BHARATHIDASAN UNIVERSITY

Program: M.Sc., Biomedical Science

Course Title : Neurobiology

Brain Cancers

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Brain Cancers

1. Cancer are typically named for the tissues from which uncontrolled growth.

2. Some cancer cell can migrate or spread to other sites in the body by metastasis called metastasized cancer or malignant (evil in nature or malevolent) cancer.

Neural cells do not divide, there are terminally differentiated, undivided cells. So there are no neural cancers.

One can get cancers, in the cranium where the brain is, that is called brain cancers.

It is not cancer of neuron.

There are two possibilities:

1. Metastasized Cancer from peripheral organs
2. Primary intercranial tumor

Metastasized Cancer from peripheral organs

The brain is also vulnerable to metastases from malignant tumors of the lung, breast, kidney, and other tissues.

one can get brain cancer from metastasized tumor cells so they tend to invade the brain, where they stay in particular region of brains, is called brain cancer.

How do they get past not only the dura but also blood brain barrier.? Real truth is we do not know how they get past into brain.

But one prediction is malignant cancer cells continuously attach Blood brain barrier, some tiny portion of malignant cell get through off and land in brain.

Then one can get metastasized cancer in cranium

- Effect of lungs and breast cancer are not predictable by what type of cell it is.
- But predictable only by where it lands in brain.
- Basically the landing is random, it can land various places in brain, all of sudden patient will get symptoms that tell doctor that part of the brain might have problem, that problem is going to give a tumor.

Primary intercranial tumor

- This type of cancers arises from cell type found within cranium, and inside the pia mater.
- These are
  1. Tumor that origin of meninges (Meningioma, or **meningeal tumor)**
  2. Tumor that origin of Glia (astrocytomas, ependymal **tumors**, Oligodendroglioma , and primitive neuroectodermal **tumors)**
  3. Pituitary adenoma
  4. Schwannoma
  5. Pinealoma
  6. Tumor of progenitor cells (prevalent only in children)

  These may be removable which case these are survivable.

  Primary intercranial tumors do not metastasize to sites outside of the CNS.

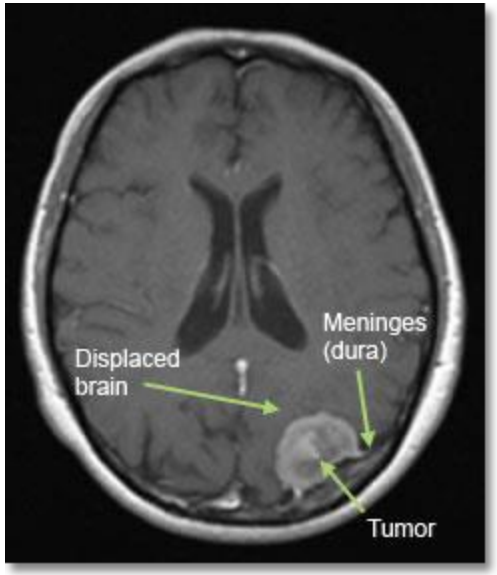
  As we have unforgiving cranial vault that cannot expand the tissue in the cranium, the benign cancer in brain can kill the person.

  Has to be removed or treat using radiofrequency leisuring.

meningeal tumor

A meningioma is a tumor that arises from the meninges that covers the brain and spine.

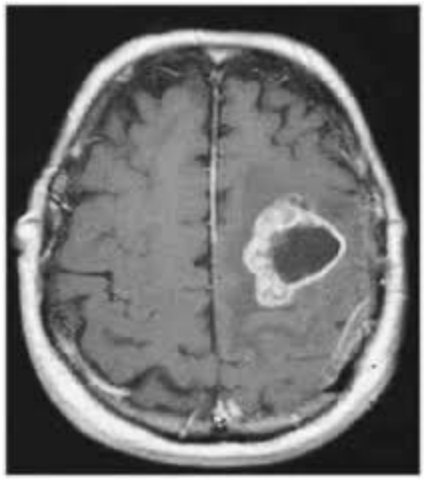
Meningiomas grow on the surface of the brain (or spinal cord), and therefore push the brain away rather than growing from within it. Most are considered “benign” because they are slow-growing with low potential to spread.



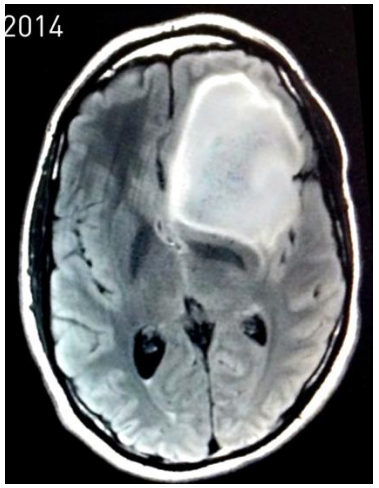
MRI image showing a typical meningioma tumor

Tumor that origin of Glia (Glioblastoma)

- Multiforme,
- Glioblastoma multiforme (GBM), fast-growing glioma that develops from glial cells (astrocytes and oligodendrocytes)
- is an aggressive astrocytoma that spread within brain, survival is roughly a year.



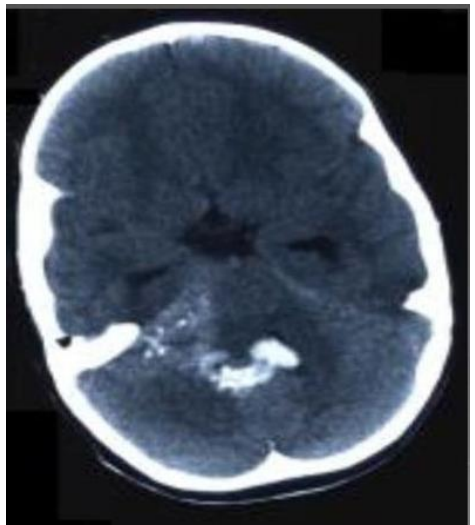
MRI image showing a typical glioblastoma multiforme



astrocytoma

ependymal tumors

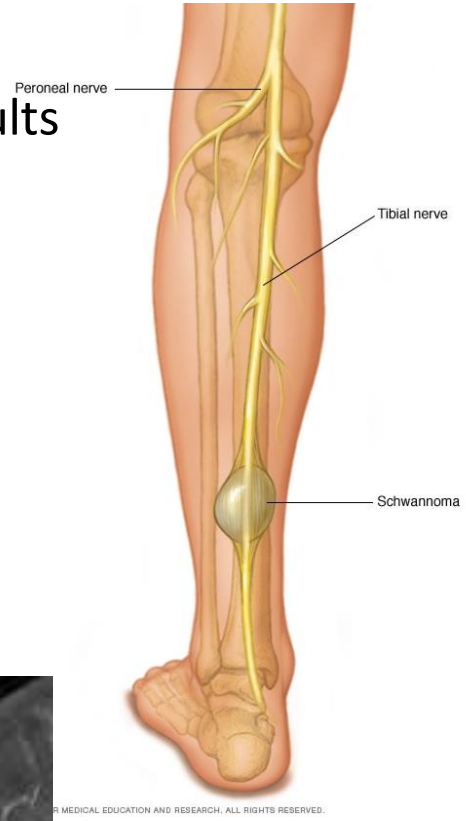
- Arise from ependymal lining of ventricles and central canal of spinal cord
- One of the intracranial gliomas, prevalent only in children.
- Usually well circumscribed and benign, commonly arises in the floor of the 4^{th} ventricle
- Has potential to spread through CSF to spinal cord, a process known as seeding.



Schwannoma

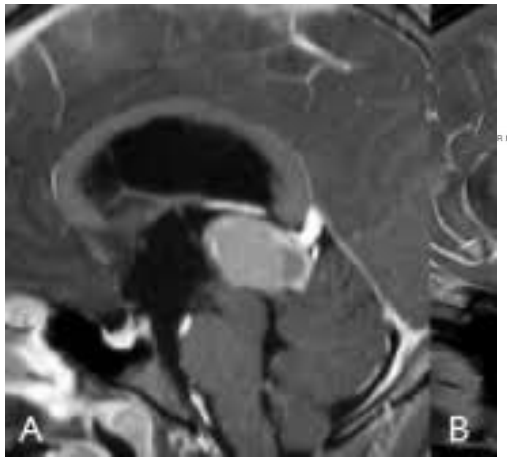
- a type of nerve tumor of the nerve sheath.
- grows slowly
- most common type of benign peripheral nerve tumor in adults
- can occur anywhere in your body, at any age
- typically comes from a single bundle (fascicle)

within the main nerve and displaces the rest of the nerve.



Pinealoma

tumor of the pineal gland that produces melatonin



Paraneoplastic diseases

- a tumor, located outside the nervous system, releases a substance that negatively affects neural function or elicits an autoimmune reaction that in turn negatively affects neural function.
- An example of paraneoplastic disease is Cushing's syndrome
  - Cushing disease is caused by an adrenocorticotropic (ACTH) secreting pituitary adenoma
  - This in turn causes excess cortisol release.
  - Cushing's syndrome is a condition marked by excess levels of cortisol, most commonly due to medications such as prednisone.
  - Cushing's syndrome typically have upper body obesity, excess hair growth, hypertension, and increased thirst and micturition reflective of impaired fluid homeostasis.
- An example of paraneoplastic disease is Lambert-Eaton syndrome
  - is an example of an autoimmune paraneoplastic disease in which antibodies are formed in response to a small cell lung carcinoma.
  - Antibodies impair synaptic transmission, and the most affected type of synapse is that between motoneurons and skeletal muscles.
  - As a result, patients with Lambert- Eaton syndrome are weak.
- Anti-NMDA receptor encephalitis discovered in 2007, can be paraneoplastic syndrome

pituitary adenomas

- slow-growing and benign, which means they are not cancer and do not spread to other parts of the body.
- However, as they grow big they can put pressure on nearby structures, such as the nerves that connect the eyes to the brain, and cause symptoms.
  - Microadenomas (smaller than 1 cm size)
  - Macroadenomas (bigger than 1 cm size)