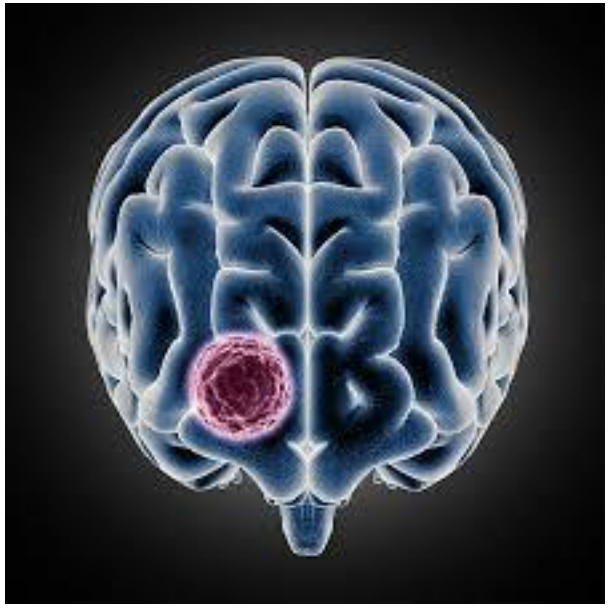
Brain Tumors

5TH YEAR MEDICAL STUDENTS



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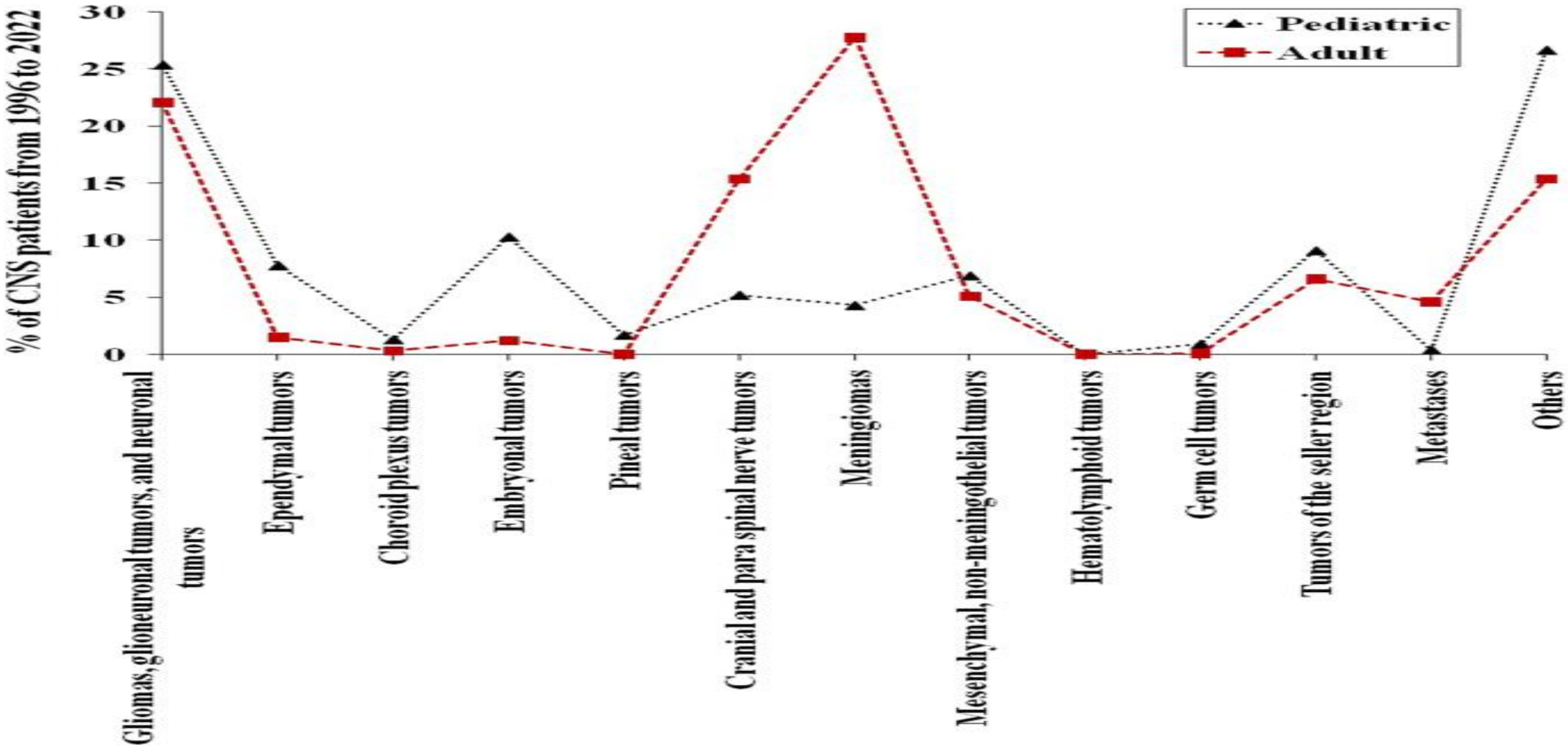
INTRODUCTION

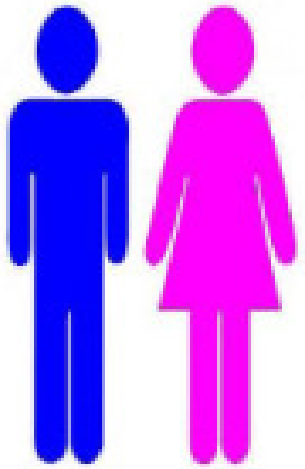
- Brain tumors :either primary or secondary(Mets)
- Primary tumors of the central nervous system (CNS) are a heterogeneous group of neoplasms that include benign and malignant tumors.
- CNS tumors are recognized as one of the leading causes of death in children and adults . In a way, these tumors are the second leading cause of death in children and the third leading cause of death in adults.
- 1.9% of all cancers
- In 2019, the total number of deaths from brain cancer worldwide was 246,253

INCIDENCES &PREVALANCE



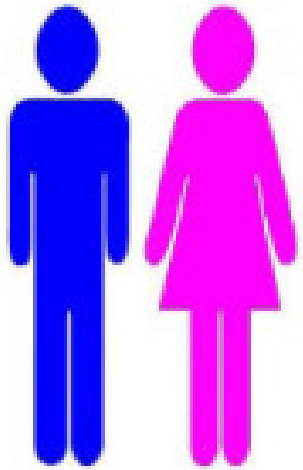
New cases

	Males		Females	
	Number	%	Number	%
Western Pacific Region	60748	32.4	59452	37.0
European Region	45744	24.4	37688	23.5
Region of the Americas	32446	17.3	27054	16.9
South-East Asia Region	23729	12.7	27054	16.9
Eastern Mediterranean Region	15779	8.4	10024	6.2
African Region	8461	4.5	6127	3.8
Global	187491	100.0	160501	100.0



Deaths

	Males		Females	
	Number	%	Number	%
Western Pacific Region	42433	30.6	33273	30.9
European Region	33385	24.1	25920	24.1
Region of the Americas	24749	17.9	19825	18.4
South-East Asia Region	20260	14.6	16658	15.5
Eastern Mediterranean Region	10582	7.6	6638	6.2
African Region	6792	4.9	4990	4.6
Global	138605	100.0	107648	100.0



- Incidence of malignant brain tumors in paediatric :(age-adjusted incidence of 3.55 per 100,000) while non-malignant brain and other CNS tumors are less common in this age group (age-adjusted incidence 2.60 per 100,000) .

- In adults:The majority of brain and other CNS tumors diagnosed in adults 20 + years old are non-malignant tumors (age-adjusted incidence of 22.38 per 100,000) while malignant brain and other CNS tumors are less common in this age group (age-adjusted incidence 8.5 per 100,000)
- Gender(M:F) 1.8:1

- Paediatric:15%

RISK FACTORS

- Despite decades of research on the etiology of brain and other CNS tumors, no risk factor accounting for a large proportion of cases has been identified.
- Single gene inherited disorders (~ 4% of childhood cases) and ionizing radiation are considered as well known risk factors.
- Some of the newest environmental risk factors to be studied in relation to risk for childhood and adolescent brain and other CNS tumors are birth weight and non-chromosomal structural birth defects.
- Immune Related Factors: Viruses, Allergy, and HLA

HEREDETARY SYNDROMES

- 5–10% have a family history of brain and CNS tumor

- There are numerous mendelian cancer syndromes that affect risk of brain and other CNS tumors, including neurofibromatosis types I and II, tuberous sclerosis, and Li Fraumeni syndrome
-
- Ancestry and Brain Tumor Risk(European)

CLASSIFICATION WHO 2021

- Aim: Prognosis &Management
- WHO CNS5 incorporates to a larger extent molecular genetics with clinical relevance, so this last edition comprises elements from both histopathology and molecular genetics giving rise to a somewhat mixed taxonomy .

The WHO CNS5 groups of tumours:

1. Gliomas, glioneuronal and neuronal tumours
2. Choroid plexus tumours
3. Embryonal tumours
4. Pineal tumours
5. Cranial and paraspinal nerve tumours
6. Meningiomas
7. Mesenchymal, non-meningothelial tumours involving the CNS
8. Melanocytic tumours
9. Haematolymphoid tumours involving the CNS
10. Germ cell tumours
11. Tumours of the sellar region
12. Metastases to the CNS
13. Genetic tumour syndromes involving the CNS

Tumour group	Types
Adult-type diffuse gliomas	- Astrocytoma, *IDH*-mutant - Oligodendroglioma, *IDH*-mutant and 1p/19q-codeleted - Glioblastoma, *IDH*-wildtype
Paediatric-type diffuse low-grade gliomas	- Diffuse astrocytoma, MYB- or MYBL1-altered - Angiocentric glioma - Polymorphous low-grade neuroepithelial tumour of the young - Diffuse low-grade glioma, MAPK pathway-altered
Paediatric-type diffuse high-grade gliomas	- Diffuse midline glioma, H3 K27-altered - Diffuse hemispheric glioma, H3 G34-mutant - Diffuse paediatric-type high-grade glioma, H3-wildtype and *IDH*-wildtype - Infant-type hemispheric glioma
Circumscribed astrocytic gliomas	- Pilocytic astrocytoma - High-grade astrocytoma with piloid features - Pleomorphic xanthoastrocytoma - Subependymal giant cell astrocytoma - Chordoid glioma - Astroblastoma, MN1-altered
Glioneuronal and neuronal tumours	- Ganglioglioma - Desmoplastic infantile ganglioglioma/desmoplastic infantile astrocytoma - Dysembryoplastic neuroepithelial tumour - Diffuse glioneuronal tumour with oligodendroglioma-like features and nuclear clusters - Papillary glioneuronal tumour - Rosette-forming glioneuronal tumour - Myxoid glioneuronal tumour - Diffuse leptomeningeal glioneuronal tumour - Gangliocytoma - Multinodular and vacuolating neuronal tumour - Dysplastic cerebellar gangliocytoma (Lhermitte-Duclos disease) - Central neurocytoma - Extraventricular neurocytoma - Cerebellar liponeurocytoma
Ependymomas	- Supratentorial ependymoma - Supratentorial ependymoma (ZFTA or YAP1 fusion-positive) - Posterior fossa ependymoma

Histological type	Histological malignancy grade
Meningothelial meningioma	1/2
Fibrous meningioma	1/2
Transitional meningioma	1/2
Psammomatous meningioma	1/2
Angiomatous meningioma	1/2
Microcystic meningioma	1/2
Secretory meningioma	1/2
Lymphoplasmacyte-rich meningioma	1/2
Atypical meningioma (including brain infiltrative meningiomas)	2
Chordoid meningioma	2
Clear cell meningioma	2
Anaplastic (malignant) meningioma	3

Layered diagnosis with an example:

Layer	Example
Layer 1 Integrated diagnosis	Diffuse astrocytoma, *IDH*-mutant, CNS WHO grade 2
Layer 2 Histopathological diagnosis	Diffuse astrocytoma
Layer 3 WHO grade	CNS WHO grade 2
Layer 4 Molecular genetics	IDH1 R132H-mutant, *ATRX*-mutant, *TP53*-mutant

Clinical presentation

1. **headache**

   result of :

   - increase in ICP
   - invasion or compression of pain sensitive intracranial structures
   - secondary to vision difficulties

2. other features of **increased ICP**

. **lateralizing** features of brain shift and herniation

. **epilepsy**

   new onset epilepsy in adult specially above age of 20 should warn the physician for possibility of tumor . because this occur in 30% of patients with tumors

Clinical presentation

- **Subtle changes in personality and behavior**
- **Progressive neurological deficit**

  (depends on site)

Investigation

- Aim is :
  - to diagnose presence of brain tumor .
  - To find the source if you suspect the tumor to be a mets

Investigation

- **Skull X-RAY**
  - **calcification** : Oligodendroglioma , meningioma craniopharyngioma and ependymoma
  - **hyperostosis** of skull
  - **bone destruction** : mets , chordoma , craniopharyngioma
  - **erosion** of sella tursica
  - **sings of ICP**
  - **midline shift** of pineal gland if calcified

Investigation

- **Brain CT**
  - site , mass effect , bone destruction , enhancement , multiplicity
  - **Enhanced tumors**
    - high grade gliomas
    - meningioma
    - mets
    - acoustic neuroma
    - large pituitary tumors

Investigation

- **MRI**

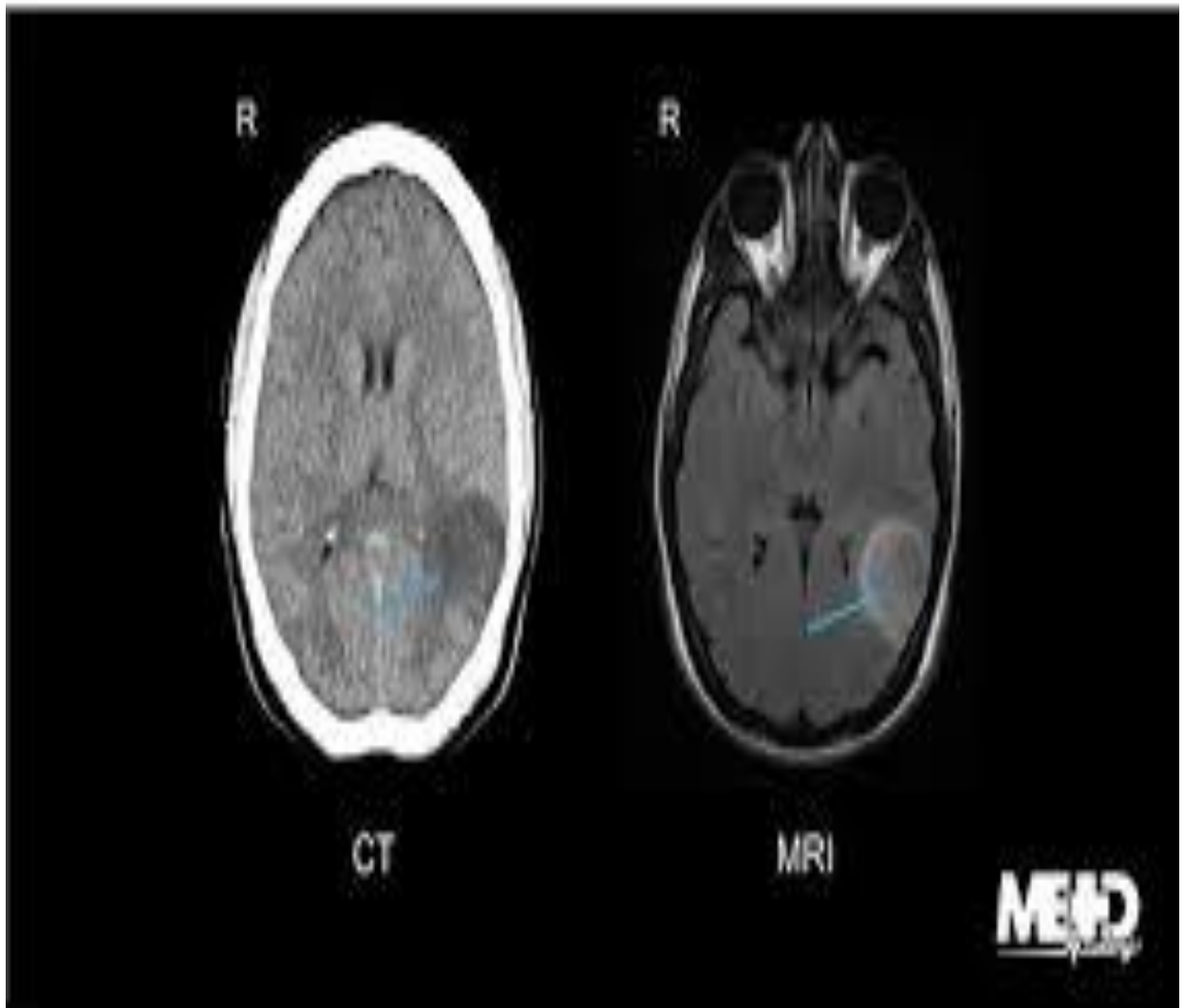
Better than CT for

  - posterior fossa tumors
  - skull base tumors

- **Angiography or MRA**
- **PET scan**
- **CSF cytology** : remember the contraindications

Investigation

- **Biopsy :**
  - needle biopsy thru burr hole ,
  - or stereo tactic biopsy image guided o
  - or at time of treatment
- **Tumor markers**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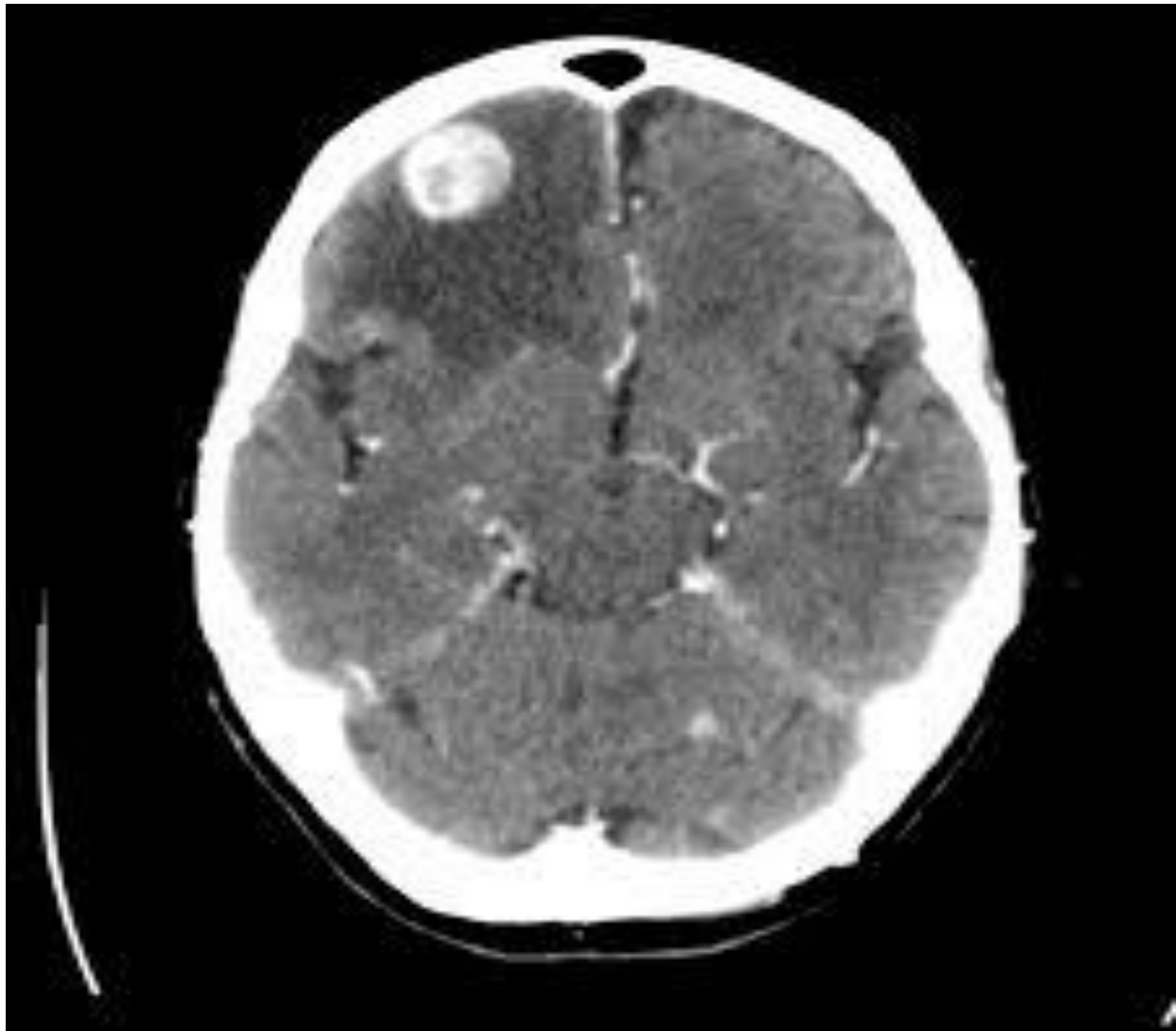
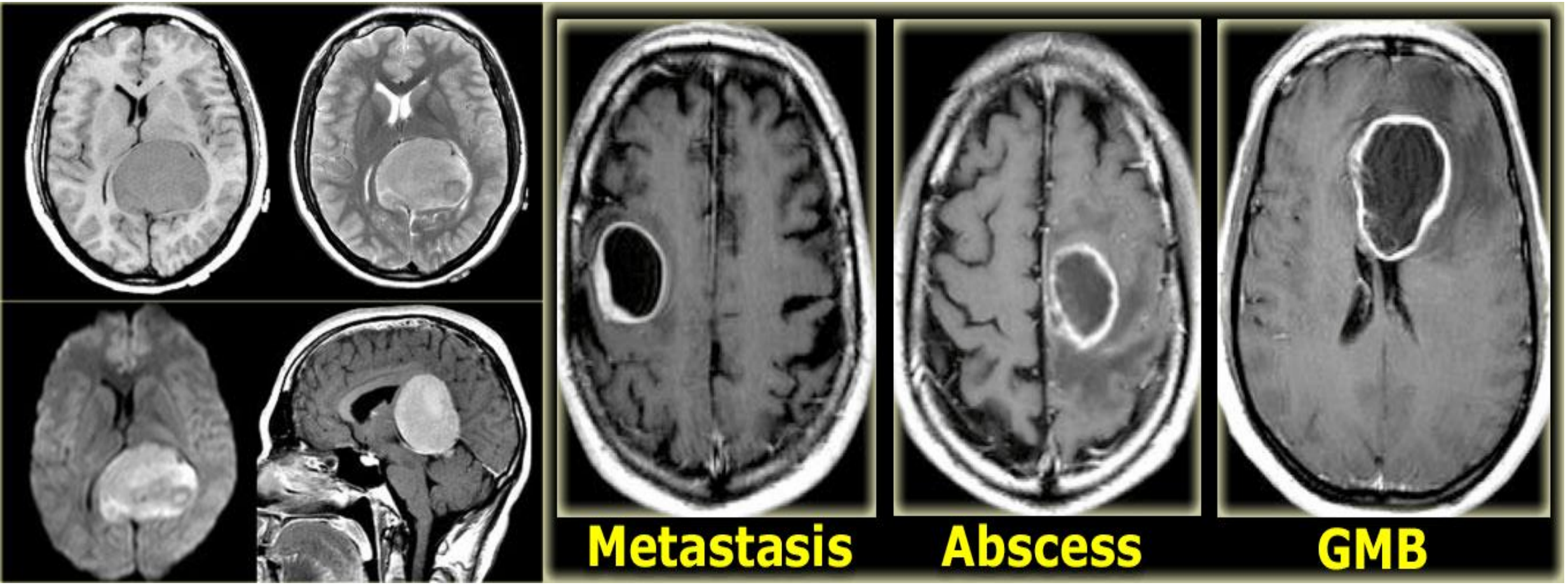
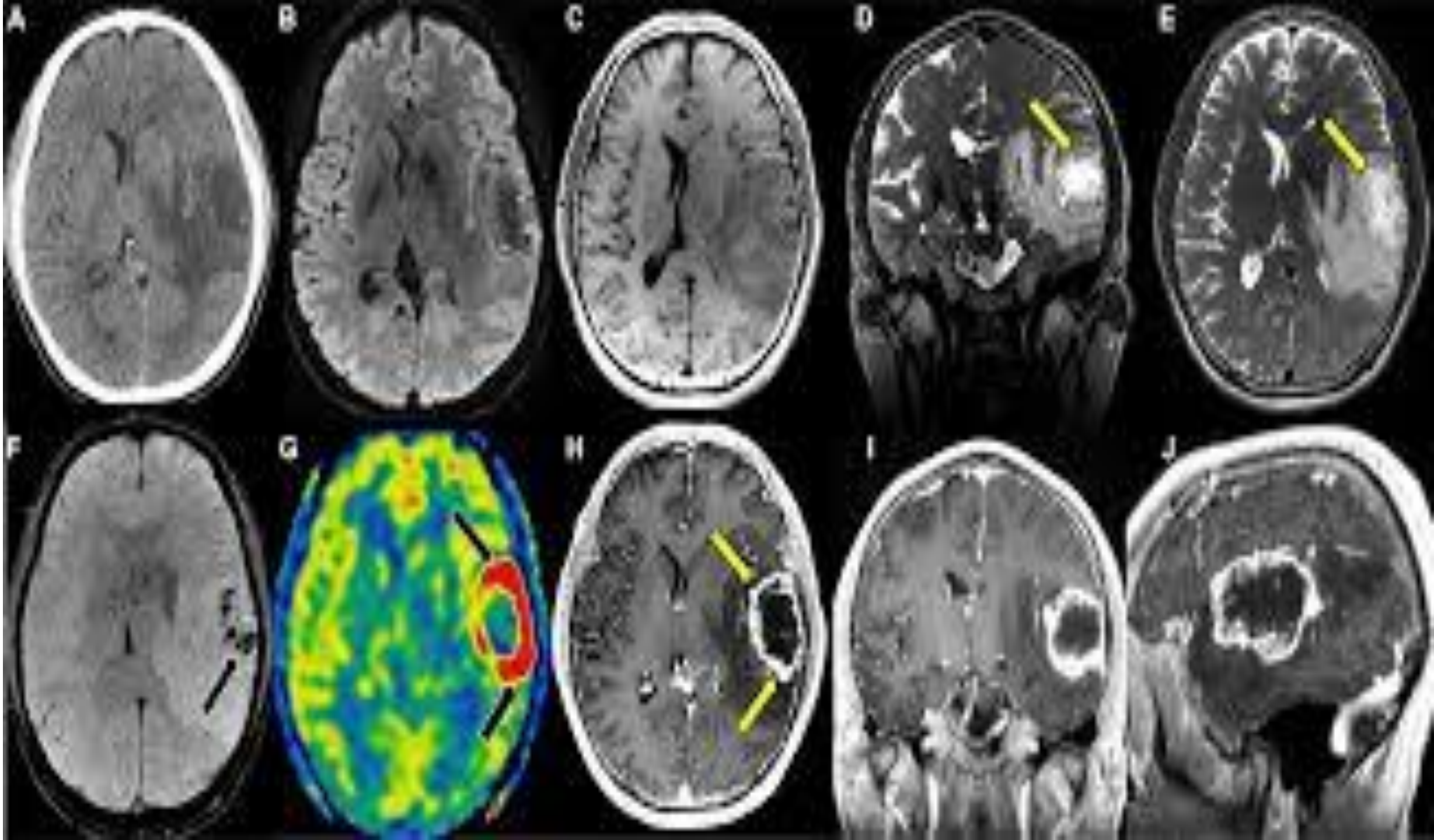
CT
MRI




Metastasis
Abscess
GMB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MX

- **Medical therapy**
  - medical treatment doesn’t affect tumor itself
  - this used only to reduce edema surrounding the tumor
  - steroid are used specially with mets , meningioma and GBM

Surgical Treatment

- Aim of surgery
    - to take a biopsy
    - removal of tumor either completely or partially (cytoreduction)
    - to treat complication as hydrocephalus
- Surgical removal is recommended for most types of brain tumors

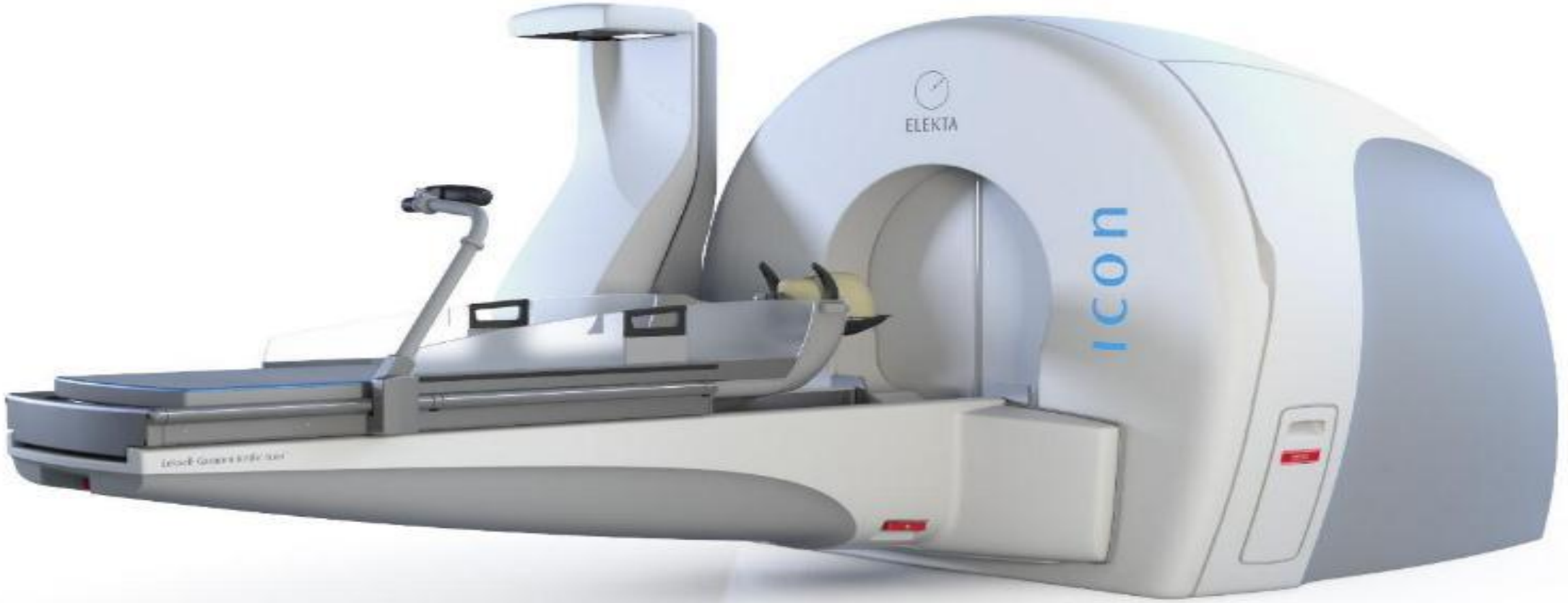
Surgical Treatment

- Craniotomy
- Cranioctomy
- Tras-sphenoidal
- Trans-oral

Radiotherapy

- Differentiate between *radiation therapy* and *radiosurgery*.
- Conventional radiotherapy used as **adjuvent** therapy
- Most radiosensitive are germinoma and medulloblastoma
- **Complications** :
  - increase edema
  - demylenation
  - radionecrosis
  - affect cognitive functions
  - may induce other kind of tumors as meningioma

Leksell Gamma Knife® Icon™
Jordan University Hospital



Chemotherapy

- problems facing conventional chemotherapy
  - presence of intact BBB.
  - small proportion of cells in active growth

- Iatrogenic disrupt this BBB by giving mannitol prior to chemotherapy
- use lipid soluble chemotherapy
- most commonly single agent used is **TMZ**
- **Oligodendroglioma,High grade glioma**

PROGNOSIS

- Survival:

  5year ,Median

  -Type of tumor

  -Treatment
- Quality of life

- Spectrum:Low grade Meningiomas to High grade gliomas

THANK YOU ALL FOR ATTENTION