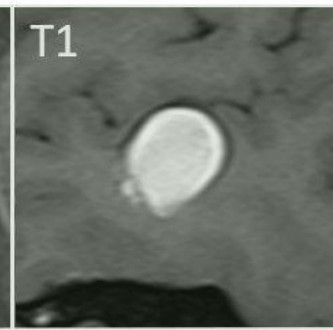
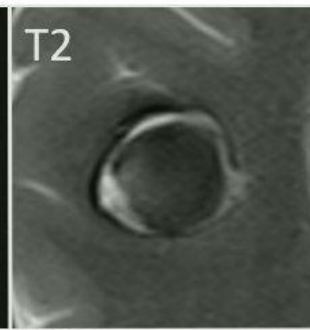
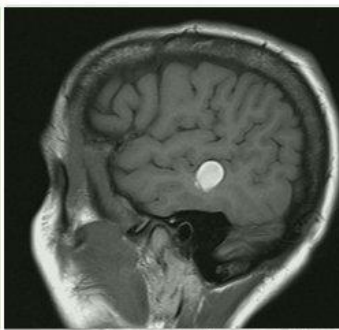


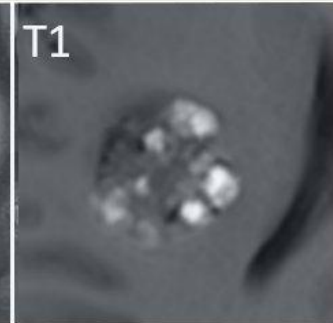
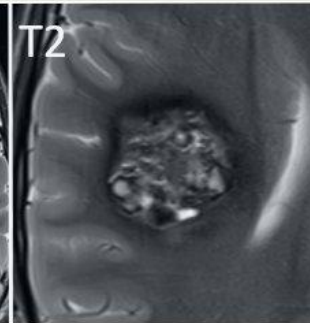
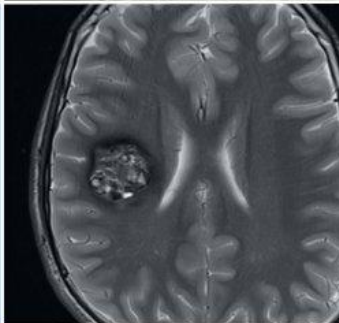
Type 1: T1-hyper

Methemoglobin;
subacute blood



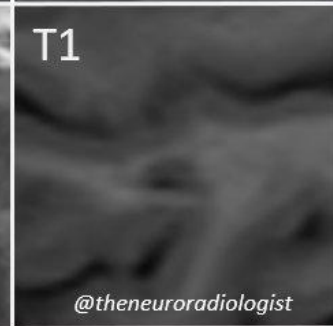
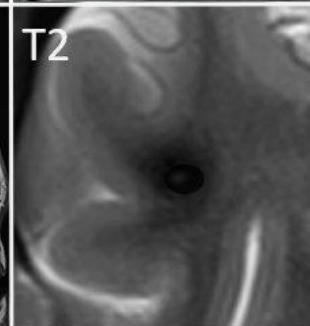
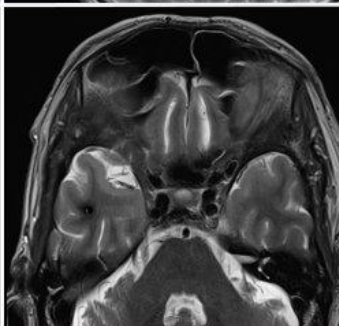
Type 2: popcorn

Classical popcorn lesion,
mixed signal intensities



Type 3: T2-hypo stain

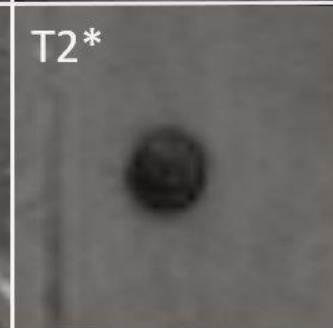
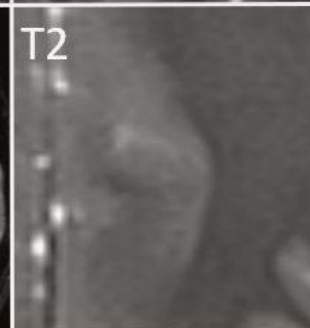
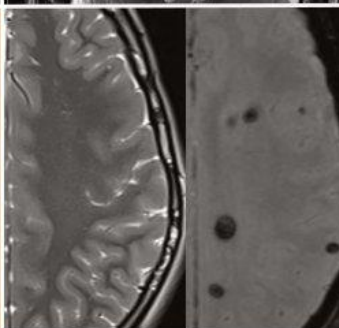
Quiescent lesion, chronic
resolved hemorrhage



@theneuroradiologist

Type 4 = invisible

Except on T2*/SWI;
punctate CCMs



Zambramski classification for cavernomas

Cavernous Malformations

MR Imaging (cont' ed)

- peripheral rim of ↓SI corresponding to deposition of hemosiderin and Fe on T2 & T2*
- Zabramski
 - Type I - subacute bleed (homogeneous ↑T1 SI)
 - Type II - typical popcorn lesion
 - Type III - iso to hypo on T1 and T2
 - Type IV - punctate hypointense foci on T1 & T2

Cavernous Malformations

- one of 4 major types of CNS vascular malformations as classified by McCormick¹
- affect 0.4 - 0.9% of general population according to large autopsy studies
- constitute 5 – 16% of all vascular malformations
- 80 – 90% supratentorial

Cavernous Malformations

Pathology

- discrete, well-circumscribed lesions
- composed of thin-walled, dilated vascular channels lined by a single layer of endothelium.
- devoid of elastin, laminin, sub-endothelial sm cells and other mature vascular wall components

Cavernous Malformations

Pathology (cont' ed)

- surrounding parenchyma contains hemosiderin-laden macrophages and iron-laden glial cells
- lack of intervening brain parenchyma is one of the hallmarks
- may at times be racemose

Cavernous Malformations

Epidemiology

- 17-54% of patients have mult lesions
- 50-85% of pts with mult lesions have a familial type of lesion
- may arise de novo
 - irradiation
 - familial
 - pregnancy

Cavernous Malformations

Clinical

- Sz most common (36%) presentation
- hemorrhage second most common (25%)
- 20% neuro deficit without hemorrhage
- 12% found incidentally
- 6% headaches

Cavernous Malformations

CT Imaging

- on NECT frequently appear as focal areas of increased density without mass effect
- margins usually indistinct and the increased density may have a stippled appearance

Cavernous Malformations

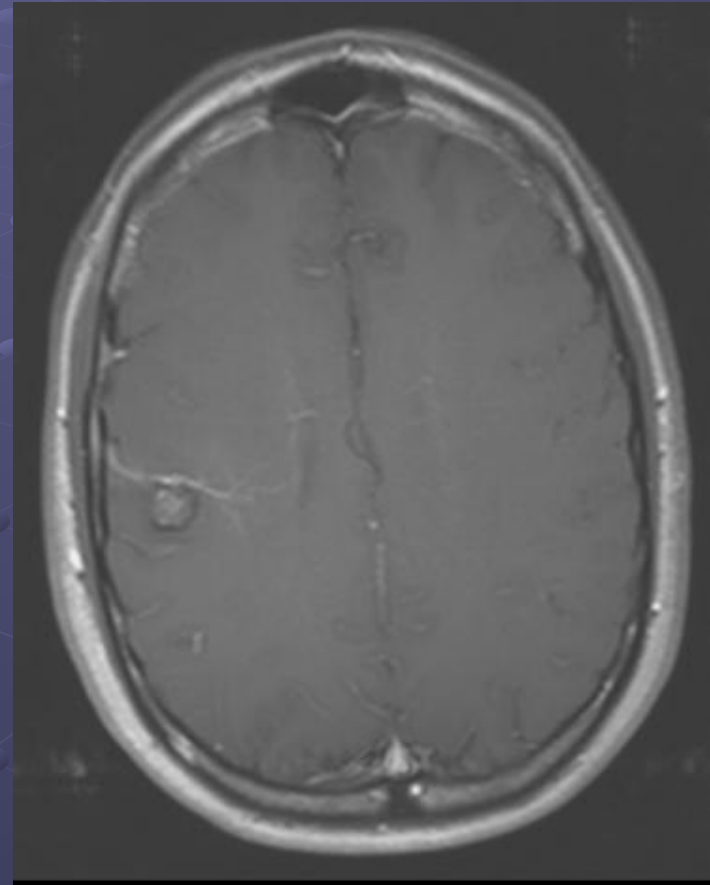
MR Imaging

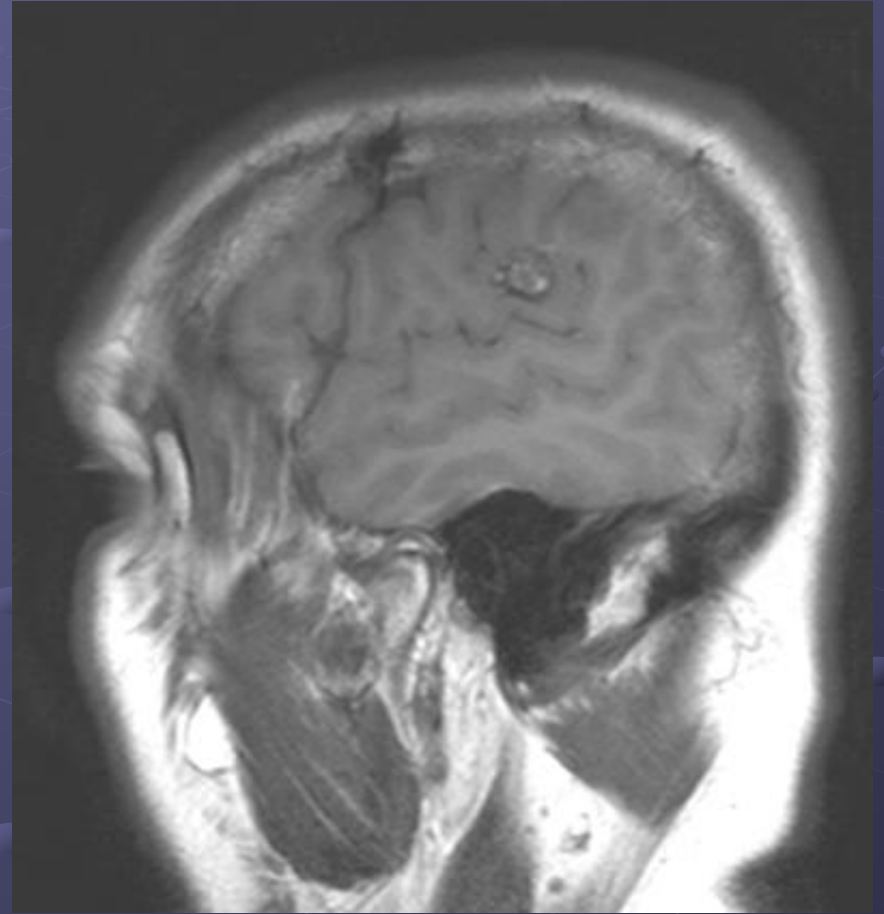
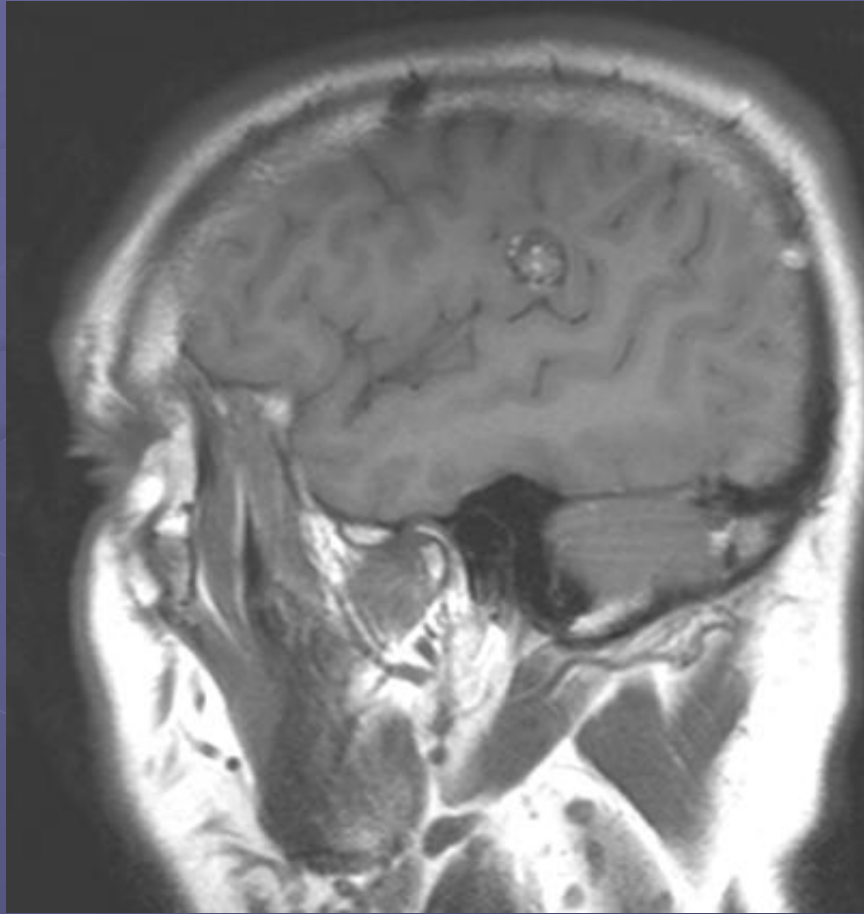
- typically a well-defined, lobulated lesion with reticulated core of heterogeneous SI on both T1 and T2
- High SI – intra and extracellular metHb
- Low SI – Ca^{++} , fibrosis and acute/subacute blood

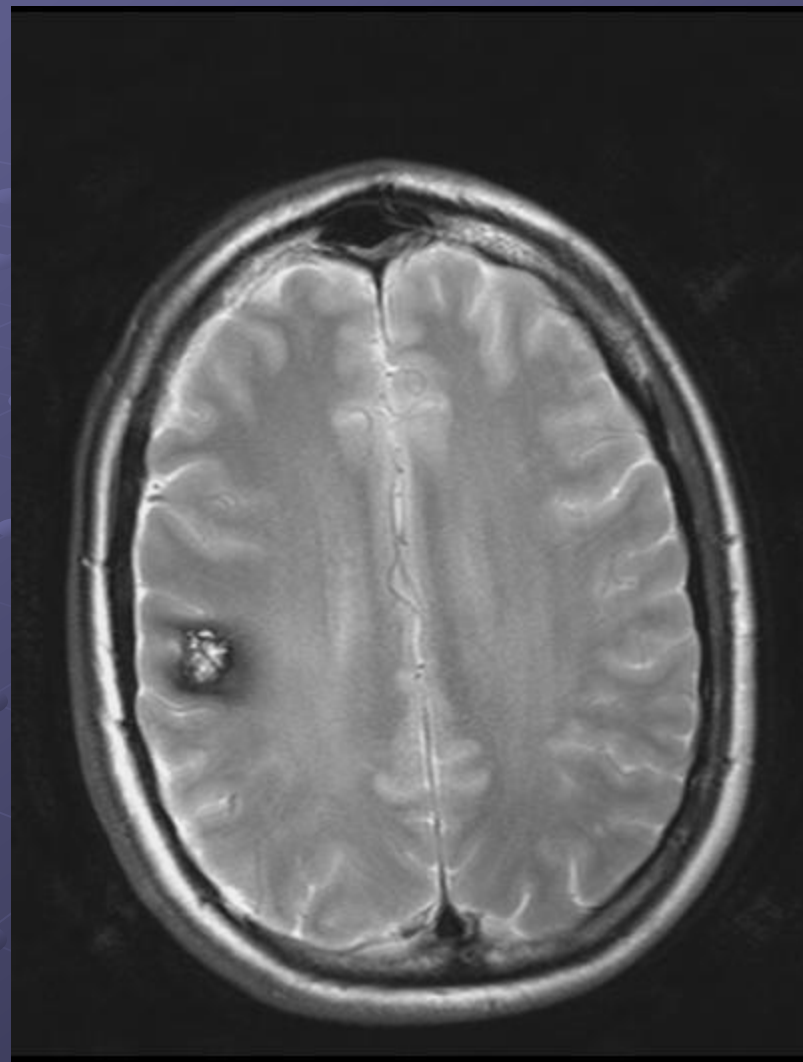
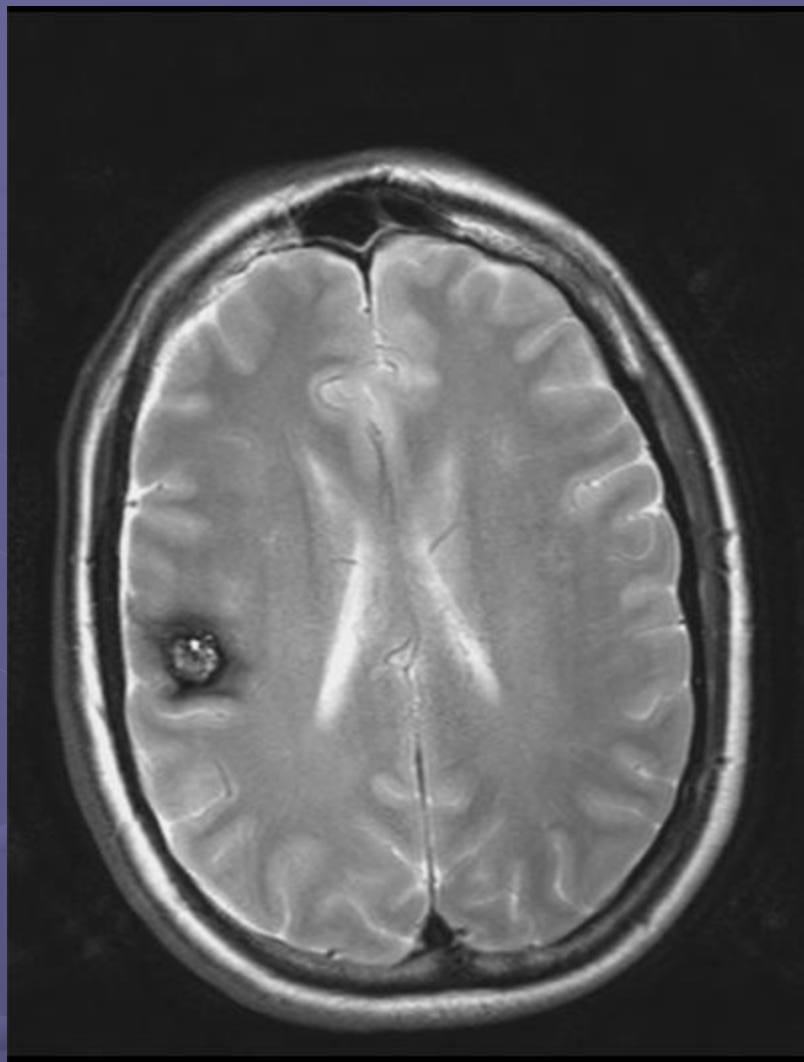
Cavernous Malformations

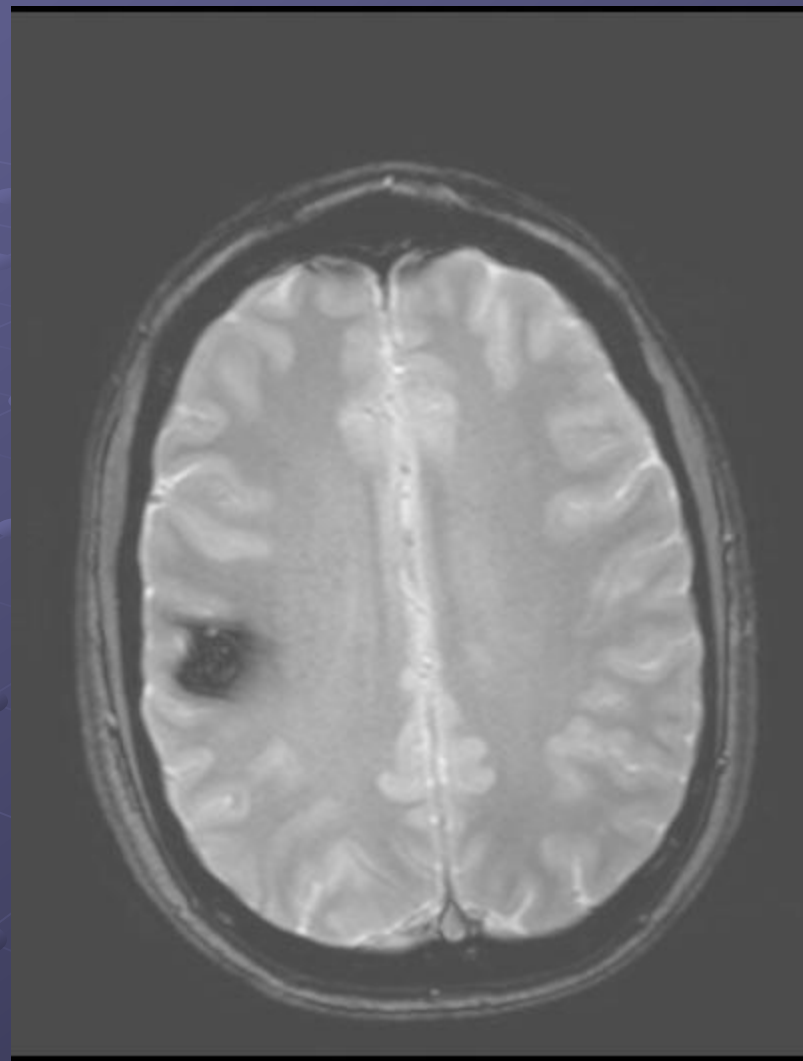
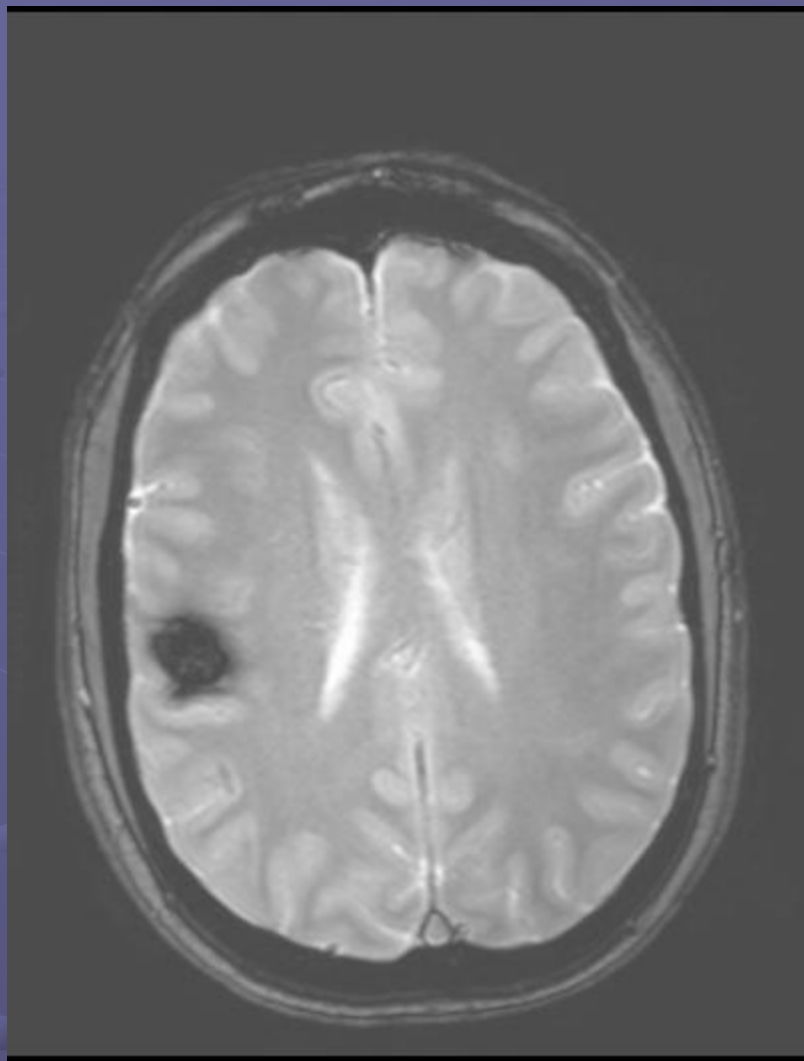
MR Imaging

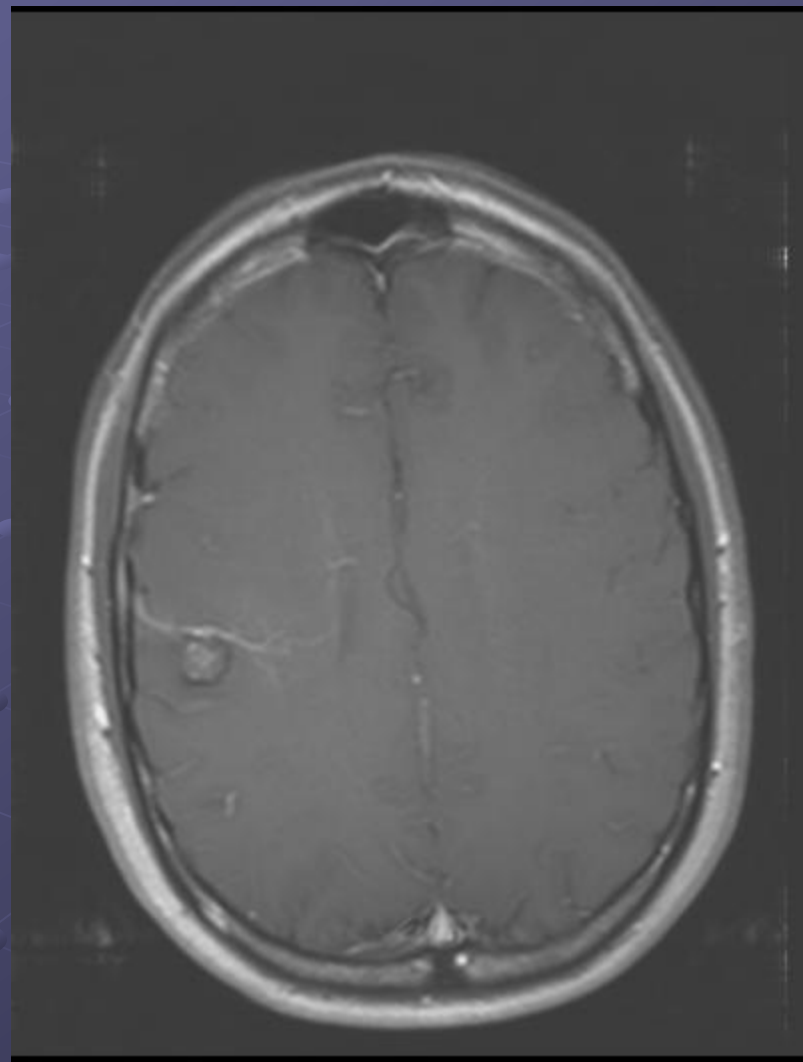
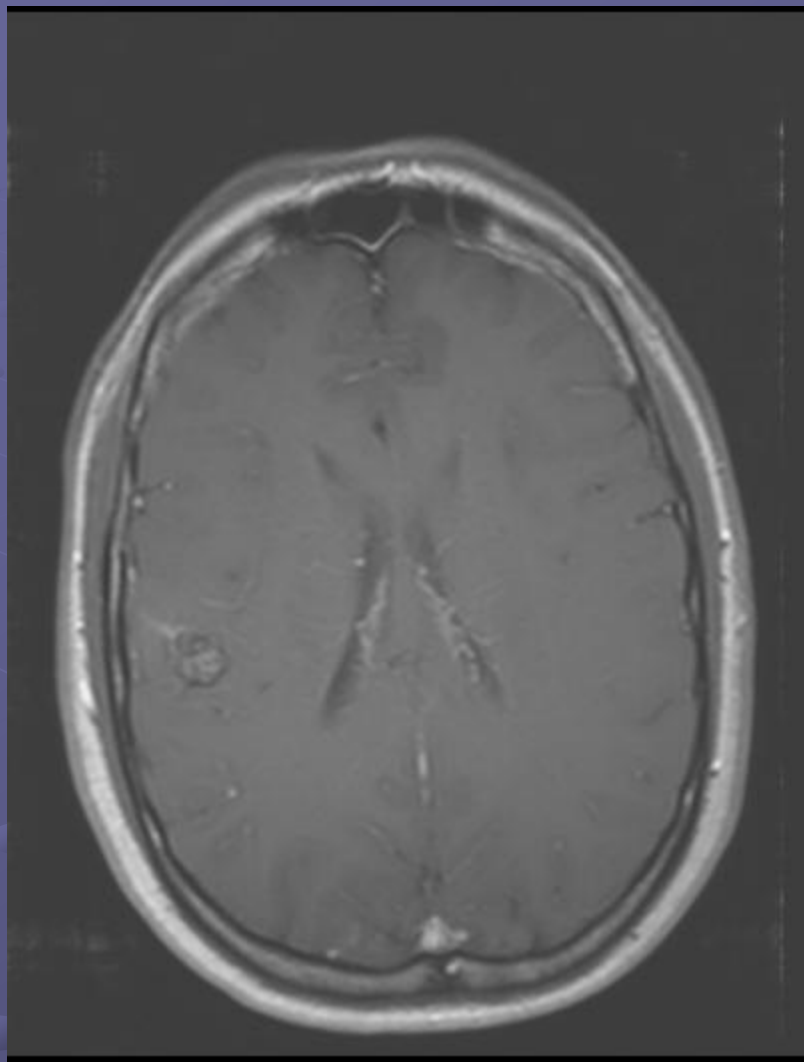
- T1 C+: minimal or no enhancement (may show associated DVA)
- MRA : normal (unless mixed mal-formation present)



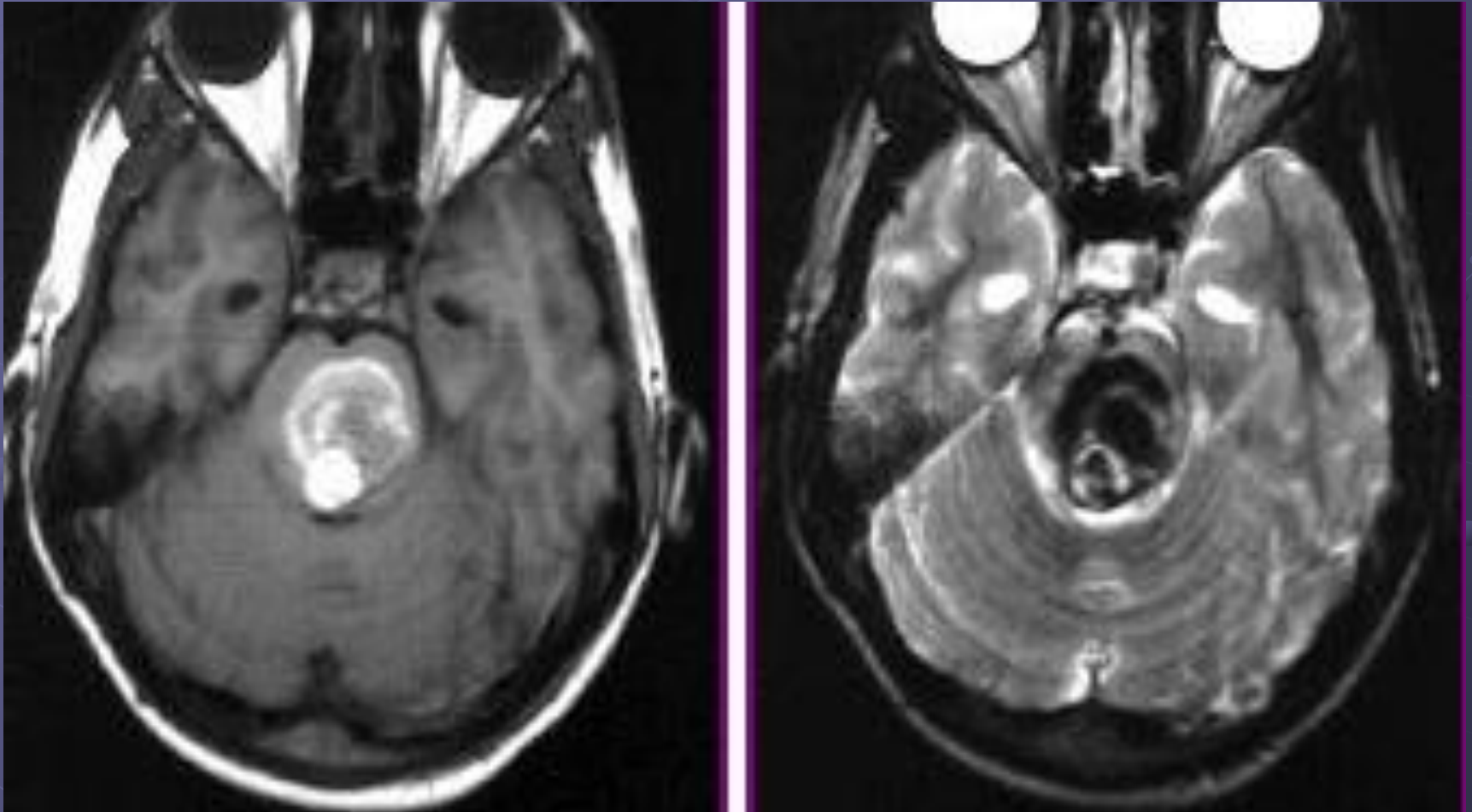








Cavernous hemangioma



Cavernous Hemangioma

- Risk of hemorrhage is .5%/yr
- In approximately 50% of cases of detected cavernous hemangioma, multiple lesions are present
- Supratentorial 80% of the time

Cavernous Hemangioma

Cavernous Angioma

- Formation of complete hemosiderin ring
- Resolution of edema and mass effect over time
- Angiographically occult

vs.

Hemorrhagic tumor

- Disorderly evolution of hemorrhage
- Persistent edema over time
- Complex heterogeneity of signal characteristics

