Tumors of the brain 1 & 2

Editing File

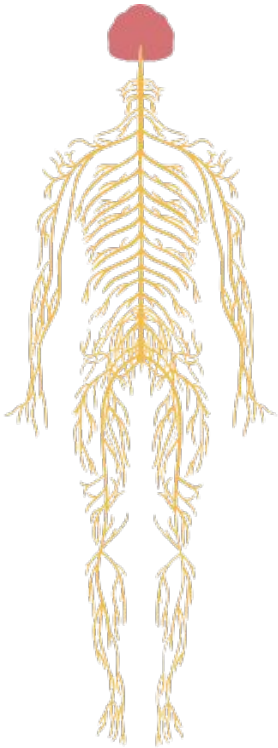
Color index :
Main text (black)
Female Slides (Pink)
Male Slides (Blue)
Important (Red)
Dr's note (Green)
Extra Info (Grey)

FEMALES SLIDES

Objectives

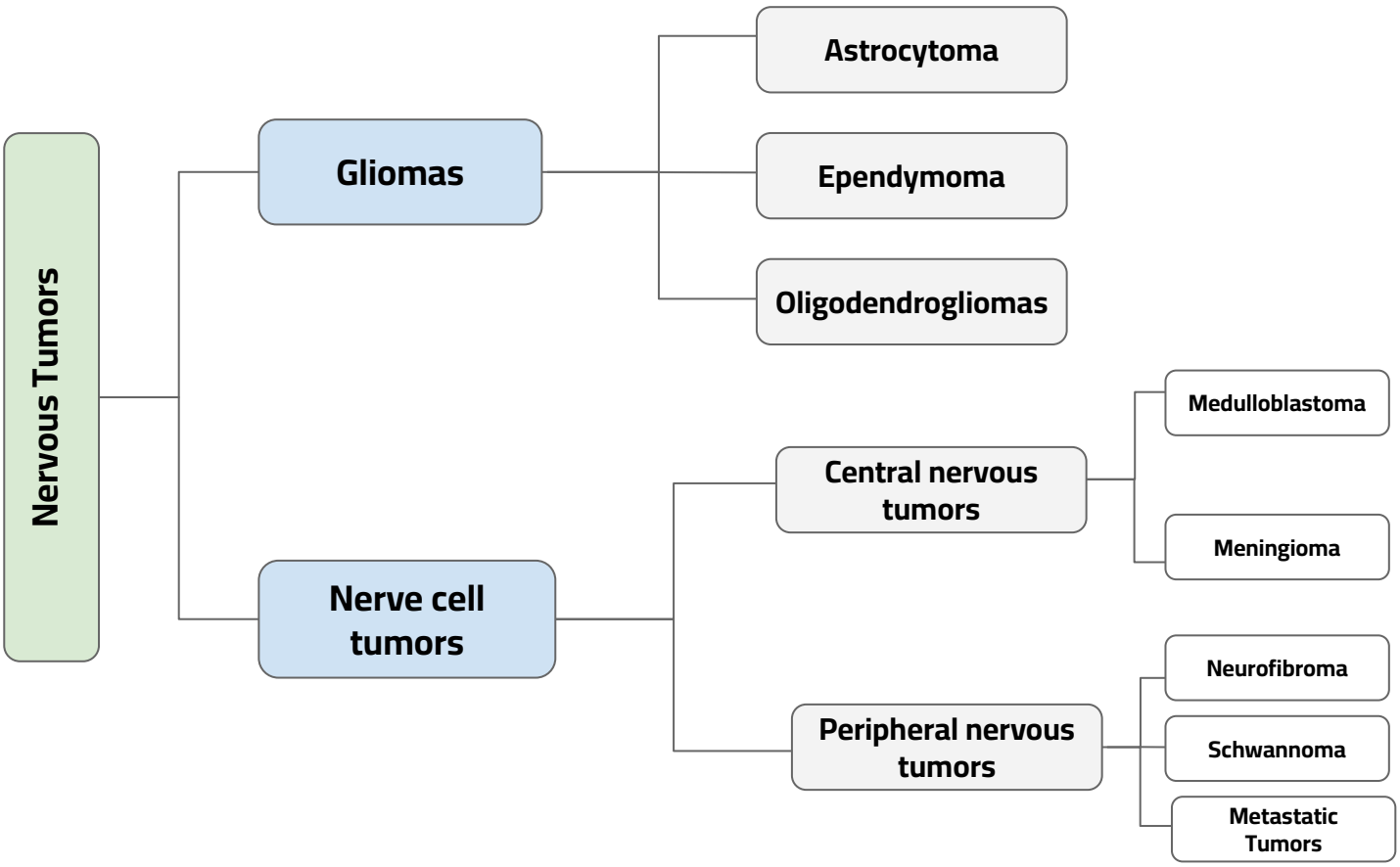
- Appreciate how the anatomy of the skull and the spinal column influences the prognosis of both benign and malignant primary CNS tumors.
- List the principal clinicopathological features of some of the main types of tumors that can arise within the central and the peripheral nervous systems.

If you want to read the lecture from Robbins click here



Overview

helpful video



Introduction

About one half to three-fourths are primary tumors, and the rest are metastatic.

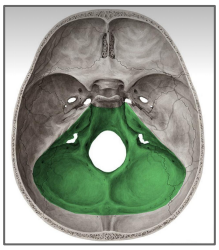
The annual incidence of CNS tumors ranges from:
- 10 to 17 per 100,000 individuals for intracranial tumors.
- and 1 to 2 per 100,000 individuals for intraspinal tumors.

Tumors of the CNS make up a larger proportion of childhood cancers, accounting for as many of 20% of all pediatric tumors.

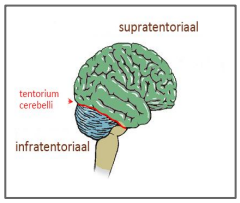
Childhood CNS tumors differ from those in adults in both histologic subtype and location.

In childhood, tumors are likely to arise in the **posterior fossa**, whereas tumors in adults are mostly **supratentorial**.

Posterior fossa



supratentorial



Characteristics of nervous system tumors

1

These tumors do not have morphologically evident premalignant or in situ stages comparable to those of carcinomas (**Carcinoma:** Malignant tumors arising from epithelial cells eg.skin , internal organs)

2

Even low-grade lesion may infiltrate large lesion of the brain, leading to serious clinical deficits , inability to be resected , and poor prognosis.

3

The anatomic site of the neoplasm can influence outcome independent of histologic classification due to local effects "even if its benign" (e.g., a **benign meningioma** may cause cardiorespiratory arrest from compression of the **medulla**). examples on such locations?[1]

4

The pattern of spread of primary CNS neoplasms differs from that of other tumors:
- Rarely metastasize outside the CNS "even the most highly malignant gliomas".
- The subarachnoid space does provide a pathway for spread.
-What are the layers that surround subarachnoid space?[2]

Extra INFO

1- Ex: Pontine angle tumors such as vestibular neuromas and meningiomas frequently present with a hearing disorder due to compression of proximal auditory nerve.
2- Dura mater - Arachnoid mater- Pia mater.

Clinical Note

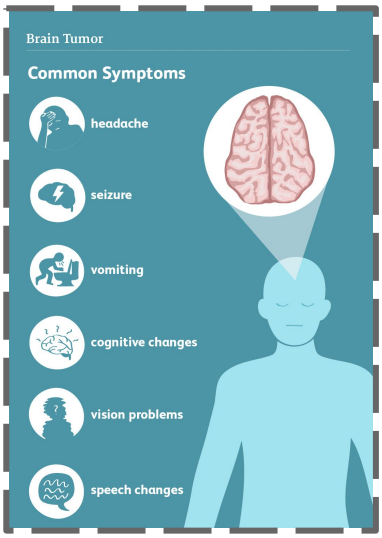
Primary CNS lymphomas:

- Lymphomas arising in the CNS in the absence of disease elsewhere.
- Strong association with immunosuppression.
- Most common type is diffuse large B-cell lymphoma (b p. 278) which, histologically, is composed of sheets of large atypical B-lymphoid cells.

CNS Tumors

Symptoms of CNS tumors include:

- seizures, headache, vague symptom
- Focal neurologic deficits related to the anatomic site of involvement. "As abnormal speech or loss of memory"
- The rate of growth may correlate with the history and duration of symptoms.



CNS tumors may arise from:

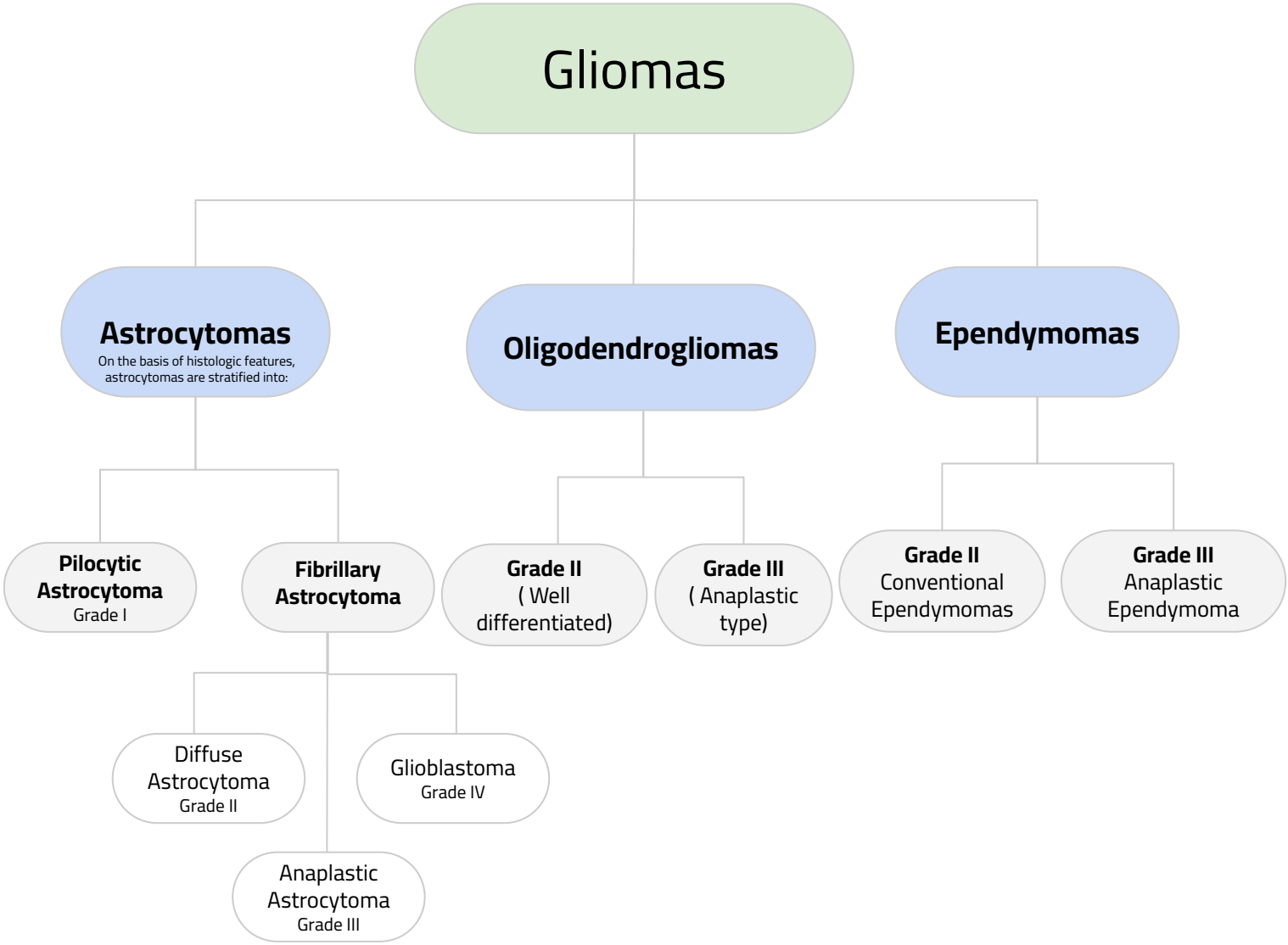
01 Cells of the coverings "meninges" (meningiomas).

02 Cells intrinsic to the brain (gliomas, neuronal tumors, choroid plexus tumors).

03 Other cell populations within the skull (primary CNS lymphoma, germ-cell tumors).

04 Tumor from elsewhere in the body spreading to the CNS (Metastases).

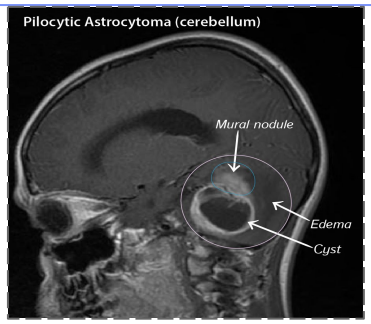
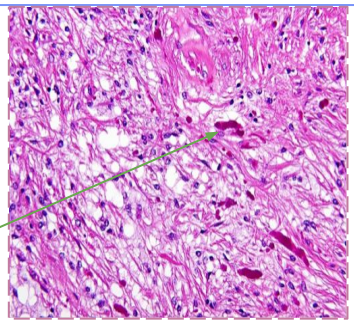
Gliomas (Overview)



The Pilocytic will not progress to Fibrallary, they are different tumors with different characteristic. For example the Pilocytic Is more common among children while the arby brain tissue Fibrillary is more common in elderly.

CNS Tumors

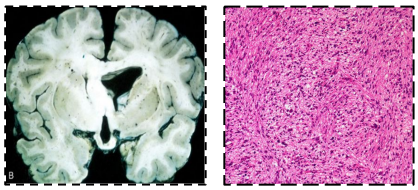
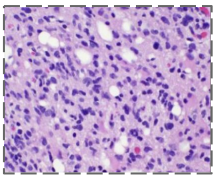
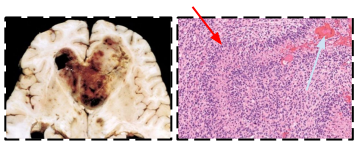
Pilocytic Astrocytoma (Grade I)

Grade	Grade I (Benign tumors)
Epidemiology	Typically affect children and young adults.
Location	most commonly found in cerebellum, they also may involve the **third ventricle, the optic Location pathways, the spinal cord, and occasionally the cerebral hemispheres**
Morphology	• There is often a cyst associated with the tumor and mural nodule in the wall of the cyst; if solid, it is usually well circumscribed. • Tumors that involve the hypothalamus are especially problematic because they **cannot be resected completely** • The tumor is composed of bipolar cells with long, thin **"hairlike"** processes that are GFAP-positive. GFAP -> immunostain that stains the glial cell only not the neuron, here it is + means there are activated Astrocytes. • Rosenthal fibers, eosinophilic (hyaline) granular bodies, and microcysts are often present, while necrosis and mitoses are rare.
Pictures	Radiology  Microscopic 
Genetic findings	• A high proportion of pilocytic astrocytomas have activating mutations or translocations involving the gene encoding the serine-threonine kinase BRAF, which result in activation of the MAPK signaling pathway. • Pilocytic astrocytomas **do not have** mutations in IDH1 and IDH2, supporting their distinction from the low-grade diffuse gliomas.

CNS Tumors

	Diffuse Astrocytoma	Anaplastic Astrocytoma	Glioblastoma The Most aggressive one
Grade	Grade II	Grade III	Grade IV
Overview	• Account for about 80% of adult gliomas. • They are most frequent in the **fourth through the sixth decades** of life. • They usually are found in the cerebral hemispheres • The most common presenting signs and symptoms are seizures, headaches, and focal neurologic deficits related to the anatomic site of involvement. • Increasingly grim prognosis as the grade increases. • There is emerging evidence that genetic subtyping provides important additional prognostic information. • Infiltration beyond the grossly evident margins is always present. • The cut surface of the tumor is either firm or soft and gelatinous; cystic degeneration may be seen.		
Prognosis	**(well differentiated)** Diffuse astrocytomas can be static for several years, but at Some point they progress ; the mean survival is more than 5 years	Patients suffer rapid clinical deterioration that is correlated with the appearance of anaplastic features and more rapid tumor growth.	Once the histologic features of static for several years, but at glioblastoma appear, the prognosis is very poor; with treatment (resection,radiotherapy, and chemotherapy), the median survival is only 15 8- 10 month
Morphology **(Gross)** FEMALES SLIDES	• They are poorly defined, gray, infiltrative tumors that expand and distort the invaded brain without forming a discrete mass. • Infiltration beyond the grossly evident margins is always present. • The cut surface of the tumor is either firm or soft and gelatinous; cystic degeneration may be seen.		variation in the gross appearance of the tumor from region to region is characteristic. Some areas are firm and white, others are soft and yellow (the result of tissue necrosis), and still others show regions of cystic degeneration and hemorrhage.

CNS Tumors

	Diffuse Astrocytoma	Anaplastic Astrocytoma	Glioblastoma The Most aggressive one
Microscopic	• low-grade (WHO grade II) astrocytomas: • Mild to moderate increase in the number of glial cell nuclei. • Variable nuclear pleomorphism. • Intervening feltwork of fine, glial fibrillary acidic protein • **(GFAP)-positive** astrocytic cell processes that give the background a fibrillary appearance • The transition between neoplastic and normal tissue is indistinct, and • tumor cells can be seen infiltrating normal tissue many centimeters from the main lesion.	show regions that are more densely cellular and have greater nuclear pleomorphism; mitotic are present.	Has a histologic appearance similar to that of anaplastic astrocytoma, as well as either necrosis (commonly present as serpiginous bands of necrosis with palisaded tumor cells along the border) or microvascular proliferation
Pictures	 poorly demarcated Grade II astrocytoma appears as expanded white matter of the left cerebral hemisphere and thickened corpus callosum. There is no border of the tumor.	 Anaplastic Astrocytoma shows a greater extent of pleomorphism, an increased cellular component than lower grade astrocytomas also mitosis present	 **Pseudopalisading necrosis** and/or Vascular proliferation Glioblastoma appearing as a necrotic, hemorrhagic, infiltrating mass. Glioblastoma is a densely cellular tumor
Genetic findings	• Mutations that alter the enzymatic activity of two isoforms of the metabolic enzyme isocitrate dehydrogenase (IDH1 and IDH2) are common in lower-grade astrocytomas. • When Diffuse astrocytoma is associated with IDH mutation -> The tumor will be aggressive same as glioblastoma • The new name for Diffuse Astrocytoma -> IDH Astrocytoma		**Primary glioblastomas** (started as 4th grade): amplification of the epidermal growth factor receptor (EGFR) gene **Secondary glioblastomas** (started as low grade then changed to higher grades): share p53 mutations that characterized low-grade gliomas

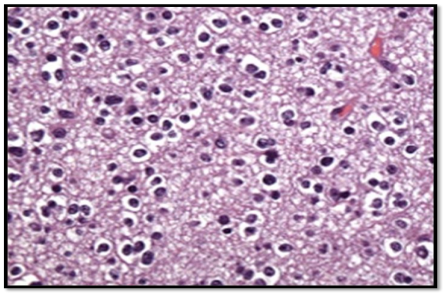
CNS Tumors

Oligodendroglioma		
Grade	Grade II (well-differentiated) (WHO Grade II)	Grade III (anaplastic type) (WHO Grade III)
Epidemiology	• Most common in the 4th and 5th decades of life. • Oligodendrogliomas account for 5% to 15% of gliomas.	
Location of the Tumor	The lesions are found mostly in the cerebral hemispheres with a predilection for white matter, mainly in the **frontal or temporal lobes.**	
Genetic findings	The most common genetic findings are loss of heterozygosity for **chromosomes 1p and 19q.** **Co-deletion of 1p and 19q** chromosomal segments are present in oligodendrogliomas. The mechanism through which these chromosomal alterations shape tumor morphology and response to treatment is unknown.	
Prognosis	• Better prognosis than do patients with astrocytomas. • Patients may have had several years of antecedent neurologic complaints, often including seizures.	
Average Survival	10 to 20 years surgery, chemotherapy, and radiotherapy	5 to 10 years surgery, chemotherapy, and radiotherapy
FEMALES SLIDES **Morphology**	are infiltrative tumors that form gelatinous, gray masses and may show cysts, focal hemorrhage, and **calcification**.	is a more aggressive subtype with higher cell density, nuclear anaplasia, increased mitotic activity, and often microvascular proliferation

1. On microscopic examination, the tumor is composed of sheets of regular cells with **spherical nuclei** containing finely granular chromatin (similar to that in normal oligodendrocytes) surrounded by a clear halo of cytoplasm

2. The tumor typically contains a delicate network of **anastomosing capillaries.**

3. **Calcification**, present in as many as 90% of these tumors,ranges in extent from microscopic foci to massive depositions. Mitotic activity usually is low.



4. Round nuclei (**Fried egg appearance**): often with a **clear cytoplasmic halo**. **Blood vessels in the background** are thin and can form an interlacing pattern.

CNS Tumors

<table>
<tr><th colspan="3">Ependymoma</th></tr>
<tr><td>Grade</td><td>Grade II
Conventional ependymomas</td><td>Grade III
Anaplastic ependymomas</td></tr>
<tr><td>Epidemiology</td><td colspan="2">• In adults, the spinal cord is their most common location; tumors in this site are particularly frequent in the setting of neurofibromatosis type 2

• In the first 2 decades of life, they typically occur near the fourth ventricle and constitute 5% to 10% of the primary brain tumors in this age group.</td></tr>
<tr><td>Location</td><td colspan="2">Ependymomas most often arise next to the ependyma lined ventricular system, including the central canal of the spinal cord.</td></tr>
<tr><td>Prognosis</td><td colspan="2">• The clinical outcome for completely resected supratentorial and spinal ependymomas is better than for those in the posterior fossa.</td></tr>
<tr><td rowspan="2">Morphology</td><td colspan="2">• In the fourth ventricle, ependymomas typically are solid or papillary masses extending from the ventricular floor
• The tumors are composed of cells with regular, round to oval nuclei and abundant granular chromatin.
• Between the nuclei is a variably dense fibrillary background.
• Tumor cells may form round or elongated structures (rosettes, canals) that resemble the embryologic ependymal canal, with long, delicate processes extending into a lumen ; more frequently present are perivascular pseudorosettes in which tumor cells are arranged around vessels with an intervening zone containing thin ependymal processes.</td></tr>
<tr><td>-</td><td>show increased cell density, high mitotic rates, necrosis, microvascular proliferation, and less evident ependymal differentiation.</td></tr>
</table>

Embryonal (primitive) Neoplasms

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Some tumors of neuroectodermal origin have a primitive “small round cell” appearance that is reminiscent of normal progenitor cells encountered in the developing CNS.

Differentiation is often limited, but may progress along multiple lineages. The most common is the medulloblastoma, accounting for 20% of pediatric brain tumors.

MEDULLOBLASTOMA	
Epidemiology	**Occur in children and and exclusively in the cerebellum**
Markers	Neuronal and glial markers may be expressed, at least to a limited extent, but the tumor is often largely undifferentiated
Prognosis	The tumor is highly malignant, and the prognosis for untreated patients is dismal. However, it is exquisitely radiosensitive with total excision,chemotherapy and radiation, The 5-year survival rate may be as high as 75%
Histology	There are a series of histologic patterns observed in medulloblastoma, which are informative about prognosis and correlate in part with the underlying genetics.

Deep Focus Question

Where is the most common location of ependymoma in children?

A. Lateral ventricle
B. Fourth ventricle
C. Spinal cord
D. Hypothalamic region

Answer: B

Deep Focus Question

Where is the most common location of ependymoma in children?

A. Oligodendroglioma
B. Glioblastoma multiforme
C. Meningioma
D. Ependymoma

Answer: C

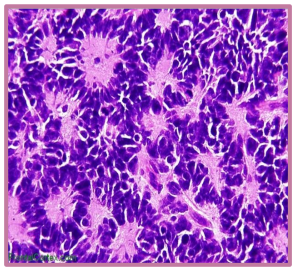
Medulloblastoma cont..

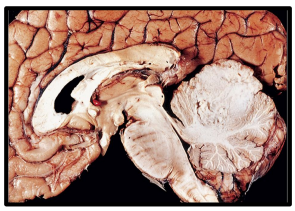
FEMALES SLIDES

Morphology

- In children, medulloblastomas are located in the midline of the cerebellum lateral tumors occur more often in adults.
- The tumor often is well circumscribed, gray, and friable and may be seen extending to the surface of the cerebellar folia and involving the leptomeninges. leptomeninges : the inner two meninges, the arachnoid and the pia mater.
- Medulloblastomas are densely cellular, with sheets of anaplastic **("small blue")** cells
- Individual tumor cells are small, with little cytoplasm and hyperchromatic nuclei; mitoses are abundant.
- Often, focal neuronal differentiation is seen in the form of rosettes, which closely resemble the rosettes encountered in neuroblastomas.
- They are characterized by primitive tumor cells surrounding central neuropil (delicate pink material formed by neuronal processes).

1. Often, focal neuronal differentiation is seen in the form of the **Homer Wright or neuroblastic rosette**
2. they are characterized by primitive tumor cells surrounding central neuropil (delicate pink material formed by neuronal processes)
3. Sagittal section of a brain showing medulloblastoma involving the superior vermis of the cerebellum.





Genetic findings

Upcoming ....

Medulloblastoma cont..

Morphology

Previous ....

Genetic findings

Genetic analysis of medulloblastoma has revealed several subtypes associated with different clinical outcomes.

Current approaches separate medulloblastoma into distinct groups with different core pathogenic pathways or driver mutations.

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- Wnt pathway activation, most commonly associated with gain of function mutations in the gene for β-catenin; these have the most favorable prognosis of all of the genetic subtypes and are commonly classic-type tumors.
- Hedgehog pathway activation, most commonly associated with loss of function mutations in PTCH1, a negative regulator of the Hedgehog; these tumors have an intermediate prognosis, but the concomitant presence of TP53 mutation confers a very poor prognosis.
- MYC overexpression, due to MYC amplification as well as other changes that result in increased expression; these tumors have the poorest prognosis.

Deep Focus Question

Which of the following brain tumor types is composed of cells arranged in rosettes?

A. Glioblastoma
B. Astrocytoma
C. Schwannoma
D. Oligodendroglioma
E. Ependymoma

Answer: E

Deep Focus Question

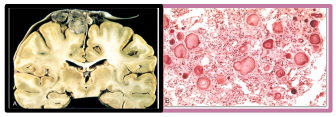
Which of the following is the most common malignant CNS tumor in a child?

A. Medulloblastoma
B. Pilocytic astrocytoma
C. Oligodendroglioma
D. Ependymoma

Answer: A

Main subtypes 1 Syncytial 2 Fibroblastic 3 Transitional

Meningioma

Grade	Grade I	Grade II Atypical	Grade III Anaplastic (malignant)
OVERVIEW	• They often come to attention because of vague nonlocalizing symptoms, or with focal findings referable to compression of adjacent brain. • Most meningiomas are easily separable from underlying brain, but some tumors are infiltrative (brain invasion), a feature associated with an increased risk for recurrence. • They usually occur in **adults** and are often attached to the **dura**.		
Location	Meningiomas are predominantly **benign** tumors that arise from **arachnoid meningothelial cells.** ▸ Meningiomas may be found along any of the external surfaces of the brain as well as within the ventricular system, where they arise from the stromal arachnoid cells of the choroid plexus.		
Prognosis	The overall prognosis is determined by the lesion size and location, surgical accessibility, and histological grade.		
Morphology	grow as well-defined dura based masses that may compress the brain but do not typically invade it). • Extension into the overlying bone may be present. • A parasagittal multilobular meningioma attached to the dura with compression of the underlying brain.(extra-axial tumor) • Meningioma with a whorled pattern of cell growth and **psammoma bodies.**  Well demarcated	recognized by the presence of either an increased mitotic rate, or prominent nucleoli, increased cellularity, patternless growth, high nucleus-ctocytoplasm ratio, or necrosis. These tumors demonstrate more aggressive local growth and a higher rate of recurrence and may require therapy in addition to surgery. Some histologic patterns—clear cell and chordoid—also correlate with more aggressive behavior, as does the presence of brain invasion.	highly aggressive tumors that may resemble a high-grade sarcoma or carcinoma morphologically. Mitotic rates are typically much higher than in atypical meningiomas.

Meningioma morphology cont..

Grade I Meningioma:

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The varied histologic patterns include:

- Meningothelial, named for whorled, tight clusters of cells without visible cell membranes.
- Fibroblastic, with elongated cells and abundant collagen deposition.
- Transitional, with features of the meningothelial and fibroblastic types.
- Psammomatous, with numerous psammoma bodies
- Secretory, with glandlike spaces containing PAS-positive eosinophilic material

Atypical meningiomas

These tumors demonstrate more aggressive local growth and a higher rate of recurrence and may require therapy in addition to surgery. Some histologic patterns—clear cell and chordoid—also correlate with more aggressive behavior, as does the presence of brain invasion.

Meningiomas & Neurofibromatosis type 2 (NF2)

When an individual has multiple meningiomas, especially in association with eighth-nerve schwannomas or glial tumors, the diagnosis of neurofibromatosis type 2 (NF2) should be considered

About half of meningiomas not associated with NF2 have somatic loss of-function mutations in the NF2 tumor suppressor gene on the long arm of chromosome 22 (22q).

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PERIPHERAL NERVE SHEATH TUMORS

A number of different tumors arise from peripheral nerves.

Such tumors may manifest as soft tissue masses, with pain or loss of function related to impingement on nerves or other surrounding structures.

In most peripheral nerve tumors, the neoplastic cells show evidence of **Schwann cell differentiation**.

These tumors usually occur in adults and include both benign and malignant variants.

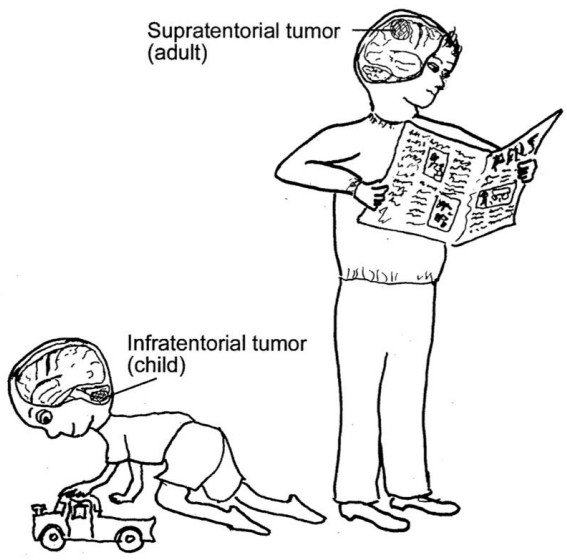
An important feature is their frequent association with the familial tumor syndromes **neurofibromatosis type 1 (NF1) and neurofibromatosis type 2 (NF2).**

PNS Tumors

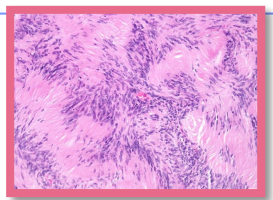
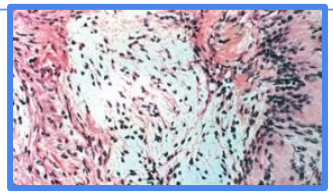
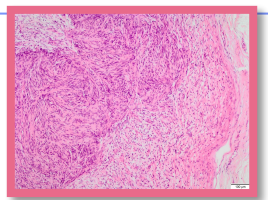
- **Shwannoma**
- **Neurofibroma**

Remember

Most common adults tumors are supratentorial , On other hand most common brain tumors in children are infratentorial



Schwannomas

Type	- Benign - They are attached to the nerve but can be separated from it
Site of tumor	- May occur in soft tissues, internal organs, or spinal nerve roots.
The most commonly affected nerve	- the vestibular portion of the eighth nerve. Tumors arising in a nerve root or the vestibular nerve (cranial vault in the cerebellopontine angle) may be associated with symptoms related to nerve root compression, which includes Tinnitus & hearing loss in the case of vestibular schwannomas.
occur associating with	- Sporadic schwannomas are associated with mutations in the NF2 gene, however bilateral acoustic schwannoma is associated with NF2 syndrome.
FEMALES SLIDES **Morphology**	- Most schwannomas appear as circumscribed masses **abutting an adjacent nerve**. - On microscopic examination, these tumors often show an admixture of dense and loose areas referred to as **Antoni A and B**, respectively. They are comprised of a uniform proliferation of neoplastic Schwann cells. In **the dense Antoni A areas**, bland spindle cells with buckled nuclei are arranged into intersecting fascicles. These cells often align to produce nuclear palisading, resulting in alternating bands of nuclear and anuclear areas called Verocay bodies. In the loose, **hypocellular Antoni B areas**, the spindle cells are spread apart by a prominent myxoid extracellular matrix. Thick-walled hyalinized vessels often are present
Microscopic -ally	 Verocay Bodies   Biphasic pattern Cellular Antoni A pattern and less cellular Antoni B nuclear-free zones of processes that lie between the regions of nuclear palisading are termed **Verocay bodies**

Neurofibroma

Definition	- Neurofibromas are benign tumors of peripheral nerves and they **cannot be separated from the nerve trunk** (in comparison to schwannomas)
occur associating with	- These arise sporadically or in association with **type 1 neurofibromatosis**, rarely malignant.
Example	- cutaneous neurofibromas or in peripheral nerve solitary neurofibroma.
Morphology	- Unlike schwannomas, neurofibromas are not encapsulated. - They may appear circumscribed, as in localized cutaneous neurofibromas, or may exhibit a diffusely infiltrative growth pattern. - Also in contrast to schwannomas, the neoplastic Schwann cells in neurofibroma are admixed with other cell types, including mast cells, fibroblast like cells, and perineurial-like cells. - Plexiform neurofibromas involve multiple fascicles of individual affected nerves, mostly arising in individuals with NF1, potential malignancy. - Diffuse neurofibromas show an extensive infiltrative pattern of growth within the dermis and subcutis of the skin.

Deep Focus Question

A patient presents with a solitary, encapsulated tumor composed of spindle-shaped cells. These findings are consistent with a schwannoma. Which of the following genes is most commonly associated with the development of sporadic schwannomas?

A. NF1 gene
B. NF2 gene
C. PTEN gene
D. TP53 gene

Answer: B

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Neurofibromatosis

Type of mutation

NF1

NF1 is an **autosomal dominant** disorder caused by mutations in the tumor suppressor **neurofibromin**, encoded on the long arm of **chromosome 17**.

Symptoms include neurofibromas, malignant peripheral nerve sheath tumors, "optic gliomas," and other glial tumors. In addition, patients with NF1 exhibit learning disabilities, seizures, skeletal abnormalities, vascular abnormalities with arterial stenoses, pigmented nodules of the iris (Lisch nodules), and pigmented skin lesions (axillary freckling and café-au-lait spots) in various degrees.

NF2

NF2 is an **autosomal dominant** disorder and patients are at risk of developing multiple schwannomas, meningiomas, and ependymomas.

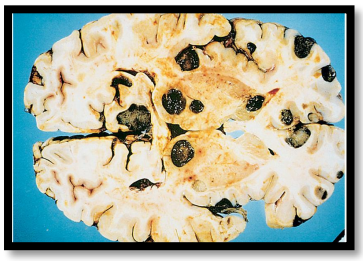
The presence of bilateral vestibular schwannomas is a hallmark of NF2; despite the name, neurofibromas are not found in NF2 patients. Affected patients carry a dominant loss of function mutation of the merlin gene on **chromosome 22**.

Metastatic Tumors

About half to three-quarters of brain tumors are primary tumors, and the rest are metastatic (One Quarter).

Lung, breast, skin (melanoma), kidney, and gastrointestinal tract are the most common primary sites for metastases.

The metastatic deposits are usually sharply demarcated with a surrounding edema.



Summary

FEMALES SLIDES

- In most peripheral nerve sheath tumors, the neoplastic cells show evidence of Schwann cell differentiation.

- Peripheral nerve sheath tumors are important features of the familial tumor syndromes NF1 and NF2.

- Schwannomas and neurofibromas are benign nerve sheath tumors.

- Schwannomas are circumscribed, usually encapsulated tumors that abut the nerve of origin and are a feature of NF2.

- Neurofibromas may manifest as a sporadic subcutaneous nodule, as a large, poorly defined soft tissue lesion, or as a growth within a nerve.

- Neurofibromas are associated with NF1.

Keywords

Astrocytoma	Pilocytic Astrocytoma	• Benign tumors • children and young adults. • in cerebellum • cyst & mural nodule • bipolar cells “hairlike” processes • Rosenthal fibers • Mutations in gene encoding the serine-threonine kinase BRAF • IDH1 and IDH2 Negative
	Diffuse Astrocytoma Grade II	• Adults (40-60) • cerebral hemispheres. • Can be static • Mild to moderate increase in glial cells • IDH1 and IDH2 positive
	Anaplastic Astrocytoma Grade III	• Adults (40-60) • cerebral hemispheres. • mitotic activity • IDH1 and IDH2 positive
	Glioblastoma Grade IV	• Adults (40-60) • cerebral hemispheres. • Pseudopalisading necrosis • microvascular proliferation • Primary: mutation in EGFR • Secondary: p53
Oligodendroglioma		• 4th and 5th decades • Cerebral hemispheres (frontal or temporal lobe) • Co-deletion of 1p and 19q • Calcification • Round nuclei, often with a clear cytoplasmic halo.
Ependymoma		• First 2 decades : fourth ventricle • Adults : spinal cord • rosettes, canals • perivascular pseudorosettes • papillary masses

Keywords

Medulloblastoma		• children • cerebellum • radiosensitive • Mitoses • Homer Wright • neuroblastic rosette • undifferentiated
Meningioma Multiple meningioma : associated with NF2 (on long arm of 22 chromosome	Benign	• adults • Arise from meningothelial cells of the arachnoid. • well-defined durabased masses • Compress the brain • psammoma bodies
	Atypical meningioma S Grade II	• adults • Arise from meningothelial cells of the arachnoid. • mitotic activity
	Anaplastic meningioma S Grade III	• adults • Arise from meningothelial cells of the arachnoid. • resemble a high-grade sarcoma or carcinoma
Schwannoma Benign		• affected cranial nerve is the vestibular portion of 8th CN • mutations in the NF2 • nuclear palisading (Verocay bodies.)
Neurofibroma		• cannot be separated from the nerve trunk • association with type 1 neurofibromatosis • not encapsulated • papillary masses
Neurofibromatosis		NF 1 : • autosomal dominant disorder : mutations in the tumor suppressor neurofibromin, encoded on the long arm of chromosome 17. NF2 : • autosomal dominant disorder • bilateral vestibular schwannomas

MCQ

1- Which neoplasm shows “Fried egg appearance“ and “calcification“ on Histopathological examination?

A) Ependymoma

B) Oligodendroglioma

C) Schwannoma

D) Transitional meningioma

2- A 48 years old woman came to the emergency with epileptic seizure, the X-ray shows a mass in the left cerebral hemisphere, with scattered foci of calcification. On histologic examination, there is small, mildly pleomorphic cells with moderate cellularity. What is the most likely diagnosis?

A) Oligodendroglioma

B) Meningioma

C) Low-grade astrocytoma

D) Ependymoma

3-Which one of the following is recognized as pathological feature of astrocytes?

A) Arise from dysplastic neurons

B) Called glioblastoma when it is well-differentiated

C) May show cystic features

D) Have well-demarcated margins under microscope

A 41 years-old man presents with a 5 months headache. Vital signs and CBC are normal. CT scan shows a tumor in the 4th ventricle. Histologic examination reveals perivascular pseudorosettes . What is the most likely diagnosis?

A) Ependymoma

B) Oligodendroglioma

C) Glioblastoma

D) Schwannoma

1-B/ 2-C/ 3-C / 4-A

MCQ

Neurofibromatosis type 2 is associated with ?

A- Neurofibroma with skin pigment lesion

B- Neurofibroma with optic glioma

C- Premalignant sheath lesion with skin pigment lesion

D- Multiple meningioma

What is the tumor associated with 1p 19q mutation?

A- Schwannoma

B- meningioma

C- Oligodendroglioma

D- Medulloblastoma

Which one of the following is characterized histologically by pseudopalisading necrosis

A- Astrocytoma

B- Medulloblastoma

C- Glioblastoma

D- Oligodendroglioma

Which of the following is cells is the origin of meningioma

A- Arachnoid cells

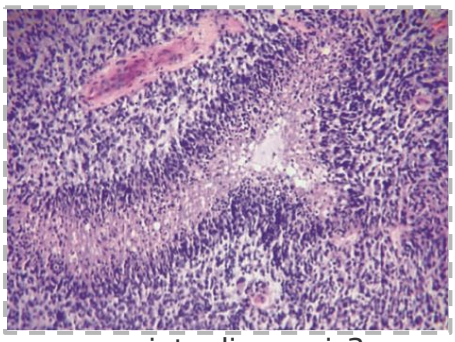
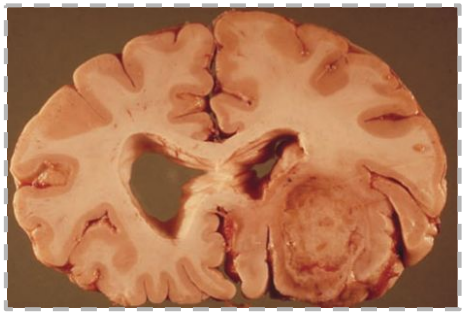
B- Pia layer

C- Epithelial cells

D- Squamous cells

1- D / 2-C / 3-C / 4- A

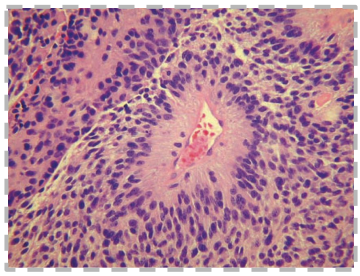
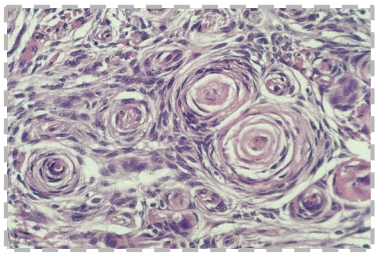
Cases

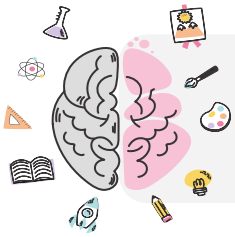
1.A 79-year-old man presents to the emergency room with severe right-sided weakness. He has noticed increasing difficulty using his right hand over the past several months and now walks with great difficulty. His past medical history is significant for colon cancer that was resected 5 years ago. He has poorly controlled hypertension and admits to smoking two packs of cigarettes a day for the past 50 years. A CT scan of the brain reveals a discrete globoid lesion in the frontal lobe with a prominent halo of edema. A CT-guided biopsy reveals neoplastic cells. Which of the following is the most likely diagnosis?			
A.Glioblastoma multiforme	B.Medulloblastoma	C.Meningioma	D.Metastatic cancer
2.A 68-year-old man presents with a 2-week history of tonic-clonic seizures that initially involve his left arm but have more recently progressed to involve his left leg. The seizures are accompanied by muscle weakness but no other neurologic signs. The cranial nerves are intact, and the Babinski sign is present. A CT scan reveals a mass in the left cerebral hemisphere. A left frontoparietal craniotomy is performed. Histologic examination of the brain biopsy is shown in the image. Which of the following is the appropriate diagnosis? 			
A.Craniopharyngioma	B.Ependymoma	C.Ganglioglioma	D.Glioblastoma multiforme
3.A 65-year-old woman presents with a 3-week history of intractable headaches. Her vital signs and CBC are normal. Two weeks later, the patient develops left-sided hemiparesis. MRI reveals a large, necrotic tumor in the right hemisphere of the cerebrum, extending across the corpus callosum into the left hemisphere. A coronal section of the patient's brain at autopsy is shown in the image. This tumor is most likely derived from which of the following cell types? 			
A.Astrocytes	B.Ependymal lining cells	C.Microglia	D.Neurons

1- D \ 2- D \ 3-A

NEED EXPLANATION ? CLICK HERE

Cases

4.A 50-year-old man presents with a 5-month history of severe headaches. Vital signs and CBC are normal. Imaging studies demonstrate a mass in the fourth ventricle and hydrocephalus. The results of a CT-guided biopsy are shown in the image. What is the appropriate diagnosis for this patient's malignant neoplasm? 			
A.Craniopharyngioma	B.Ependymoma	C.Glioblastoma multiforme	D.Oligodendroglioma
5.A 45-year-old woman is brought to the emergency room after experiencing a generalized seizure. An X-ray film of the skull reveals a lytic bone mass. A CBC is normal. A portion of the skull and the adherent mass are removed. Microscopic examination of the surgical specimen is shown in the image. What is the appropriate diagnosis? 			
A.Glioblastoma multiforme	B.Hemangioblastoma	C.Medulloblastoma	D.Meningioma
6.A 20-year-old man complains of increasing difficulty in hearing over the past several years. Physical examination confirms bilateral sensorineural hearing defi cerebellopontine angle tumors, consistent with schwannomas. This patient has a strong family history for benign tumors, including low-grade gliomas and meningiomas on his mother's side of the family. Which of the following is the probable diagnosis?			
A.Neurofibromatosis type 1	B.Neurofibromatosis type 2	C.Sturge-Weber syndrome	D.Von Hippel-Lindau syndrome



Need a SUMMARY ? Click here

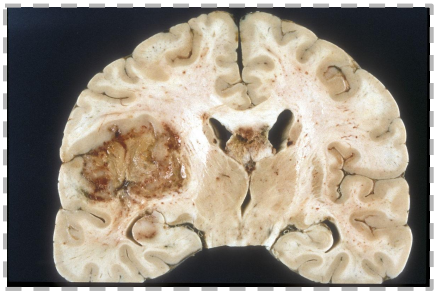
4- B \ 5- D \ 6-B

NEED EXPLANATION ? CLICK HERE

Cases

EXTRA CASES REQUIRE EXTRA INFO

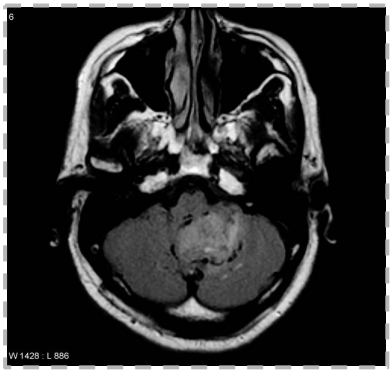
1.A 60-year-old man is admitted to the emergency department due to a seizure. The patient's wife reports that during the past 3 weeks, he has been complaining of headaches. She also notes that he has been "acting strange" and has had difficulty walking over the past few days. His medical history is significant for type 2 diabetes mellitus treated with metformin. Physical examination shows the patient has postictal confusion but is responsive. The patient dies two days later secondary to respiratory arrest despite appropriate interventions. An autopsy is performed, and gross examination of the brain is shown:



Histopathological examination of this patient's lesion is most likely to show which of the following findings?

A.Pleomorphic tumor cells surrounding an area of central necrosis	B.Thin-walled capillaries with minimal intervening parenchyma	C.Concentrically arranged spindle cells in a whorled pattern with areas of calcifications	D.Large abnormal lymphocytes infiltrating perivascular spaces

2.An 8-year-old boy is brought to the physician's office by his parents due to headaches and difficulty walking. The parents report that he had a viral infection 2 months ago, and since then he has had a mild headache, especially in the morning. They also state that he has become clumsier, and his school performance has declined. His temperature is 37.2°C (99°F), pulse is 84/min, and blood pressure is 121/75 mmHg. Physical examination shows a broad based gait and head bobbing. A horizontal nystagmus is present. Magnetic resonance imaging of the head and spine is obtained and shown



A biopsy of the mass is performed and shows blue cells palisading around a central core. Which of the following is the most likely diagnosis?

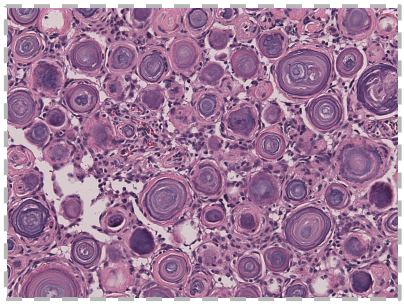
A.Ependymoma	B.Schwannoma	C.Medulloblastoma	D.Meningioma

1 - A \ 2- C

Cases

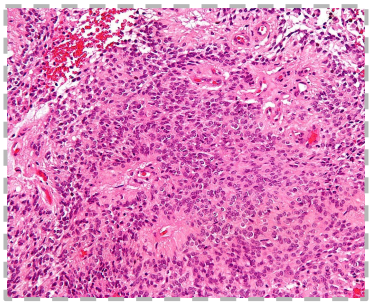
EXTRA CASES REQUIRE EXTRA INFO

3.A 43-year-old woman presents to the emergency department due to rhythmic jerking of the limbs followed by a period of drowsiness and confusion. Her husband reports she has been experiencing mild headaches for the past 2 years that occasionally awoke her from sleep, in addition to some noticeable left leg weakness over the past few months. The patient denies any trauma or vision changes. Neurological examination shows increased tone and hyperreflexia in the left lower extremity. Magnetic resonance imaging of the head is obtained and reveals a right parasagittal intracranial mass. The patient undergoes a biopsy of the lesion, and the results are shown below:



A.Endothelial cells	B.Oligodendrocyte cells	C.Arachnoid cells	D.Schwann cells

4.A 4-year-old boy is brought to the emergency department due to progressive lethargy, drowsiness and vomiting. His parents state he had been complaining of progressive headaches and worsening vision for the past several months. Height, weight and head circumference are at the 50th percentile for age. His temperature is 37.0°C (98.6°F), pulse is 80/min, and blood pressure is 125/85 mmHg. On physical examination, the patient appears drowsy. Fundoscopic examination reveals bilateral papilledema. A brain MRI shows a lesion in the fourth ventricle with dilated ventricles. A stereotactic biopsy is performed, and the hematoxylin and eosin (H&E) stained sample is shown below. What is the most likely diagnosis in this patient?



A.Medulloblastoma	B.Pilocytic astrocytoma	C.Oligodendroglioma	D.Ependymoma

5.A 30-year-old woman is found to have an incidental brain mass after receiving a CT-scan of her head to investigate chronic sinusitis. The mass is located in the frontal lobe, occupying part of the white matter with areas of calcifications. She denies headaches or vision changes, and her medical history is non-contributory. Physical examination shows no abnormalities. A biopsy of the mass is performed and reveals sheets of cells with round nuclei surrounded by clear cytoplasm, with delicate, branching capillaries and microcalcifications. Which of the following is the most likely diagnosis?

A.Meningioma	B.Oligodendroglioma	C.Glioblastoma multiforme	D.Pilocytic astrocytoma

3- C \ 4- D \ 5- B

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