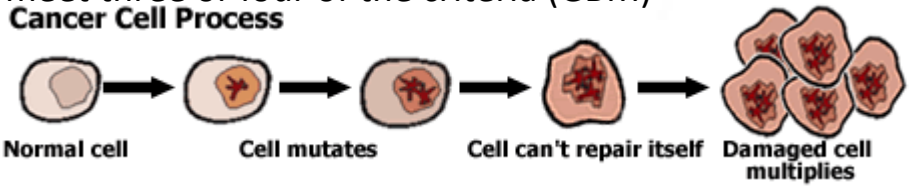
Neurooncology

Crash course

Malignancy grading(Benign=>Malignant)

WHO(St Anne-Mayo based) tumor grading

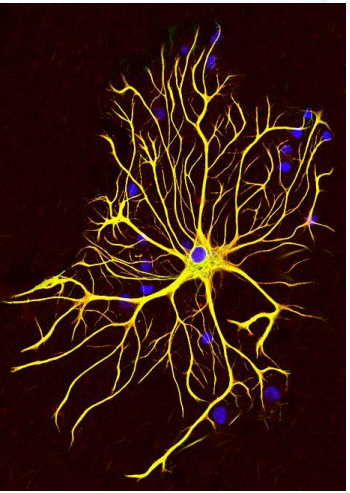
- The St Anne-Mayo grading system also is used to grade astrocytomas; however, this system uses four morphologic criteria to assign a grade:
  - a) *nuclear atypia*,
    b) *mitosis*,
    c) *endothelial proliferation*-'piled-up' endothelial cells. NOT hypervascularity
  - d) *necrosis*.
- The WHO grade has four categories of tumors:
  - **Grade 1** tumors do not meet any of the criteria(meningioma, adenoma).
  - **Grade 2** tumors meet one criterion, usually nuclear atypia (pilocytic astrocytoma(low-grade)).
  - **Grade 3** tumors meet two criteria, usually nuclear atypia and mitosis(anaplastic astrocytomas).
  - **Grade 4** tumors meet three or four of the criteria (GBM)



WHO classification of nervous system tumors(by structure)

1. Tumors of neuroepithelial tissue
2. Tumors of cranial and paraspinal nerves
3. Tumors of the meninges
4. Lymphomas and hematopoietic neoplasms
5. Germ cell tumors
6. Tumors of the sellar region
7. Metastatic tumors

Tumors of neuroepithelial tissue



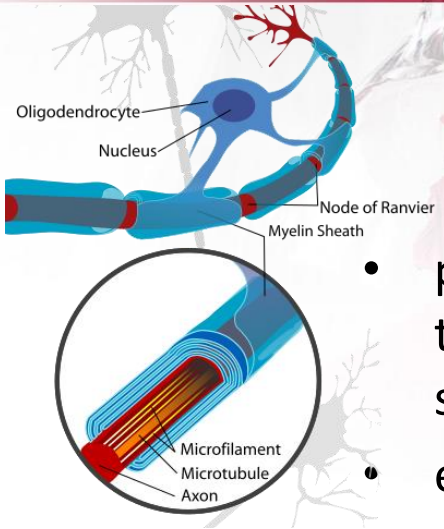
Astrocytes

- blood–brain barrier formation
- provision to the nervous tissue
- maintenance of ion balance
- repair and scarring process of the brain and spinal cord following traumatic injuries

Astrocytoma

- Diffuse/circumscribed astrocytoma(WHO I)
- Anaplastic astrocytoma(WHO III)
- Glioblastoma (WHO IV)

Tumors of neuroepithelial tissue



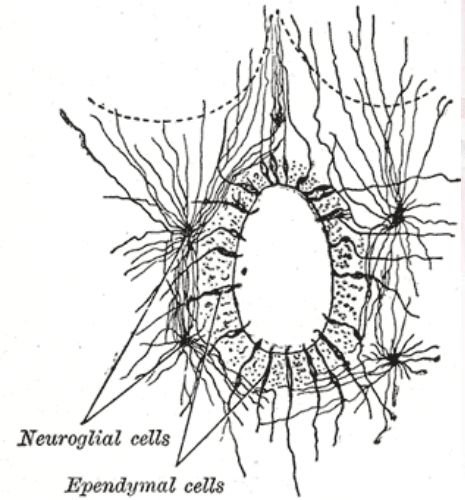
Oligodendrocyte

- provides support and insulation to axons in the central nervous system(myelinisation)
- equivalent to the function performed by Schwann cells in the peripheral nervous system

Oligodendroglioma

- Oligodendroglioma (WHO I)
- Anaplastic oligodendroglioma (WHO III)
- Oligoastrocytoma(WHO II-III)

Tumors of neuroepithelial tissue



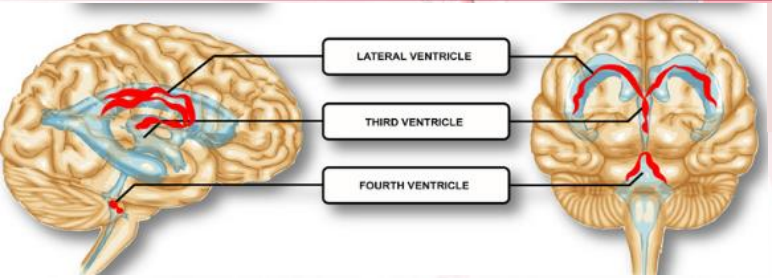
Ependymocytes

- play an important role in the production and regulation of CSF. Their apical surfaces are covered in a layer of cilia, which circulate CSF around the CNS.
- act as reservoir cells in the forebrain, which can be activated after stroke and as in vivo and in vitro stem cells in the spinal cord

Ependymoma

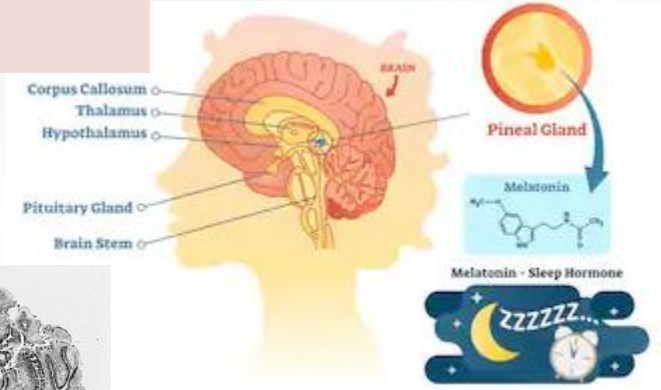
- Ependymoma (WHO II)
- Anaplastic (malignant) ependymoma (WHO III)
- myxopapillary ependymoma: filum terminale only (WHO I)
- subependymoma (WHO I)

Tumors of neuroepithelial tissue



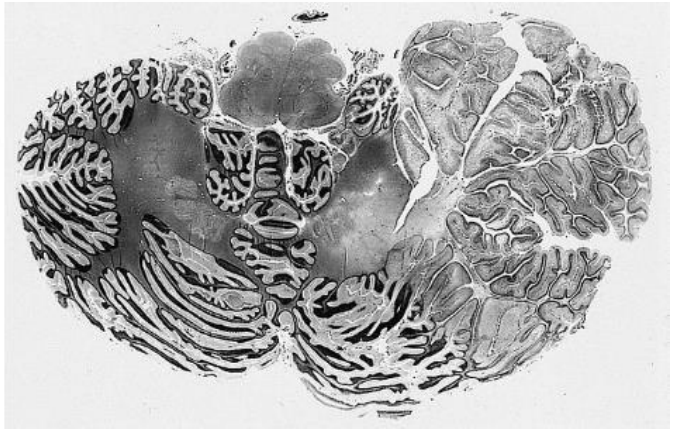
Mixed neuronal-glial tumor

- gangliocytoma
- ganglioglioma



Choroid plexus tumors

- choroid plexus papilloma



Pineal parenchymal tumors

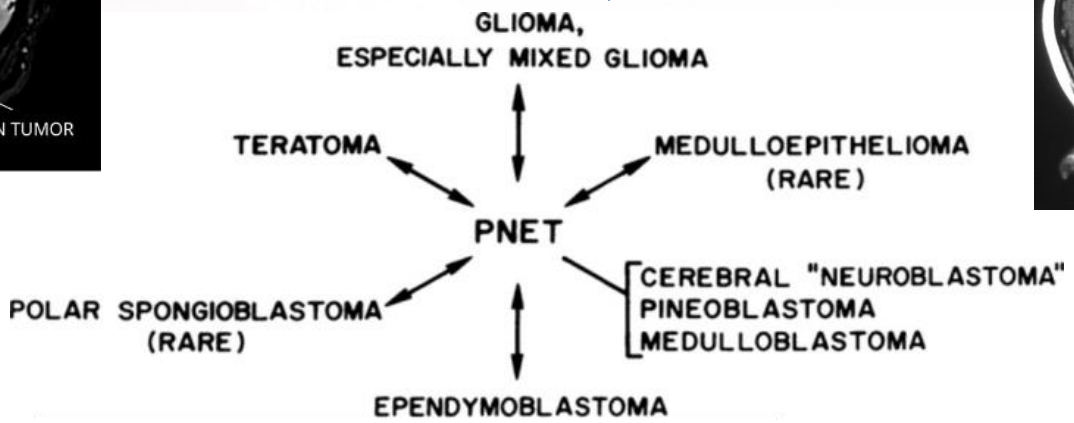
- pineocytoma (pinealoma)
- pineoblastoma

Tumors of neuroepithelial tissue

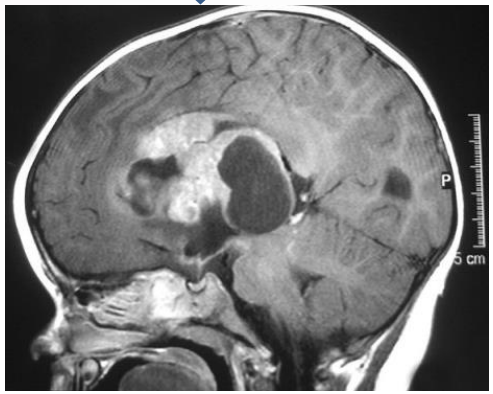
Embryonal tumors

Medulloblastoma

PNET (primitive neuroectodermal tumors)



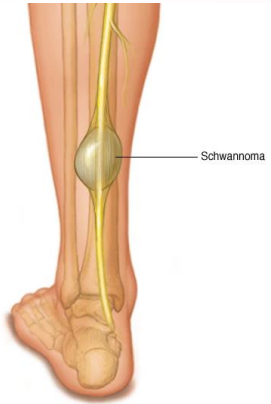
Atypical teratoid/rhabdoid tumor (AT/RT)

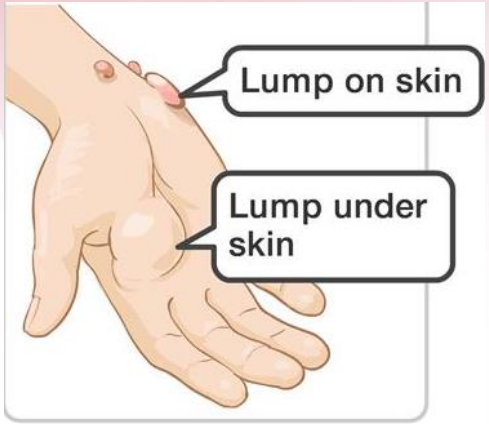


TUMORS OF CRANIAL, SPINAL AND PERIPHERAL NERVES

Schwannoma

- the most common type of benign tumor of the peripheral nerve sheath in adults





- nerve tumor that forms soft bumps on or under the skin.
- can develop within a major or minor nerve anywhere in the body
- usually benign

Neurofibroma

Intraneural perineurioma

- is a rare benign tumor within the sheath of a single nerve

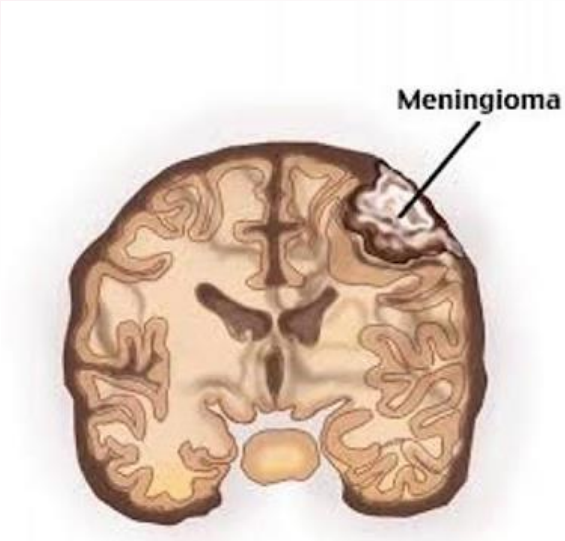
Malignant peripheral nerve sheath tumor (MPNST) – last but not least.

TUMORS OF THE MENINGES

Meningothelial cells

- cellular components of the meninges enveloping the brain.
- learance of waste products from the CSF
- nvolved in immunological processes in the brain by secretion of pro-inflammatory cytokines

Meningioma



TUMORS OF THE……

Mesenchymal, non-meningothelial tumors

- lipoma,
- angiolipoma
- hiberneuroma
- liposarcoma (intracranial)
- solitary fibrous tumor
- fibrosarcoma
- malignant fibrous histiocytoma
- leiomyoma
- hemangiopericytoma
- anaplastic hemangiopericytoma
- angiosarcoma
- Kaposi sarcoma
- Ewing sarcoma – PNET
- eiomyosarcoma
- rhabdomyoma
- rhabdomyosarcoma
- chondroma
- chondrosarcoma
- osteoma
- osteosarcoma
- osteochondroma
- hemangioma
- epithelioid
- hemangioendothelioma

*and there even more…..

Even more tumors to keep in mind…

LYMPHOMAS AND HEMATOPOIETIC NEOPLASMS

- Malignant lymphoma (primary CNS lymphoma)
- Plasmacytoma
- Granulocytic sarcoma

GERM CELL TUMORS

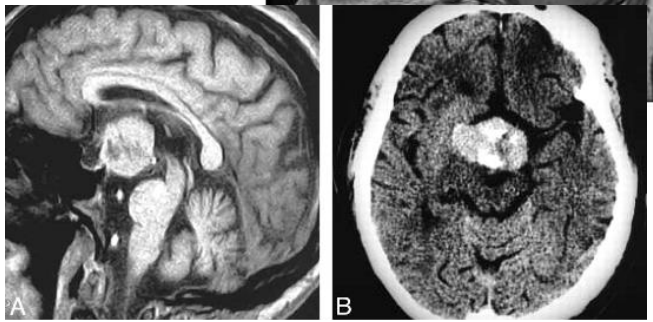
- Germinoma
- Embryonal carcinoma
- Endodermal sinus tumor (EST) (yolk sac tumor)
- Choriocarcinoma
- Teratoma (from all 3 germ-cell layers)
- Mixed germ cell tumors

At last(but not least(and actually, not last)): TUMORS OF THE SELLAR REGION

1. Craniopharyngioma

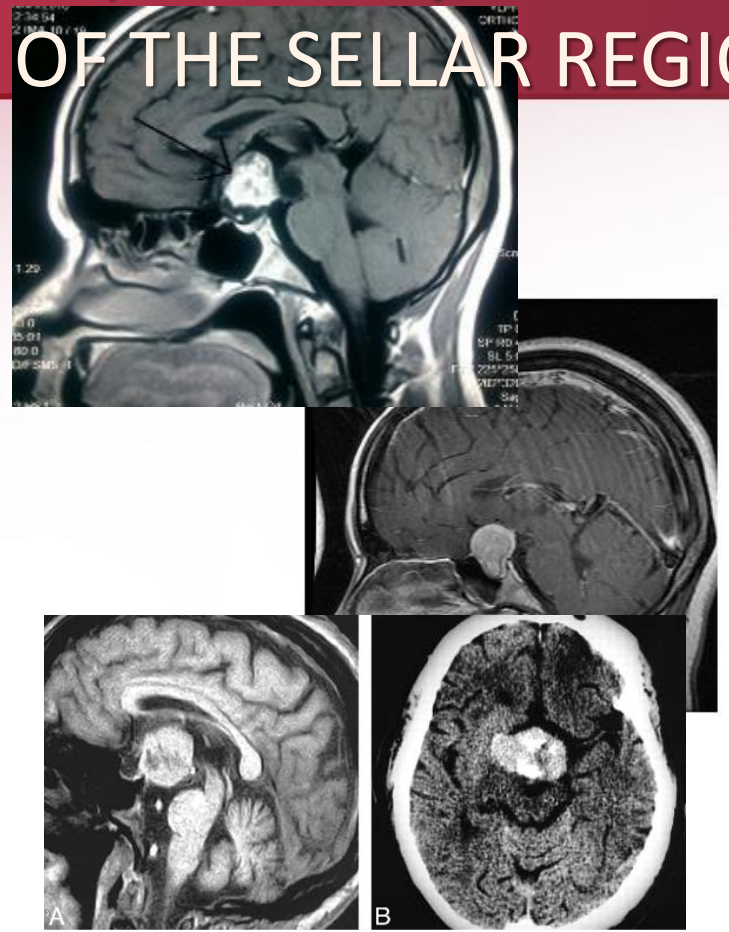
2. Adenohypophyseal cells pituitary adenoma

3. Neurohypophysis and infundibulum tumors (granular cell tumor)

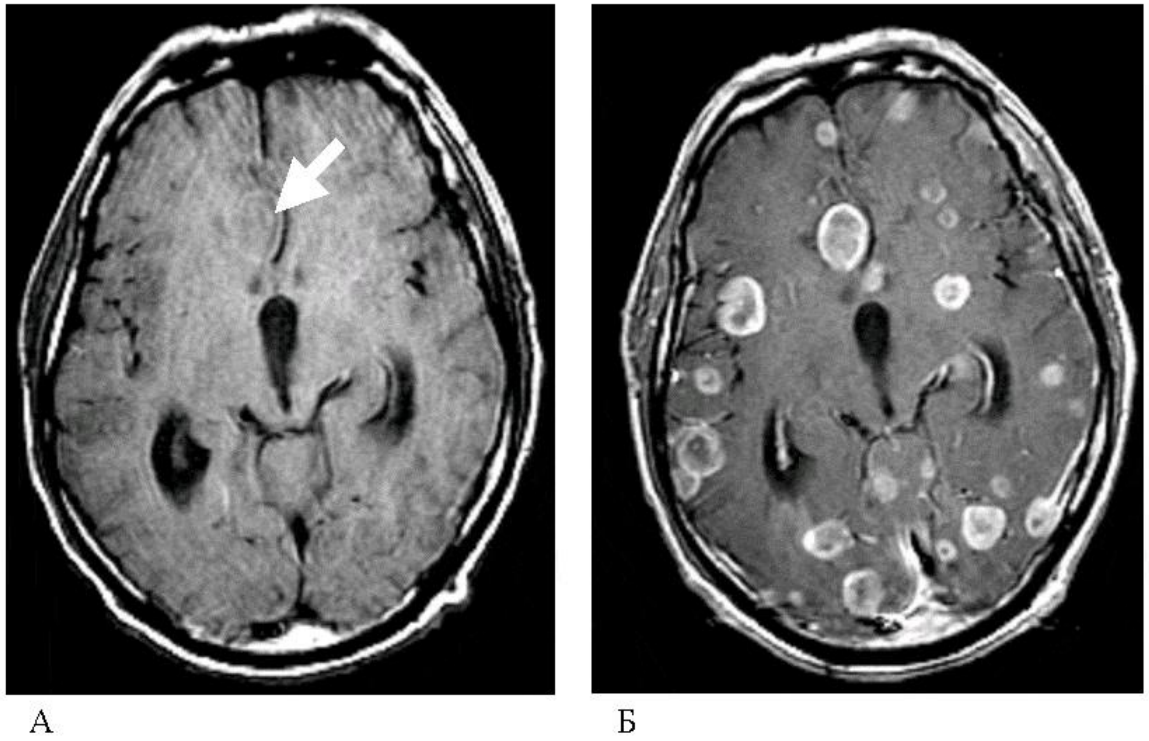


At last(but not least(and really, not last)): TUMORS OF THE SELLAR REGION

FLAT PEG: **F**SH (Follicle Stimulating Hormone), **L**H (Leutinizing Hormone), **A**CTH (Adrenocorticotropic Hormone), **T**SH (Thyroid Stimulating Hormone)(also flat hormones are trophic), **P**rolactin, **E**ndophins, and **G**rowth Hormones(peg gormones are direct)



Almost there: METASTASIS



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Symptoms:

Most brain tumors present with:

- Progressive neurologic deficit (68%): usually motor weakness (45%).
- Headache: was a presenting symptom in 54%.
- Seizures in 26%. Often focal in onset (due to cortical irritation in the area of the tumor), may generalize secondarily.

Symptoms:
Neurologic deficit

1. frontal lobe: abulia, dementia, personality changes. Often nonlateralizing, but apraxia, hemiparesis or dysphasia (with dominant hemisphere involvement) may occur
2. temporal lobe: auditory or olfactory hallucinations, déja vu, memory impairment . Contralateral superior quadrantanopsia may be detected on visual field testing
3. parietal lobe: contralateral motor or sensory impairment, homonymous hemianopsia. Agnosias (with dominant hemisphere involvement) and apraxias may occur; see Clinical syndromes of parietal lobe disease
4. occipital lobe: contralateral visual field deficits, alexia (especially with corpus callosum involvement with infiltrating tumors)
5. posterior fossa: cranial nerve deficits, ataxia (truncal or appendicular)

Symptoms: Headache

1. increased intracranial pressure (ICP)
2. invasion or compression of pain sensitive structures:
   (a) dura (b) blood vessels (c) periosteum
3. secondary to difficulty with vision
4. extreme hypertension resulting from increased ICP (part of Cushing's triad)
5. psychogenic: due to stress from loss of functional capacity (e.g. deteriorating job performance)

Symptoms: Seizures

Look answer in “neurologic deficit/symptoms” slide.

Or neurology course…

Treatment

Surgery

- Microscopic surgery
- Endoscopic surgery
- Robotic surgery
- (mostly stereotactic)
- Stereotactic surgery

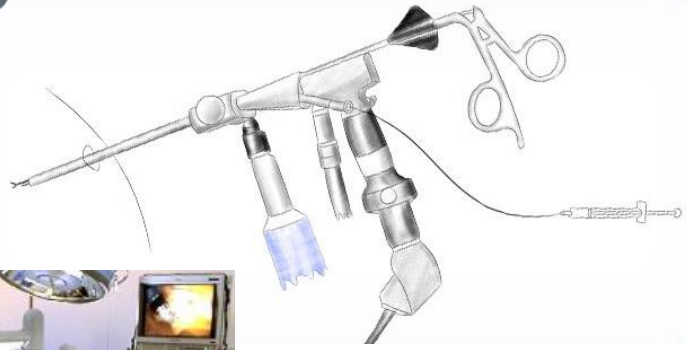
Radiosurgery

- Gamma-knife (first 1968)
- Lieneac(also – cyber-knife)
- Heavy charged particle radiosurgery (proton beam)

Chemotherapy and medications

- Steroids
- Anticonvulsants
- Chemoterapeutic agents
- Immunotherapy

Treatment
Surgery



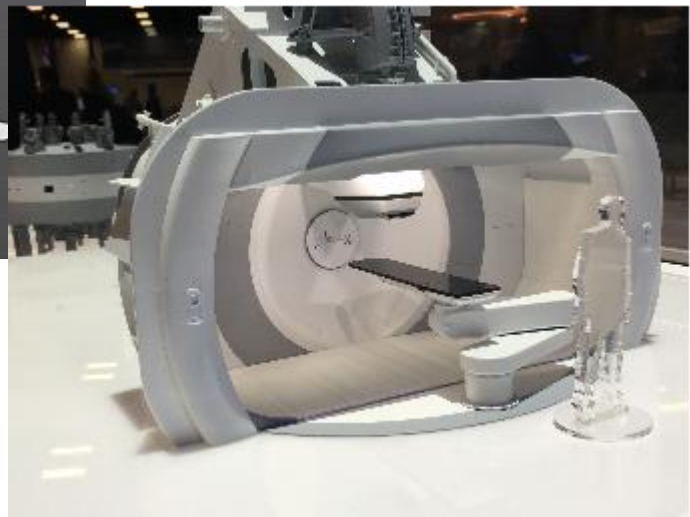
- Microscopic surgery
- Endoscopic surgery
- Robotic surgery

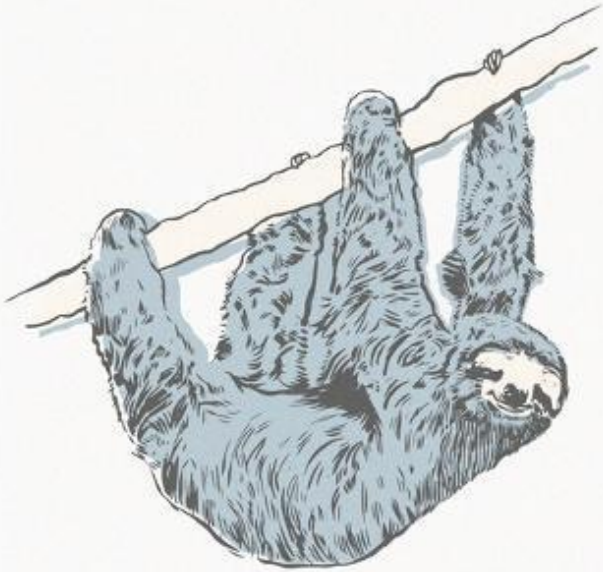
(mostly stereotactic)

- Stereotactic surgery

Treatment Radiosurgery

- Gamma-knife (first radiosurgical apparat 1968) Source of radiation - 192 cobalt-60 sources.
- Lieneac(also – cyber-knife) generate x-rays by accelerating electrons and directing them to strike a target from different angles.
- Heavy charged particle radiosurgery (proton beam). Uses protons or helium ions and Bragg effect.





HANG IN
THERE