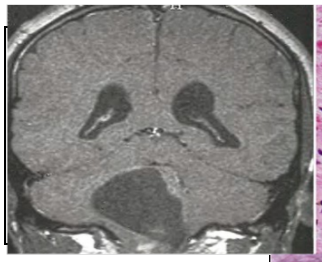
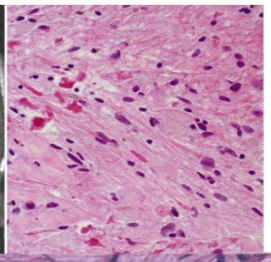
Circumscribed astrocytic gliomas: Pilocytic Astrocytoma, WHO grade 1

• Location: cerebellum (especially in children)/ Optic nerve/ Midline locations: Brainstem, optic chiasm/ hypothalamus, basal ganglia/ Spinal cord/ Cerebral hemispheres: Rare in children but happens in adults.

• Activating mutations or translocations involving the gene encoding the BRAF ➔ activation of the MAPK signaling pathway.

• do not have mutations in IDH1 and IDH2.



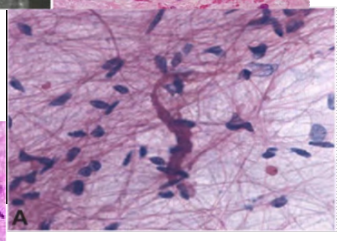


Macroscopic:

• Well circumscribed (discrete) Cystic tumor with a mural nodule in the wall of the cyst or solid +/- calcifications.

Microscopic:

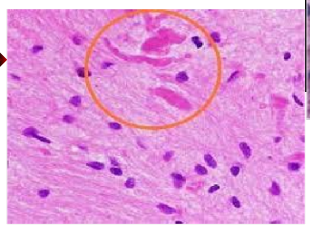
• Bipolar cells with long, thin GFAP positive "hairlike" processes



• Microcysts are often present

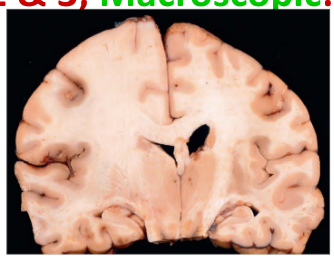
• Necrosis and mitoses are rare.

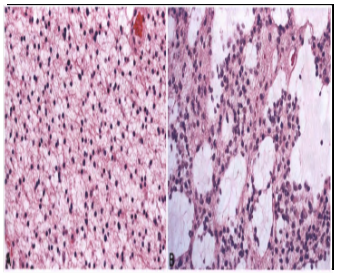
• Rosenthal fibers: brightly eosinophilic corkscrew shaped structures within the astrocytic processes. Can be physiologic (gliosis) or pathologic (PA) and Alexander disease.



• Eosinophilic granular bodies: rounded hyaline droplets in cytoplasm of astrocytes. Can be seen in PA and ganglion-cell tumors.

Diffuse astrocytoma, WHO grade 2 & 3, Macroscopic:





• poorly defined, infiltrative tumors (you can't tell where the tumor starts and end).

• expand and distort the invaded brain.

• NO discrete mass.

• Infiltration beyond the grossly evident margins.

• +/- cystic degeneration >>> microcyst formation

Diffuse astrocytoma, WHO grade 2, Microscopic:

• The transition between neoplastic and normal tissue is indistinct.

• Tumor cells infiltrate normal tissue many centimeters from the main lesion.

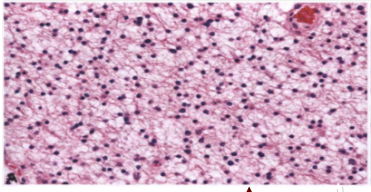
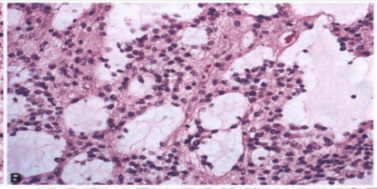
• Hypercellular: mild to moderate increase in the number of glial cells.

• NO or rare Mitotic activity.

• NO necrosis.

• NO microvascular proliferation.

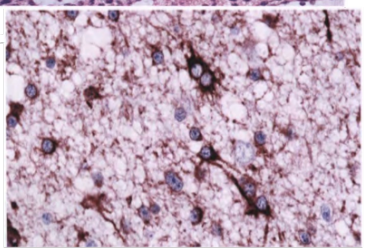
• Cytologic atypia: ► Mild
► No prominent atypia

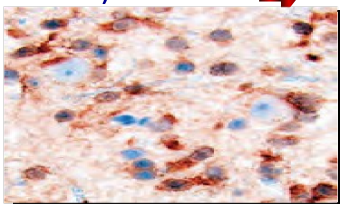
► Enlarged, elongated or irregular hyperchromatic nuclei

→fibrillary background (made of fine astrocytic cell processes).

We use special stain (GFAP: glial fibrillary acidic protein) to see it

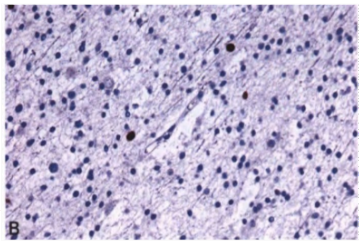


• If GFAP is negative we use IDH1 and IDH2



• Proliferating index (Ki67): is used to measure the mitotic activity of a tumor .

-Grade 2 have the least Ki67 index , while grade 4 have the highest one. Ki67

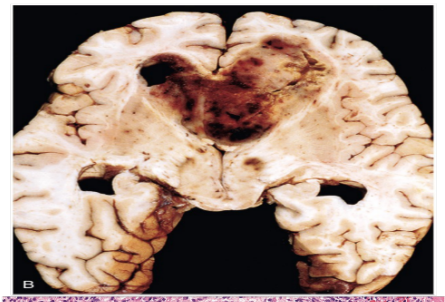


Anaplastic astrocytoma, grade 3, Microscopic:

❖ cellular ❖ nuclear pleomorphism ❖ mitotic figures are present

❖ NO necrosis ❖ NO microvascular proliferation

Glioblastomas, grade 4:



Macroscopic:

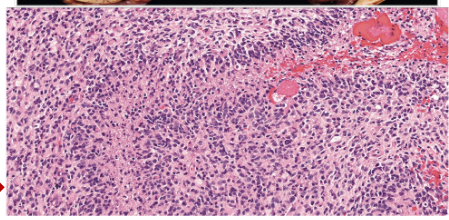
• Variation in the gross appearance of the tumor from region to region (glioblastoma multiforme).

• Some areas are firm and white, others are soft and yellow (due to tissue necrosis), others show regions of cystic degeneration and hemorrhage.

Microscopic:

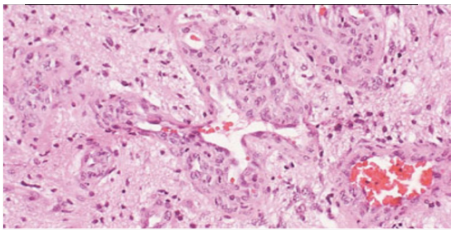
• Anaplastic astrocytoma features + either:

Necrosis: irregular zones of necrosis surrounded by dense accumulations of tumor cells (palisading necrosis)



or

Microvascular proliferation: the presence of abnormal vessels with walls composed of 2 layers or more of vascular wall cells >>> Glomeruloid structure



OLIGODENDROGLIOMAS

• Diffusely infiltrating, slow-growing glioma with IDH1 or IDH2 mutation and codeletion of chromosomal arms 1p and 19q.

• Location: mostly in the cerebral hemispheres (frontal or temporal lobes), white matter.

• The combination of surgery, chemotherapy, and radiotherapy yields an average survival of:

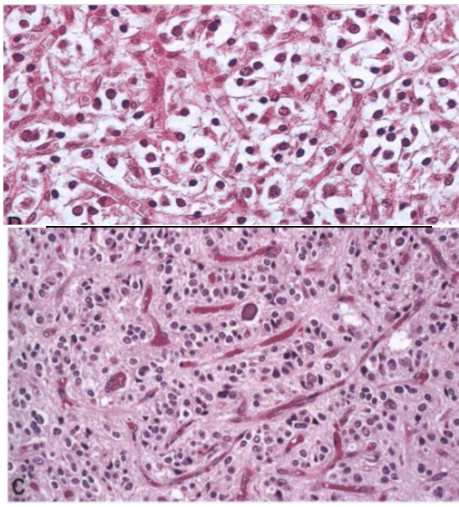
❖ 10-20 years for WHO grade 2. ❖ 5-10 years for WHO grade 3.

• Grade 3 is more aggressive than grade 2 oligodendroglioma.
• Better prognosis than astrocytoma of the same grade!
• NO grade 1 OR 4 oligodendroglioma.

Oligodendroglioma ,WHO grade 2:

Macroscopic:

• infiltrative tumors with blurring of grey matter-white matter boundary.
• +/- cystic degeneration, focal hemorrhage, and calcification.



Microscopic:

• Regular uniform cells resembling oligodendrocytes.
• Round nuclei containing finely granular chromatin (salt and pepper)
• The nuclei are surrounded by a clear halo of cytoplasm
  ➔ fried-egg appearance.
• Delicate network of anastomosing capillaries "chicken-wire"
• Calcification in 90% of tumors.
• Mitotic activity usually is absent or low (Ki67 <5%)
• No spontaneous necrosis.
• No microvascular proliferation.

Anaplastic oligodendroglioma , WHO grade 3:

• IDH-mutant and 1p/19q-codeleted oligodendroglioma with focal or diffuse histological features of anaplasia (pathological microvascular proliferation and/or brisk mitotic activity with or without necrosis).
• Homozygous deletion of the cyclin-dependent kinase inhibitor 2A or 2B.