A Review Series of Intraventricular Neoplasms:
The Lateral Ventricles.

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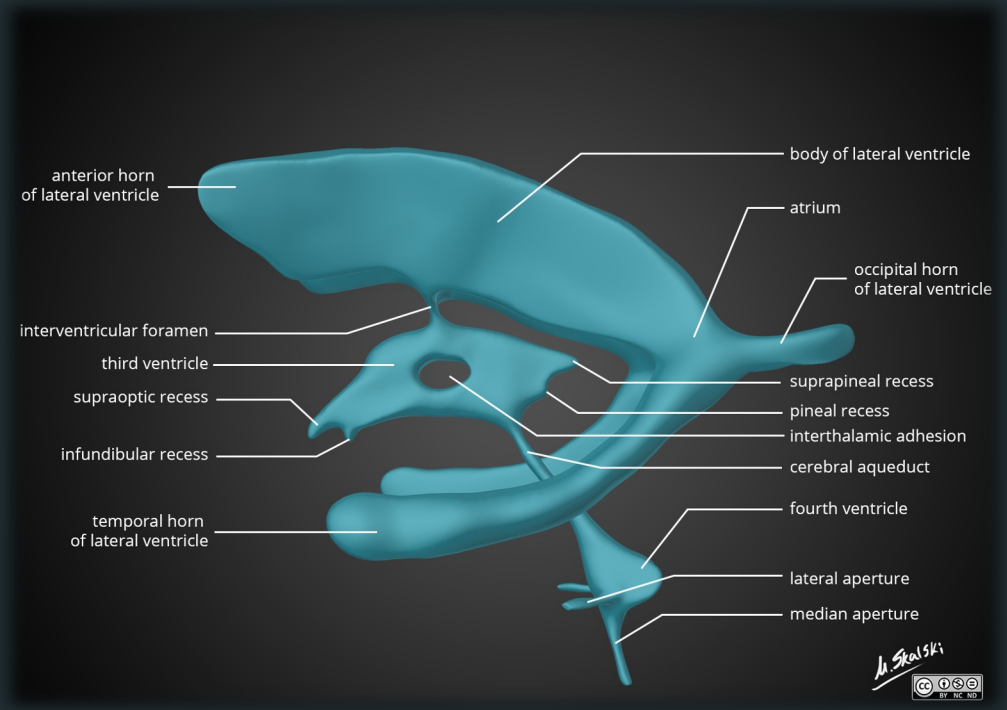
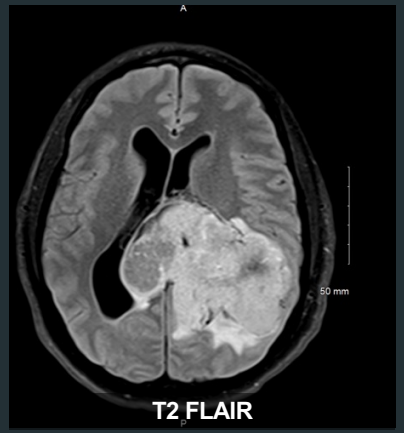
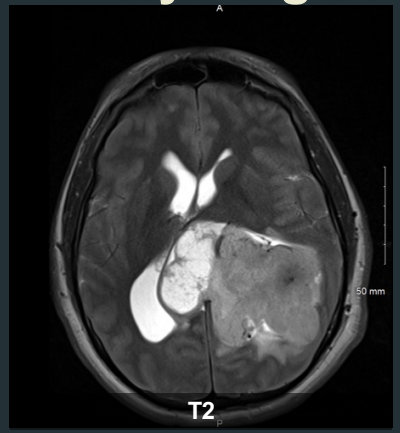
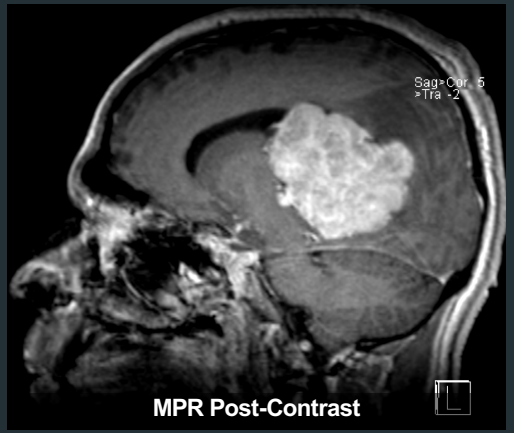
Anatomy Review of the Ventricular System

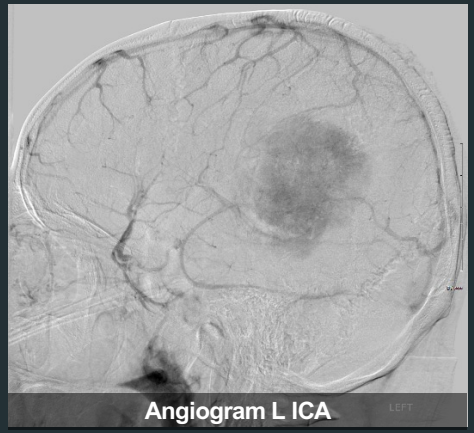


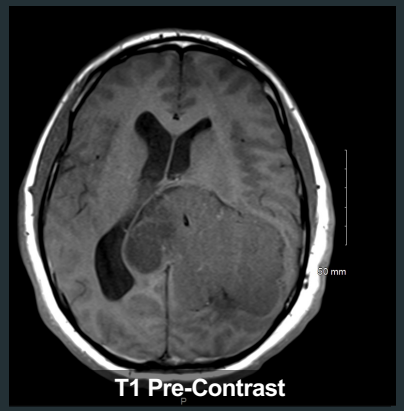
34-year-old male with memory and balance complaints with recent falls. What is the most likely diagnosis?

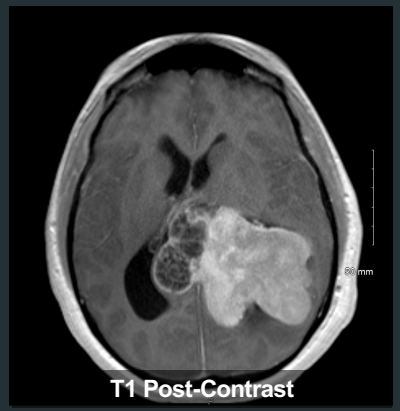

T2 FLAIR


T2


MPR Post-Contrast


Angiogram L ICA


T1 Pre-Contrast


T1 Post-Contrast

- **FLAIR** and **T2WI** (top left) shows a large lobulated well circumscribed predominately solid mass centered in the trigone of the left lateral ventricle. T2 fluid-intensity cystic component with incomplete FLAIR suppression is noted displacing the dorsal septum pellucidum. Solid component is isointense to slightly hypointense to grey matter likely due to its fibrous components (fibrous histological subtype is the most common subtype of this intraventricular neoplasm). Peripheral serpiginous and round structures reflect flow voids of vessels associated with the mass indicating a highly vascular neoplasm.
- **Pre-contrast T1WI** and **contrast-enhanced T1WI** (bottom left) shows solid component is isointense to gray matter on T1. Cystic component is slightly less hypointense than CSF. Post contrast imaging demonstrates avid heterogeneous enhancement of the solid component. There is enhancement along the wall of the cystic component and there are enhancing septae within it.
- Left ICA Angiogram (top right) shows delayed vascular blush of this mass in venous phase (note the superior sagittal sinus).

Meningioma

Background

- Usually WHO grade I
- 9.8-14% of all intraventricular tumors
- F:M, 2:1; **Most common lesion in >30-year-old female** at **trigone of lateral ventricle**
- Interventricular meningiomas are **most common in lateral ventricles**, then 3rd; rare in 4th ventricle

Imaging Features

- Often **large** before patient is symptomatic and imaging is performed
- Well-defined **globular mass**
- Calcifications present in 50%
- MRI: iso/hypointense to gray matter on T1, iso/hyperintense on T2; **avid enhancement** is often seen (as they are highly vascular)
- Angiography: hypervascularity, delayed vascular blush, 75% receive blood supply from dural vessels

Treatment / Prognosis

- Surgical excision is curative
- Recurrence rate is low at 5%

Lateral Ventricle Neoplasms

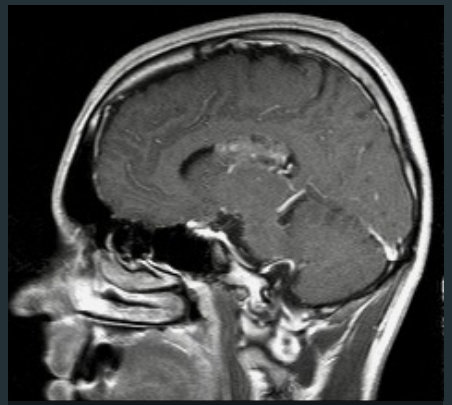
Pediatric

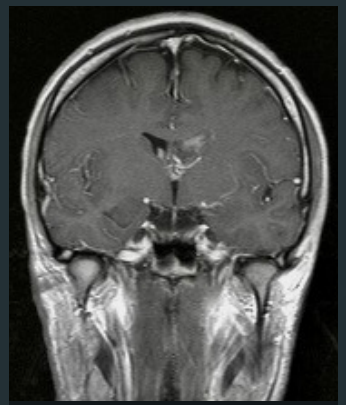
- Choroid Plexus Tumors
- Ependymoma
- Primitive Neuroendocrine Tumor (PNET)
- Teratoma
- Astrocytoma

Adult

- Gliomas
  - Astrocytoma
  - Subependymoma
  - Subependymal Giant Cell Tumor (SGCT/SEGA)
- Meningioma
- Ependymoma
- Choroid Plexus Tumors
- Metastasis
- CNS Lymphoma

Central Neurocytoma


T1 Post-Contrast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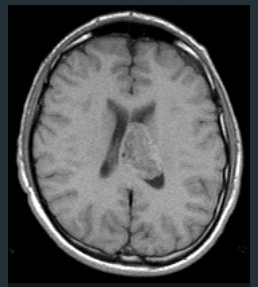
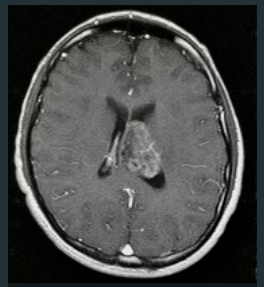
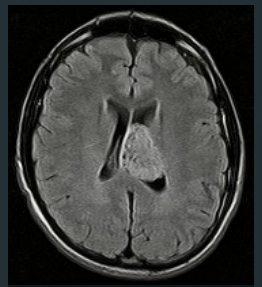

T1 Pre-Contrast


T1 Post-Contrast


FLAIR

Background

- WHO grade II
- Mean age 29 with wide age range
- Arise from the septum pellucidum or from the walls of the lateral ventricles
- Patients typically present with signs of increased intracranial pressure

Imaging Characteristics

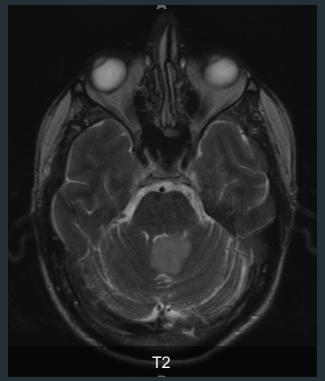
- Well-circumscribed, lobulated masses with internal cysts, attributing to their often “bubbly” appearance
- Calcifications are seen in approximately 50% of cases
- On MR, they are isointense on T1WI to white-matter, and hyperintense on T2WI usually located centrally around the septum pellucidum
- Variable enhancement is seen

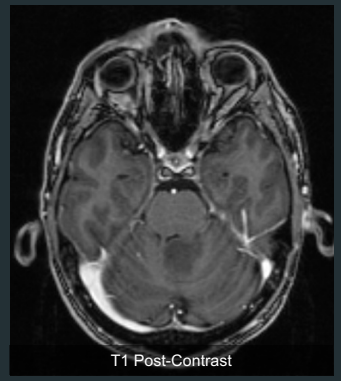
Treatment / Prognosis

- Complete surgical resection is best initial treatment
- Adjuvant radiotherapy increases local control rates but demonstrates no survival benefit
- 10-year overall survival rate of 83%

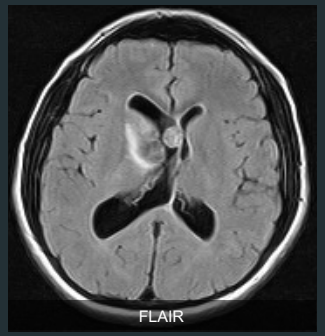
Subependymoma

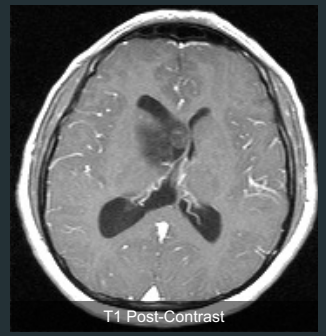
Patient 1





Patient 2





Background

- WHO grade I
- Most occur in male patients (~2:1, M:F) and >15 years old
- Usually asymptomatic but may obstruct the foramen of Monroe and cause hydrocephalus
- **50%** located in **4th ventricle**; **40%** in **lateral ventricle**

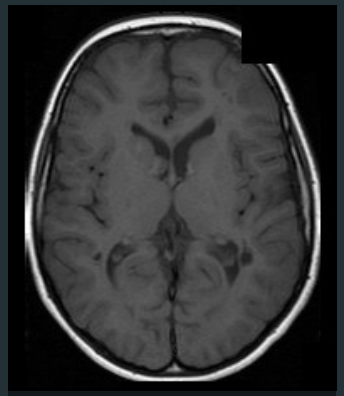
Imaging Characteristics

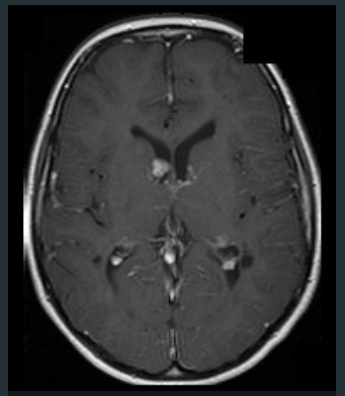
- Lesions are well-circumscribed
- On T1WI, they are iso- or hypointense to white matter; hyperintense on T2WI
- **Minimal to no enhancement**
- Cystic degeneration is common

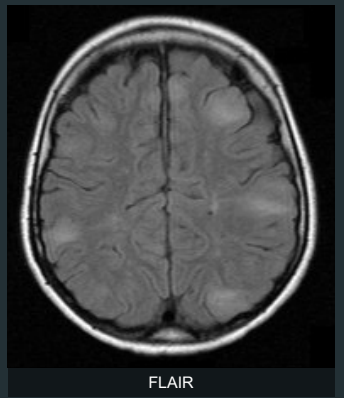
Treatment / Prognosis

- Complete surgical resection
- Radiotherapy typically reserved for cases where resection is not possible
- 5-year overall survival rate of 89%

Subependymal Giant Cell Astrocytoma


T1 Pre-Contrast


T1 Post-Contrast


FLAIR

Background

- WHO grade I
- Both Subependymomas and Subependymal Giant Cell Astrocystomas (SGCA/SEGAs) are associated with **Tuberous Sclerosis** (left; T2 FLAIR showing cortical tubers). Therefore, suspected subependymomas are often followed for change in growth which may suggest an alternative diagnosis of SGCA.

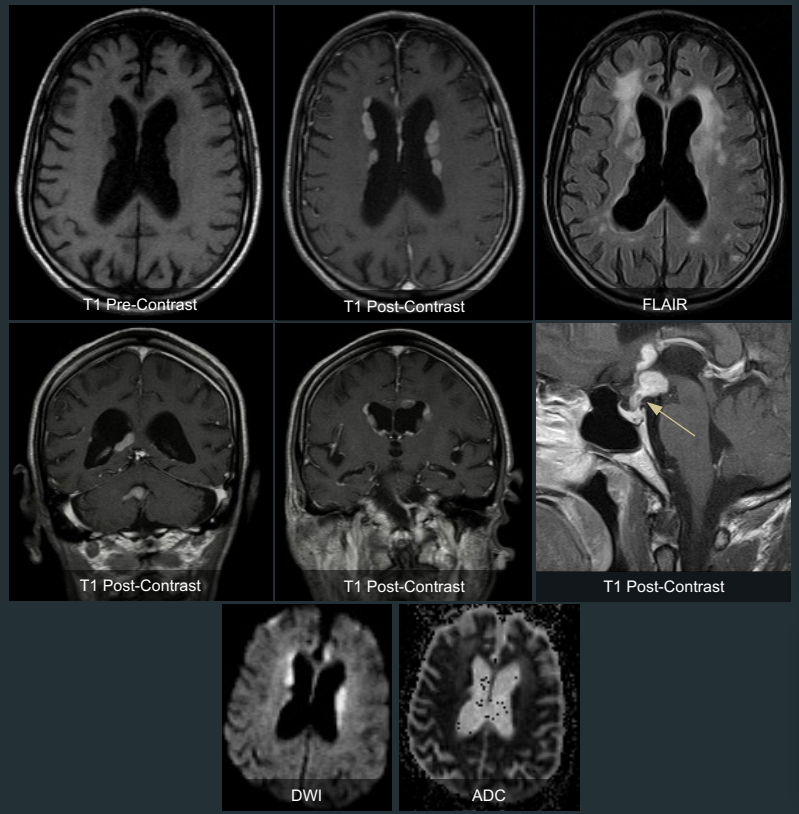
Imaging Characteristics

- Well-circumscribed lesion, typically >1 cm
- On MR, hypo- or isointense to gray matter on T1WI; hyperintense on T2WI
- Variable calcification and hemorrhage
- Strong enhancement with contrast
- Surveillance for growth and obstructive hydrocephalus is often performed

Treatment / Prognosis

- Total surgical resection is curative
- If tumor is asymptomatic but growing, or if total resection is not possible, mTOR inhibitors may be used

Lymphoma



Background

- CNS lymphoma may be primary (representing the first site of disease) or secondary (leptomeningeal spread)
- Non-Hodgkin diffuse large B-Cell Lymphoma is the most common type in both cases
- Primary CNS lymphoma represents 4% of all brain neoplasms, but is exceedingly rare intraventricularly
- Mean age of onset for immunocompromised patients is 4th decade; 7th decade for immunocompetent patients
- Multiple lesions are common, especially among immunocompromised patients

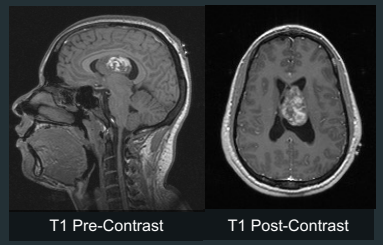
Imaging Characteristics

- Usually fully solid tumors with peritumoral brain edema
- On MR, lesions are typically hypo-isointense, as well as iso to hypointense on T2WI
- **Restricted diffusion** is common (*left*)
- Typically demonstrate solid enhancement (in immunocompetent patients)
- Thickening of the pituitary-stalk is rare (seen with lymphoma, sarcoidosis, and Langerhans cell histiocytosis), but if seen, may help with the diagnosis (*left; arrow*)

Treatment / Prognosis

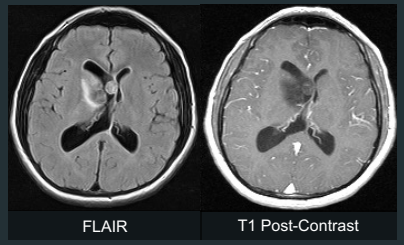
- Treatment includes high-dose methotrexate-based chemotherapy with or without radiotherapy
- Prognosis is poor with frequent recurrence
- Overall survival is 35 months

Rapid Review



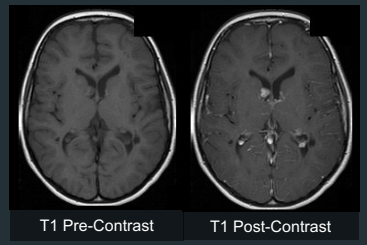
Central Neurocytoma

- Mean age 29; with wide age-range.
- Arise from the septum pellucidum or ventricles walls of the lateral ventricles.
- Patient's typically present with increased intracranial pressure.
- **Imaging**: Well-circumscribed, lobulated masses with internal cysts, attributing to their often "bubbly" appearance. Calcifications (50%). Usually located centrally around the septum pellucidum (above).



Subependymoma

- Most occur in male patients (~2:1, M:F) and >15 years old.
- May obstruct the foramen of Monroe and cause hydrocephalus.
- **50%** in **4th ventricle**; **40%** i n **lateral ventricles**.
- **Imaging**: Lesions are well-circumscribed; on T1WI, they are Hypo- to isointense to white matter. Hyperintense on T2WI. Minimal to no enhancement. Cystic degeneration is common.

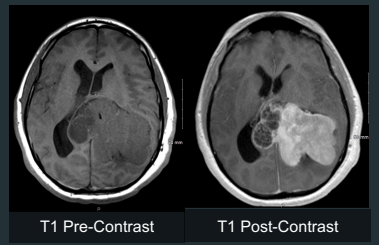


Subependymal Giant Cell Astrocytoma

- Associated with **Tuberous Sclerosis**.
- **May obstruct the foramen of** Monroe, and cause hydrocephalus.
- Imaging: Well-circumscribed lesion, typically >1 cm. On MR, hypo- or isointense to gray matter on T1WI; hyperintense on T2WI. Variable calcification and hemorrhage. Strong enhancement with contrast.

Lymphoma

- Primary or secondary CNS lymphoma may be seen anywhere in the brain.
- **Imaging**: Due to high-cellularity, high-T1 and low T2 signal may be seen; **Restricted diffusion** is common (above).
- **Thickening of the pituitary-stalk** is rare (seen with lymphoma, sarcoidosis, and Langerhans cell histiocytosis), but if seen, may help with the diagnosis.



Meningioma

- F:M, 2:1; **Most common lesion in >30-year-old female** at **trigone of lateral ventricle.**
- **Most common in lateral ventricles**, then 3rd; rare in 4th ventricle.
- **Imaging**: Often **large, globular** mass with **avid enhancement.** May have delayed vascular blush on angiography.

References

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