# INTRACRANIAL GLIOMAS-RADIOLOGY, DIAGNOSIS AND MANAGEMENT

Presented By : Dr. Prasad

# Introduction

- WHO classification (2000) of CNS tumors:

1. Neuroepithelial tissue
2. Cranial an spinal nerves
3. Meninges
4. Hematopoietic  system
5. Germ cell
6. Cysts and tumor like condition
7. Tumors of the sellar region
8. Local extension of regional tumors
9. Metastatic tumors

# Neuroepithelial tumors

- Sub classification:

1. Astrocytic tumors:
   - A. Diffusely infiltrating:
     1. Astrocytoma- fibrillary
        protoplasmic
        gemistocytic
        mixed
     2. Anaplastic astrocytoma
     3. Glioblastoma multiforme: Grade 1V
        Giant cell
        Gliosarcoma
   - B. Circumscribed lesions:
     1. Pilocytic astrocytoma
     2. Plemorphic Xanthoastrocytoma
     3. Subependymal Giant cell astrocytoma

2. Oligodendrogliomas
3. Ependymal tumors: ependymomas
anaplastic
myxopapillary
subependymomas
4. Mixed gliomas
5. Choroid plexus tumors: papilloma
carcinoma
Tumors of uncertain origin: astroblastoma
polar spongioblastoma
gliomatosis cerebri

7. Neurons: a. ganglioglioma

b. dysplastic gangliocytoma

c. desmoplastic infantile ganglioglioma

d. dysplastic neuroepithelial tumors

e. gangliocytoma

f. central neurocytomas

g. olfactory neuroblastomas

8. Pineal tumors: pinealocytomas
pinealoblastomas
mixed pineal tumors

9. Embryonal tumors: medulloepithelioma
neuroblastoma
retinoblastoma
primitive neuroectodemal tumors( PNET):
a. medulloblastoma
1. desmoplastic
2. medullocytoma
3. melanotic
b. cerebral and spinal PNET’s

# Low Grade Gliomas

Classified as:

1. WHO grade II astrocytomas
2. Oligodendrogliomas
3. Mixed oligodendrocytic/ astrocytic
4. Gangliogliomas
5. Juvenile pilocytic astrocytomas
6. Pleomorphic astrocytomas
7. Dysembryoplastic neuroepithelial tumors

# Spatial definition

- Type I:
  Solid tumor without infiltration:
  pilocytic astrocytoma,
  ganglioglioma
- Type II:
  Solid tumors with infitration:
  grade II astrocytoma
- Type III:
  Infilterative without solid component:
  oligodendroglioma

# Grading of gliomas

- WHO

  Based on cellularity,pleomorphism,vascular, proliferation, necrosis

  I Special tumors

  II Astrocytomas (low grade)

  III Anaplastic Astrocytomas

  IV Glioblastoma
- Kernohan
- St Anne/Mayo :atypia,mitosis,endothelial proliferation,necrosis

# Grading by CT/MRI

- I : CT; Low density, MRI; Abnormal signal
  no mass effect, no enhancement
- II : CT; low density, MRI;abnormal signal
  mass effect, no enhancement
- III : Complex enhancements
- IV :Necrosis ( ring enhancement)

# Pathological features

- Diffuse astrocytomas:

Gross findings: Adults hemispheric, children brainstem. Alter color, texture of tissue.

Microscopy: Hyper chromatic nuclei

GFAP containing cell process

Astrocytic cells without

macrophages/ microglia

Cells distributed in clumps( fibrillary/

protoplasmic, gemistocytic)

# Anaplastic astrocytomas

- Margins better  defined
- Cells populous/pleomorphic
- Perineural satellitoses
- Absence of necrosis/ vascular proliferation

# Glioblastomas

- Occur denovo
- Dedifferentiation
- Macroscopic picture: grey fleshiness/ cystic / necrotic areas wide spread
- Microscopic picture: Astrocytes with long fine process with vascular proliferation/ necrosis

  large cells bizarre- giant cell GBM

  gliosarcoma
- Adequate pathological specimen required

# Pilocytic astrocytoma

- Macroscopic picture:

  Optic nerve- fusiform dilatation

  Hypothalamic- soft lobular

  Cerebellar- well circumscribed

  Cerebral
- Microscopic picture:

  Elongated cells/ rosenthal fibres

# Pleomorphic xanthoastrocytomas

- Young adults
- Superficial cortical areas
- Temporal lobe
- Cellular pleomorphism
- Lipidisation of cells
- Low mitotic rate
- Necrosis absent

# Subependymal giant cell astrocytoma

- Tuberous sclerosis
- Abundant eosinophilic cytoplasm
- Neurofilament protein

# Oligodendroglioma

- Cerebral hemispheres: frontal lobe
- Both grey and white matter
- Monotonous round cells
- Perineural satellitoses
- Calcification
- Perinuclear haloes
- GFAP negative
- High/ low grade

# Ependymoma

- Frontal horns to filum
- IV ventricle/ filum
- Discrete
- Perivascular pseudo rosette
- Myxopapillary variant- caudal cell mass
- Gangliogliomas: both neural and glial cells

# Clinical features

- Due to raised ICP: headache
  nausea/ vomiting
  nuchal rigidity
  papilloedema
  VI nerve palsy
- Site specific changes: Irritative- seizures
  destructive- mental apathy
  memory loss
  personality disturbance
  focal neurological findings
- Progressive nature

# Diagnosis

- Imaging- pre operative
  postoperative
  intra operative
- CT
- MRI
- SPECT
- Angiography

# Imaging appearance

- Homogenous changes: reduced attenuation on CT

  hypo on T1W hyper on T2W
- Mixed/ inhomogenous changes
- Mildly/ homogenously increased density on CT/ T1W
- Hypo/ iso on T2W

# Grading features

- Homogenity
- Margins
- Cysts/ necrosis
- Calcification
- Edema

# Low Grade Astrocytomas

- CT: low density homogenous mass that is poorly marginated
- MRI: hypo on T1W/ hyper on T2W

  mass effect is less

  non enhancement
- D/D: cerebral infarct

  area of demyelination

# Anaplastic astrocytomas

- Mass effect is greater
- Moderate contrast enhancement
- Absence of areas of necrosis and hemorrhage
- D/D solitary metastasis/ acute demylination

# Glioblastoma multiforme

- Irregular homogenous areas of abnormality that are poorly marginated
- Hyper density on CT
- Hyper on T1W/ hypo on T2W
- Contrast enhancement
- Non enhancing areas
- Areas of hemorrhage
- D/D: Metastases/ abscess/ malignant meningioma

# Oligodendroglioma

- Centrum semiovale of cerebral hemispheres/ found in adults
- CT. X-Rays prominent calcification
- MRI similar to astrocytoma
- D/D: central neurocytoma/ intraventricular meningiomas

# Ependymoma

- Location
- Mimic low/ intermediate grade gliomas
- Homgenous
- Moderate enhancement
- Gangliogliomas:

  temporal lobe/ posterior fossa

  calcification/ cysts

# Other modalities

- Angiography: tumor/ giant aneurysm
  superficial/ intra axial/ extra axial masses
  vascularity
- FDG/ PET: grading/ treatment response/ recurrence/ radionecrosis
- MRS: lactate/ choline/ NAA/ creatine

- Diffusion perfusion weighted images
- SPECT, thallium201/ technetium99/ iodine 123
- Functional imaging- MRI/ PET/ MEG

# PreoperativeTreatment

- Anticonvulsants
- Peritumoral edema:

  steroids/head end elevation/ mannitol/ diuretics/ hyper ventilation

# Definitive treatment

- Surgery
- Radiotherapy
- Chemotherapy
- Others

# Surgery

- Timing: early/ late
- Type of surgery: experience of surgeon
  attempt at gross total removal
  image guided surgery

- Indication: establishing diagnosis
  pilocytic astrocytoma
  mass effect
  hydrocephalus
  seizures
  to delay adjuvant therapy
  small tumors

- Role of surgery limited in: disseminated tumors
    - multifocal tumors
    - location in eloquent areas

# Radiotherapy

- Controversial area
- No conclusive benefit
- Risk of radiation induced complications

- Recommendations:

  - in cases of gross total removal/ incomplete removal in pilocytic astrocytomas RT to be withheld

  - incomplete removal of low grade glioma- 45 GY to tumor bed and 2 cm margin

  - malignant degeneration to be treated RT

  - Chiasmal/ hypothalamic tumors

# Chemotherapy

- Not indicated except in tumor progression
- PCV regimen
- Pilocytic astrocytoma: cerebellum/ optic nerve/ hypothalamic glioma

# Thank you