Tumor-like lesions of the pediatric brain

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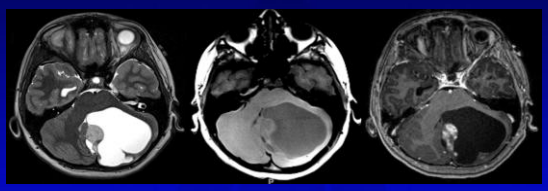
Frequently it is straightforward



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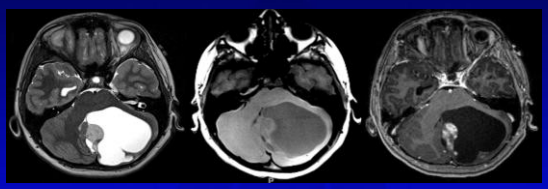
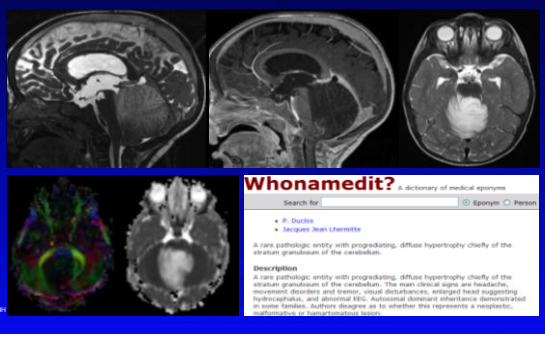
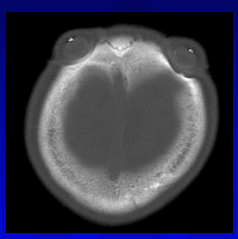


Pilocytic astrocytoma

Even when the tumor is rare

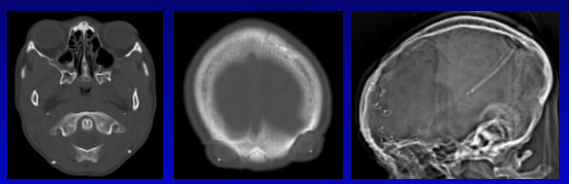


"Imaging may be confusing"



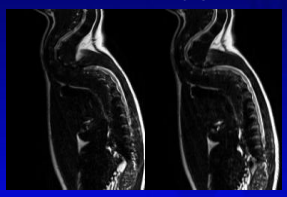
Developmental delay, TORCH infection?

"Imaging may be confusing"



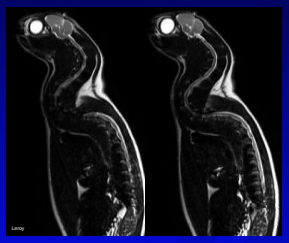
“Imaging may be confusing“

Back pain?
Ataxia, wobbly gait



- Especially if you are not familiar with the anatomy, findings or pathology

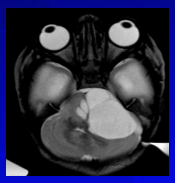
“Imaging may be confusing“



Tumor versus “Tumor-like“

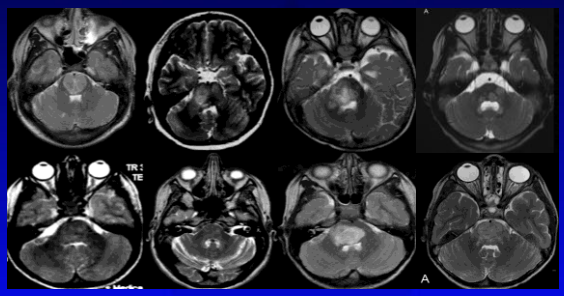
- Every skilled radiologist will say:
  I am an expert, I can differentiate between “tumor” and “tumor like”

Pilocytic astrocytoma



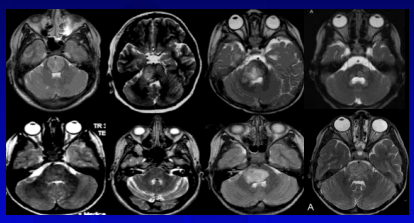
Arachnoid cyst

Differentation may be difficult



How many true neoplasm are shown?

1. 0
2. 1-2
3. 3-4
4. 5-6
5. 7-8



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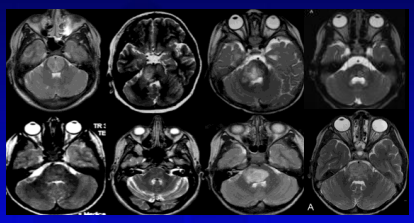

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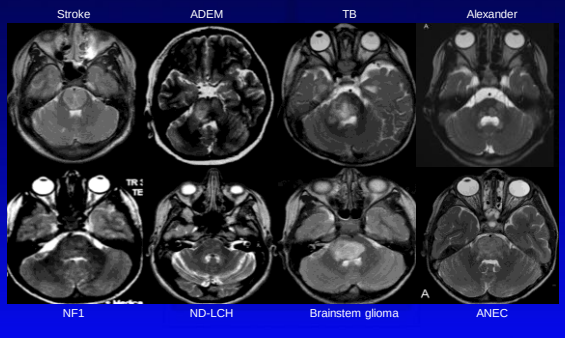
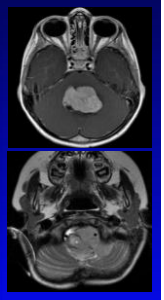


When does a radiologist calls a lesion a tumor?

- Mass
- Focal density/signal alterations
- Displacement of structures
- Infiltration of structures
- Surrounding edema
- Contrast enhancement



What is "Tumor like"

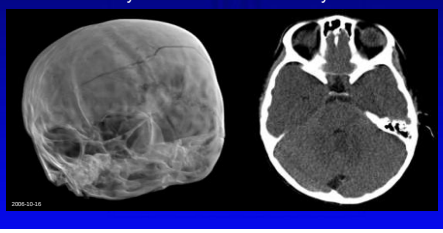
- Anything that resembles a tumor but isn't……
- Translated in the radiologist language:

Findings compatible with a tumor-like lesion, however neoplasm cannot be ruled out. Clinical correlation and follow-up examinations are necessary

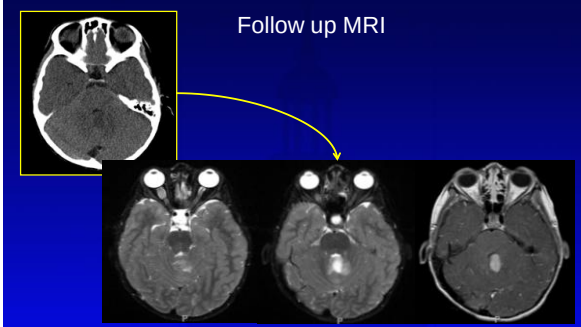
How to differentiate?

- Tumor and tumor-like lesion may look alike, radiologist needs:
  - Good clinical history
  - Good neurological examination
  - Familiarity with neurological diseases and pathology

- 5yr boy who was playing with friends and collided with a much larger child. No loss of consciousness, but became lethargic
- Upon arrival to JHH ED, GCS=15
- Emergency CT was done
- Previous history remarkable for some "eye issues"

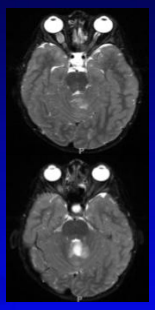


Follow up MRI



What is the most likely diagnosis?

1. Neurofibromatosis type 1
2. Neurofibromatosis type 2
3. Tuberous sclerosis complex
4. Bourneville-Pringle disease
5. Von Hippel-Lindau disease



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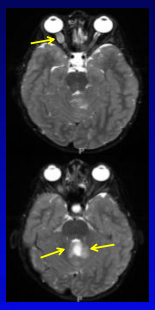
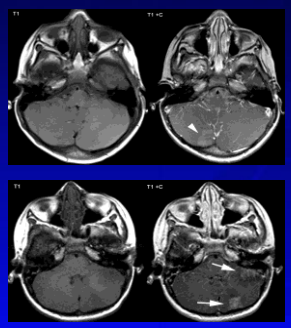


Neurofibromatosis is a clinical diagnosis

Two or more of the following:

1. ≥ 6 café-au-lait spots that are 5 mm in prepubertal individuals or 15 mm in post-pubertal individuals
2. ≥ 2 neurofibromas or 1 plexiform neurofibroma
3. Axillary or inguinal freckling
4. Optic glioma
5. ≥ 2 Lisch nodules
6. Osseous lesions: sphenoid dysplasia or thinning of the long bone or pseudoarthroses
7. First degree relative with NF1

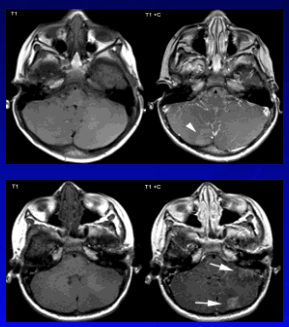
Another case,….



Two children with TSC and seizures

www.123rf.com

Be familiar with rare (?) manifestations



Cerebellar tubers

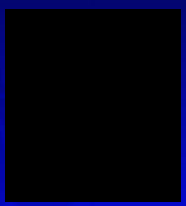
Cerebellar abnormality in children and young adults with tuberous sclerosis complex: MR and diffusion weighted imaging findings

Anomalie cérébelleuse chez des enfants et adultes jeunes présentant une sclérose tubéreuse complexe : aspects en IRM cérébrale et imagerie de diffusion

G. Ertan[1], S. Arulrajah[1], A. Tekes[2], L. Jordan[3], T.A.G.M. Huisman[4,*]

What is the most likely diagnosis in this 5 year old girl?

1. Giant cell astrocytoma
2. Pilocytic astrocytoma
3. Hemangioblastoma
4. ATRT
5. Meningeoma



T1 with contrast of the posterior fossa

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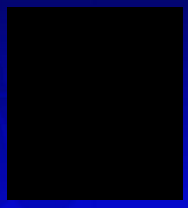


T1 with contrast of the posterior fossa

Take advantage of the statistics

Neoplasms in the pediatric posterior fossa:

Cerebellar astrocytoma	30-35%
Medulloblastoma	20-25%
Brainstem glioma	20-25%
Ependymoma	10-15%
Total	80-90%

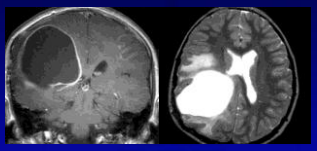
Meningiomas, schwannomas, metastasis are rare in children

General considerations

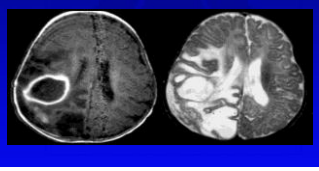
- A rare manifestation of a common disease is more likely than a common manifestation of a rare disease

- Brain tumors are rare in children
- Infections are more frequent in children

Classical "Tumor like" lesion



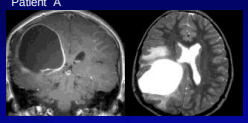
GBM versus Abscess



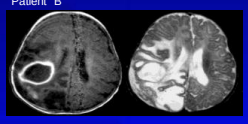
Which patient has an abscess?

1. A
2. B
3. A + B
4. None

Patient A



Patient B



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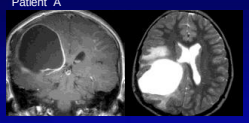
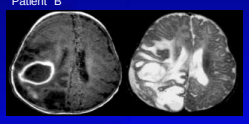
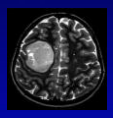


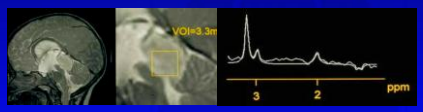
Patient B



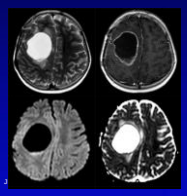
How to facilitate differentiation?

- Tumor and tumor-like lesion may look alike, radiologist needs:
  - ✓High-end anatomical imaging
  - ✓Functional imaging tools: MRS, CSI (finger print), DTI, PWI

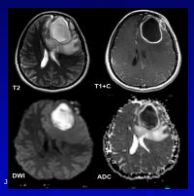




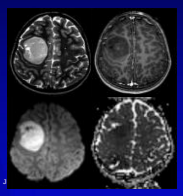
DTI allows to characterize lesions



Necrotic/cystic tumor

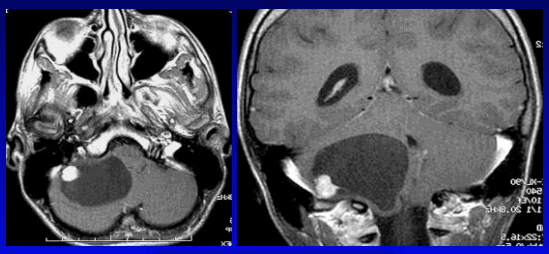


Abscess



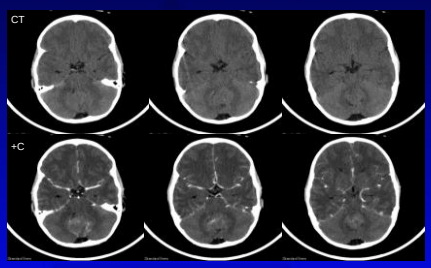
Solid tumor: Astrocytoma

Be familiar with imaging characteristics



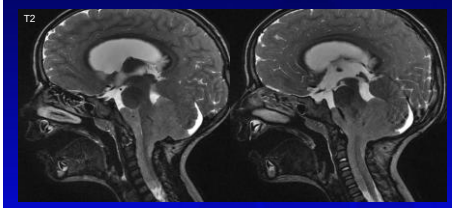
Pilocytic astrocytoma

Be familiar with imaging characteristics



Medulloblastoma

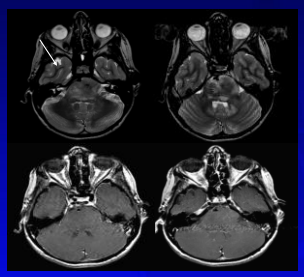
Be familiar with imaging characteristics



Ependymoma frequently originates from velum medullare posterior

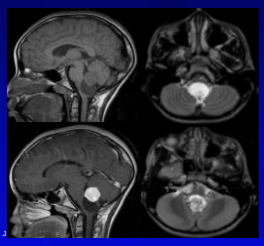
Toothpaste

Be familiar with imaging characteristics



Dangerous embracement

Be familiar with look alikes



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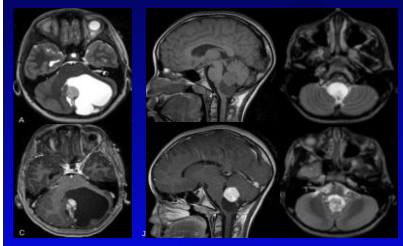

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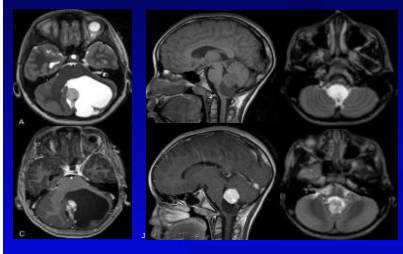
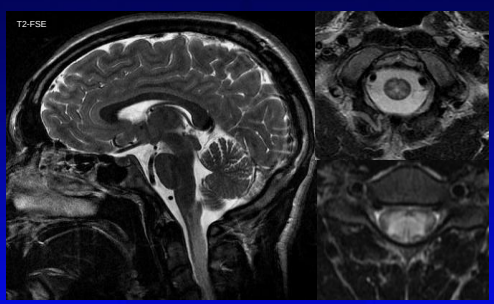


Be aware of what does not fit

Combine clinical information and "Look at the periphery of the film"

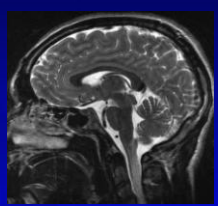
- Young adolescent with recurrent history of headache
- Multiple MRI studies of the head were "normal".
- Medical history relevant for: cystadenoma of the epididymis, and multiple pancreatic cysts

Diagnosis?



What is your most likely diagnosis?

1. Transverse myelitis
2. Longitudinal myelitis
3. ADEM
4. Spinal cord neoplasm
5. MS
6. Hydromyelia



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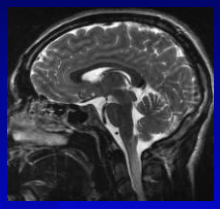

More imaging

What is your most likely diagnosis?

1. Tuberous sclerosis complex
2. Sturge Weber Dimitri syndrome
3. Von Hippel Lindau syndrome
4. Von Recklinghausen disease
5. Meckel Gruber syndrome

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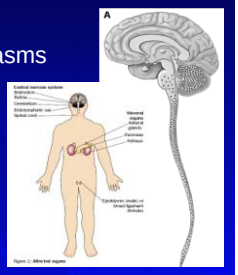
Know where to look for

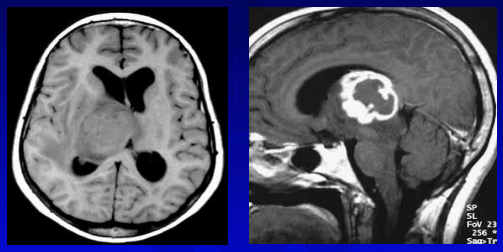
- Hemangioblastoma in VHL
- 1-7% of all spinal cord neoplasms
- Intramedullary, extension to intra- and extradural space
- Slowly growing
- Mostly solitary
- Multiple in von Hippel-Lindau



What other kind of “Tumor-like“ lesions should be considered?

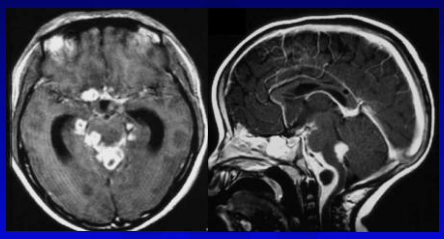
- Infection (next to asbcess)
- Hemorrhage/Ischemia
- Tumefactive demyelination
- Phakomatoses, Hamartoma
- Treatment (radiotherapy)
- Metabolic disorders
- ,.....

?



Courtesy Dr. Kling W. Chong

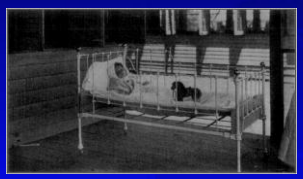
Tuberculous meningitis



Courtesy Dr. Kling W. Chong

Tuberculous meningitis

- Many thought we defeated TB
- However, it is back
- Think about TB as a differential diagnosis



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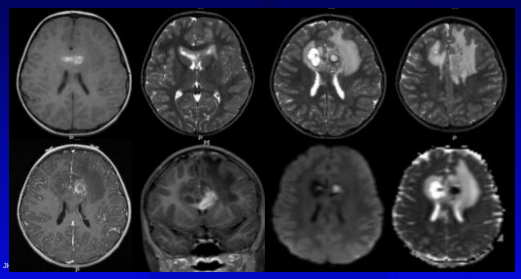
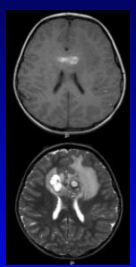


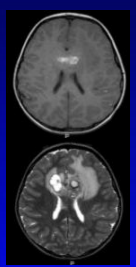
What is your most likely diagnosis?

1. Trauma related shear injury
2. High grade (butterfly) glioma
3. Herpes simplex encephalitis
4. Hematoma related to AVM
5. ADEM

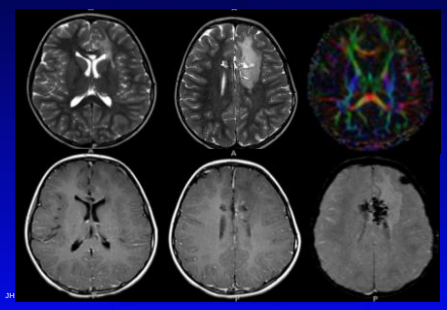


What is your most likely diagnosis?

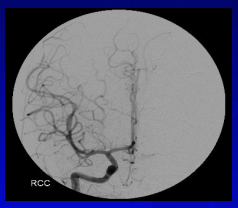
1. Trauma related shear injury
2. High grade (butterfly) glioma
3. Herpes simplex encephalitis
4. Hematoma related to AVM
5. ADEM



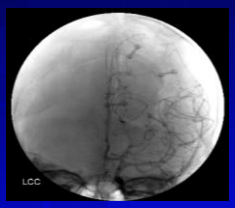
Follow up, no treatment



Significant consequences

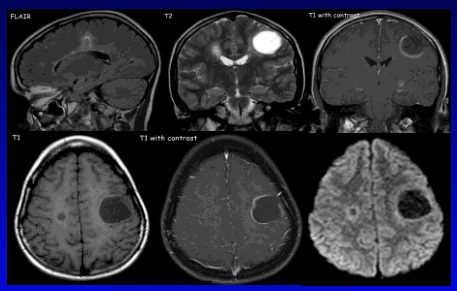


DSA



Biopsy

?



What is your most likely diagnosis?

1. Abscess
2. Necrotic tumor (GBM)
3. Tumefactive MS
4. Hematoma
5. Hydatid disease

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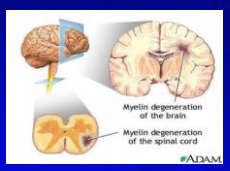
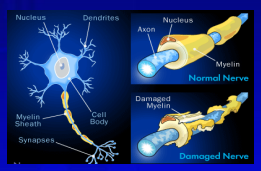
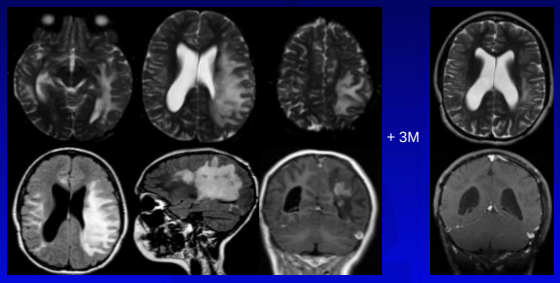
Tumefactive demyelination

- Tumefactive demyelination
- Demyelination with mass effect





Tumefactive ADEM (?)



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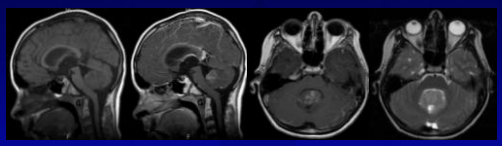
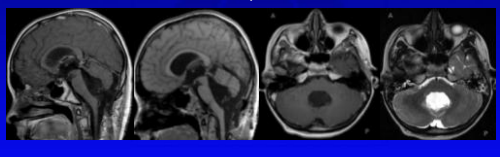


Medulloblastoma → Surgery



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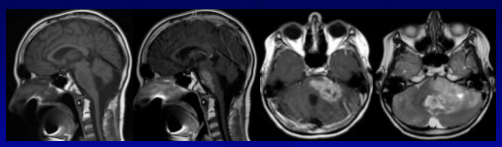
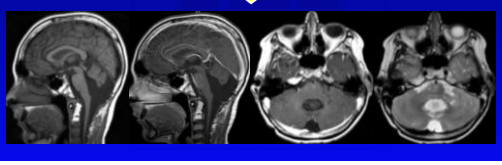
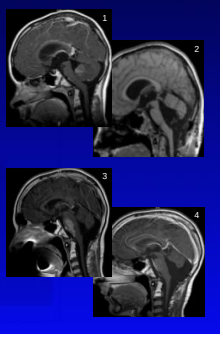




What is your most likely diagnosis?

1. Recurrent medulloblastoma
2. CSF seeding
3. Inflammation
4. Radiation necrosis
5. Pontine myelinolysis



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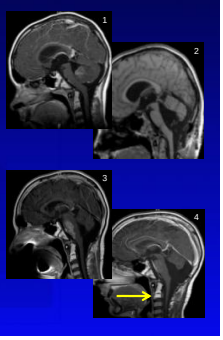

Summary

- Be prepared for the unexpected
- Consider non-neoplastic etiologies
- Use high resolution anatomical and functional techniques
- Correlate with clinical history, findings, follow up, and treatment
- Rare presentation of a common disease is more frequent than the common presentation of a rare disease

Thank you