FINAL

Lecture 2

بسم الله الرحمن الرحيم

Pathology Mind Maps

CNS Tumors-2

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This file contains the lecture material presented through mind maps to make the information clearer, more organized, and easier to follow. It is designed to simplify studying and make revision more effective.

We truly hope you find it beneficial.
If it helps you in any way, please remember us in your prayers.

Best of luck in your studies !

Glioblastomas, IDH-wild-type, grade 4

رَبِّ اشْرَحْ لِي صَدْرِي وَيَسِّرْ لِي أَمْرِي وَاحْلُلْ عُقْدَةً مِّن لِّسَانِي يَفْقَهُوا قَوْلِي

Definition: **Diffuse** glioma that is **IDH-wildtype and H3 wildtype** and has **one or more** of the following histologic or genetic features:

- Microvascular proliferation
- Necrosis
- TERT promotor mutation
- EGFR gene amplification
- Combined gain of entire chromosome 7 and loss of entire chromosome 10 [+7 / -10]

Clinical Features:

- **ALWAYS GRADE 4:** (No lower grade precursor)
- **EPIDEMIOLOGY:** The most common malignant glioma (50% of all primary malignanat brain tummors in adults).
- **AGE:** 6th-8th decades of life
- **SITE:** Cerebral hemispheres (temporal , parietal, frontal lobes, basal ganglia and thalamus)

Glioblastomas, IDH-wild-type, grade 4

Clinical Features:

CLINICALLY:

1. **Rapid progression**
2. **Seizures**, neurocognitive impairment, nausea, vomitting, and headache
3. **Butterfly Glioma**: Rapid infiltration of the corpus callosum with growth to the contralateral hemisphere leading to **bilateral symmetrical lesion**

PROGNOSIS:

Very Poor (even with resection, chemotherapy and radiotherapy)

The median survival is only about **15-18 months**

MORPHOLOGY:

MACROSCOPICALLY:

- Variation in the gross appearance of the tumor from region to region is characteristic (was called **glioblastoma multiforme**).
- Some areas are **firm and white**, others are **soft and yellow** (due to tissue necrosis), others show **cystic degeneration** and **hemorrhage**.

Glioblastomas, IDH-wild-type, grade 4

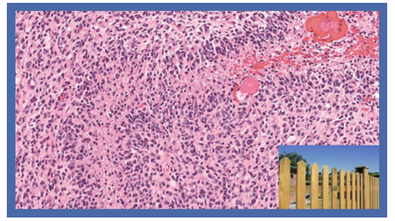
MORPHOLOGY:

MICROSCOPICALLY:

Similar to astrocytoma, IDH-mutant, grade 4 with **High cellularity**, **Prominent nuclear atypia, Brisk mitotic activity**

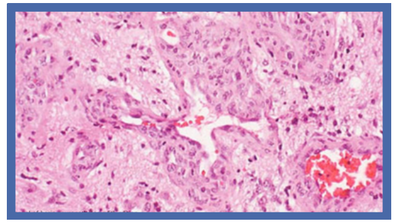
AND

- **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 2 >layers of vascular wall cells



The presence of any of the following Molecular Features (even in the absence of necrosis or microvascular proliferation) lead to the designation of glioblastoma, IDH wild type,grade 4:

- The presence of TERT promotor mutation
- EGFR gene amplification
- +7/-10 chromosome copy number changes

OLIGODENDROGLIOMA, IDH-MUTANT, & 1P/19Q-CODELETED

Definition: A diffusely infiltrating, slow-growing glioma with **IDH1 or IDH2 mutation** and **codeletion of chromosomal arms 1p and 19q**

General Characteristics:

- **Prevalence:** 5-15% of gliomas
- **Age at Diagnosis:** 40-50 yrs
- **Location:** Mostly in the cerebral hemispheres, mainly in the frontal or temporal lobes, white matter
- **Prognosis After Treatment:**

  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

- When corrected for tumor grade, oligodendrogliomas (CNS WHO grade 2,3) have **best prognosis** among diffuse glial tumors
- **NO grade 1 OR 4 oligodendroglioma**

OLIGODENDROGLIOMA, IDH-MUTANT, & 1P/19Q-CODELETED

MORPHOLOGY:

MACROSCOPICALLY:

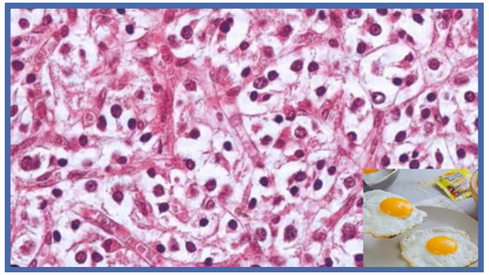
- infiltrative tumors with blurring of grey matter-white matter boundary.
- • +/-gelatinous gray mass, cysts, focal hemorrhage, and calcification.

MICROSCOPICALLY:

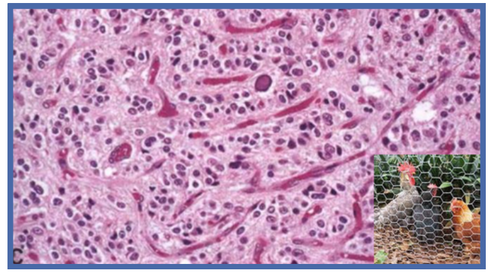
- Sheets of regular uniform cells resembling oligodendrocytes
- Spherical nuclei containing finely granular chromatin (salt and pepper)
- The nuclei are surrounded by a clear halo of cytoplasm →fried-egg appearance
- Delicate network of "chicken-wire" –like anastomosing capillaries

Histological Features of WHO Grade 2 Oligodendroglioma:

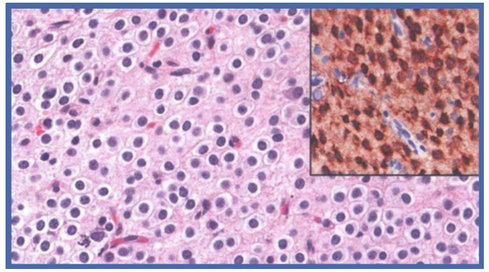
- Calcification up to 90% of cases.
- Mitotic activity usually is absent or low (Ki67<5%)
- No spontaneous necrosis
- No microvascular proliferatio



Fried-egg Appearance



(Chicken-wire)-like anastomosing capillaries

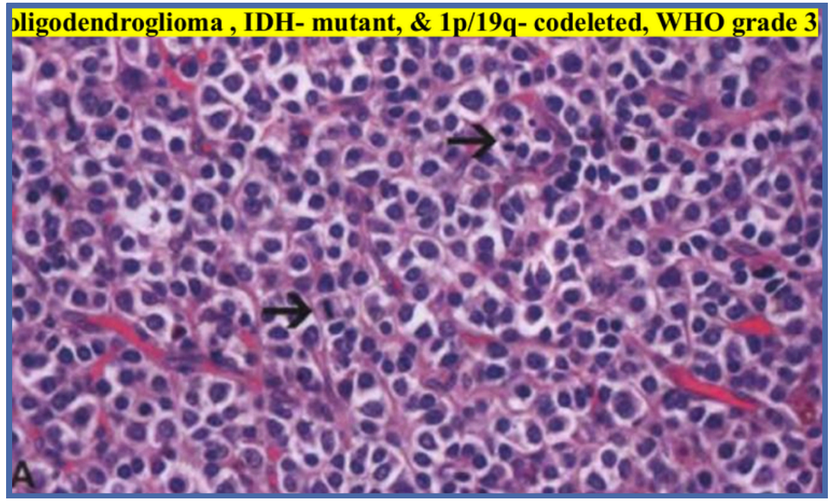


Positive IDH1 mutation in Brown

OLIGODENDROGLIOMA, IDH-MUTANT, & 1P/19Q-CODELETED

Oligodendroglioma , IDH-mutant, & 1p/19q-codeletedWHO grade 3:

Definition: An IDH-mutant and 1p/19q-codeleted oligodendroglioma with focal or diffuse histological features of anaplasia (in particular, **pathological microvascular proliferation and/or brisk mitotic activity with or without necrosis**).

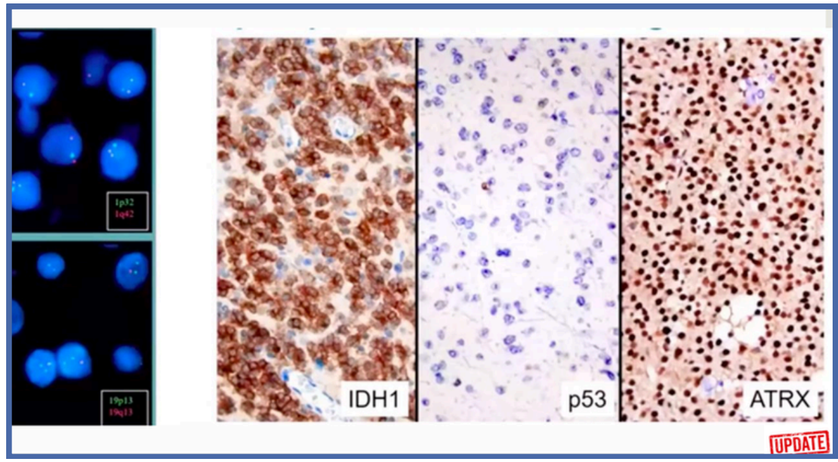


- **Compared to grade 2, grade 3 tumors demonstrate increased cellularity, hyperchromatic nuclei**
- **Brisk mitotic activity (black arrows)**

IDHm 1p/19q-codel Oligodendrogliomas, grades 2-3

Essential diagnostic criteria for oligodendroglioma, IDH-mutant and 1p/19q-codeleted, WHO grade 2	Essential diagnostic criteria for oligodendroglioma, IDH-mutant and 1p/19q-codeleted, WHO grade 3
A diffuse glioma	A diffuse glioma
WITH	WITH
an IDH1 codon 132 or IDH2 codon 172 missense mutation*	an IDH1 codon 132 or IDH2 codon 172 missense mutation*
AND	AND
combined whole arm deletions of 1p and 19q	combined whole arm deletions of 1p and 19q
AND	AND
absence of histological features of anaplasia	histological features of anaplasia, including brisk mitotic activity and/or pathological microvascular proliferation with or without necrosis
	AND/OR
	homozygous *CDKN2A* deletion**

IDH1 Mutated **ATRX Positive**



FISH **P53 Negative**

Ependymoma:

Definition: Glioma, Mostly arise next to the ependyma-lined ventricular system, including the central canal of the spinal cord

Clinical Features:

LOCATION:

- Posterior fossa: near the 4thventricle, accounting for 5-10% of tumors in the first two decades of life
- Supratentorial
- Spinal: the most common location in adults and in patients with NF2

AGE:

- In the first 2 decades of life; near the **4thventricle (post. Fossa)** accounting for 5-10% of primary brain tumors in this age group.
- In adults the **spinal cord and supratentorial ependymomas occur with almost equal frequency**

PROGNOSIS:

The clinical outcome for completely resected **supratentorial and spinal ependymomas** is better than for those in the posterior fossa.

Ependymoma, WHO grade 2

MICROSCOPIC:

- Uniform small cells with round to oval nuclei and granular chromatin in a fibrillary background
- Low cellularity
- Low mitotic count
- No necrosis or MVP
- Cilia and microvilli are seen on ultrastructural examination.

MORPHOLOGY:

Tumor cells may form glandlike structures (rosettes) → **Rosette formation**:

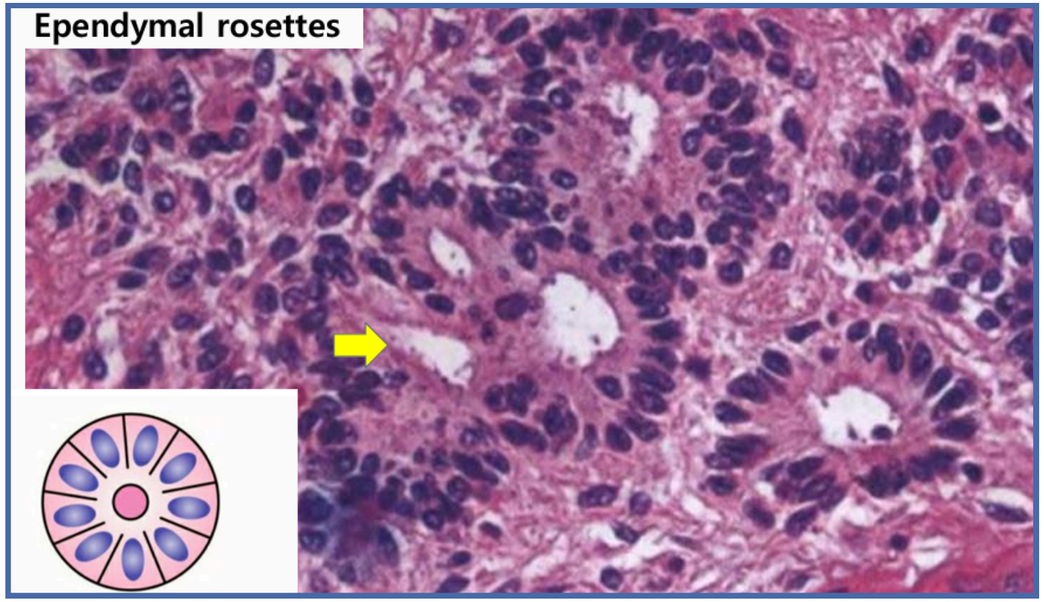
Ependymal Rosettes:

- **Diagnostic hallmark** of ependymoma (25%)
- Tumor cells arranged around **central canal or lumen** that resemble the embryologic ependymal canal, with long, delicate processes extending into a lumen.

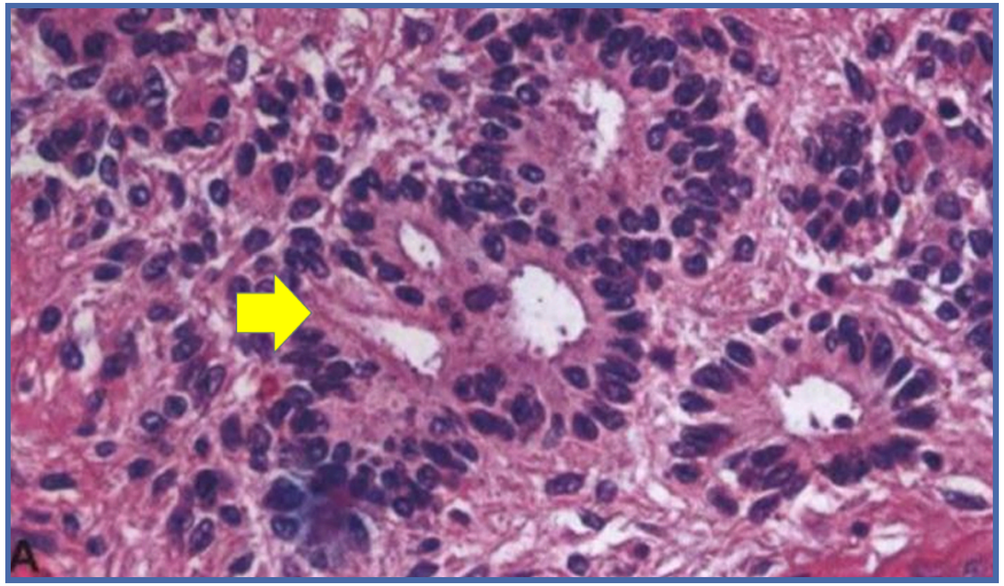
Perivascular Pseudorosettes:

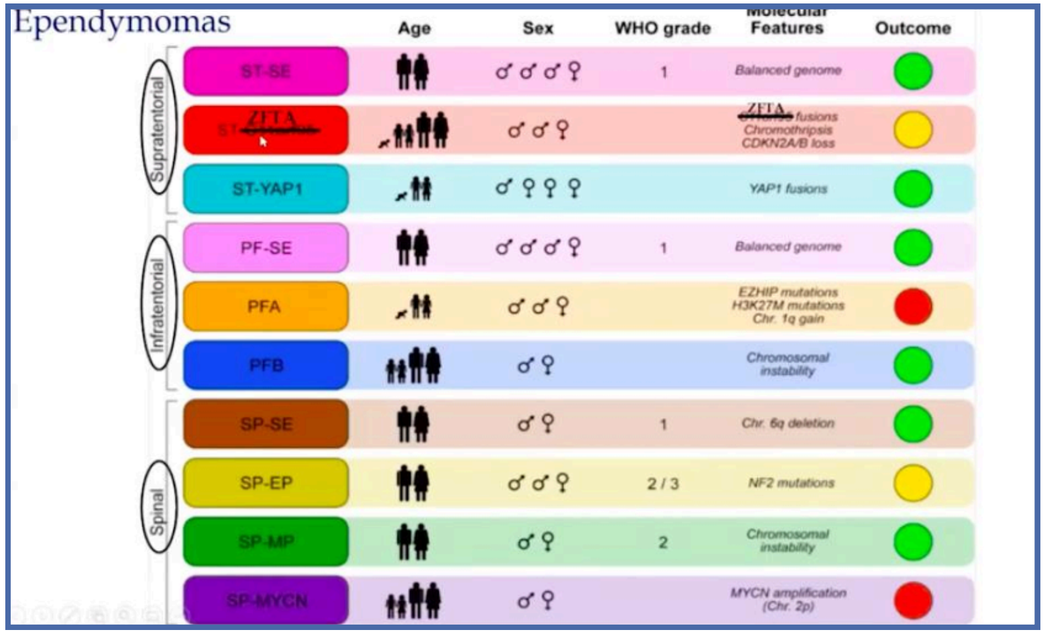
- **Not specific** for ependymoma (seen in glioblastoma and medulloblastoma)
- Tumor cells radially arranged around **vessels**.
- Called “pseudo” because the central structure is not formed by the tumor itself, but instead represents a native, non-neoplastic element.

Ependymoma, WHO grade 2



Ependymal Rosettes

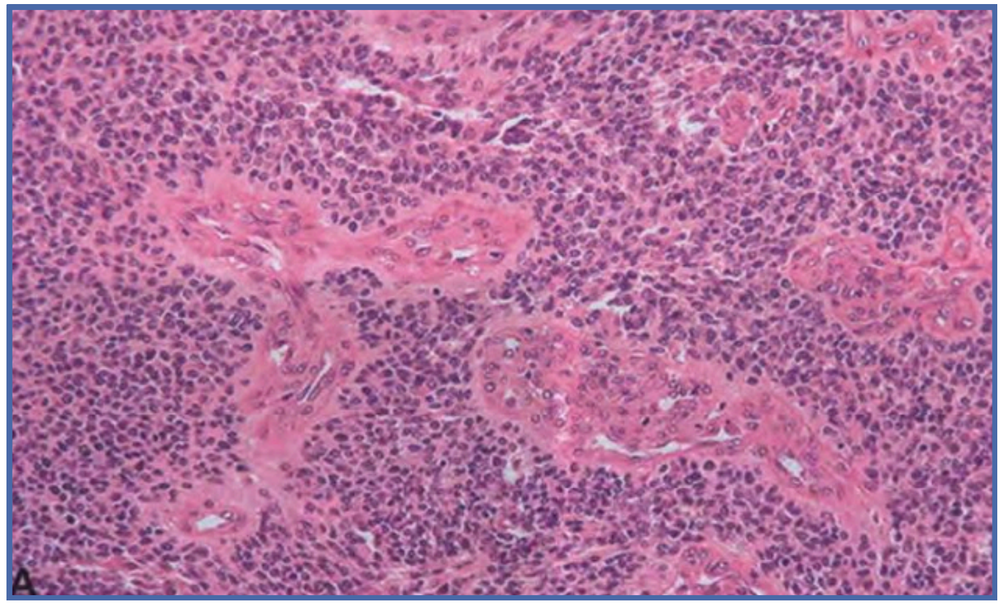




Anaplastic ependymomas, WHO grade 3:

MORPHOLOGY:

- Show less evident ependymal differentiation.
- **Brisk mitotic rates, and microvascular proliferation** carry **more prognostic impact** than necrosis and atypia.



Shows more cellularity, more cytologic atypia, and less evident ependymal differentiation, thus anaplastic.

اللهم اجعل أجر هذا العمل صدقة جارية عن روح **عمر عطيه عوده المرابي**

- اللَّهُمَّ اغْفِرْ له وَارْحَمْهُ، وَاعْفُ عنْه وَعَافِهِ، وَأَكْرِمْ نُزُلَهُ، وَوَسِّعْ مُدْخَلَهُ، وَ اغْسِلْهُ بمَاءٍ وَثَلْجٍ وَبَرَدٍ، وَنَقِهِ مِنَ الخَطَايَا كما يُنَقّى الثَّوْبُ الأبْيَضُ مِنَ الدَّنَسِ.
- اللَّهُمَّ أبدله داراً خيراً من داره، وأهلاً خيراً من أهله، وأدخله الجنّة، وأعذه من عذاب القبر ومن عذاب النّار.
- اللهمّ يمّن كتابه، ويسّر حسابه، وثقل بالحسنات ميزانه، وثبّت على الصراط أقدامه، وأسكنه في أعلى الجنات، بجوار حبيبك محمد صلّى الله عليه وسلم.
- اللهم اغفر لحينا وميتنا وشاهدنا وغائبنا وصغيرنا وكبيرنا وذكرِنا وأنثانا اللهم من أحييته منا فأحيِه على الإسلام ومن توفيته منا فتوفه على الإيمان اللهم لا تحرمنا أجره ولا تضلنا بعده.
- اللهم اغفر له وارفع درجته في المهديين، واخلفه في عقبه في الغابرين، واغفر لنا وله يا رب العالمين، وافسح له في قبره، ونوّر له فيه.
- اللَّهُمَّ أنزل على أهله الصّبر والسلوان وارضهم بقضائك.

اللهم لا تفجعنا بأنفسنا ولا أهلنا ولا أحبتنا، اللهم أعوذ بك من فواجع الأقدار ومن مصائب الدنيا وتقلب حوادثها، اللهم إنا نخاف الفقد فلا تحملنا ما لا طاقة لنا به.