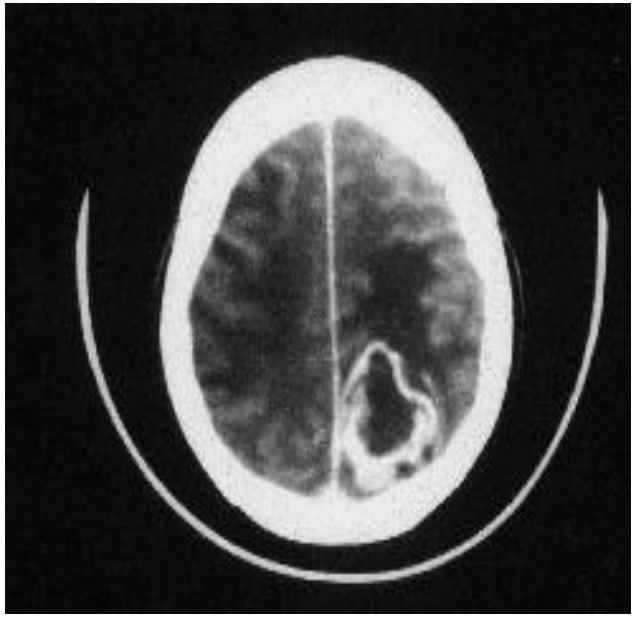
CNS Tumors
Clinical Features–Pathogenesis

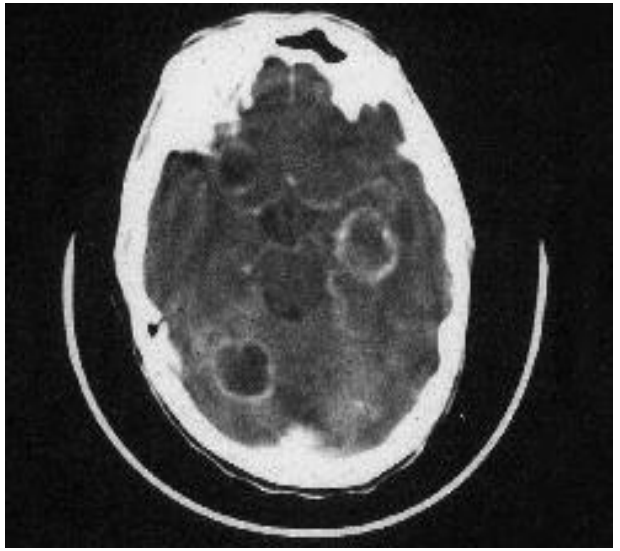
Headaches (morning)	Increased ICP
Papilloedema	Increased ICP
Nausea or vomiting	ICP – Medulla ob.
Bradycardia	ICP – Parasymp.
Seizures (convulsions).	Irritation.
Drowsiness, Obtundation	Brain Stem compress
Personality or memory	Frontal lobe
Changes in speech	Temporal lobe
Limb weakness	Motor area
Balance/Stumbling	Cerebellum
Eye movements or vision	Optic tract, occipital.

Approach

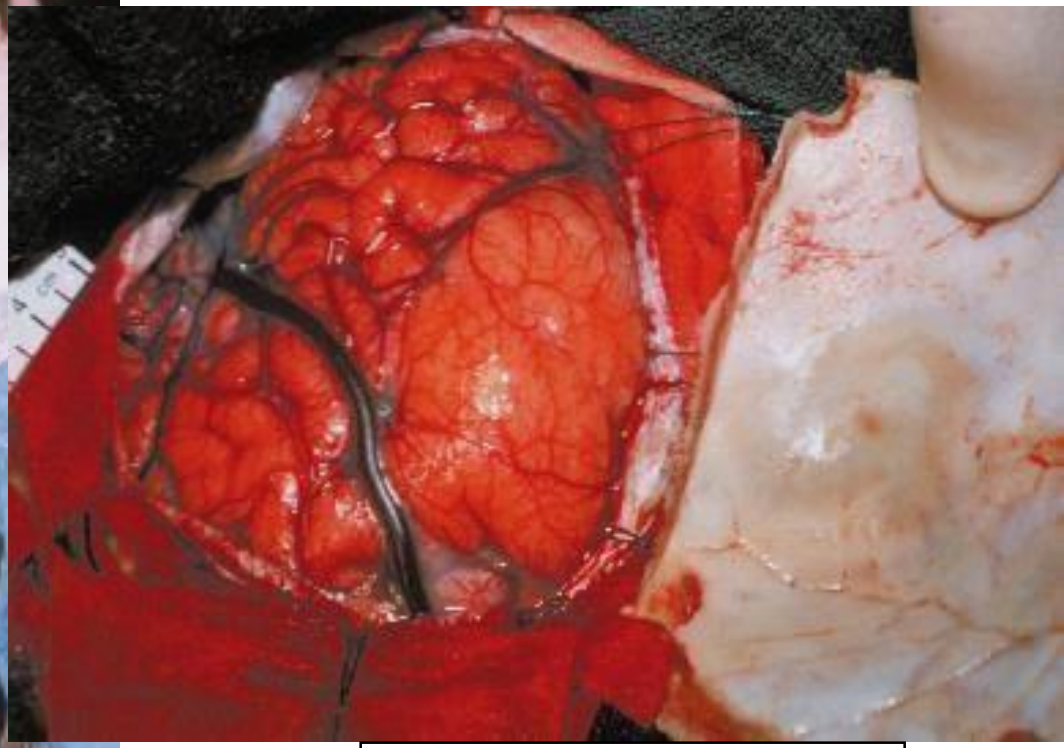
- History
- Physical & neurologic Ex
- Lumber puncture (including cytology)
- CT
- MRI
- Brain angiography
- Biopsy







Stereotactic Biopsy



Craniotomy

Primary Tumours - Aetiology

- Environmental:
  - Radiation: Often 5-25 years after treatment of pituitary adenoma or craniopharyngioma.
    - Cell phones* ???: Mobile phones use electromagnetic radiation → Possibly carcinogenic (IARC 2011).
  - Immunosuppression (as lymphomas).
  - Viral & Chemical carcinogens
- Genetic:
  - Sporadic (as P53, EGFR …).
  - Familial (inherited familial tumor syndromes).

Classification of Tumors :

- Classified according to:
  - → Cell of origin & degree of differentiation .

- However, slowly growing entities may undergo transformation into more aggressive tumors.

- WHO grading system important for treatment and prognosis.

1. Gliomas*:
   i. Diffuse gliomas (common)
      a. Astrocytoma (many variants)
      b. Oligodendroglioma
      c. Mixed
   ii. Solid gliomas (less common)
      Ependymoma

2. Neuronal Tumors:
   i. Central neurocytoma
   ii. Ganglioglioma
   iii. Dysembryoplastic neuroepithelial tumor

3. Embryonal (Primitive) Neoplasms:
   Medulloblastoma

4. Meningiomas:

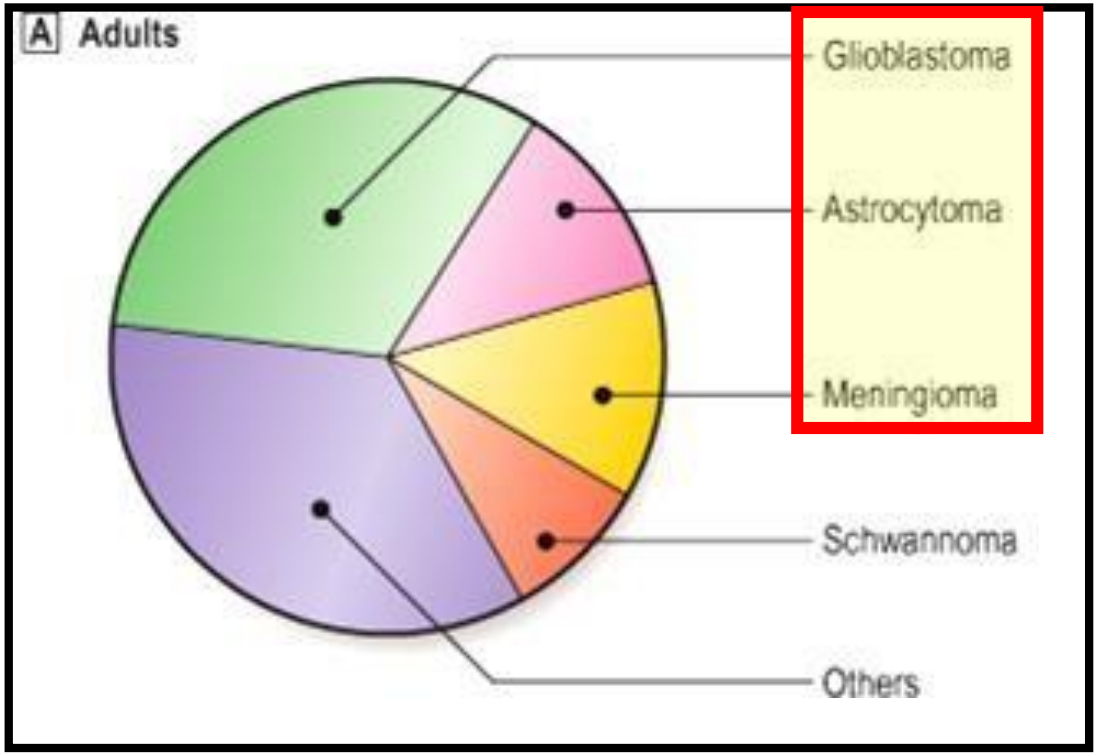
5. Nerve Sheath:
   i. Schwannoma
   ii. Neurofibroma

6. Other Parenchymal Tumors:
   i. Primary CNS Lymphoma
   ii. Germ Cell Tumors

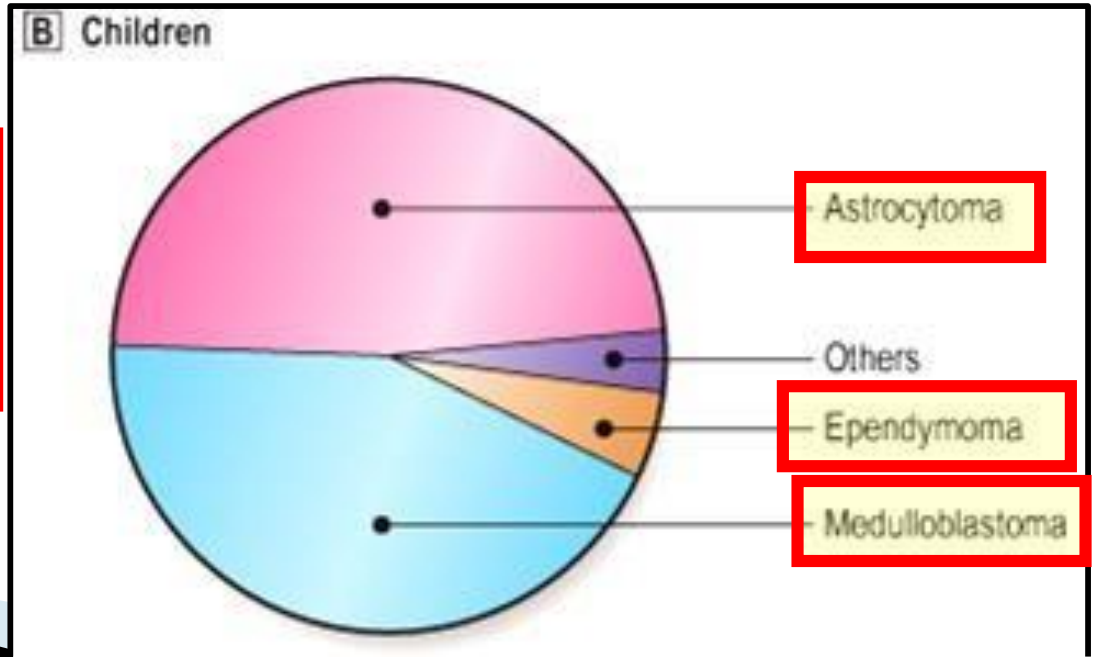
7. Metastatic Tumors.

Commonest tumors in:

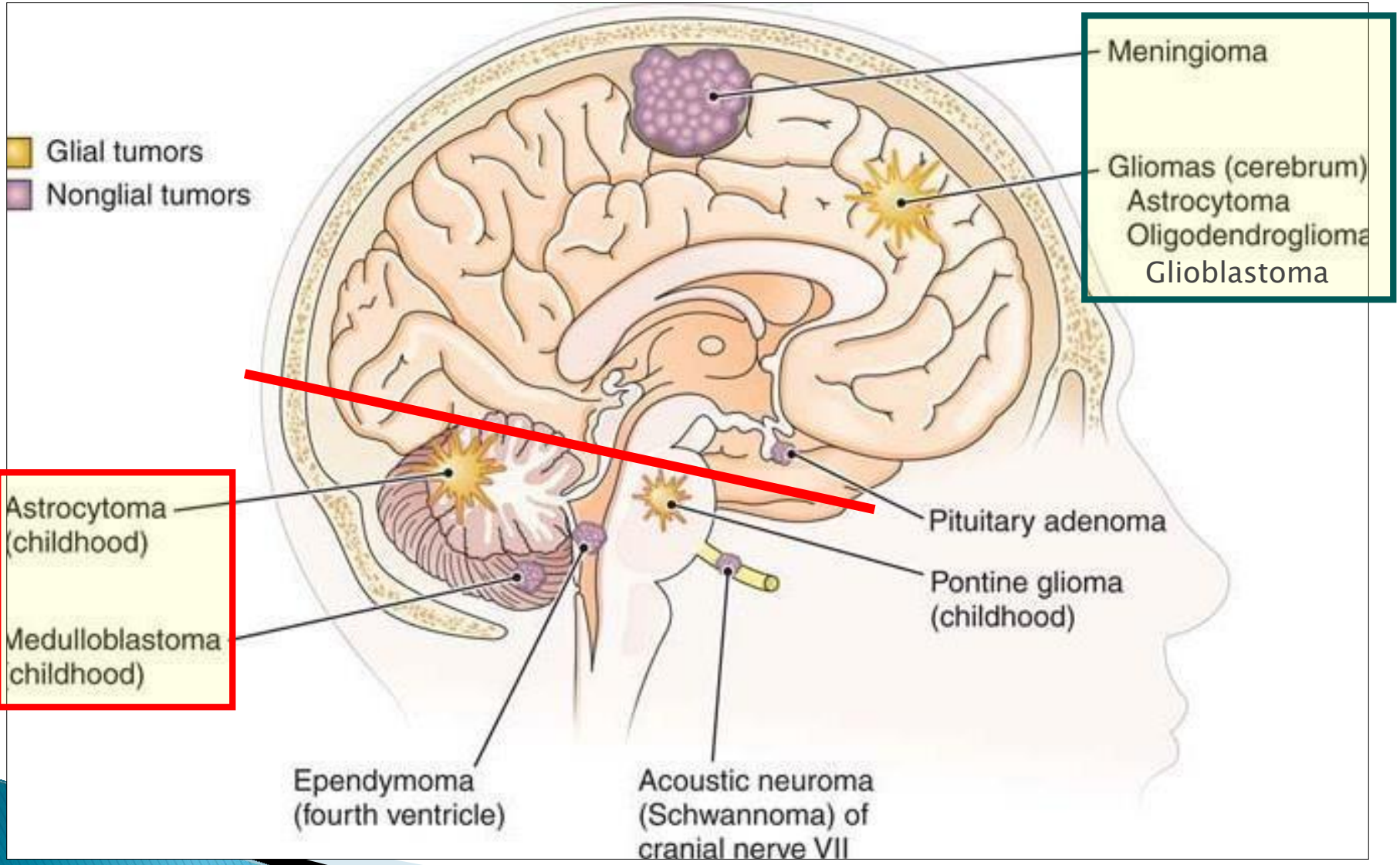
- Adults:
  1. Metastasis.
  2. Glioblastoma
  3. Astrocytoma
  4. Meningioma



- Children:
  1. Astrocytoma
  2. Medulloblastoma
  3. Ependymoma



CNS Tumors


Glial tumors
Nonglial tumors
Meningioma
Gliomas (cerebrum)
Astrocytoma
Oligodendroglioma
Glioblastoma
Astrocytoma (childhood)
Medulloblastoma (childhood)
Pituitary adenoma
Pontine glioma (childhood)
Ependymoma (fourth ventricle)
Acoustic neuroma (Schwannoma) of cranial nerve VII

Gliomas

1. Astrocytoma

- Commonest glial tumor.
- WHO Grading, depends on:
    1. Nuclear pleomorphism
    2. Mitotic activity
    3. NECROSIS
    4. Vascular proliferation
- High grade tumors (as Glioblastoma) can arise from transformation of low grade gliomas OR can occur de novo.

Gliomas

1. Astrocytoma

A. Pilocytic astrocytoma:

- Children and young adults.
- Commonly cerebellum (sometimes 3rd ventricle or optic nerve*).
- Relatively benign.

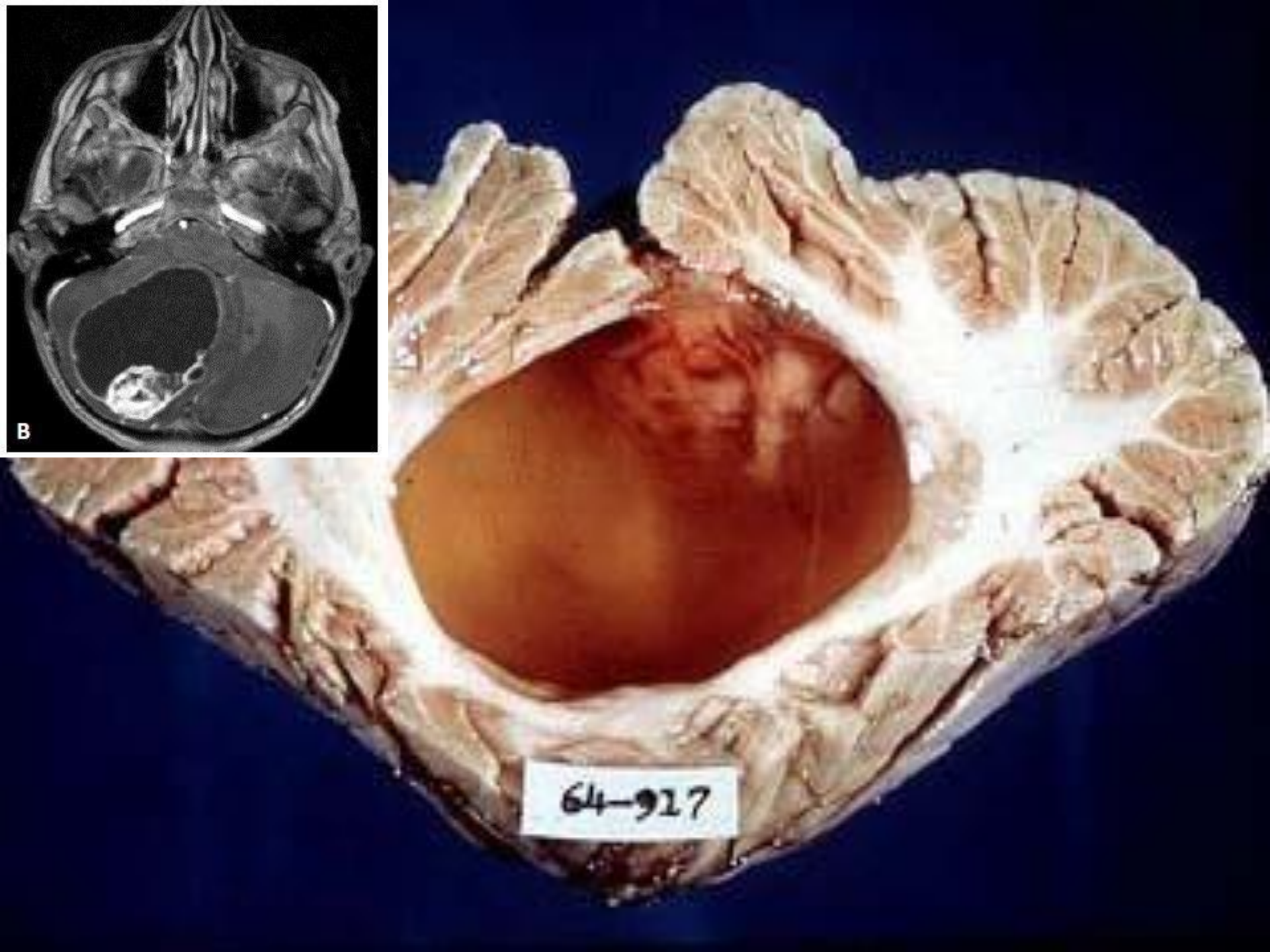
B. Diffuse (Fibrillary) astrocytoma:

- 4th to 6th decade.
- Commonly cerebral hemisphere
- Variable grades:
  - Well differentiated astrocytoma
  - Anaplstic astrocytoma
  - Glioblastoma multiforme

Pilocytic astrocytoma

(WHO grade I)

- Gross:
  - Often cystic* (with mural nodule) or well circumscribed solid mass.
- Microscopic:
  - Bipolar cells with long, thin "hairlike" processes.
  - Microcysts & Rosenthal fibers & eosinophilic granular bodies are commonly seen.
  - NO or rare mitosis & necrosis.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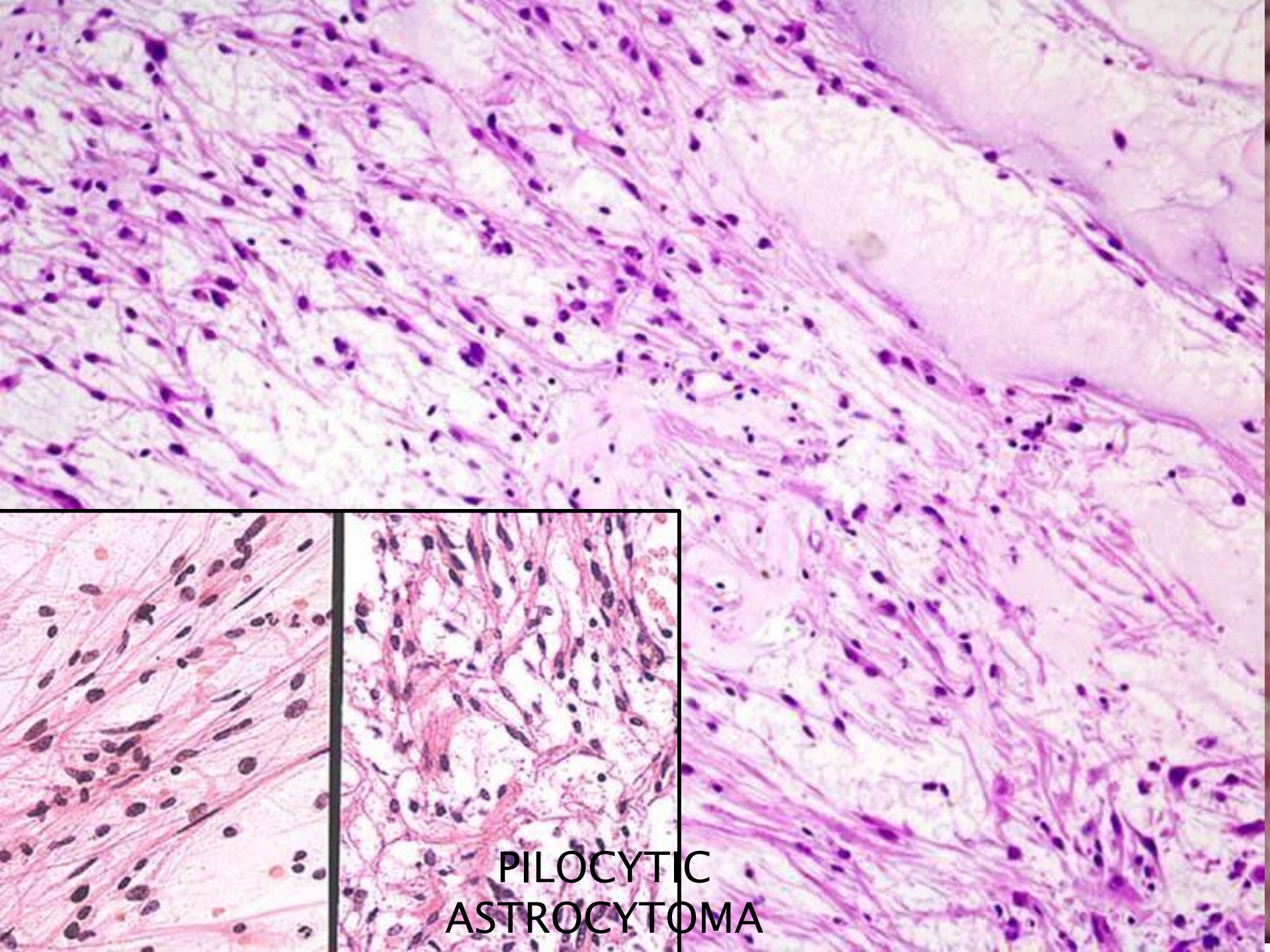
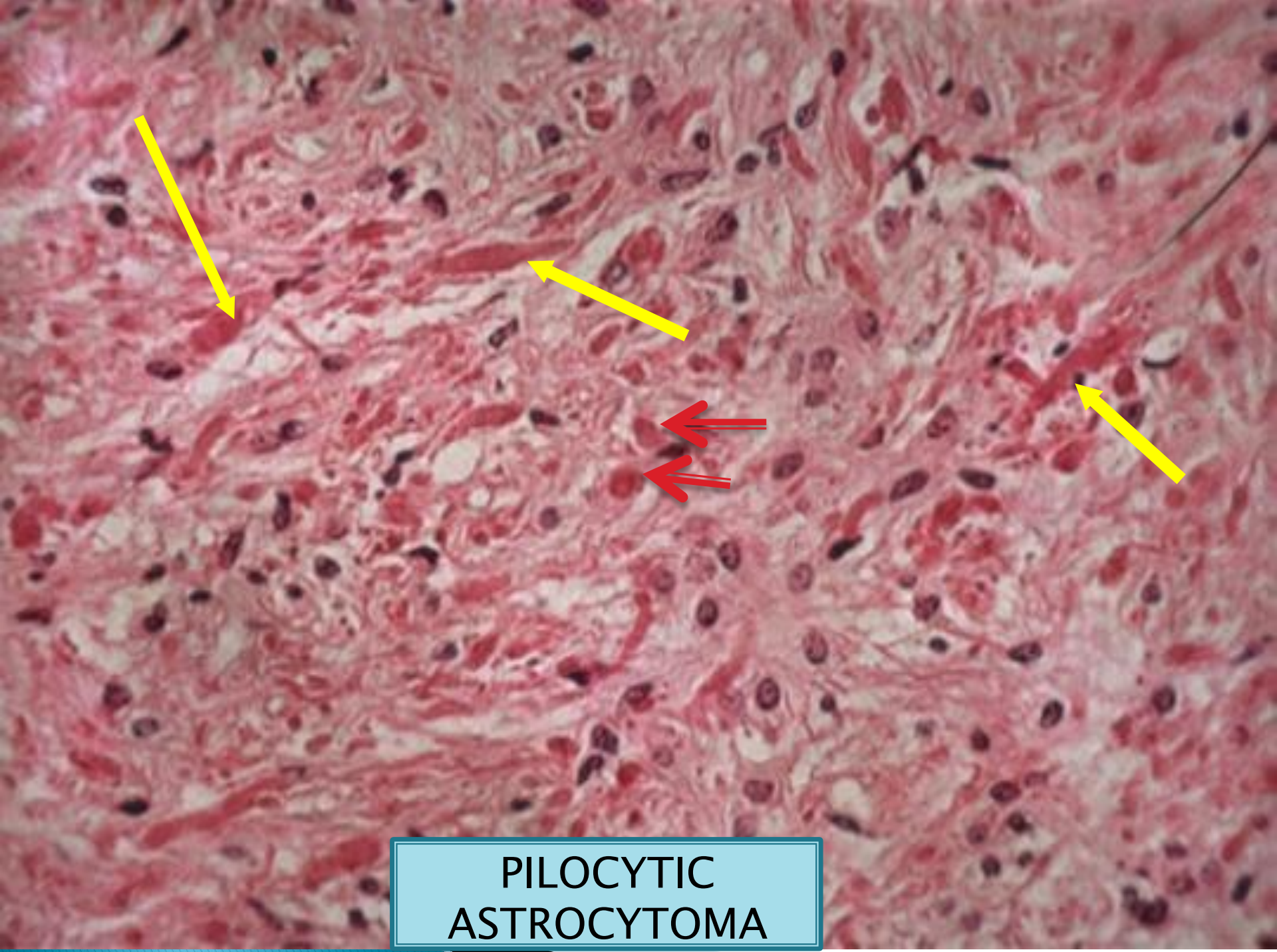

PILOCYTIC
ASTROCYTOMA

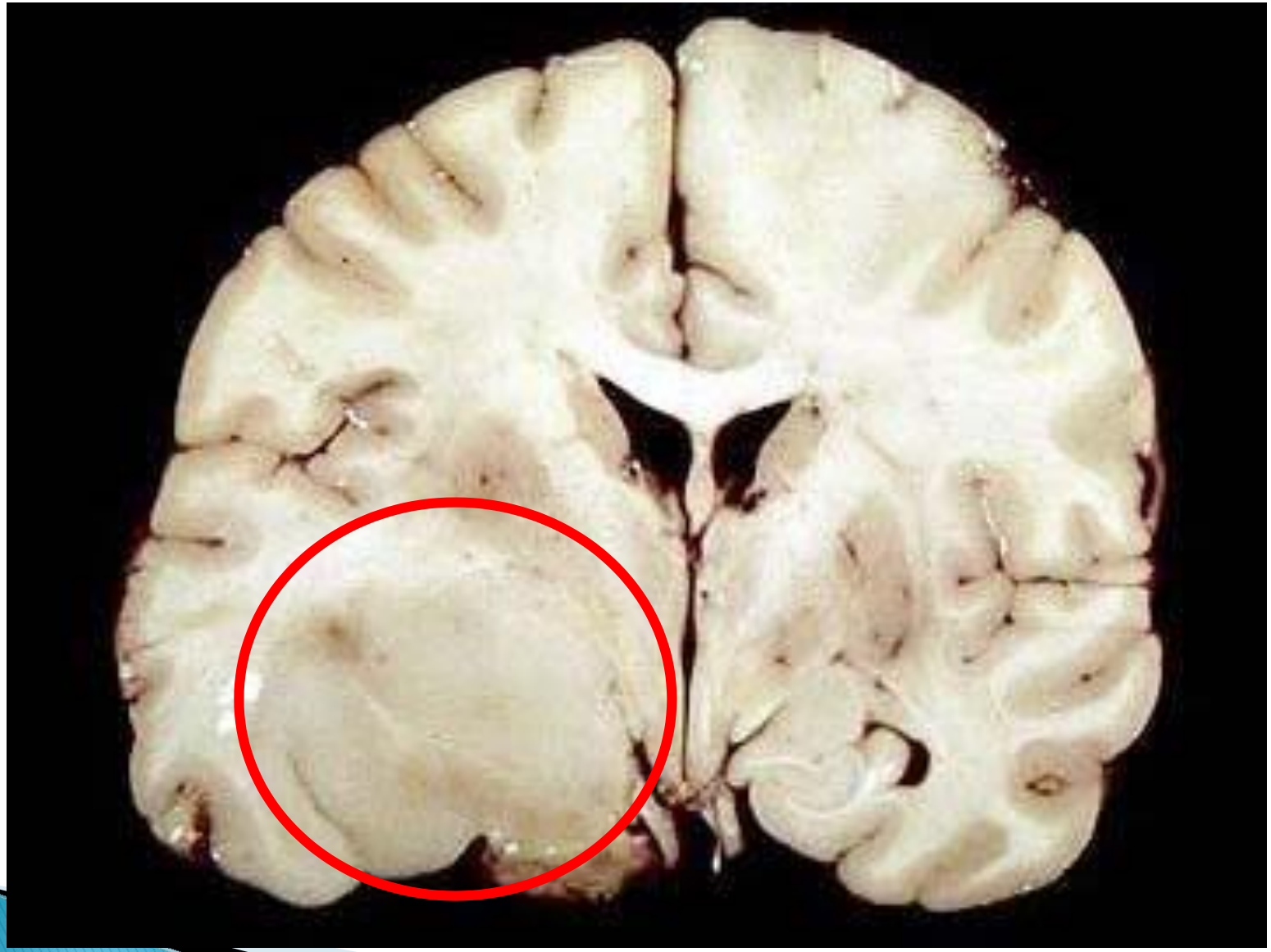

PILOCYTIC
ASTROCYTOMA

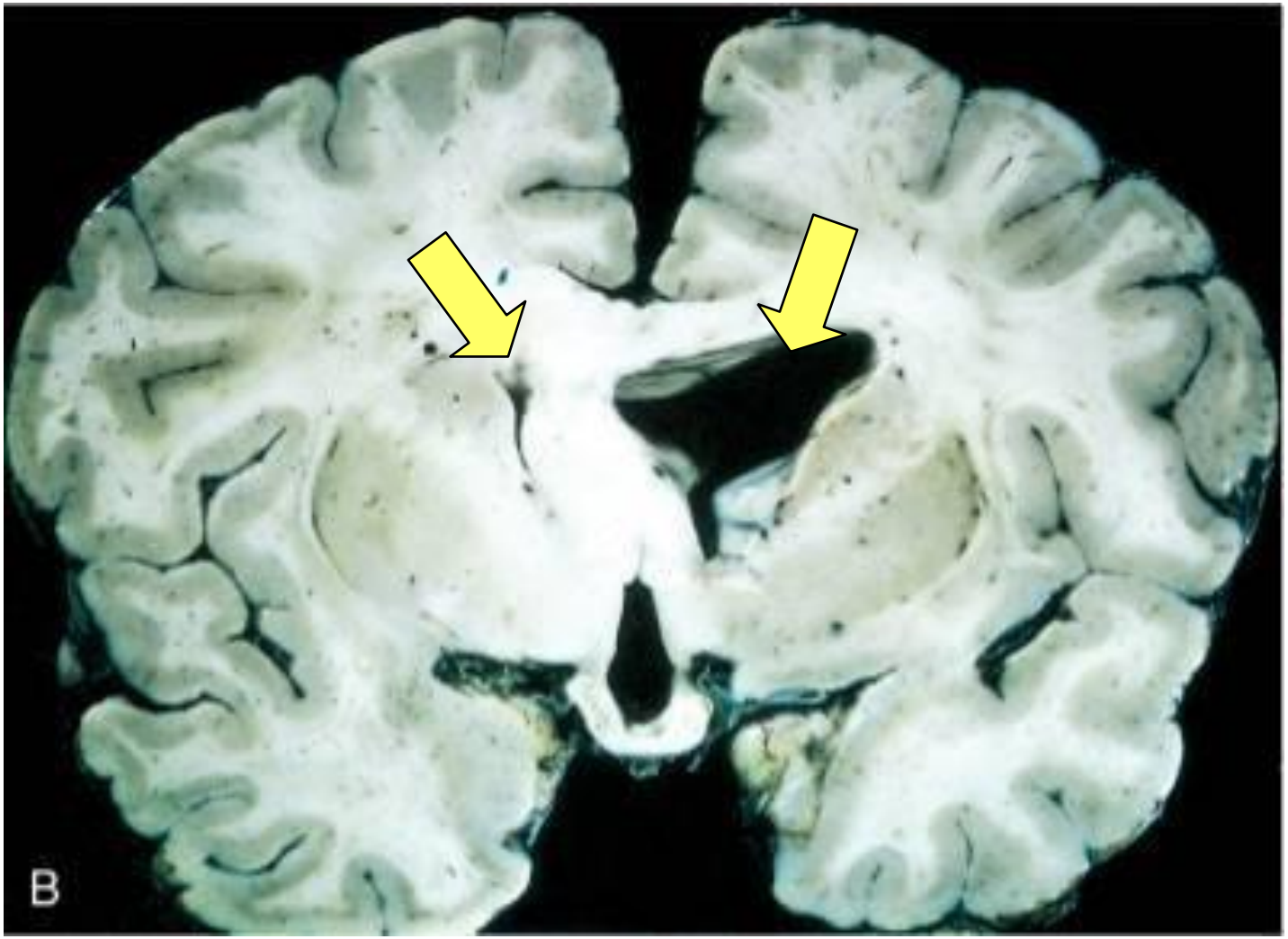
Well differentiated astrocytoma
(WHO grade II)

- Static or progress slowly* (mean survival of more than 5 years).

– Static → low degree.

- Gross:
  - Poorly defined infiltrative tumor extending beyond the grossly evident margins (no clearly defined margin).
- Microscopic:
  - Mild-moderate ↑ cellularity, minimal pleomorphism, & fine fibrillary background.

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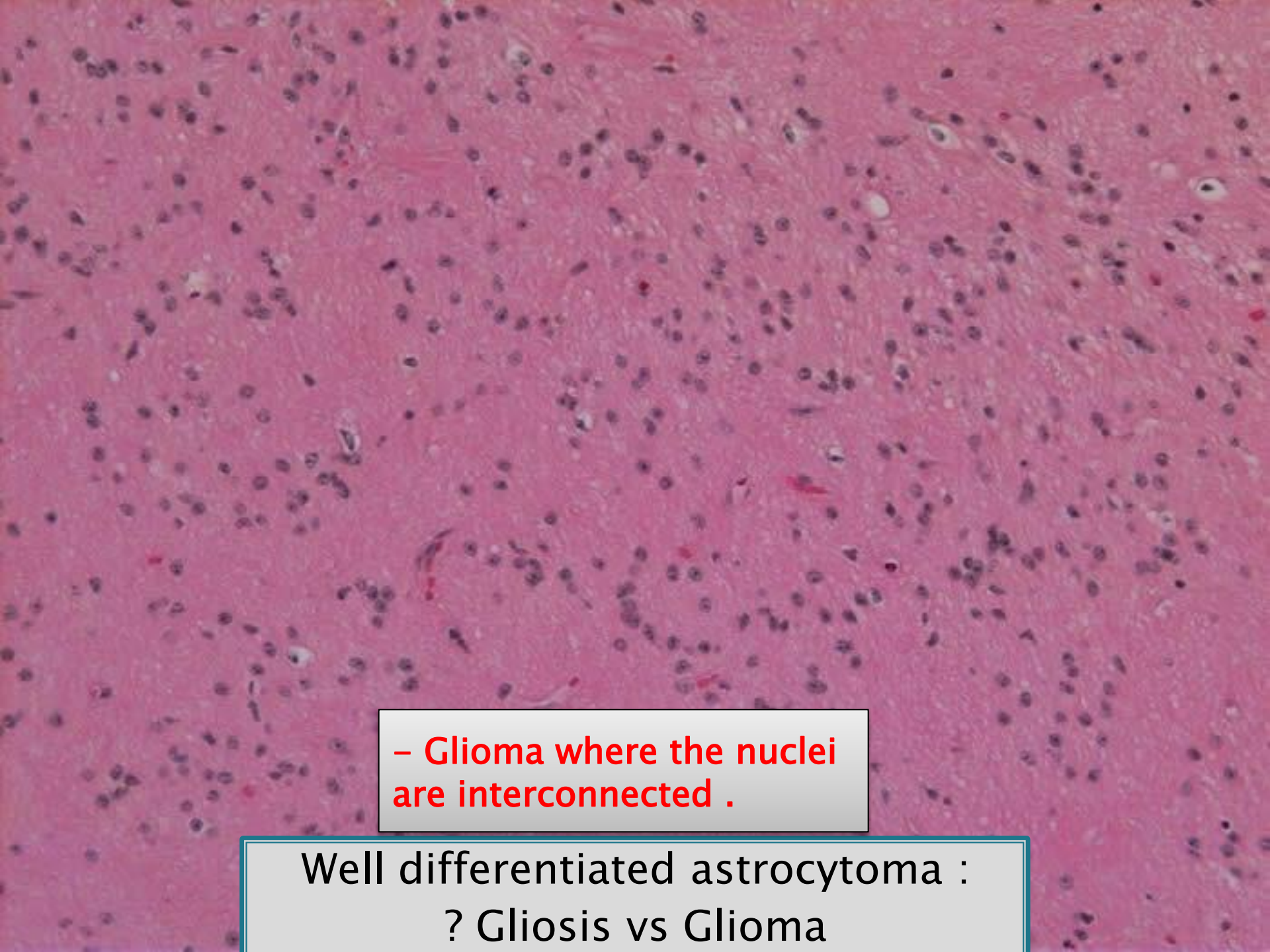


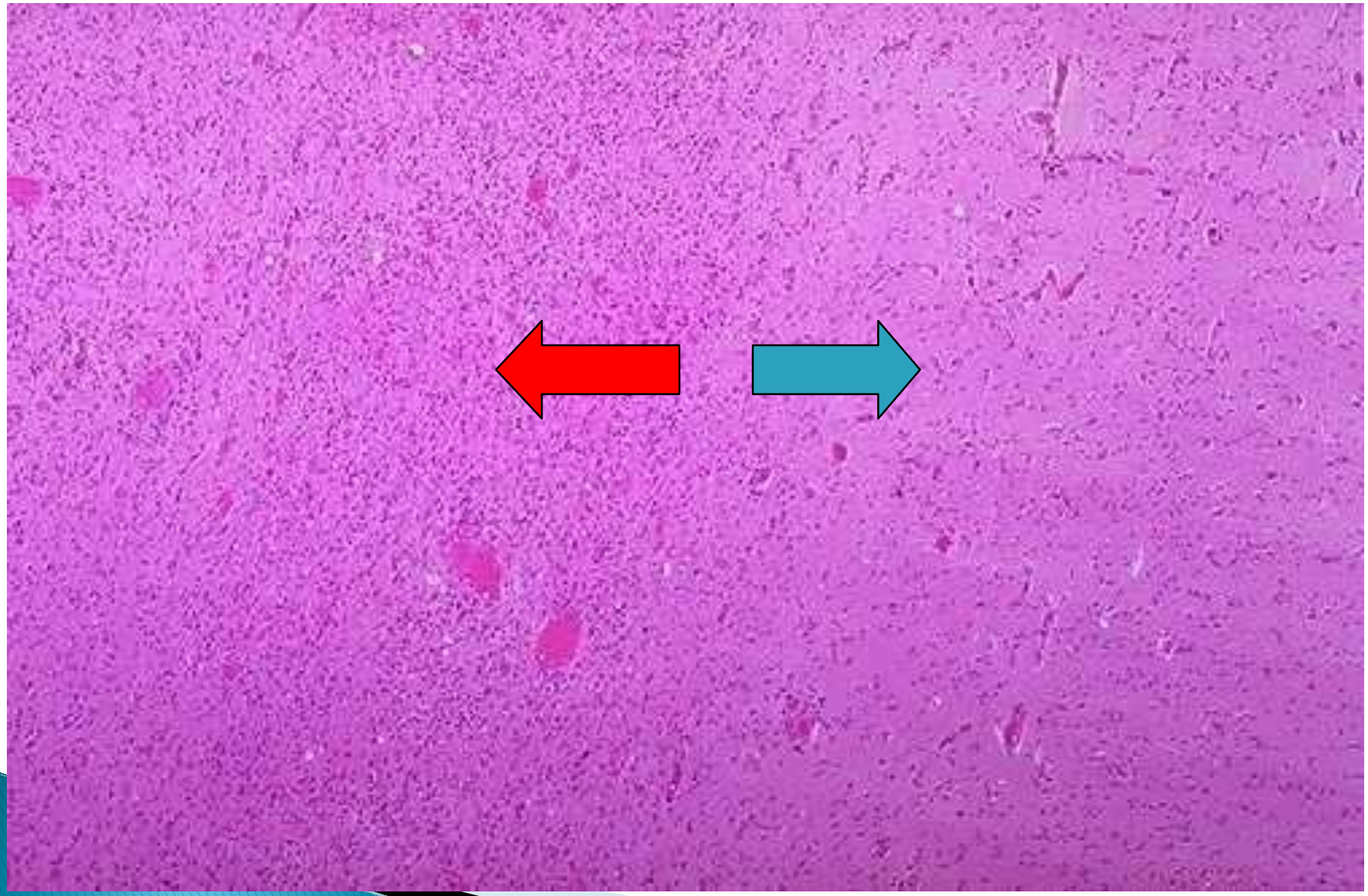
- Glioma where the nuclei are interconnected .

Well differentiated astrocytoma :

? Gliosis vs Glioma

Glioma

Brain Normal

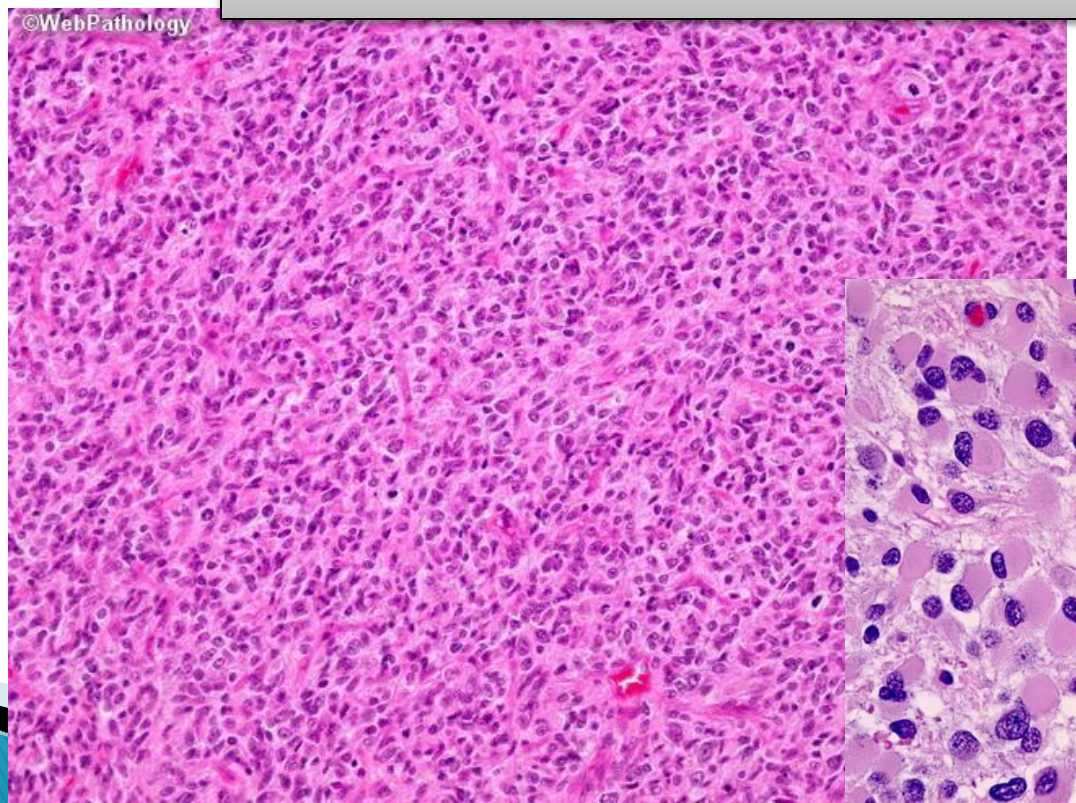


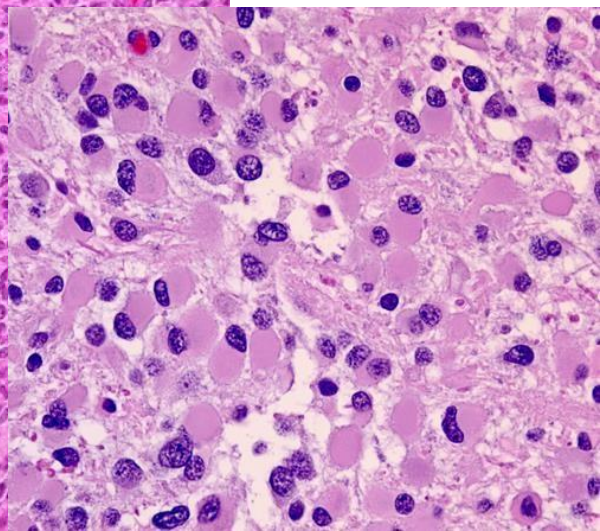
Anaplastic astrocytoma

(WHO grade III)

- Microscopic:
  - More cellularity, pleomorphic & mitosis.
  - NO palisading necrosis or microvascular proliferation

(لانه وحدة فيهم وجوده كفاية انه يطوره ليوصل للدرجة 4)



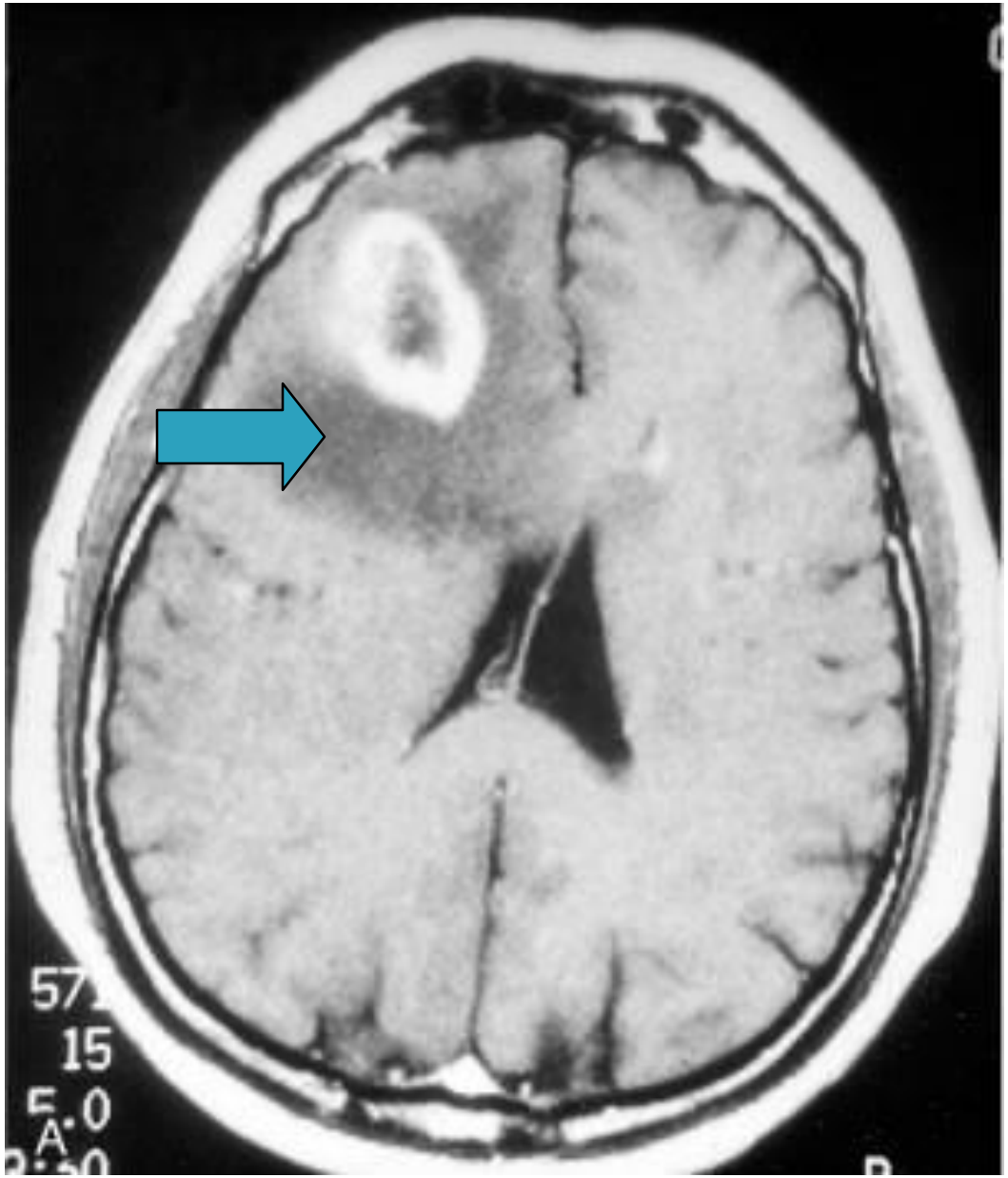


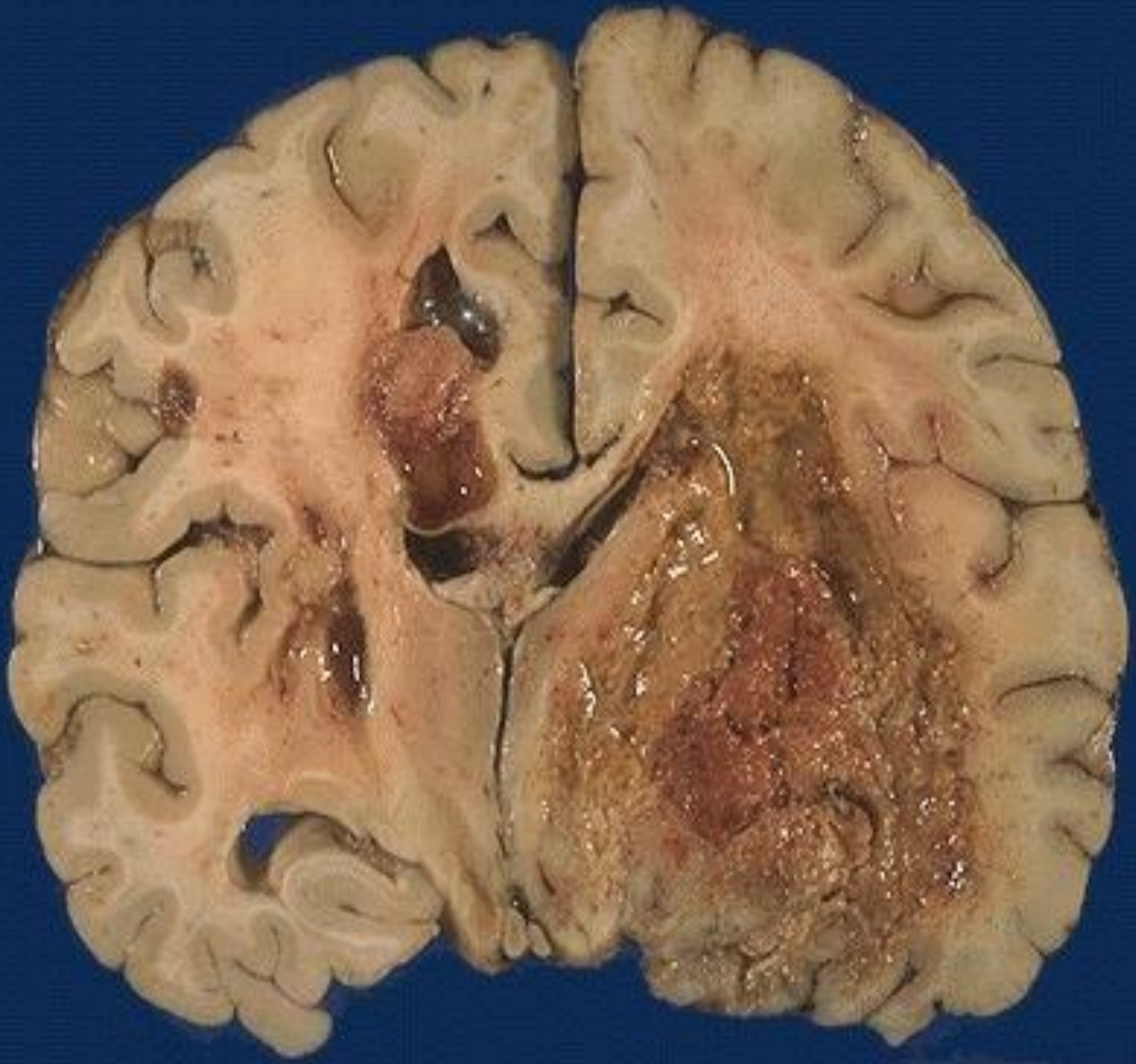
Glioblastoma

(WHO grade IV)

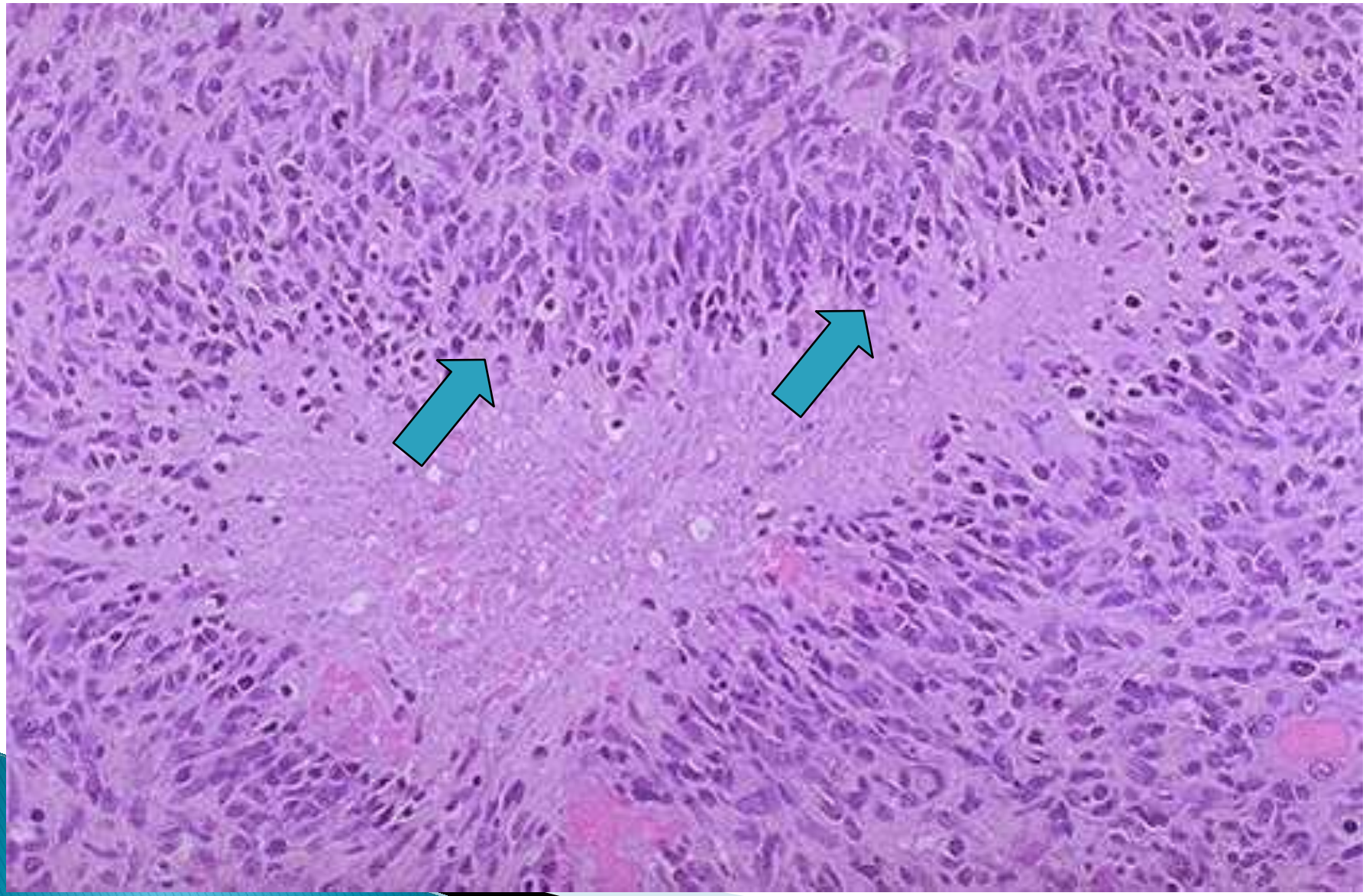
- CT/MRI:
  - Supratentorial enhancing tumor with surrounding edema.
- Microscopic:
  - Similar to anaplastic astrocytoma with:
    - Palisading necrosis
    - ± Microvascular (glumeruloid) proliferation
- Prognosis:
  - Very poor; with treatment, the median survival is only 15 months.
  - De-novo GBM has a worse Px than secondary GBM.

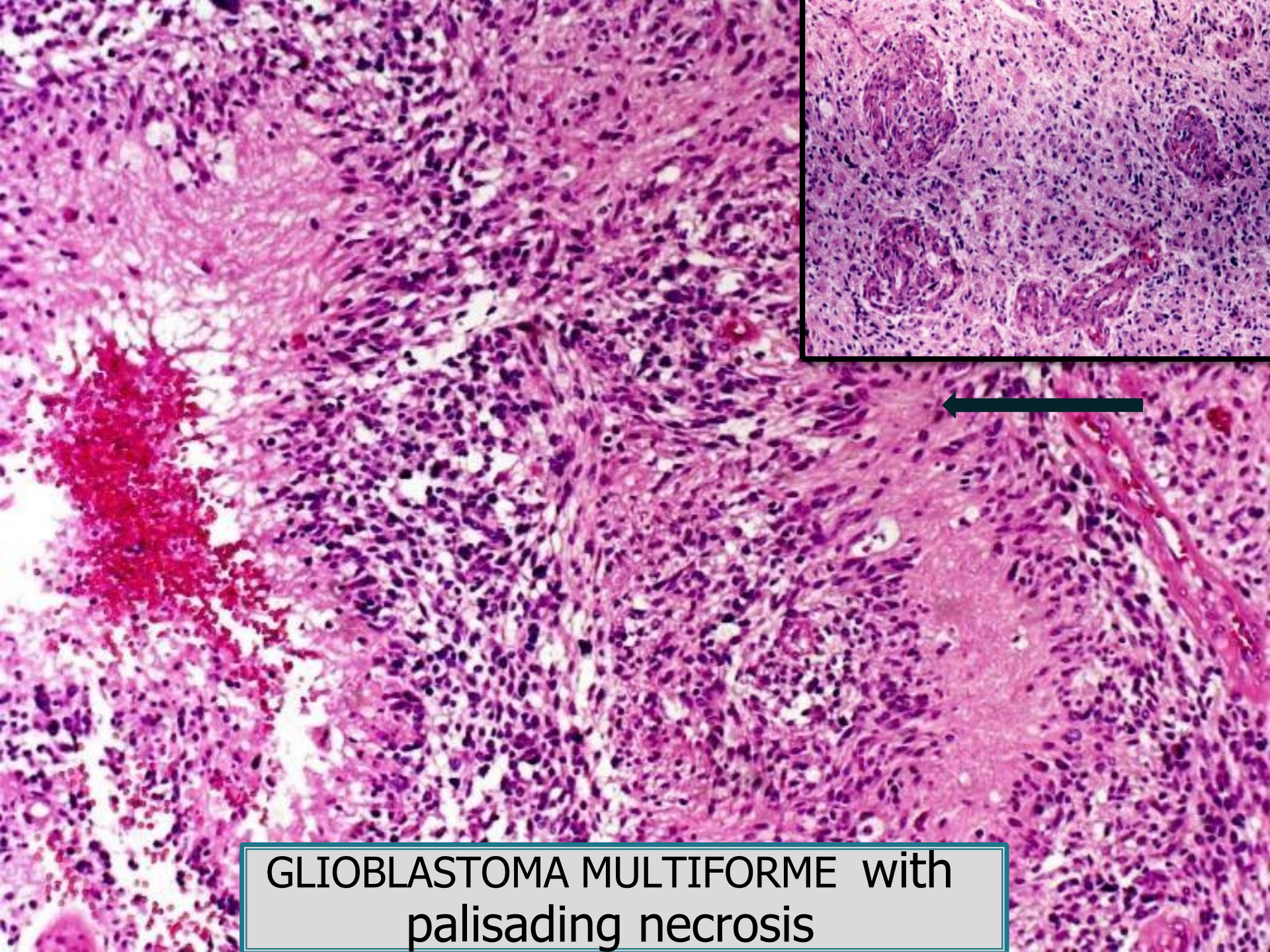
Glioma: Enhancement with peritumoral edema.





GBM





GLIOBLASTOMA MULTIFORME with palisading necrosis

Genetics mutation associated with astrocytomas

- Pilocytic astrocytoma:
  - Serine-threonine kinase BRAF
- Lower grade astrocytoma:
  - Isocitrate dehydrogenase (IDH1 and IDH2).
- GBM:
  - Inactivation of p53 & Rb (Secondary GBM + low grade astro.)
  - Activation of PI3K.
  - Amplification of EGFR (Primary GBM).

-IDH1 كتير منيح .
- Primary starts from normal.
- Secondary starts from low.

Genetic abnormalities in Glioma:

Low grade → Anaplastic → GBM