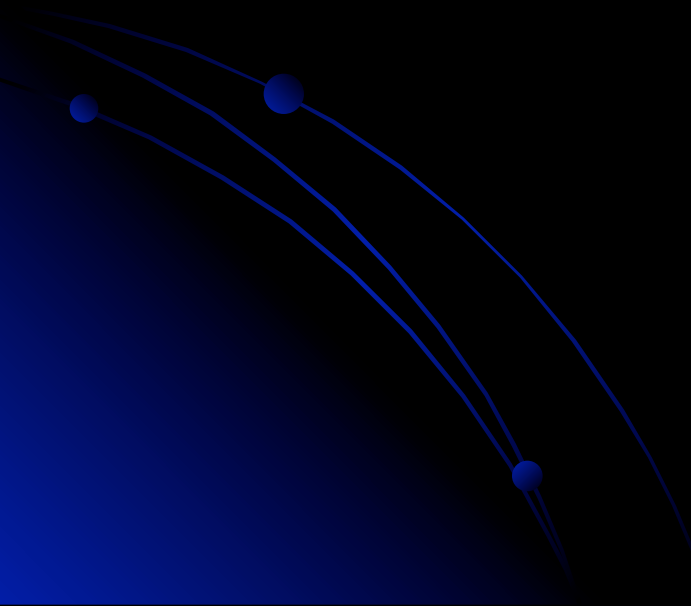


INTRACRANIAL GLIOMAS- RADIOLOGY, DIAGNOSIS AND MANAGEMENT



Introduction

- WHO classification (2000) of CNS tumors:
 1. Neuroepithelial tissue
 2. Cranial and 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

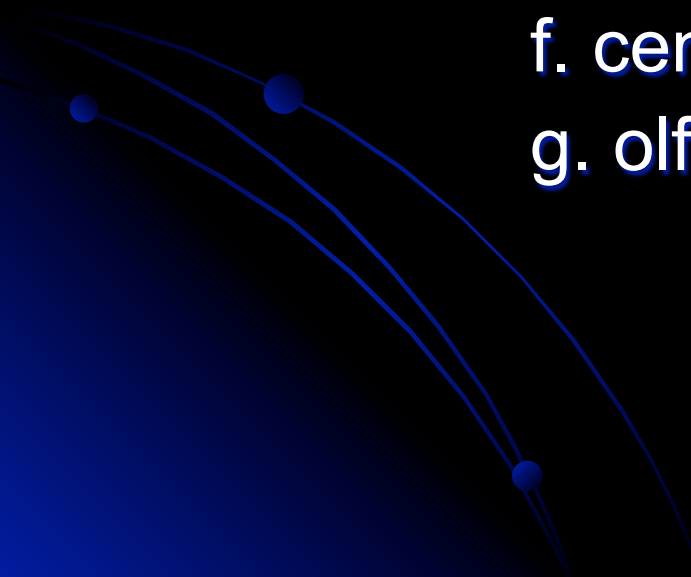
5. Choroid plexus tumors: papilloma

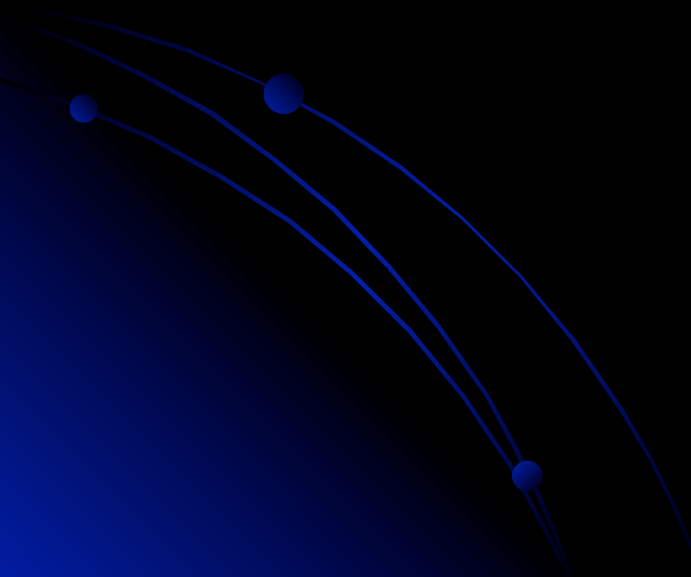
carcinoma

Tumors of uncertain origin: astroblastoma

polar spongioblastoma

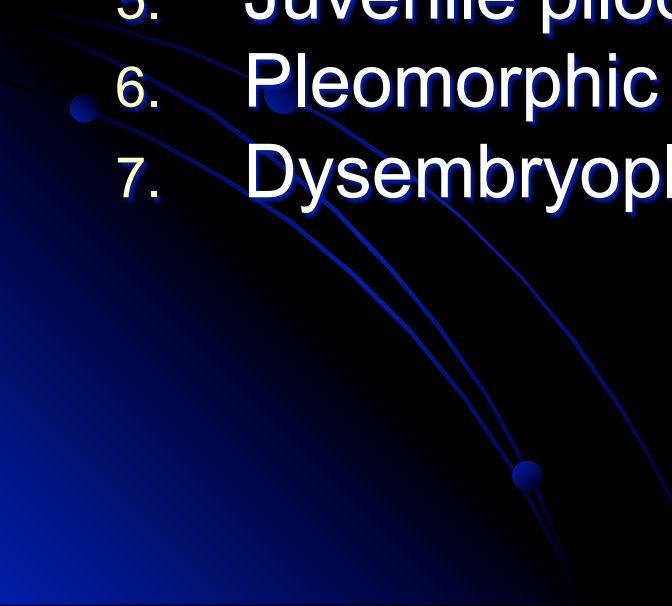
gliomatosis cerebri

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 neuroectodermal 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 infiltration:
grade II astrocytoma
- Type III:
Infiltrative without solid component:
oligodendroglioma

Grading of gliomas

- WHO

Based on cellularity, pleomorphism, vascular proliferation, necrosis

I Special tumors

II Astrocytomas (low grade)

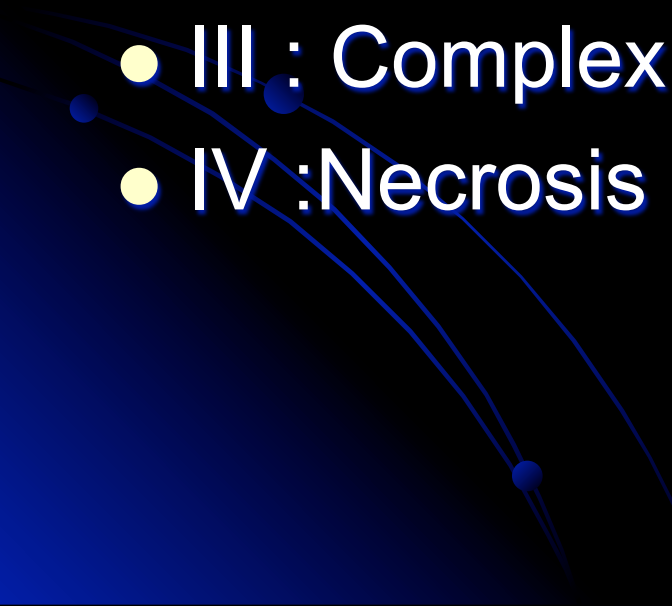
III Anaplastic Astrocytomas

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

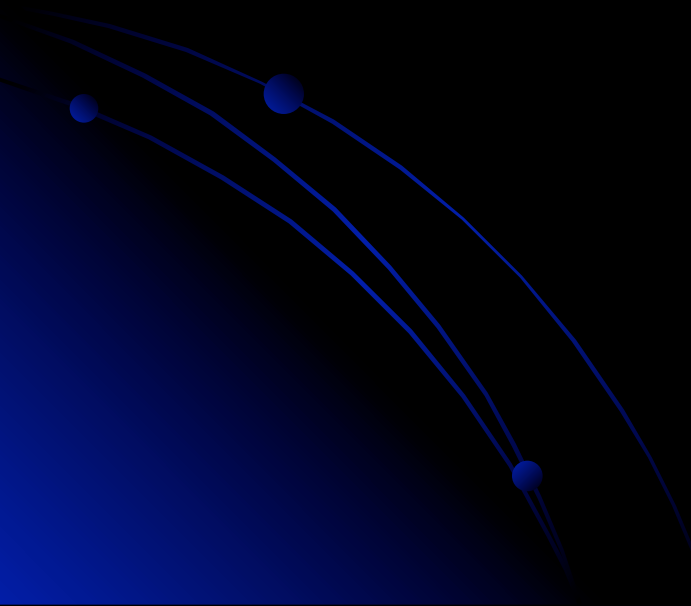
Astrocytic cells without

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

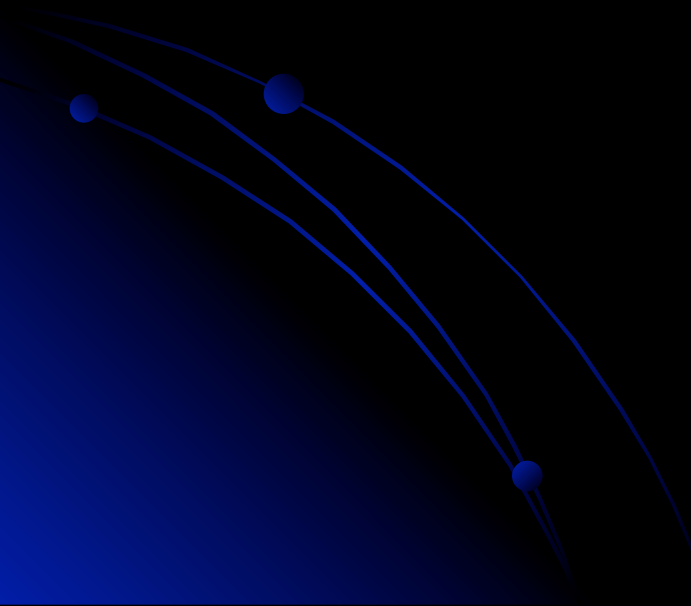
- Macroscopic picture:
 - Optic nerve- fusiform dilatation
 - Hypothalamic- soft lobular
 - Cerebellar- well circumscribed
 - Cerebral
- Microscopic picture:
 - Elongated cells/ rosenthal fibres

Pleomorphic xanthoastrocytomas

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

Subependymal giant cell astrocytoma

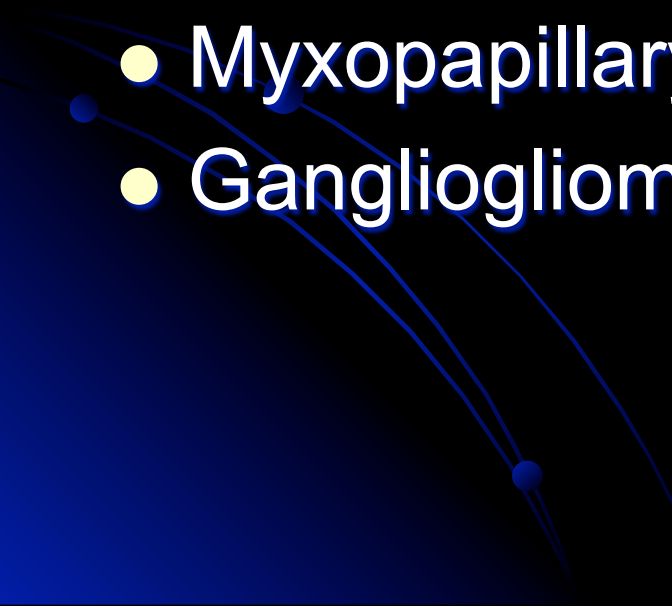
- Tuberos sclerosis
- Abundant eosinophilic cytoplasm
- Neurofilament protein




Oligodendroglioma

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

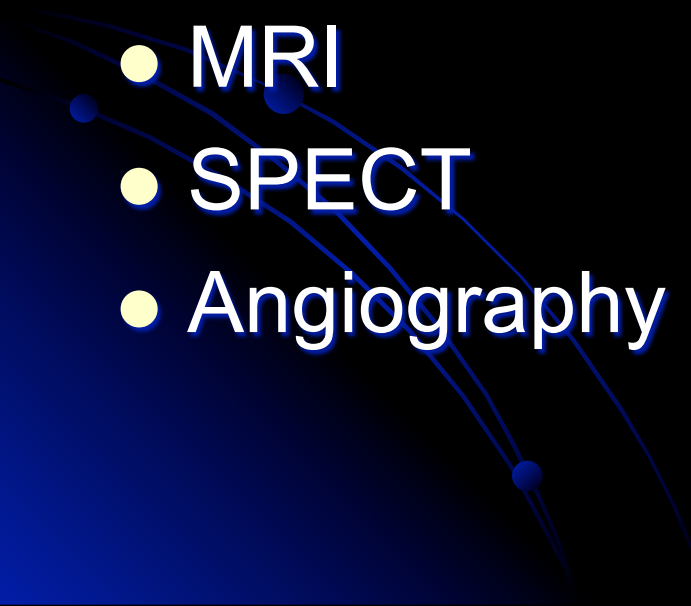
Ependymoma

- 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
- 

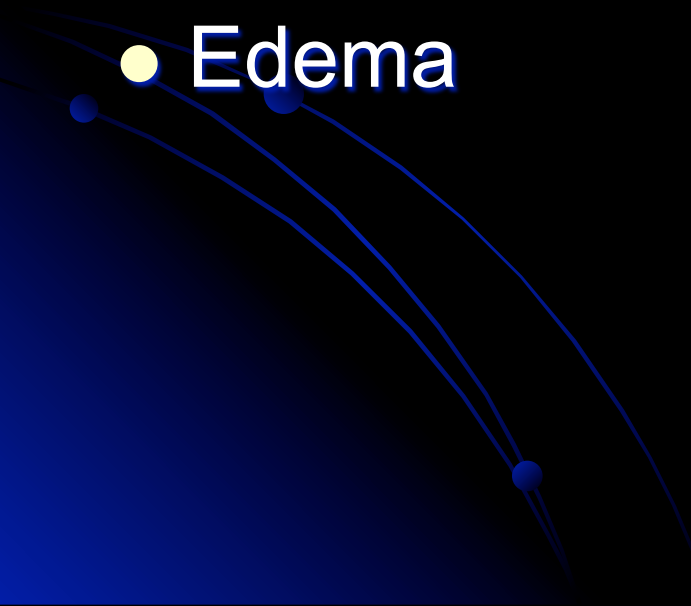
Diagnosis

- 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/ homogeneously increased density on CT/ T1W
- Hypo/ iso on T2W

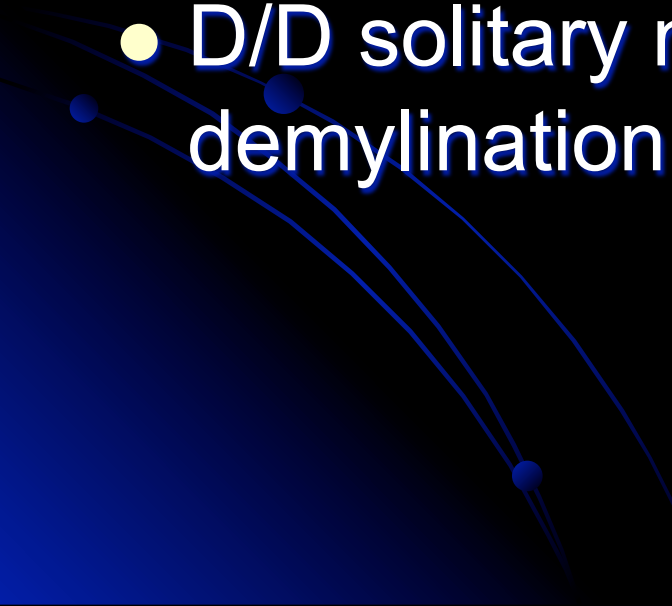
Grading features

- Homogeneity
 - 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
- 

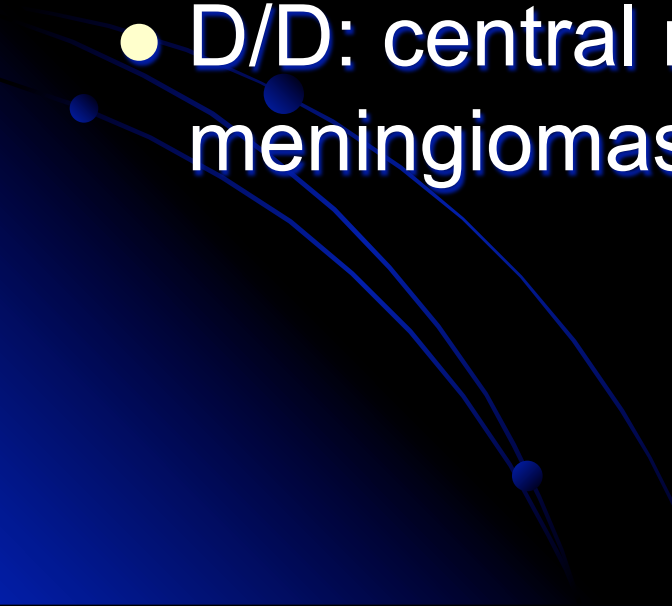
Anaplastic astrocytomas

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

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
- 

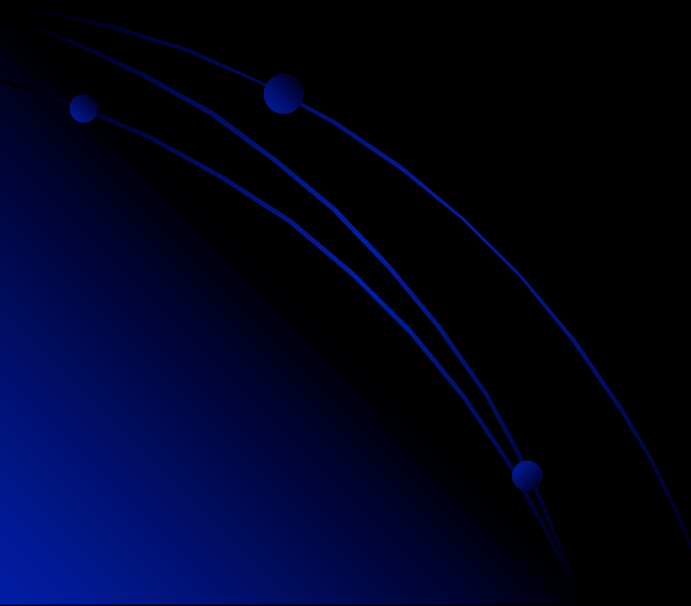
Ependymoma

- Location
- Mimic low/ intermediate grade gliomas
- Homogenous
- Moderate enhancement
- Gangliogliomas:
 - temporal lobe/ posterior fossa
 - calcification/ cysts

Other modalities

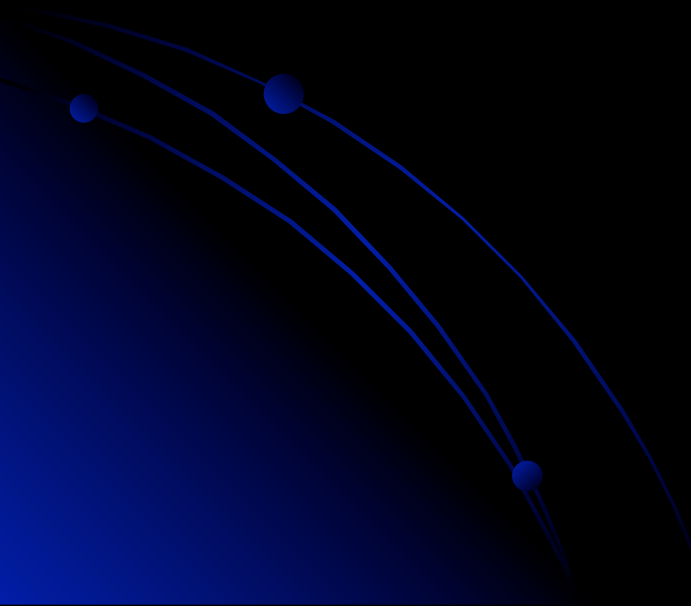
- Angiography: tumor/ giant aneurysm
superficial/ intra axial/ extra
axial masses
vascularity
- FDG/ PET: grading/ treatment response/
recurrence/ radionecrosis
- MRS: lactate/ choline/ NAA/ creatine

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



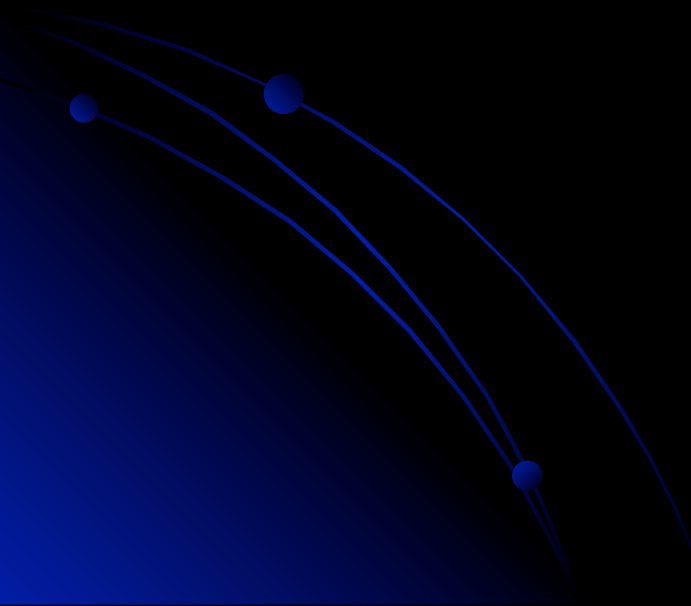
Preoperative Treatment

- Anticonvulsants
- Peritumoral edema:
 - steroids/head end elevation/ mannitol/
diuretics/ hyper ventilation



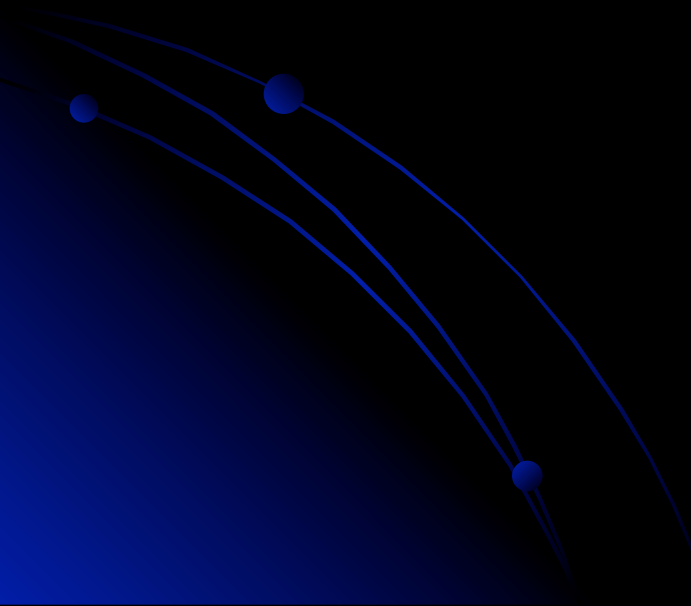
Definitive treatment


- Surgery
- Radiotherapy
- Chemotherapy
- Others



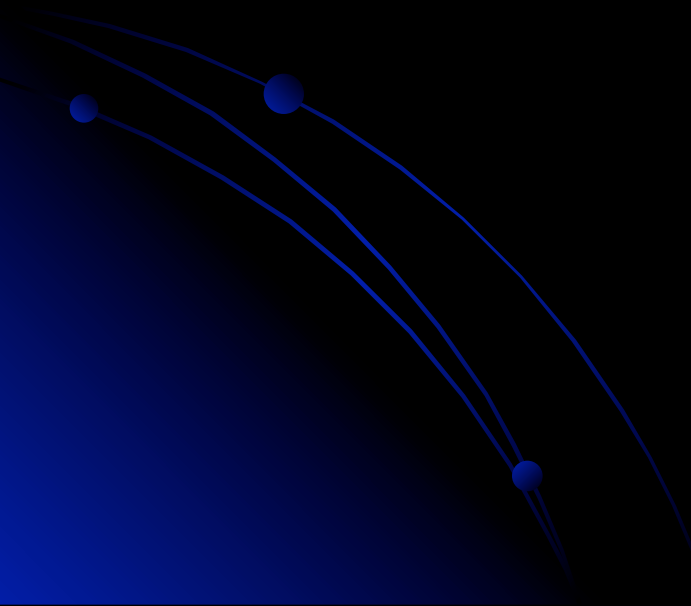
Surgery

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



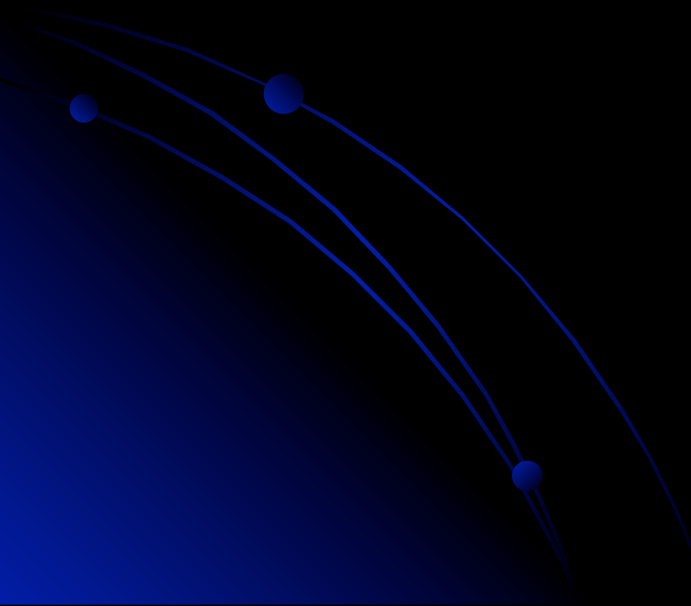
- Indication: establishing diagnosis
pilocytic astrocytoma
mass effect
hydrocephalus
seizures
to delay adjuvant therapy
small tumors
- 

- 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

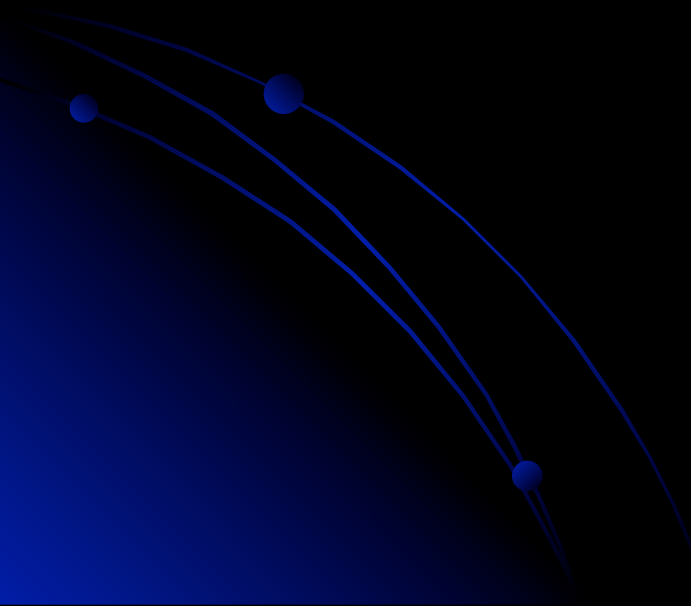
- incomplete removal of low grade glioma- 45 GY to tumor bed and 2 cm margin

- 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

