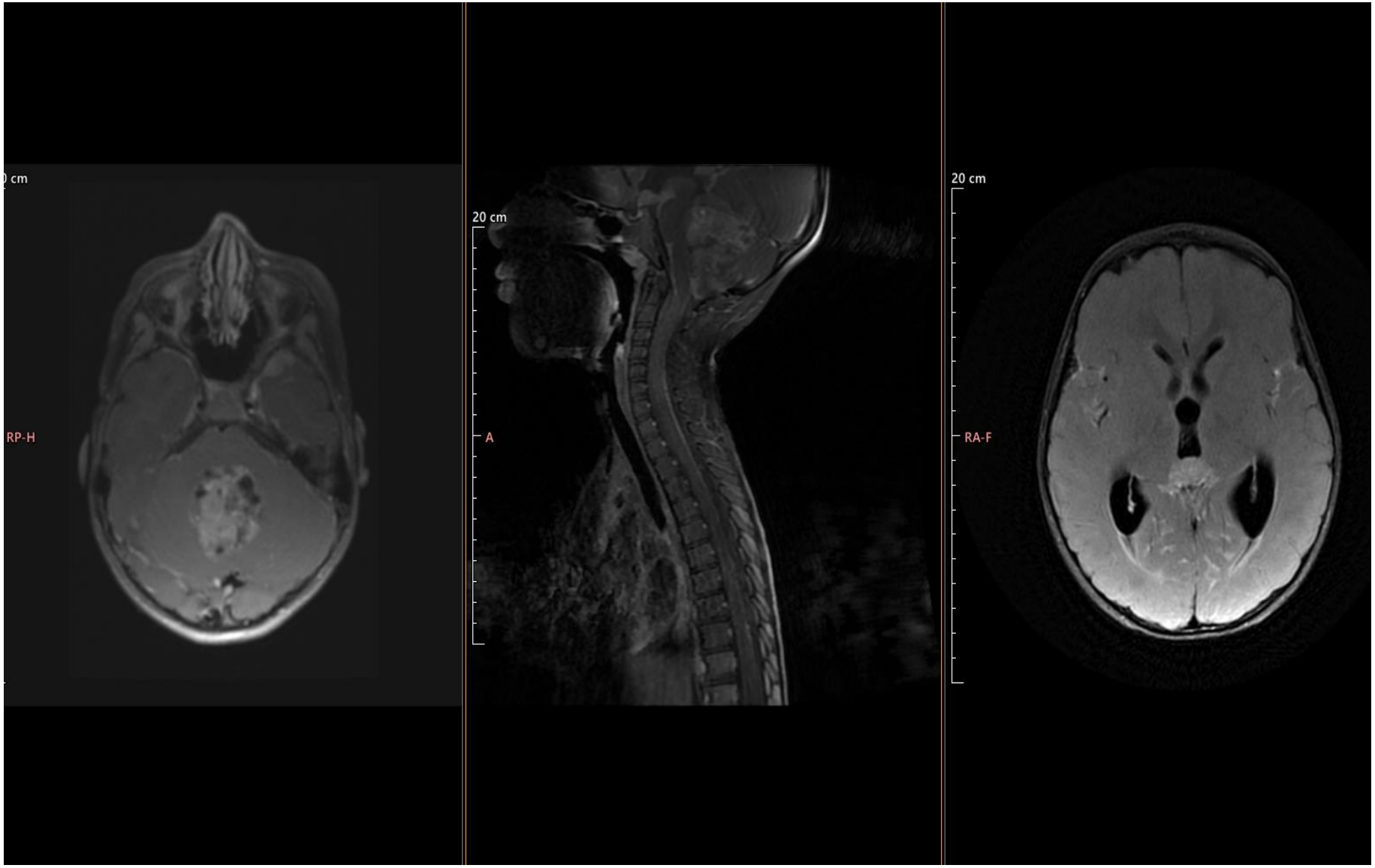
2025

KARNATAKA RADIOLOGY EDUCATION PROGRAM

CASE PRESENTATION

CASE 1

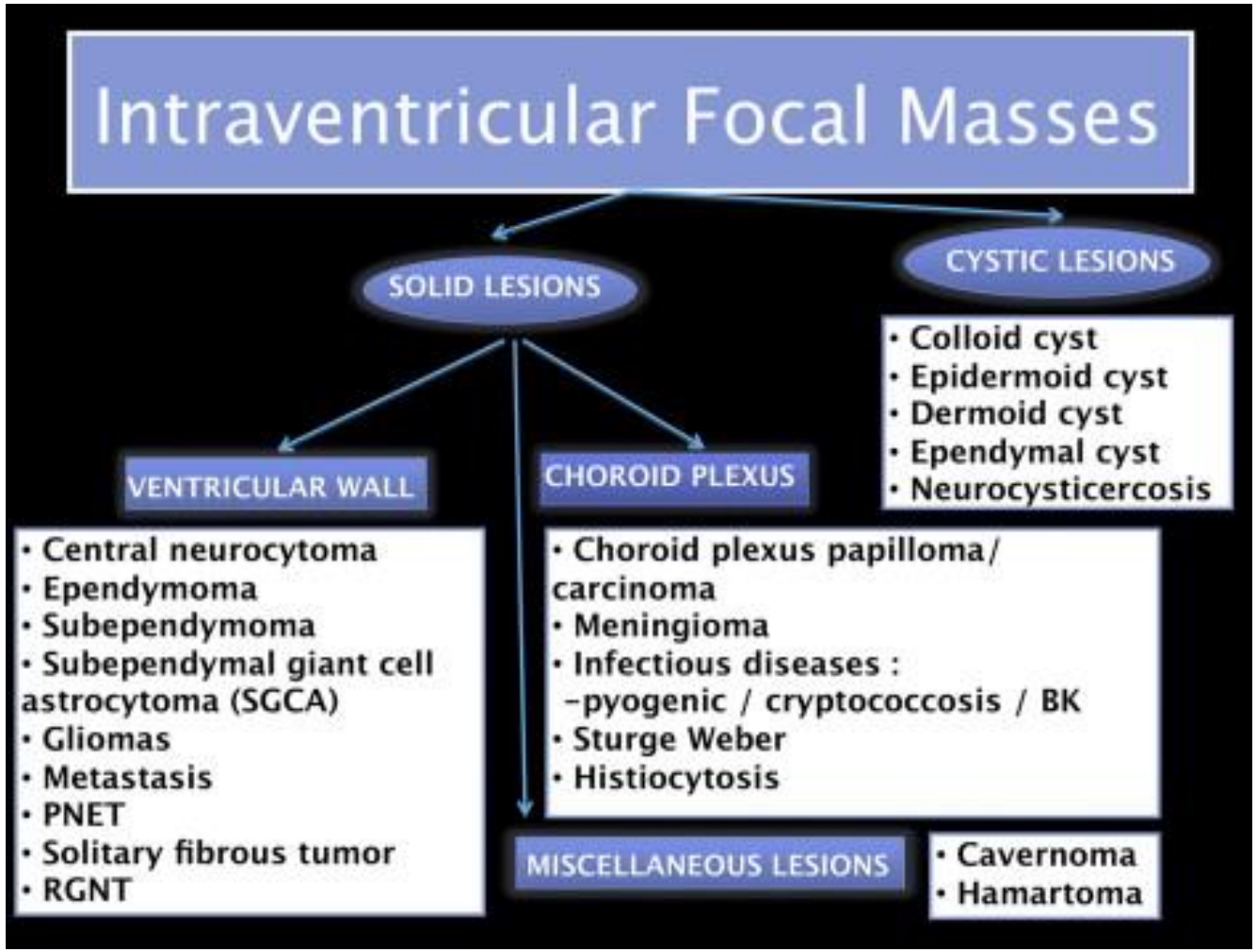
- 3 year 9 month old male child
- k/c/o childhood occipital epilepsy presented with complaints of vomiting since 3 months, headache since past 10 days and left ear pain since 1 day.
- At presentation, child was alert and active.
- ENT opinion was sought in view of left ear pain, showed normal findings.
- Ophthalmology opinion was sought showed normal examination of eyes, no evidence of papilledema.
- MRI Brain was advised.


cm
RP-H
20 cm
A
20 cm
RA-F

MRI FINDINGS

- A heterogeneous lobulated mass with diffusion restriction, cysts, microbleed and foci of calcification, epicentered in the fourth ventricle extending along fourth ventricular outlet foramina on either side causing obstruction of the fourth ventricle with upstream hydrocephalus and associated mild periventricular seepage of CSF
- Leptomeningeal enhancement along the surface of spinal cord,along the cauda equina roots with nodular enhancing deposits within the thecal sac at the level of sacrum,suggestive of metastasis

- Neurosurgery opinion was sought, planned for surgery .
- Currently child is hemodynamically stable.


Intraventricular Focal Masses
SOLID LESIONS
CYSTIC LESIONS
• Colloid cyst
• Epidermoid cyst
• Dermoid cyst
• Ependymal cyst
• Neurocysticercosis
VENTRICULAR WALL
CHOROID PLEXUS
• Central neurocytoma
• Ependymoma
• Subependymoma
• Subependymal giant cell astrocytoma (SGCA)
• Gliomas
• Metastasis
• PNET
• Solitary fibrous tumor
• RGNT
• Choroid plexus papilloma/ carcinoma
• Meningioma
• Infectious diseases :
-pyogenic / cryptococcosis / BK
• Sturge Weber
• Histiocytosis
MISCELLANEOUS LESIONS
• Cavernoma
• Hamartoma

ORIGIN OF INTRAVENTRICULAR LESIONS

- The epithelial lining of the ventricles is composed of ependymal cells, which are the cell of origin of the ependymoma.
- A subependymal plate formed by glial cells/astrocytes

  ↓

  Ependymomas, Subependymomas, Subependymal giant cell tumors
- Septum pellucidum → lined by glial cells and residual neuronal precursor cells → gives origin to Central Neurocytoma
- Arachnoid cap cells → trapped within choroid plexus during development → give origin to Meningiomas
- Choroid plexus- Choroid plexus cyst,Xanthogranuloma,Tumors- CP papilloma/atypical papilloma/carcinoma
- Vascular Choroid Plexus - hematogeneous metastasis

EPENDYMOMA

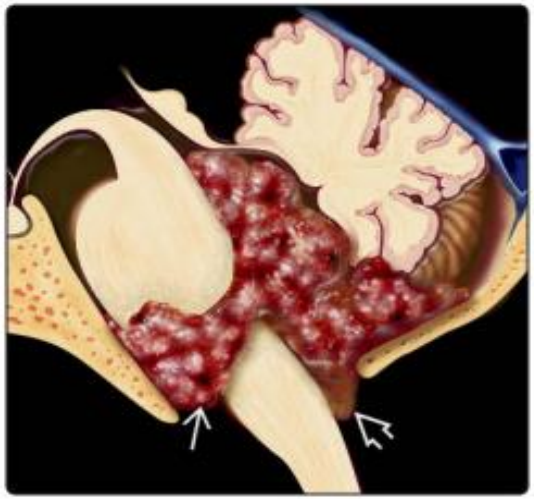
- Location: 60-70% -infratentorial – of this- 95% - fourth ventricle

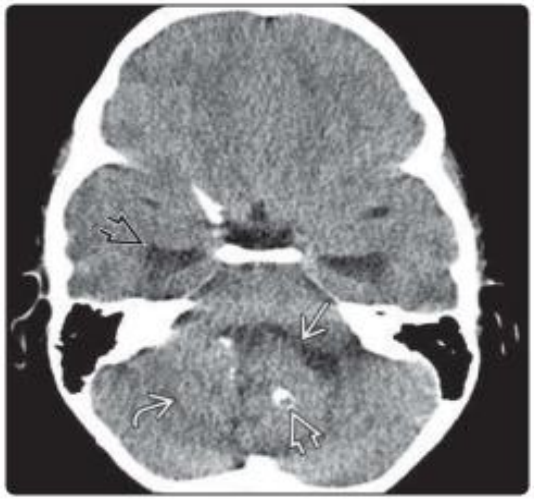
  30-40% - supratentorial – as hemispheric parenchymal neoplasms

- Posterior fossa lesions are more common in children (mean age, 6 years), whereas the mean age for supratentorial lesions is 18–24 years
- Third most common brain neoplasm in children, behind medulloblastoma and astrocytic tumors
- Imaging : well defined plastic tumors ,typically arising from fourth ventricle

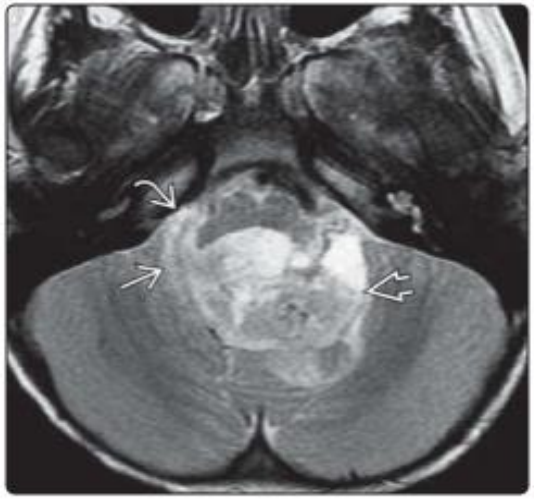
  Extent laterally through foramen of lushka toward CP angle cistern and posteroinferiorly through foramen of magendie into cisterna magna

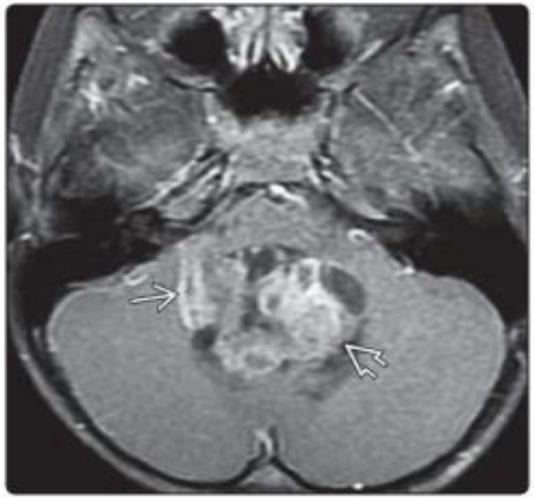
- At MR imaging, they are iso- to hypointense on T1-weighted images and iso- to hyperintense on T2-weighted images.
- Heterogeneous enhancement is seen on contrast–enhanced images.
- Blooming may be seen on T2*-weighted images if calcification or hemorrhage is present.
- Findings on diffusion-weighted images are variable.
- Intraparenchymal lesions have a “cyst and mural nodule” appearance, for which the differential diagnosis includes pilocytic astrocytoma, pleomorphic xanthoastrocytoma, and ganglioglioma



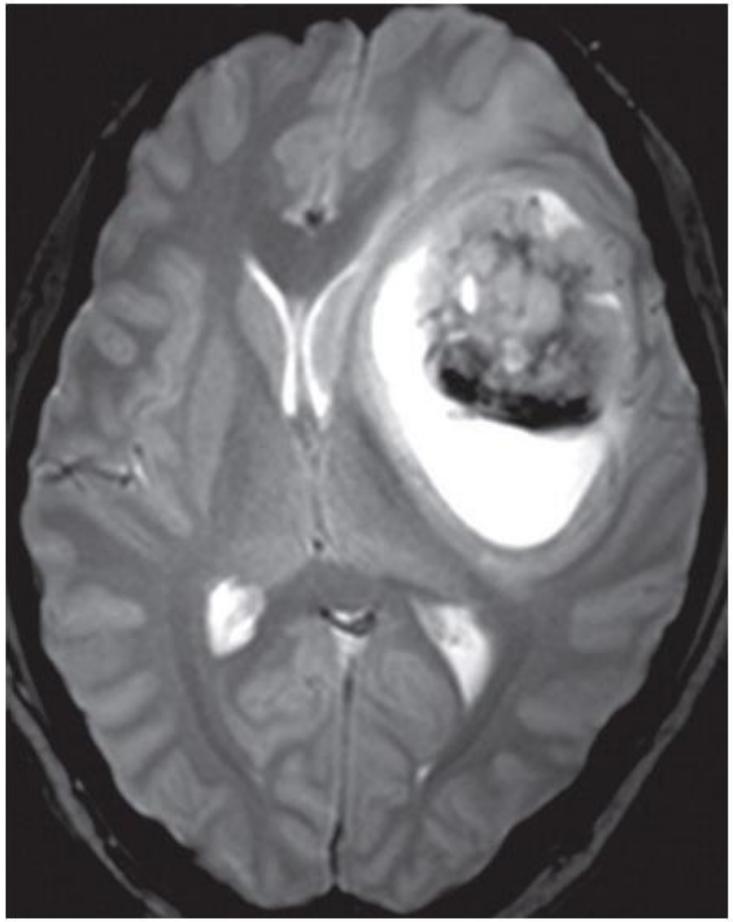


(Left) *Sagittal graphic shows a posterior fossa ependymoma extending through the 4th ventricle outlet foramina into the cisterna magna and cerebellopontine angle (CPA) cistern. This plastic pattern of growth is typical of ependymoma in this location and increases the difficulty of surgical resection.* **(Right)** *Axial NECT in a 3-year-old boy with nausea, vomiting shows a mostly isodense mass filling an expanded 4th ventricle. Note intratumoral calcifications and obstructive hydrocephalus*



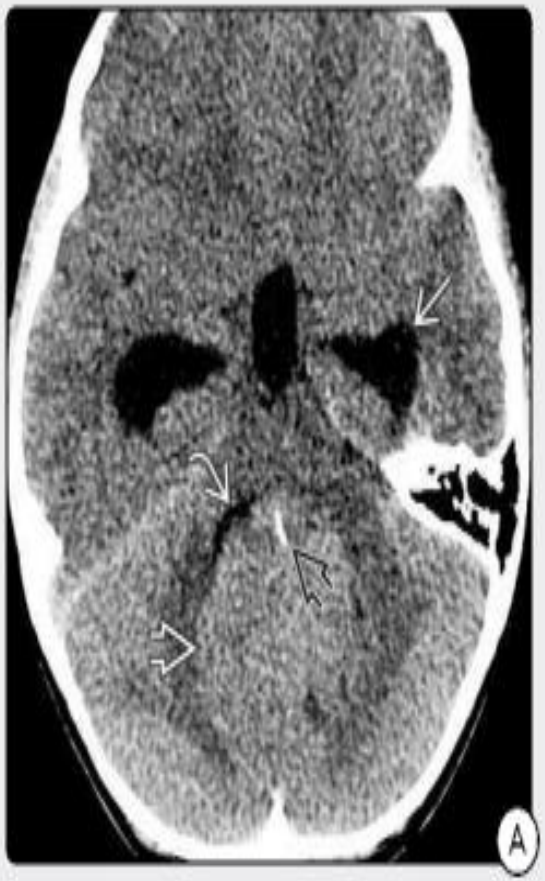


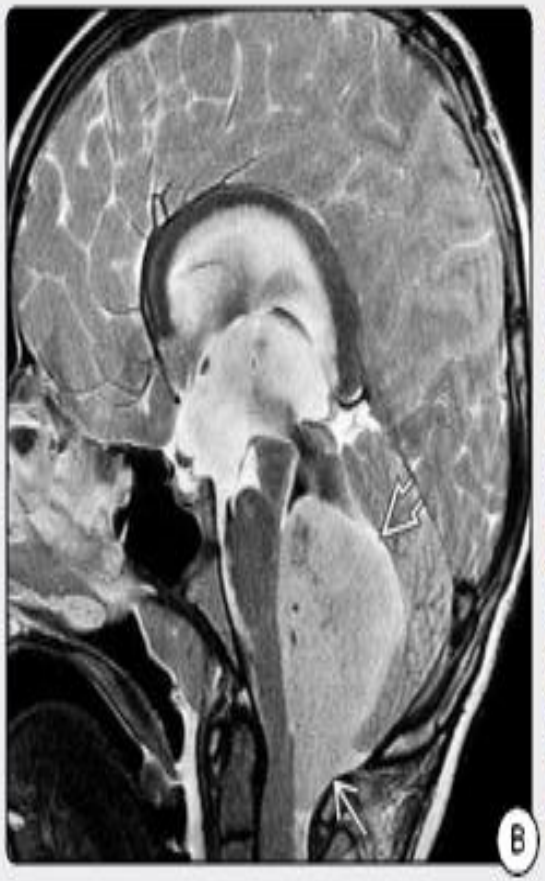
(Left) *Axial T2 MR in the same patient shows a heterogeneously hyperintense mass filling the 4th ventricle. Note tumor extension through an enlarged right lateral recess and foramen of Luschka into the CPA cistern.* **(Right)** *Axial T1 C+ FS MR shows the mixed solid and cystic, heterogeneously enhancing mass fills the 4th ventricle. Enhancing "plastic" tumor extending through the right lateral recess is readily apparent.*



MEDULLOBLASTOMA

- They cause 10% of all pediatric brain tumors and are the most common malignant posterior fossa childhood neoplasm.
- NECT scans show a moderately hyperdense, relatively well defined mass in the midline posterior fossa.
- Strong but heterogeneous enhancement is seen on CECT
- Almost all CMBs are hypointense relative to gray matter on T1WI and hyperintense on T2WI.
- Enhancement patterns show striking variation, ranging from minimal to patchy to marked.
- CMBs often show moderate restriction on DWI.



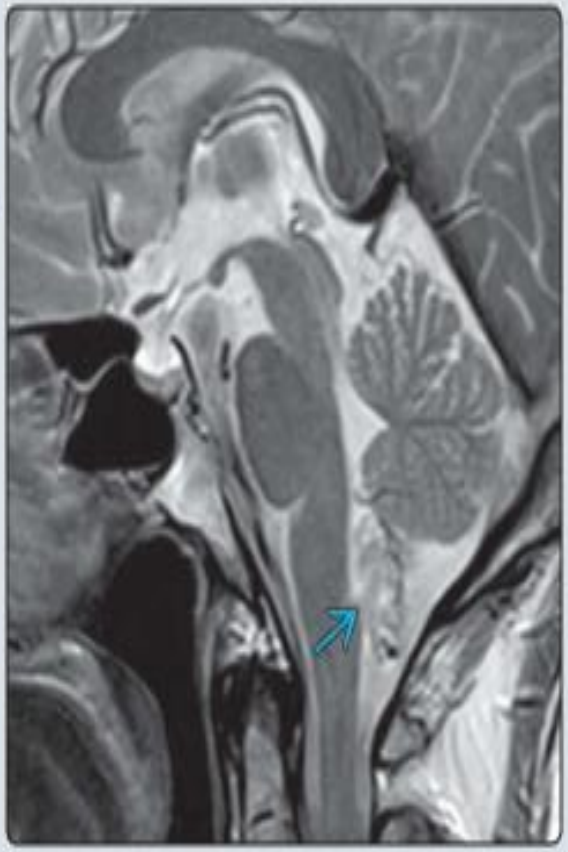


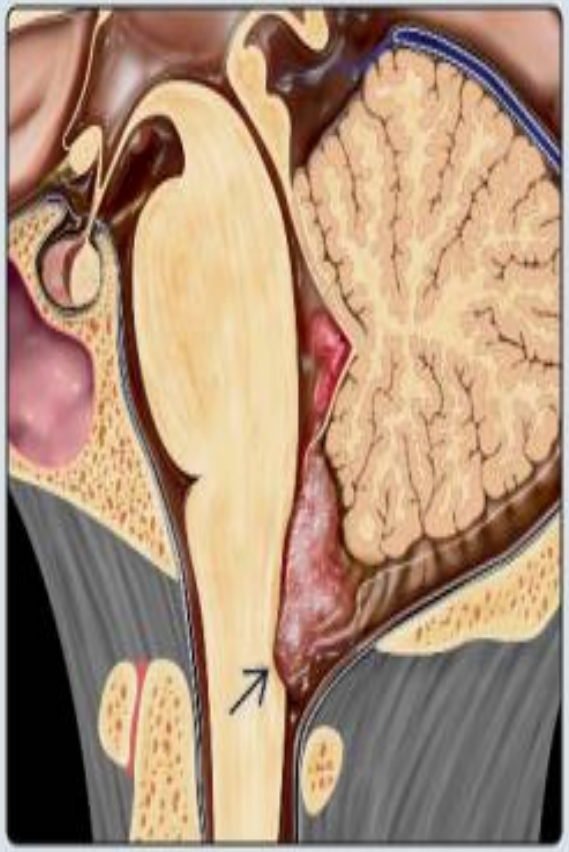
(21-9A) NECT in an 8y boy with confusion, headache, and 3 weeks of vomiting shows a mildly hyperdense mass in the midline posterior fossa that fills the fourth ventricle. Obstructive hydrocephalus and a small focus of calcification in the mass are present. (21-9B) Sagittal T2WI shows that the mass fills the fourth ventricle and extends posteroinferiorly through the foramen of Magendie into the cisterna magna.

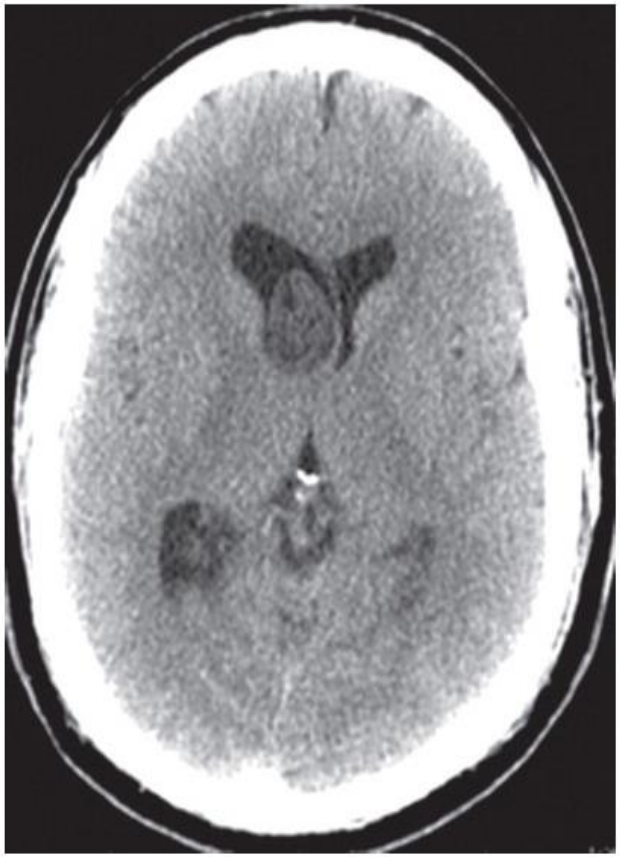
SUBEPENDYMOMA

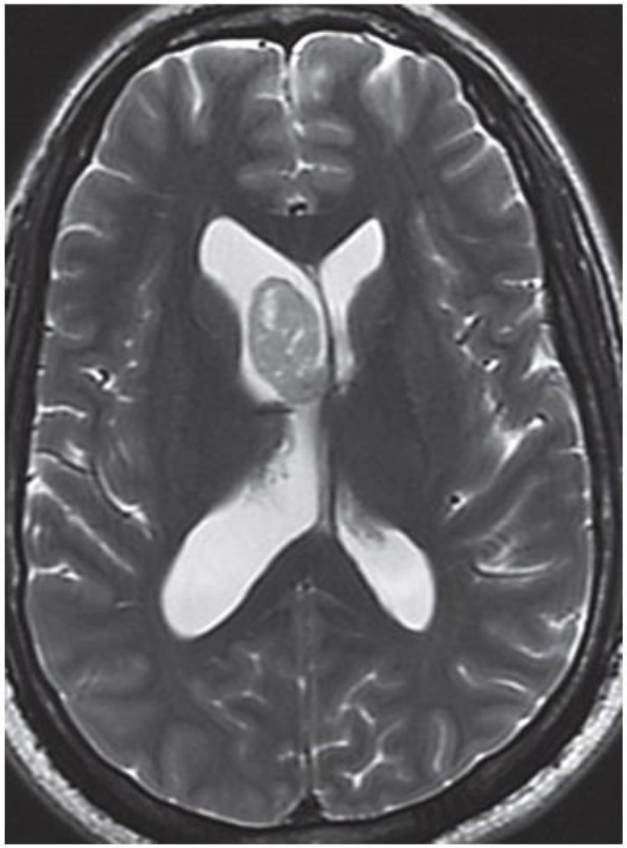
- Location: 4th ventricle and lateral ventricles
- M: F – 2.3 : 1
- 60% asymptomatic ,if symptomatic-hydrocephalus is present
- The classic scenario is a middle aged man with an incidental finding of an intraventricular neoplasm at imaging
- Imaging: well circumscribed lesion ,hypo or isoattenuating at CT
- MRI- T1 hypo to iso, T2 hyper, no or minimal enhancement
- Unlike ependymomas, no invasion into the brain parenchyma occurs
- No CSF dissemination occurs

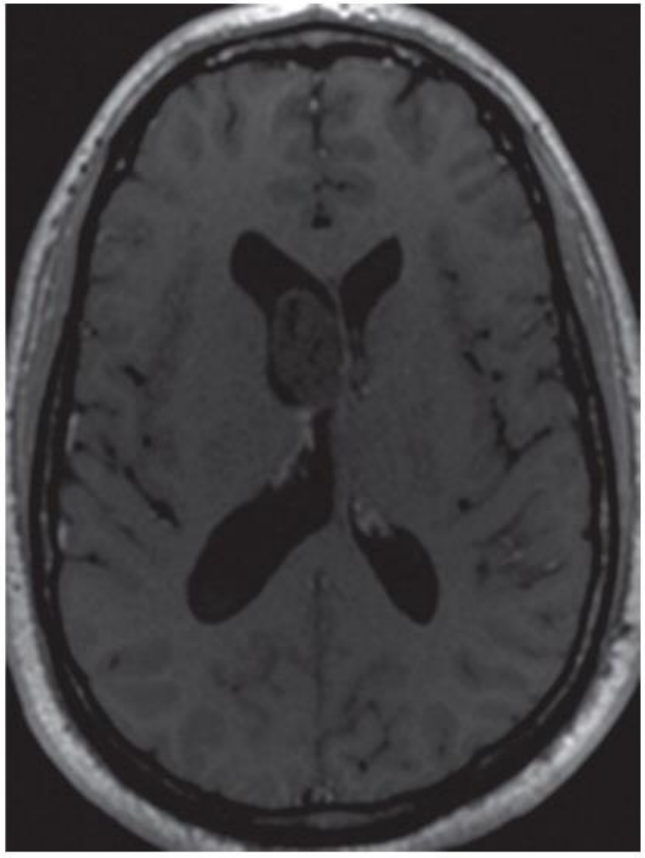
(Left) *Sagittal T2 MR shows a solid, hyperintense mass along the inferior 4th ventricle in a 64-year-old man with headaches. A subependymoma was found at resection. These 4th ventricular tumors are often asymptomatic. T2 and FLAIR are typically the most sensitive sequences to identify this WHO grade 1 tumor.*
(Right) *Sagittal graphic shows a solid, well-circumscribed mass arising from the floor of the 4th ventricle with mild mass effect. Note the lack of hydrocephalus and edema in the adjacent brain, typical of a subependymoma.*





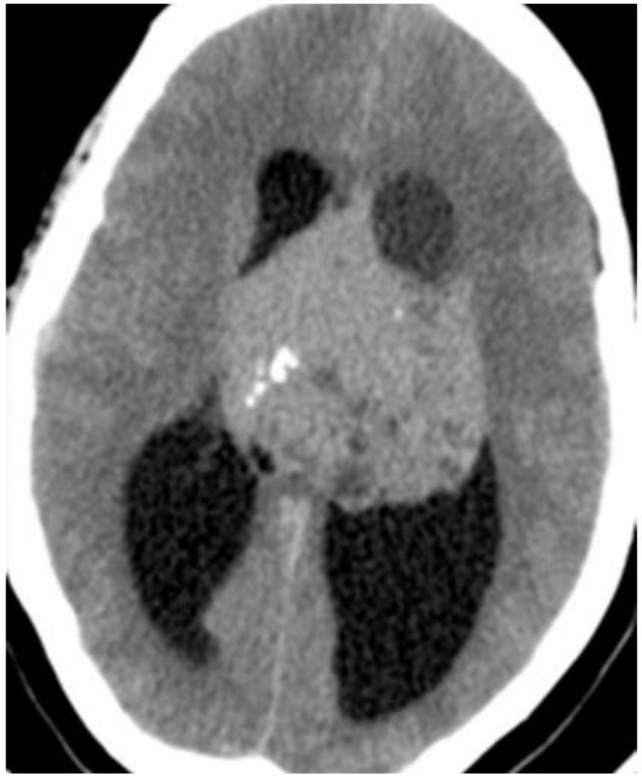


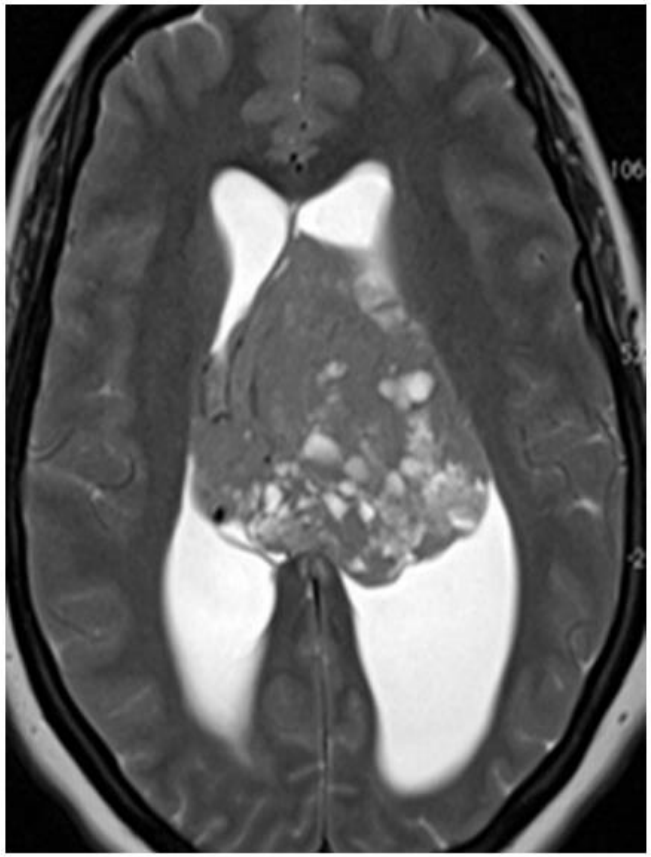


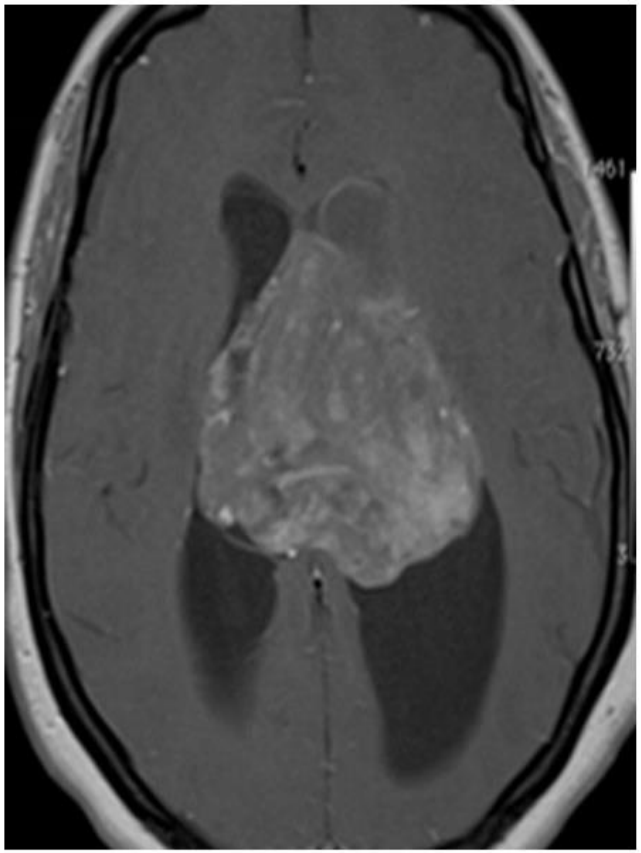


CENTRAL NEUROCYTOMA

- Glioneuronal tumor
- Arising from the septum pellucidum or ventricular wall
- The epicentre is midline in region of septum pellucidum,extending into both lateral ventricles
- Well circumscribed, lobulated, cyst like areas –giving the lesion a bubbly appearance
- CT – hyperattenuating
- MRI- T1 iso and T2 hyper,moderate to strong enhancement,prominent flow voids
- MR spectroscopy-glycine peak (3.55 ppm)
- Extraventricular neurocytomas are also described and arise in the brain parenchyma, cerebellum, and spinal cord.
- The term *central neurocytoma* is reserved for neurocytomas that occur in the ventricular system.

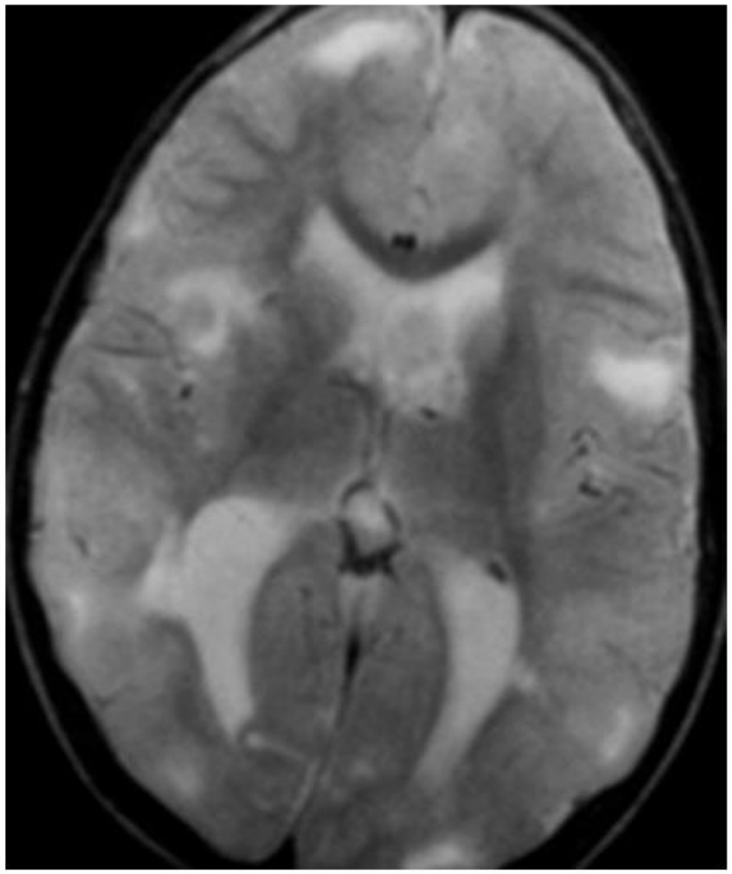


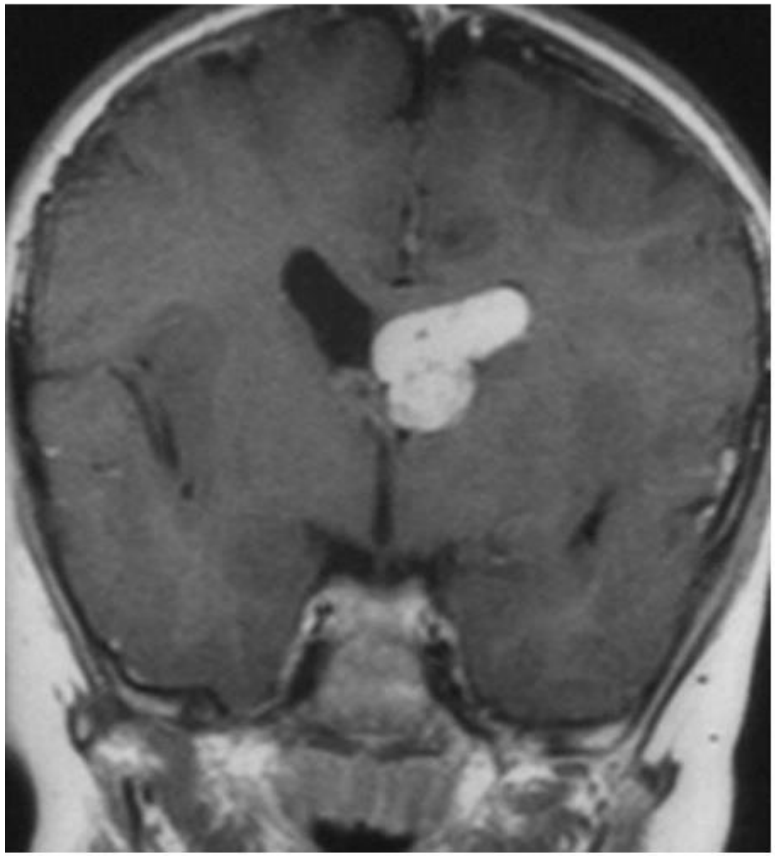




SUBEPENDYMAL GIANT CELL TUMOR

- Most common cerebral neoplasm in patients with tuberous sclerosis
- Previously known as subependymal giant cell astrocytoma
- Typically ,larger than 1 cm
- Most common location – near the foramen of Monro
- Multiple calcified and non calcified tubers are also seen in brain,which helps in diagnosis
- At CT, SGCTs are hypo- to isoattenuating.
- MR imaging reveals a lesion that is hypo- to isointense to gray matter on T1-weighted images and iso- to hyperintense on T2-weighted images.
- At contrast-enhanced imaging, the lesions avidly enhance.

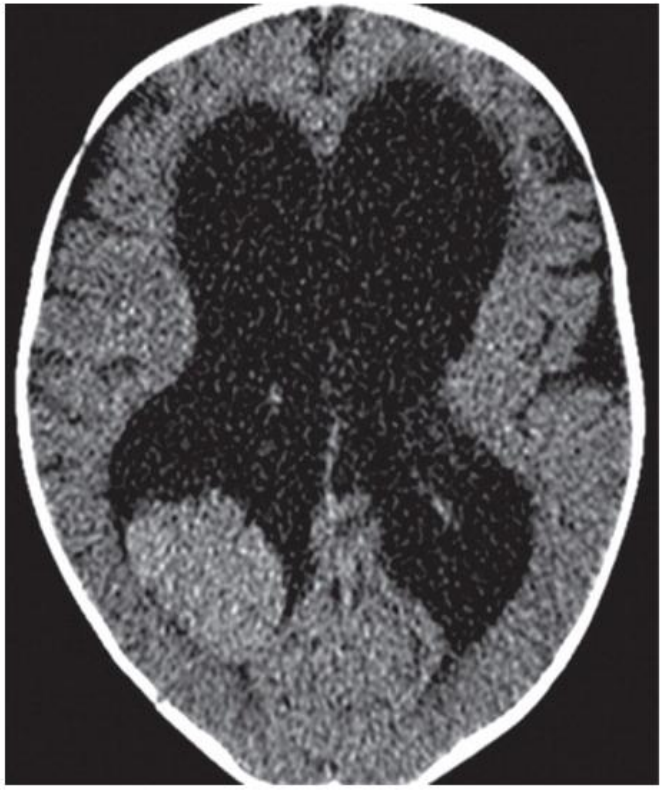


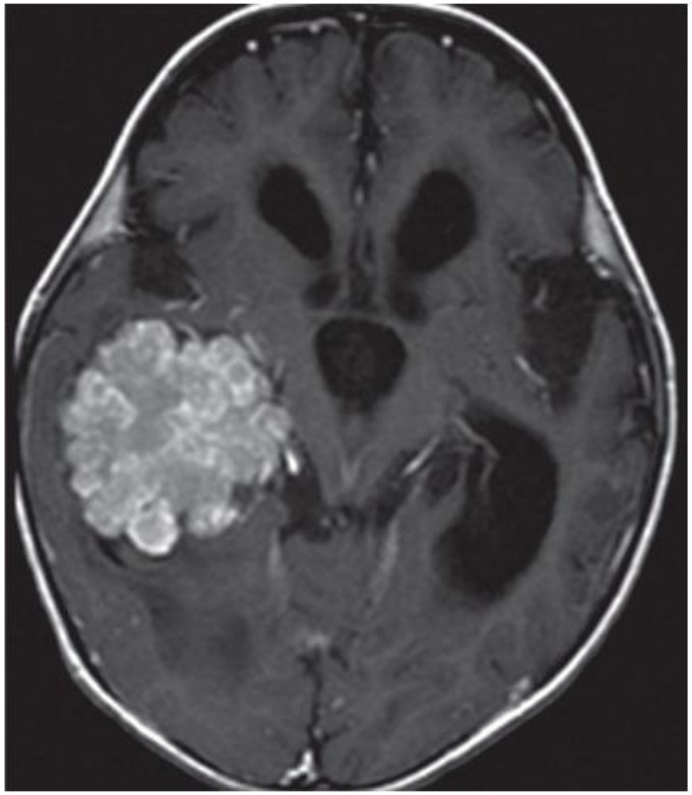


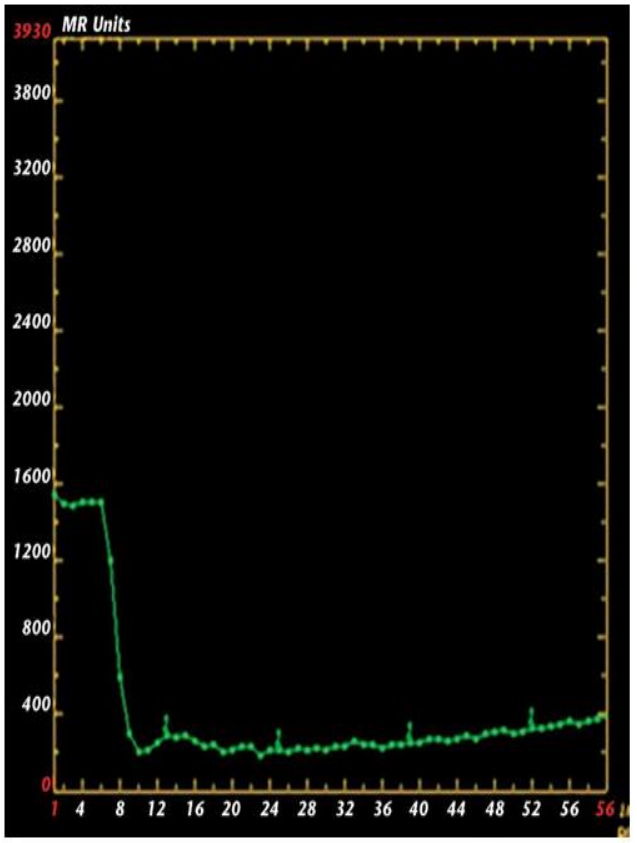
CHOROID PLEXUS NEOPLASMS

- 20% of pediatric neoplasms occur in the 1st year of life
- Develop from choroid plexus epithelium
- Most common location – atrium of lateral ventricle(50%),40%- 4th ventricle,10%- 3 rd ventricle
- Imaging:
- Lesions show a frond like appearance of their surface,hemorrhage and cyst formation may be seen in all neoplasms(CPC > CPP)
- Very vascular lesions- demonstrate avid enhancement

- Choroid plexus neoplasms may be subdivided on the basis of histologic findings into choroid plexus papilloma (CPP) (WHO grade I), atypical CPP (WHO grade II), or choroid plexus carcinoma (CPC) (WHO grade III).
- CPCs tend to be more heterogeneous than CPPs at CT and MR imaging, in part reflecting areas of necrosis






MR Units
3930
3800
3200
2800
2400
2000
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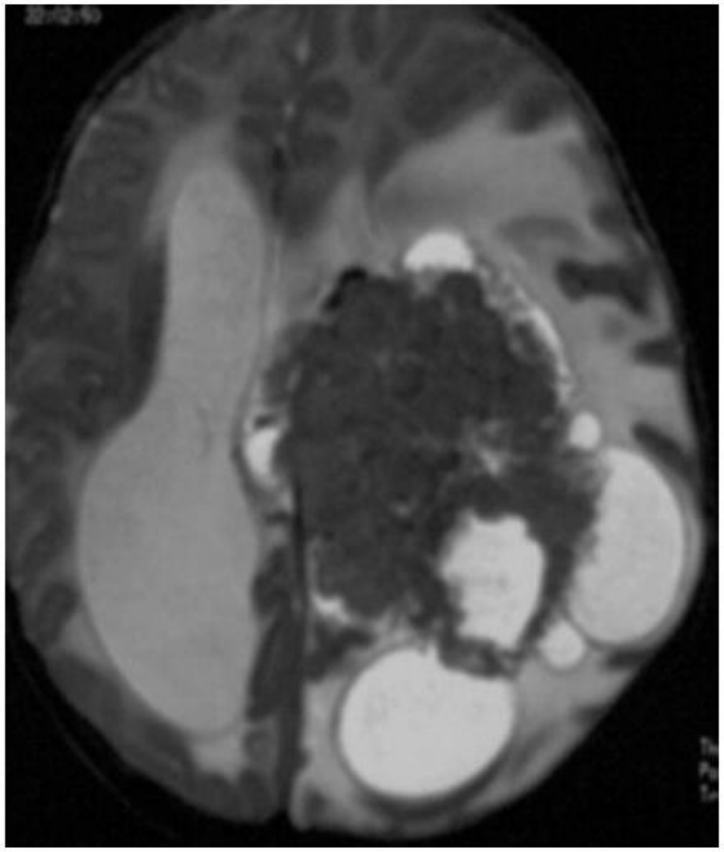
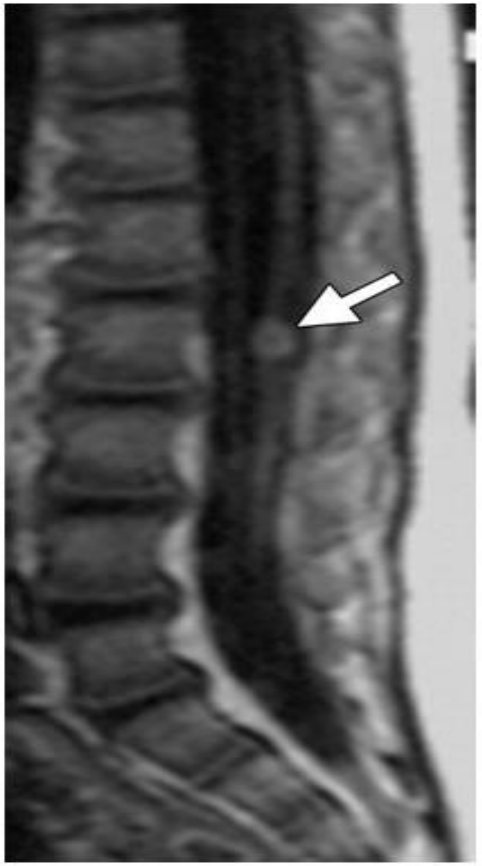
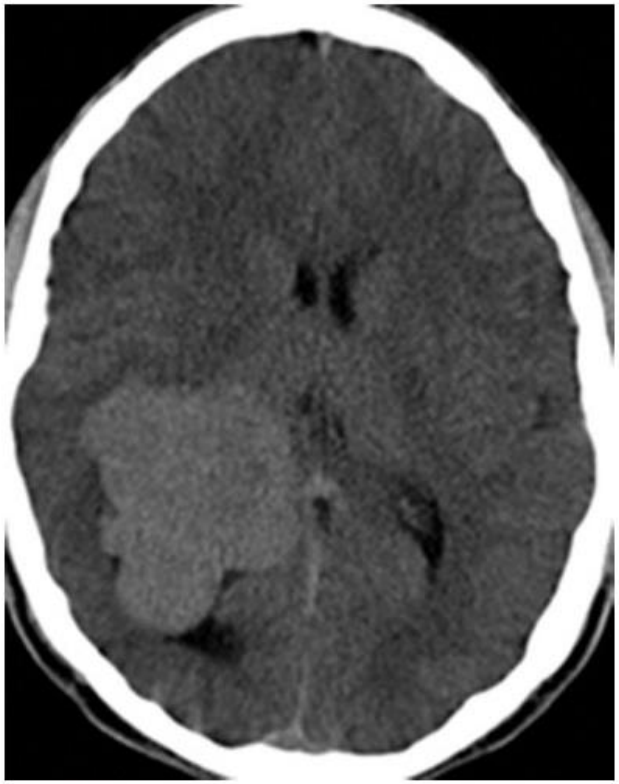
0
1 4 8 12 16 20 24 28 32 36 40 44 48 52 56 56

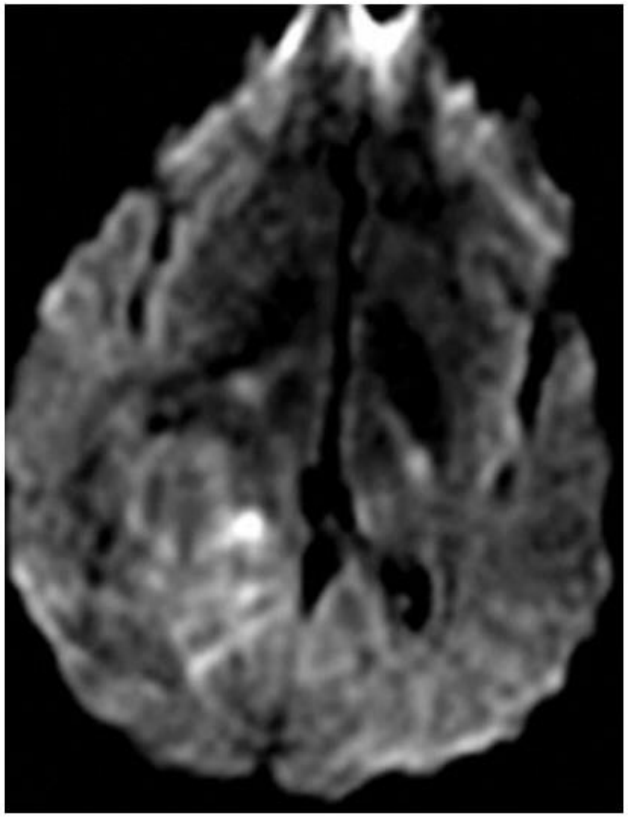


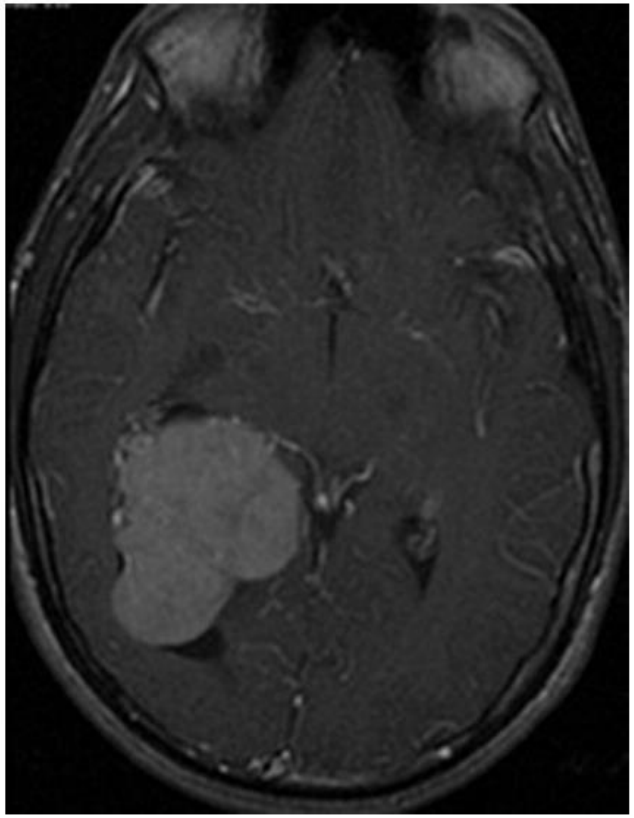


MENINGIOMA

- The most common location for intraventricular meningiomas is in the atrium of the lateral ventricles
- CT reveals a well-defined, iso- to hyperattenuating globular mass.
- MR imaging demonstrates a mass that is iso- to hypointense on T1-weighted images and iso- to hyperintense on T2-weighted images.
- Owing to the highly vascular nature of these lesions, avid enhancement is seen on contrast-enhanced images.

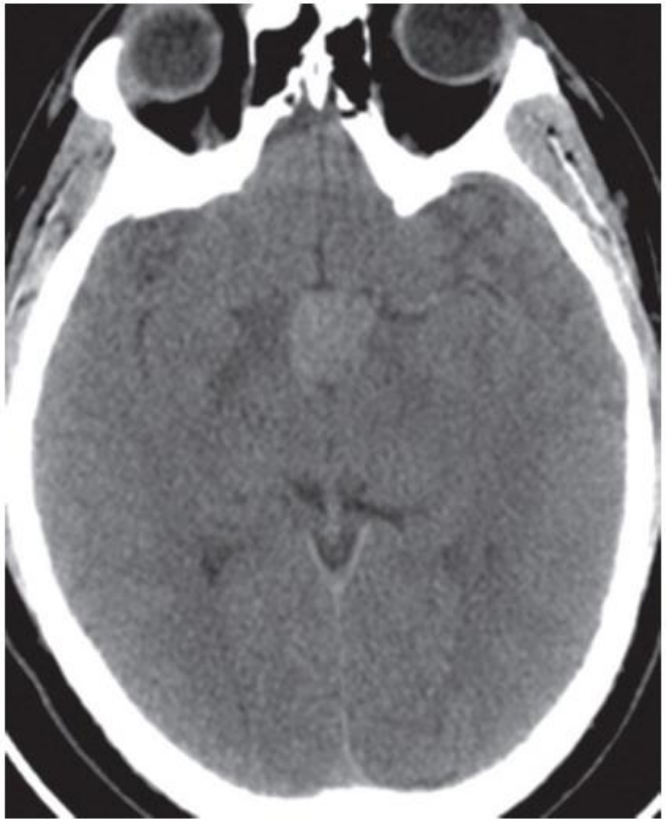


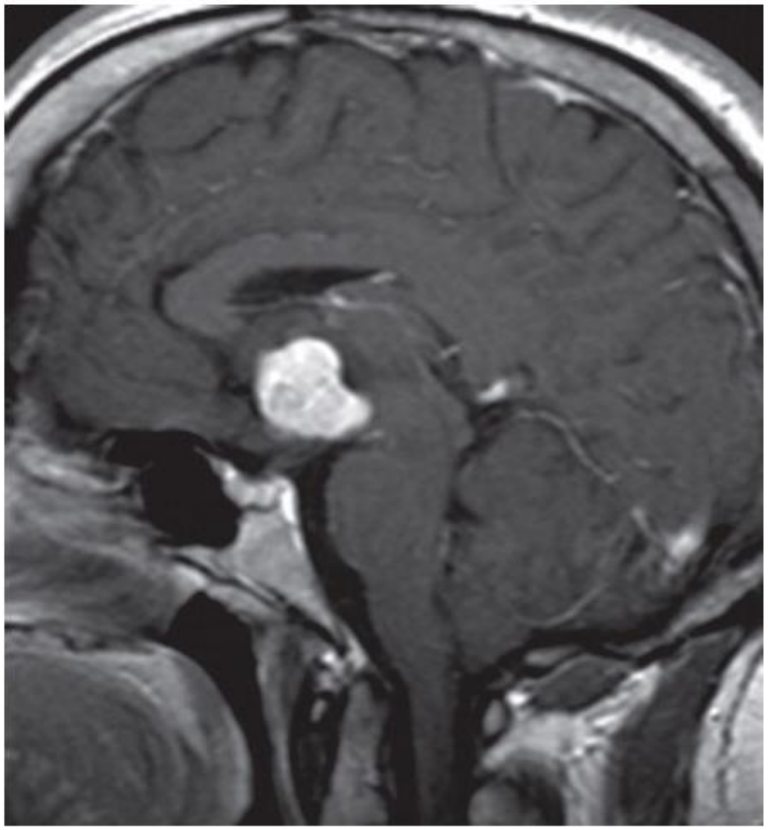




CHORDOID GLIOMA

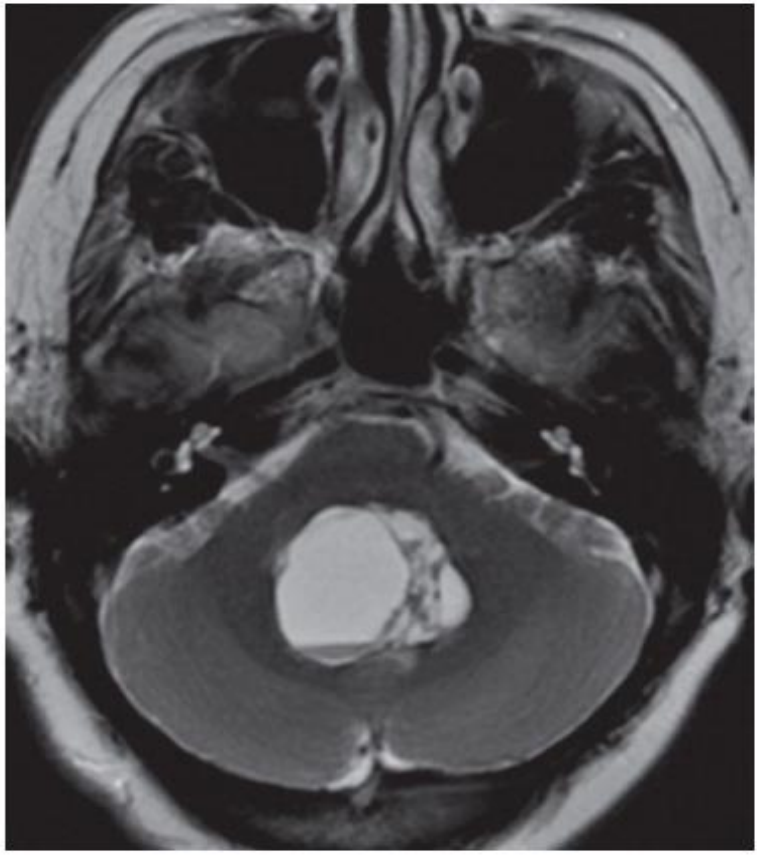
- WHO grade II, slow-growing glial neoplasm involving the region of the anterior third ventricle and the hypothalamus.
- They are hyperattenuating at CT . At MR imaging, chordoid gliomas are isointense to gray matter on T1-weighted images and hyperintense on T2-weighted images and enhance avidly after contrast material administration.

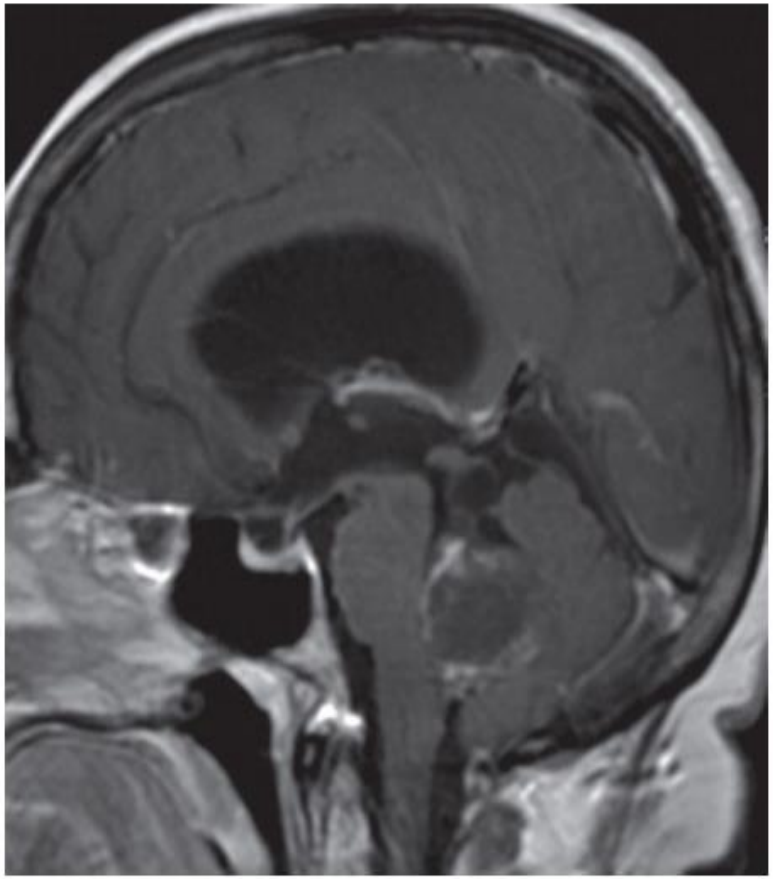




ROSETTE FORMING GLIO-NEURONAL TUMOR

- Cystic neoplasm of the fourth ventricle in an adult
- Well defined multiseptate cystic lesion in 4th ventricle,mixed solid-cystic appearance
- Fluid – fluid levels are seen within the cysts
- Mild peripheral and septal enhancement on post contrast imaging
- Lesion does not show any diffusion restriction
- T1WI - Iso- hypointense mass
- T2WI/FLAIR - Hyperintense, heterogeneous





METASTASES

- In adults - renal, colon and lung carcinoma are the most common causes.
- In children - neuroblastoma, wilms tumor and retinoblastoma are most common.
- They are most common in the lateral ventricles.
- Avid enhancement is usually seen on contrast-enhanced images and vasogenic edema may be seen in the adjacent brain parenchyma.

CONCLUSION

- Many tumors have similar imaging appearances, making the imaging findings less helpful in narrowing the differential diagnosis.
- Consideration of the tumor location and the patient's age and gender in combination with the imaging findings is currently the best method for narrowing the differential diagnosis.