

Subject Pathology 2 موضوع الدرس

Date : / / الموافق التاريخ

brain tumors

[10-17 / 100,000 intracranial
1-2 / 100,000 interspinal]

The majority are primary (brain is not a common site for metastasis)

20% of all Cancers of childhood

70% of childhood CNS tumors arise in the post. fossa - (intra tentorial)

A comparable number of supratentorial tumors in adult.

Brain stem
Cerebellum

CNS tumors have different concept of benign and malignant

even benign may prove fatal

• أغلب أنواع الtumors ينقسم لـ 3 grades
وأحيانا ينقسم لـ Low or high grade
بـ 4 grades brain tumors
ولكن ما زاد ال grade كثر أسوأ

- grade 1 ⇒ benign (as astrocytoma)

Subject موضوع الدرس لغني أنا صلة كل ما أنا شاف

Date التاريخ بالتاريخ microscopically الله الموافق 1 / 1

CNS tumors mostly not amenable for complete resection (Subtotal resection or gross total resection)

CNS tumor are infiltrative
مطعماً لله لها كذا أنا ب grades قليلة وكثرة
أحياناً يتسبب في vital functions
كم في لا brain (لغني كل نقر مرة نأني نقر
حسناً حتى ضحك)

most of neurosurgery for CNS tumors should be followed by radiotherapy

CNS tumors may metastasize outside CNS but it cause cerebrospinal dissemination (spread through CSF around meninges or inside ventricles)

• Classification by Grading (1-4)

grade 1 : most close to benign concept

grade 4 : most close to malignant form

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Gliomas :- [1] tumors of neuroglial tissue origin

[2] The most common of primary tumors

[3] Derived from multipotent Progenitor cells

[4] within particular age groups.

[5] تفضّل أمّ ولد مميّنة predilection for specific regions

Gliomas types :-

(1) **Astrocytoma** : grade 2, 3, 4
(from 2-4)

- 80% of primary brain tumors in adults

- usually in cerebral hemispheres.
(supra tentorial)

- May occur also in cerebellum
Brain Stem
Spinal Cord

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• age: 4-6 decades.

• Morphologic Classification ^{حد كبر متدرج}
↓ ^{وكيفية جزيئية وعضوية له}
molecular classifications.

Classification:-

Grade 1: Pilocytic Astrocytoma.

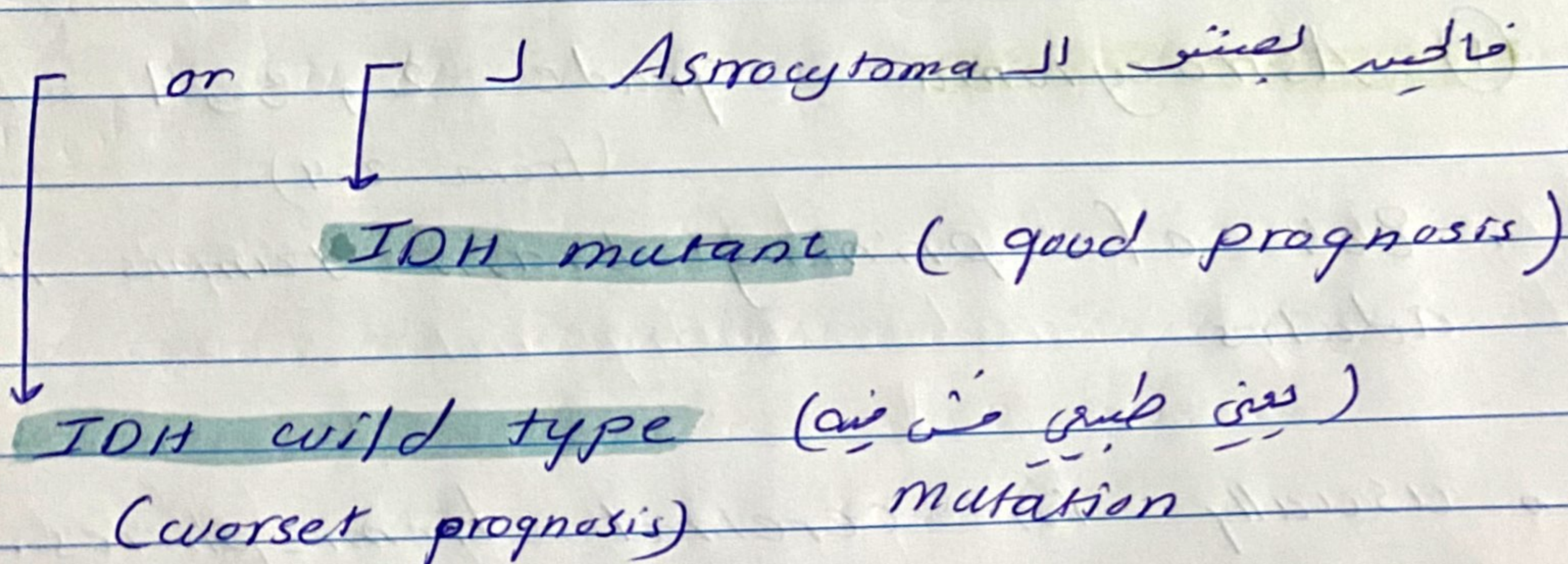
Grade 2: Corresponded to diffuse astrocytoma

Grade 3: Anaplastic Astrocytoma

Grade 4: Glioblastoma.

by Molecular classifications:-

IDH mutation (metabolic gene mutation)



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Glioblastoma : 2 types primary and 2ry

Pathogenesis of 1ry :

- in older individual + new onset
- Most of cases are wild type IDH (bad prognosis)
- Gains of chromosome 7 & losses of chroms. 10
- with TERT promoter mutation
- with EGFR amplification (more sensitive to growth signals)

Pathogenesis of 2ry :

- in younger patients.
- progression of lower grade astrocytoma
- Driver mutations IDH₁ IDH₂

جميع نكبات أورام gliomas شلل عام

most gliomas have genetic aberrations that lead to

- ① evasion of senescence (telomerase)
- ② escape normal growth control (CDKN2A deletion)
- ③ Activation of growth signaling (EGFR or PDGFR amplification)
- ④ evasion of apoptosis (TP53 mutation)

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you can't demarcate
or see tumor

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Diffuse astrocytoma characterized by

لو المرئى حاح وأخذ brain
ال tumor لأن autopsy
ولأنها ال glial cells
لـ brain substance ولأنه لو الشئ خير مشون

Gross Morphology: • distortion of basic
of diffuse. Land marks.

neuclear أمر features • effacement of
normal ال عند ال gray and white
matter

infiltrative لأن لـ size: from cms to
entier brain

by immunohistochemistry
GFAP, IDH1
لو لـ

Anaplastic astrocytoma Morphology:-

as diffuse astrocytoma
with • more cellular

• higher mitotic activity
(More rapidly growing.

• well demarcated mass

• More nuclear atypia.

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Glioblastoma Morphology:-

- may pass through to opposite hemisphere.
- ↑ mitotic activity
- nuclear polymorphism
- Necrosis due Ischemia. (butterfly appearance)
- blood vessels proliferation.
- well demarcated Mass
- easily bleeding (site for hematoma)

Diffuse astrocytoma : (Microscope)

- fibrillar background
- hyperchromatic rounded oval nuclei to evenly dispersed larger.
- adjacent nuclei to each other.
- neoplastic astrocytes aggregates around the ~~tumor~~ neurons.

Glioblastoma (microscope)

(1) necrosis (eosinophilic areas)

- tumor cells arranged perpendicular to necrosis
- tufting of capillary structures (blood vessel proliferation)

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② oligodendroglioma:

Best prognosis of glial tumors

5-15% of gliomas.

in 4-5 decades.

Site: white matter of cerebral hemispheres.

Pathogenesis

- IDH mutation and whole arm chromosomal deletion 1p and 19q

- With progression to anaplastic^{grade 3} form loss of CDKN2A

(more aggressive) (لغيت بال mutation الجيد صر أكثر عدوانية)

← (grade 2) oligodendroglioma (بـ 2) أوليغودندروغليوما

- No EGFR amplification (in contrast to high grade astrocytoma)

- TERT promoter mutation (as in glioblastoma)

Morphology often with cyst.

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Anaplastic oligodendroglioma

Microscopic

- Similar to Anaplastic astrocytoma.
- ↑ cellularity
- ↑ nuclear atypia.
- ↑ mitotic activity

→ • regular rounded nuclei surrounded by clear Halo

• branching anastomosing Capillary System.

• The vast majority of cases are characterized by calcification.

(لا تقصروا بنفسكم بقرشي كأننا أشي زي حجر ليني)

IHC: GFAP

grade 2 3 4

adult. ١-٢

grade 1

Pilocytic astrocytoma: ① More common in children and young adults.

② well demarcated from surrounding (easily resection) Complete.

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③ Relatively benign behavior

④ site: cerebellum and around 3rd ventricle

Morphology: • well demarcated and
cystic with mural nodule

cystic space around the
tumor mass attached to the rem
outside part of the tumor.

• limited brain invasion

Microscope:-

2 Components ←

• Loose part with microcystic
spaces (fluid filled
spaces)

• more compact and
more cellular component
(dense fibrillar areas)

ليس كمرها

Pilocytic ⇒ tumor cells characterized
by cell processes hair
like bundle structure

Parallel to each other

كأنه

(Microscopic)

• Rosenthal fibers

(eosinophilic & long fibers)

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ependymoma :- close to ependymal cells lined spaces,

in 1-2 decades / 5-10% of Iry brain tumors.

Site : near the 4th ventricle.

in adults : ① Spinal cord is the most common site.

② Frequently in the setting of NF₂.

Pathogenesis

- NF₂ gene mutated in spinal cord tumors
- Distinct set of driver mutations not ~~for~~ shared with those of astrocytoma.

Morphology : Solid non infiltrative

May be seen ~~Most common~~ in locations :

Cerebrum & cerebellum & spinal

Microscopic : round & bland nuclei

monotone appearance.

rosettes formation.

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rosette formation: The cells are aligned in the form of rosette (ورقة)

2 types

true rosette
(when surround
lumen) And the
neoplastic cells are
arranged perpendicular
in the lumen)

Pseudo rosette
(arranged
around Blood
vessels)

ependymoma special types:-

- 1- Myxopapillary ependymoma (in lower part of spinal cord)
- 2- Subependymoma

choroid plexus tumors:-

- Rare + benign or Malignant

- Choroid plexus papilloma:-

benign (Malignant form may exist)
Most common in children
in 1st ventricle.
in adults in 4th ventricle.

patient presentation: hydrocephalus
(due to ↑ CSF)
secretion.

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neuronal and glioneuronal tumors :-
as, ① gangliogliomas

② Dysembryoplastic neuroepithelial tumor

Medulloblastoma :- embryonal cells مُتَابِعَةٌ

embryonal primitive neoplasm

20% of pediatric brain tumors.

Exclusively in the cerebellum

predominantly in children. (مُتَابِعَةٌ دُسُوفُضَايَ الْعُشْرِيَّاتِ)

embryology: embryonal layers

Sulcus مُتَابِعَةٌ

neural tube. رَبْدُصِيكُ al sulcus edges ال closed.

The wall of neural tube

Primitive cells بُزْ

صِنَه
هَيْكَلِيَه
كُلِّ ار
CNS.

- active chromatin
- ↑ nuclear/cytoplasmic ratio
- well developed nucleolus
- very high mitotic activity

Medulloblastoma cells are similar to
with rapid proliferation rate
So bad clinical course.

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Morphology : often well circumscribed
May involve the leptomeninges.

CSF spread / Spread outside CNS rare.

Pathogenesis

2 pathways:

SHH pathway

WNT pathway

Location

vermis and
Lat cerebellum

Around the Ant
3rd ventricle

→ Subarachnoid / CSF
dissemination

or
Middle cerebellar
Peduncle.

• (CSF seeding) small nodules عُقُود

going out the leptomeninges.
along the surface

Microscopic

- ↑ Mitotic activity
- including atypical forms of mitosis

- Homer Wright rosettes

• arrangement of
tumor cells around fibrillary central
extensions.

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Variants

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① Desmoplastic nodular variant. → Loose Dense nodules
(Almost always SHH activated)

② Large cell anaplastic variant.

Meningiomas:-

- Tumors of adults (مُؤْتَفِقَاتُ الرُّفْعَالِ frequent)
- Arise from the arachnoid.
- Usually attached to the dura.
- Located at any point of the external surface. or within the Ventricular system from the choroid plexus.
- previous radiotherapy is a risk factor

Pathogenesis

- Common lesion in NF2
- 50-60% of sporadic cases show mutant NF2

Morphology (Gross)

Swelling or mass attached to the dura.

tumor cells grow

toward the

dura. without

forming well demarcated mass

← (En plaque growth)

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• En plaque growth = Thickening of dura

• firm to gritty (Psammoma
special calcified
bodies)

• Sometimes may invade
brain tissue



union skin
appearance

microscopic No signs of nuclear malignancy

Morphologic classification:

Prognosis

كل ما كان أي مرض به

Meningothelial
fibroblastic
Transitional.

• Psammoma : Concentric layers of calcification

meningeoma cells wrapping around other
(concentric wrapping) ذي الودع
(whorls)

if there's extensive psammoma bodies ⇒ Psammomatous
meningeoma

معنى ما لا تأخذ في ال Prognosis

meningeoma is grade 1

لزيادة ال mitotic activity أو ال cellularity ونقص في

Atypical
meningeoma

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Atypical meningiomas:- grade 2

- $\frac{1}{4}$ of Cases
- High recurrence rate need radiotherapy in addition to surgery
- with Aggressive features (brain invasion)
(↓ rescurability)
- clear cell and choroid patterns.
(grade 2)

Anaplastic meningiomas:- grade 3

- 1-3% of Cases
- Carcinomatous / Sarcomatous features.
- Papillary and rhabdoid variants.

The
end