Pathology

Tumors of the Nervous System

Prof. Dr. Azza AbdelAziz Ali

azza3a@mans.edu.eg azza3a@yahoo.com

Learning Outcomes

By the end of the lecture, you will be able to:

- Identify classification of the nervous system tumors.
- Recognize pathology of common tumors affecting the nervous system.
- Identify effects of intracranial tumors

Tumors of Nervous System

- Gliomas
  - Astrocytoma
  - Oligodendroglioma
  - Ependymoma
- Embryonal tumors
  - Medulloblastoma
- Tumors of Meninges
  - Meningioma
  - Nonmeningothelial
- Tumors of peripheral nerves.
  - Schwannoma
  - Neurofibroma
- Metastatic tumors.
- Hemopoietic tumors.
  - Plasmacytoma
  - Lymphoma

Classification of Nervous System Tumors

1- Gliomas:
- Astrocytoma
- Oligodendroglioma
- Ependymoma

2- Embryonal tumors:
- Medulloblastoma.

3- Tumors of Meninges:
- Meningioma
- Mesenchymal Nonmeningothelial tumors

4-Tumors of peripheral nerves.
- Shwannoma
- Neurofibroma
- Malignant nerve sheath tm

5- Hemopoietic tumors
- Plasmacytoma
- Lymphoma

6- Germ cell tumors

7- Tumors of seller region
- Pituitary tumors
- Craniopharyngioma

8- Choroid plexus tumors:
- Choroid plexus papilloma.
- Choroid plexus carcinoma.

9-Pineal body tumors
- Pinealoma
- Pineoblastoma

10- Metastatic tumors

Gliomas

Astrocytomas

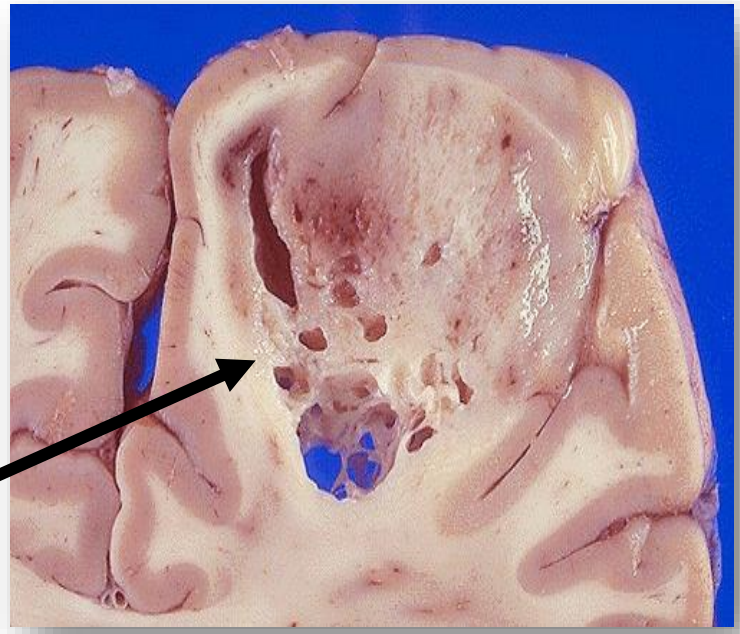
Tumors of astrocytes are the commonest glioma.

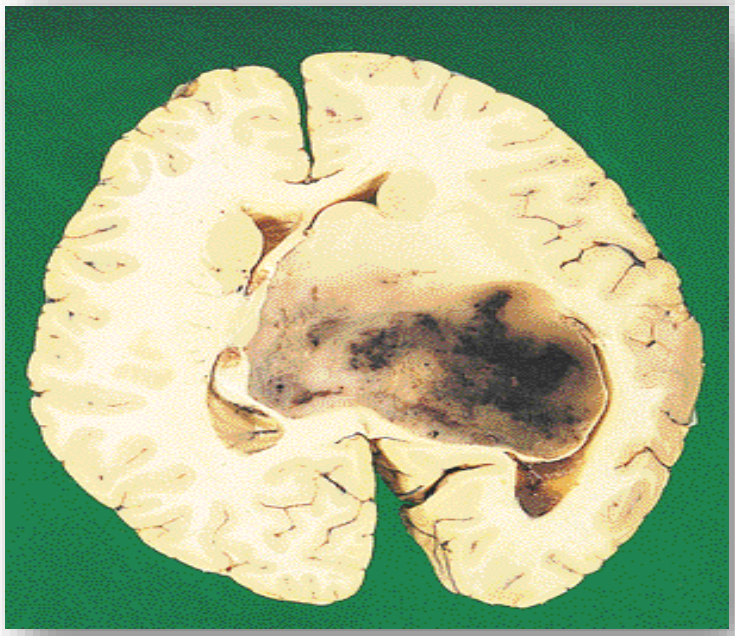
Site:

- Cerebellum of children.
- Cerebrum of adults.

N/E:

- Soft grey mass with ill-defined outline. The cut surface shows areas of cystic degeneration.
- In high grade forms it shows necrosis and hemorrhages.





Gliomas
Astrocytomas

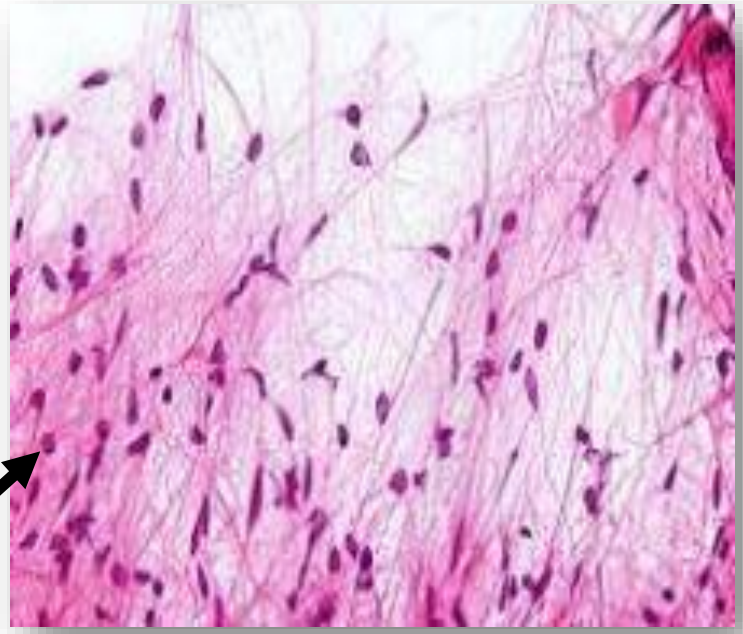
M/E:

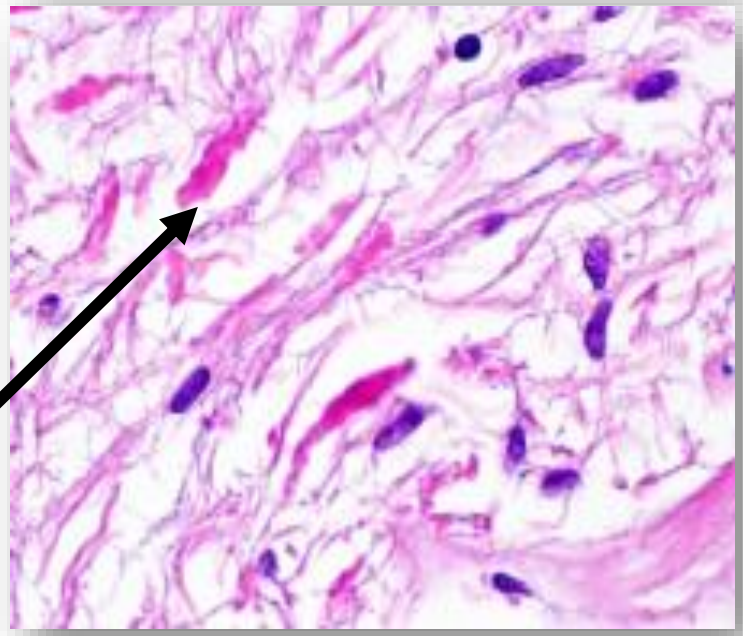
- Neoplastic Astrocytes, branched cells with fibrillary background it may be of variable grades of differentiation.

1) Localized astrocytomas:

Pilocytic astrocytoma ---grade I

- Mildly cellular, formed of mature astrocytes within excess fibrillary back ground, cells are bipolar with stroma of eosinophilic elongated and coma shaped fibers (Rosenthal fibers).



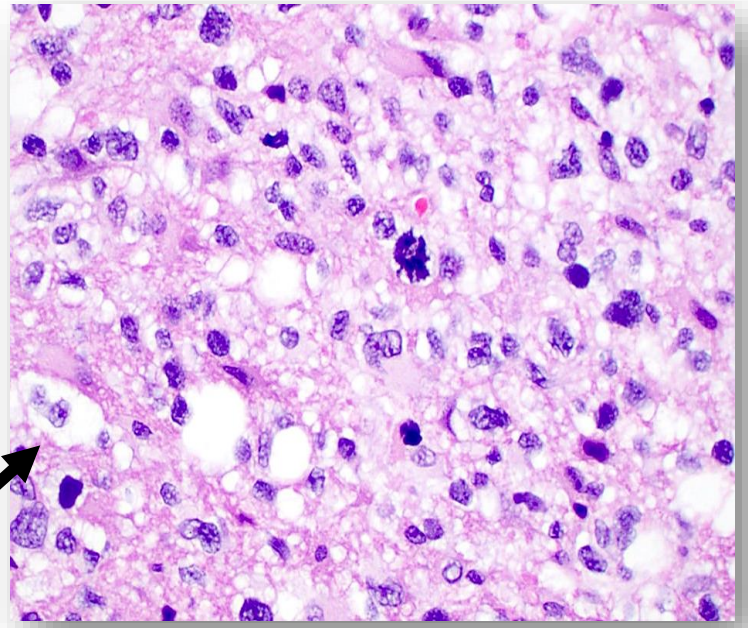


Gliomas
Astrocytomas

2) Diffuse astrocytomas:

a) Diffuse fibrillary astrocytoma ---grade II:

- Hypercellular, formed of pleomorphic astrocytes within excess fibrillary background. A subtype of Grade II diffuse astrocytoma show Large astrocytes with excess esinophilic cytoplasm and eccentric nuclei ; called gemistocytic astrocytoma.

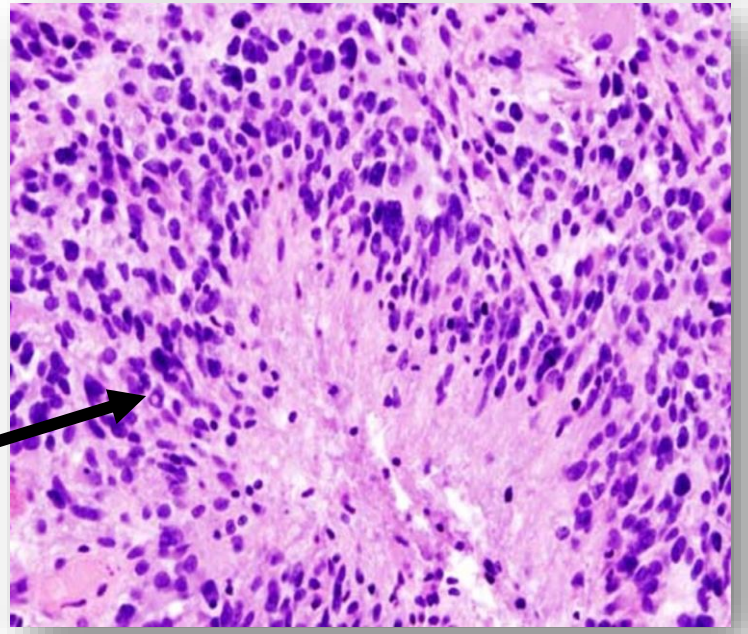


b) Anaplastic astrocytoma---- grade III:

- Formed of pleomorphic less mature astrocytes with excess mitosis without necrosis

c) Glioblastoma Multiforme -----grade IV:

- Formed of primitive astrocytes with marked pleomorphism, Giant cells, mitosis, necrosis (palisaded), vascular endothelial proliferation (glomeruloid).



Now….Answer this

Match the following astrocytoma grade with microscopic feature:

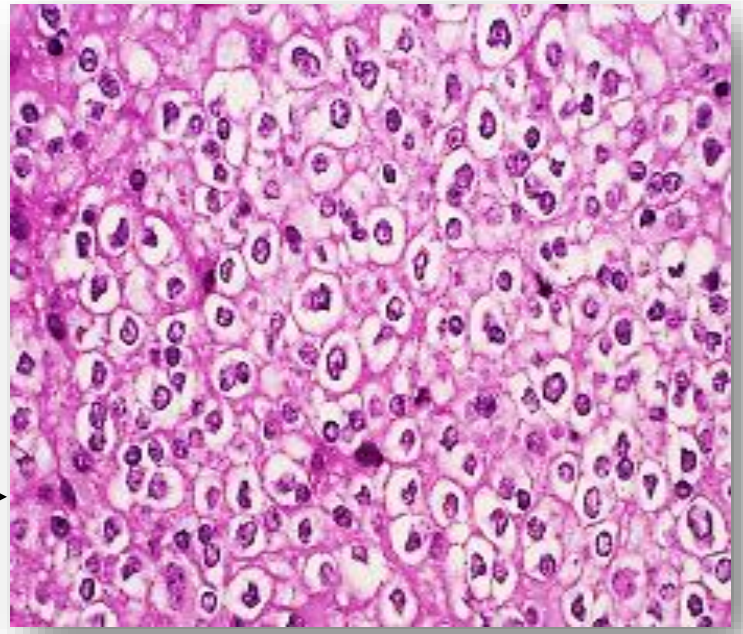
1. GII diffuse astrocytoma
2. GIII anaplastic
3. Glioblastoma

a. perivascular rosettes
b. Hypercellularity & pleomorphism only
c. Pleomorphism & mitosis
d. Vascularity & necrosis
e. Psamoma bodies

Gliomas

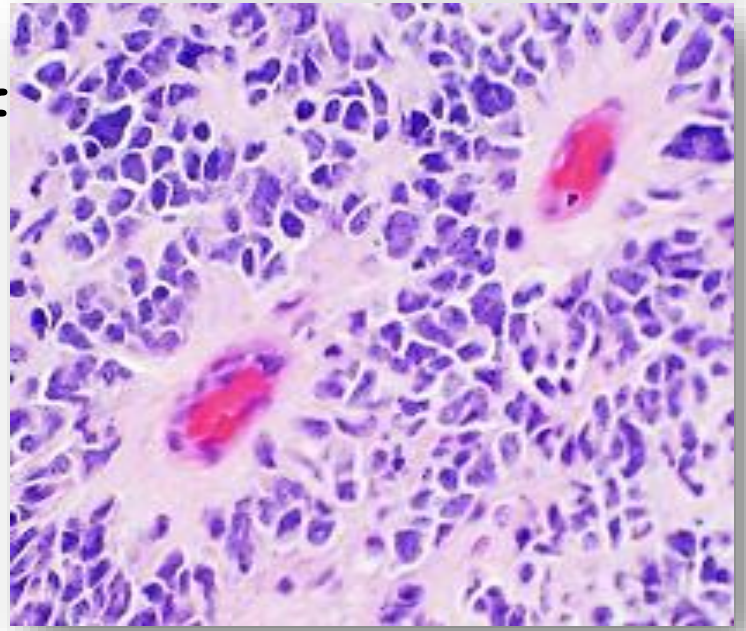
Oligodendroglioma

From oligodendroglia cells of cerebrum.
Middle age.
N/E: pink, Firm with cyst formations and calcification.
M/E: Rounded cells, with uniform round nuclei and clear cytoplasm with focal of calcification.



Ependymoma

From ependymal cells lining the ventricles, commonly the 4th ventricle and Lower part of the spinal cord
Children and young adults.
N/E: Fleshy vascular mass with calcification.
M/E: Elongated cells arranged perivascular in pseudorosettes.



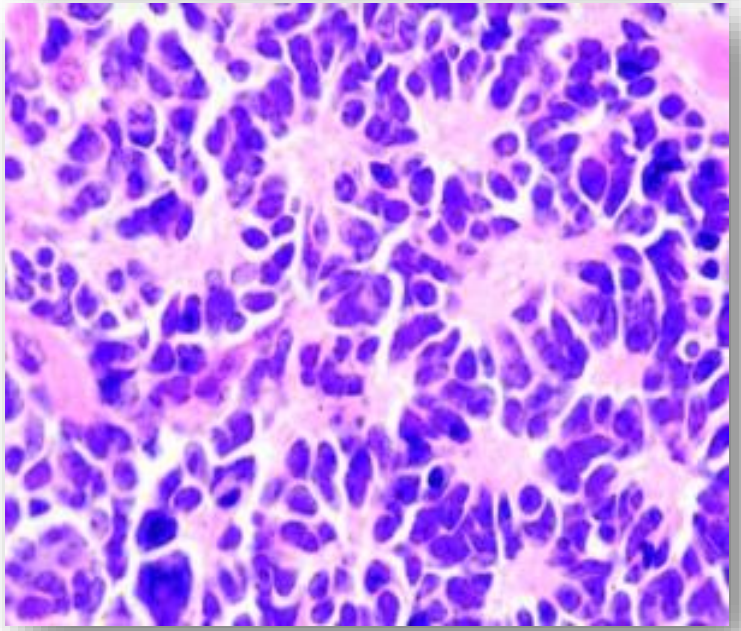
Embryonal tumors

Medulloblastoma

- Common childhood brain tumor
- At the roof of 4th ventricle

N/E: Fleshy soft grey mass projections in the 4th ventricle may penetrate the brain to reach the subarachnoid space.

M/E: Small dark stained cells arranged in rosettes.

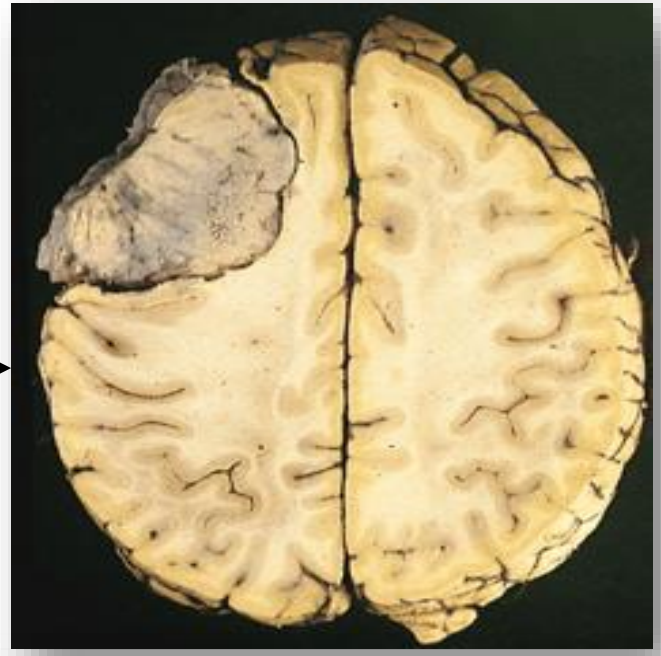


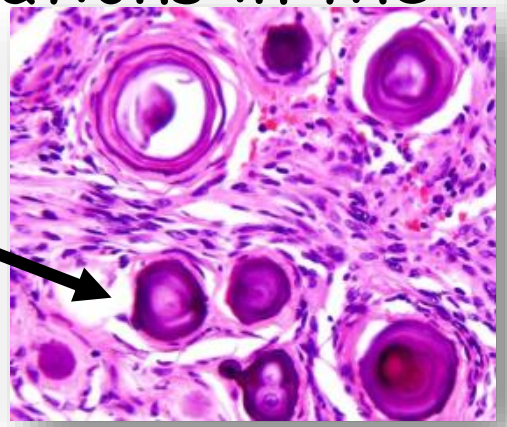
Tumors of Meninges

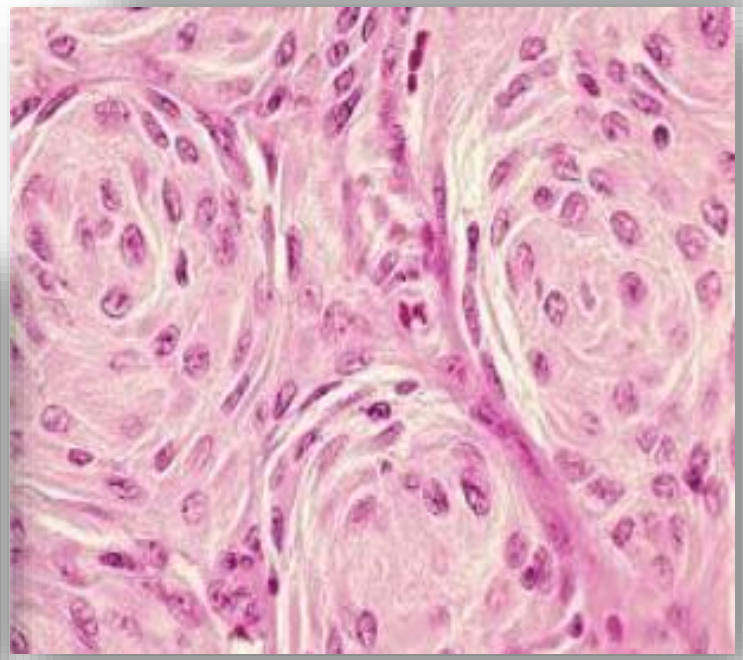
Meningioma

-In adults common in females.
-Originates from the endothelial cells of the arachnoid villi
N/E: Rounded firm capsulated tumor attached externally to the dura and imbedded in the brain tissue internally.- Cut surface: greyish white and often show whorly appearance.
M/E: Formed of spindle shaped cells arranged in concentric layers with calcifications in the center (Psammoma bodies).

Meningioma may turn malignant.







Tumors of peripheral nerves

Schwannoma

-It is a benign tumor of cranial and spinal nerves, originate from schwann cells which cover the peripheral nerves.

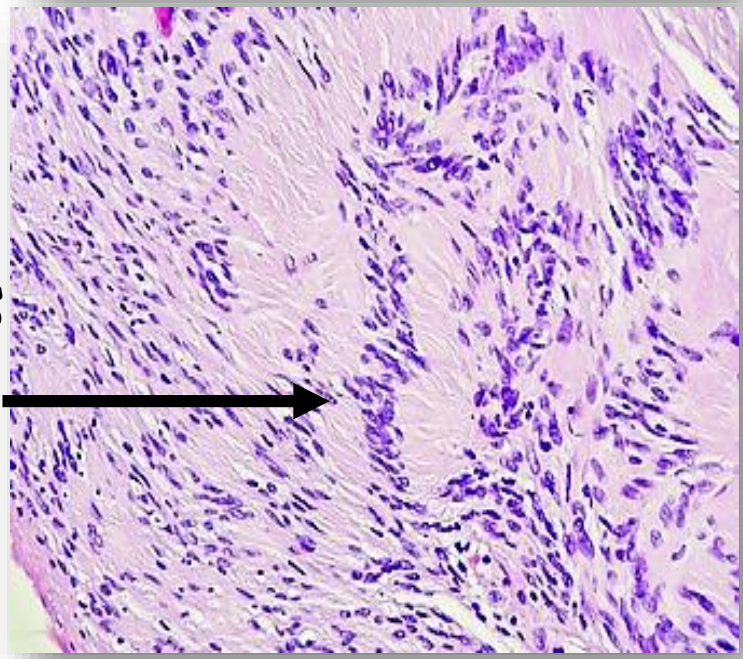
- Age: 50-60 years.

N/E: Acoustic neuroma of 8th cranial nerve at the base of the brain (cerebello- pontine angle)

Solitary mass, capsulated, firm round or fusiform with the related nerve at one side

Cut surface is grey white and may show cysts

M/E: Spindles shaped cells arranged in bundles with rod- shaped nuclei side by side in palisade manner with reticular and collagen fibers in between.



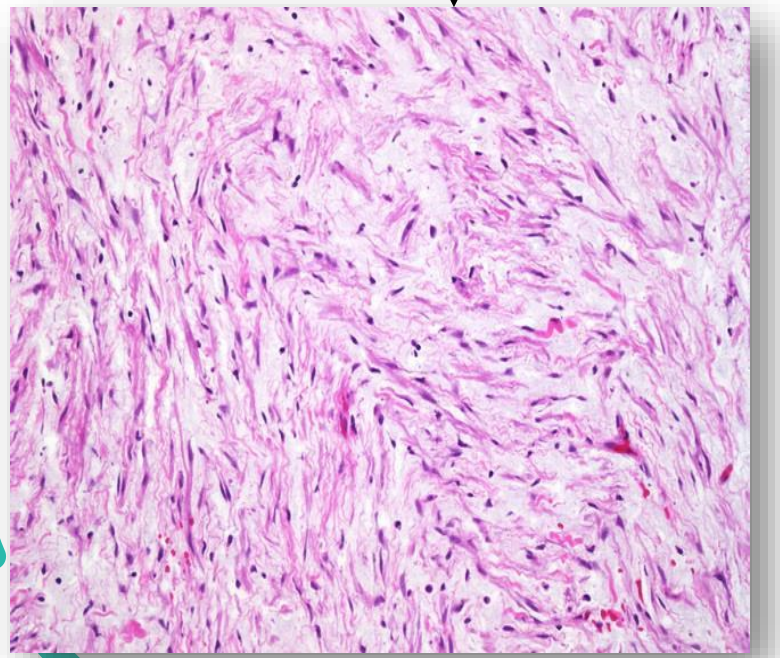
Tumors of peripheral nerves

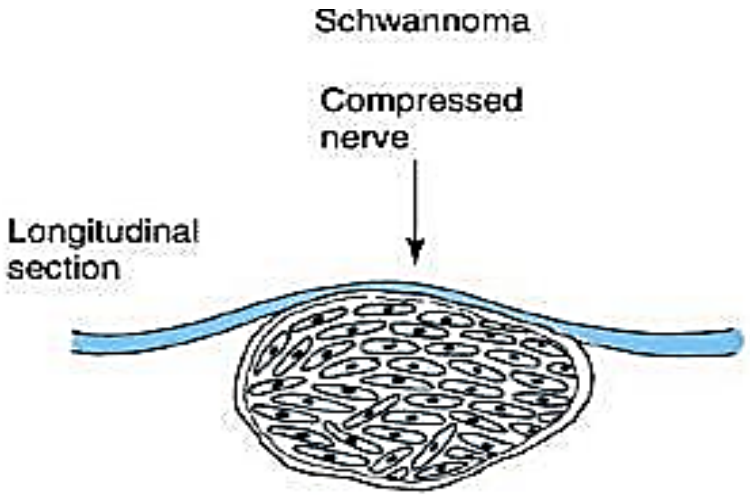
Neurofibroma

N/E: Fusiform mass through which the nerve pass Firm grey uncapsulated.

M/E: Spindle shaped cells in bindles with fibrous stroma and neurofibres.

Neurofibroma





- Tumor encapsulated
- Separable from nerve of origin
- Composed of Schwann cells

- Tumor not encapsulated—represents expanded nerve
- Composed of mixture of Schwann cells and fibroblasts and contains axons

Tumors of peripheral nerves

Neurofibroma

Multiple neurofibromatosis. (Von-Reckling-Hausen disease).

- Hereditary autosomal dominant hamartoma.
- Multiple neurofibromas of cutaneous nerves.
- Cafe au lait skin patches of skin hyperpigmentation.
- Localized or diffuse overgrowth of fibrous tissue of overlying skin (Elephantiasis neuromatosa).

Prognosis:

- Malignant transformation is common than in schwannoma. (10%)

Metastatic tumors

The most common malignant tumor in the brain representing 30% of brain tumors.

- Majority are carcinomas.
- Occur mostly in older people.
- They reach the C.N.S. through arteries or vertebral system of veins.
- Common sources: carcinomas of lungs, breast and kidney

N/E: Multiple nodules of variable size in the cerebrum at junction of grey and white matter surrounded by oedema, show hemorrhage, necrosis and cyst formation

M/E: As primary tumor and in relation to blood vessels

Effect of intracranial tumors

Local effects:

- Compression and destruction of the affected site lead to neurologic deficit such as hemiplegia.
- Hydrocephalous.
- Increased intracranial tension caused by increased intracranial contents by:
  - Tumor mass
  - Cerebral oedema due to compression of the veins by tumour obstruction of C.S.F. pathway.

Manifestations:

- Headache
- Papilloedma (blurring of vision) oedema of optic disc due to compression of retinal veins.
- Brain herniation.

Now….Answer this

Match the following intracranial tumor & feature:

1. Meningioma
2. Medulloblastoma
3. Oligodendroglioma

a. Calcification
b. Localized tumor
c. arise in the 4 th ventricle
d. Nerve tumor
e. Psammoma bodies

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- Hemopoietic tumors.
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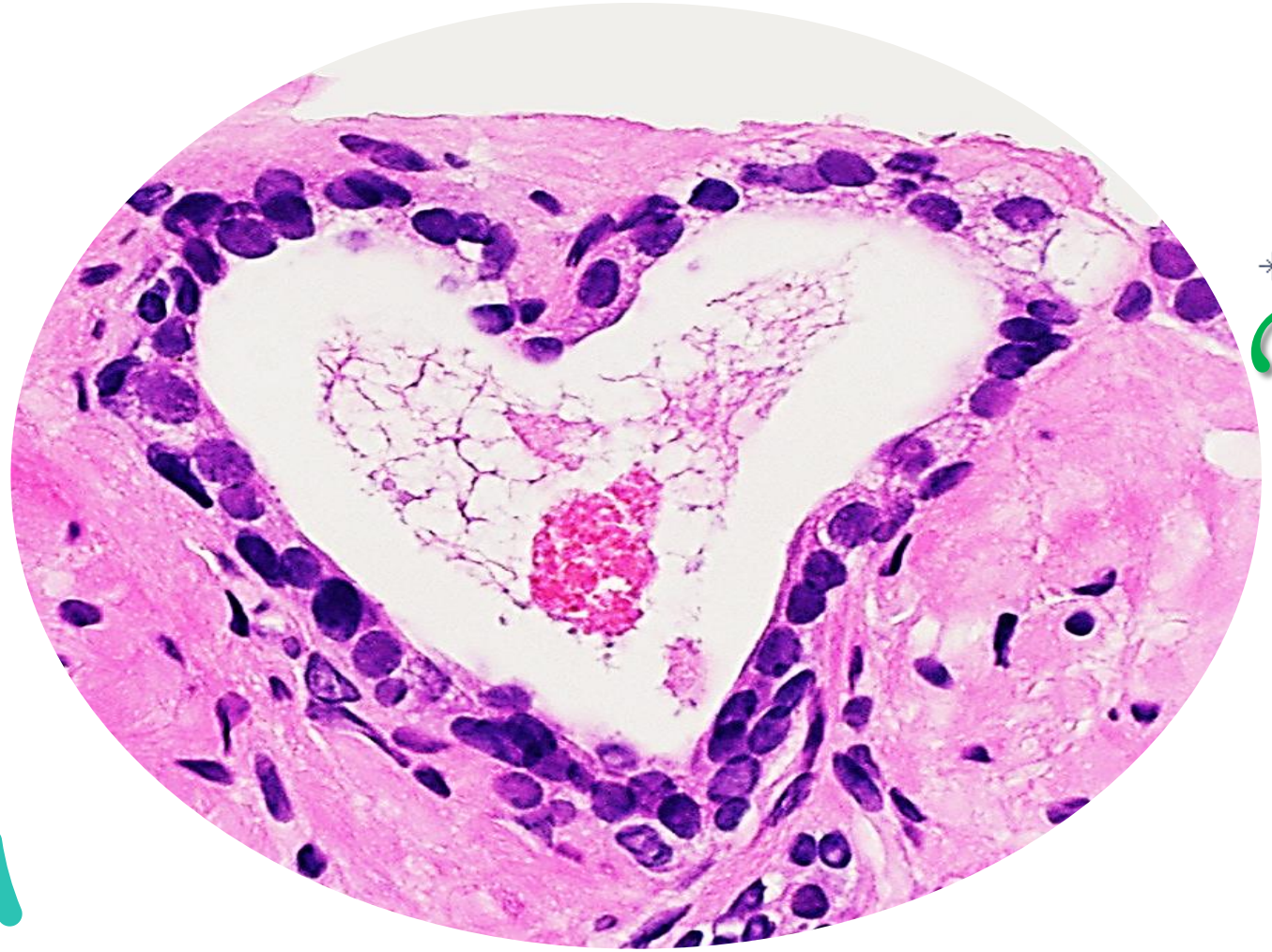
  - Lymphoma

Discussion & Feedback

References & recommended readings

1. Robbins & Cotran Pathologic Basis of Disease, (Robbins Pathology), 2018 ISBN: 978-0-323-35317-5, Edition: 10th
2. Webpath: https://webpath.med.utah.edu/webpath.html
   https://www.pathologyatlas.ro/index.php



Thank you