

How to read your MRI

Mary Gaskill-Shipley, MD

Professor of Radiology

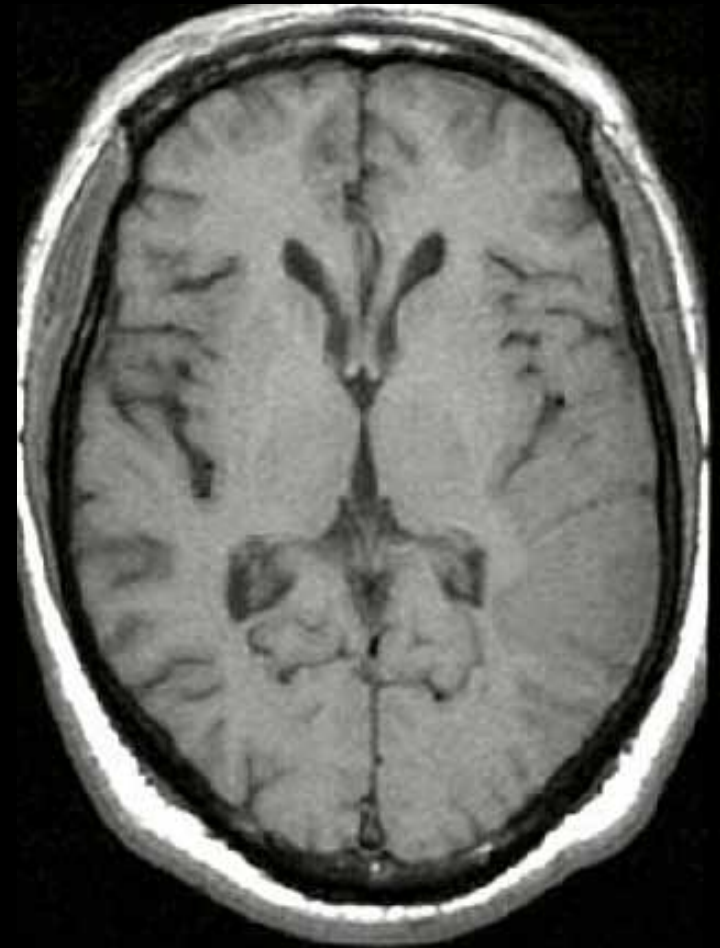
University of Cincinnati

Department of Radiology/Division of Neuroradiology

Magnetic Resonance (MR)

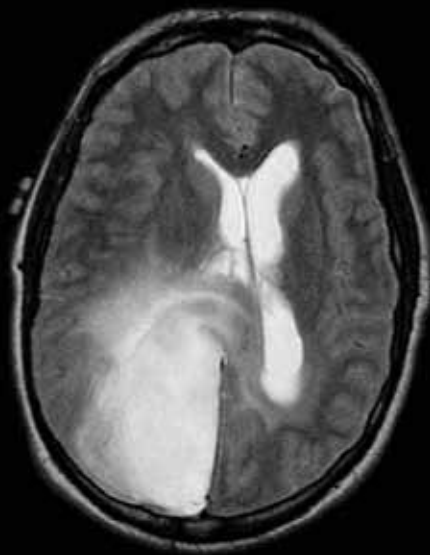
– The basics

- § MR utilizes a strong magnetic field combined with radiofrequency pulses to obtain signal from the brain
- § Changes in signal are processed by computer to form images
- § Does not use radiation

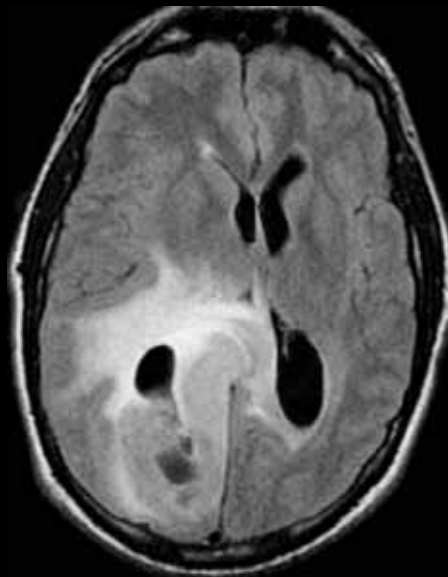


MR Sequences

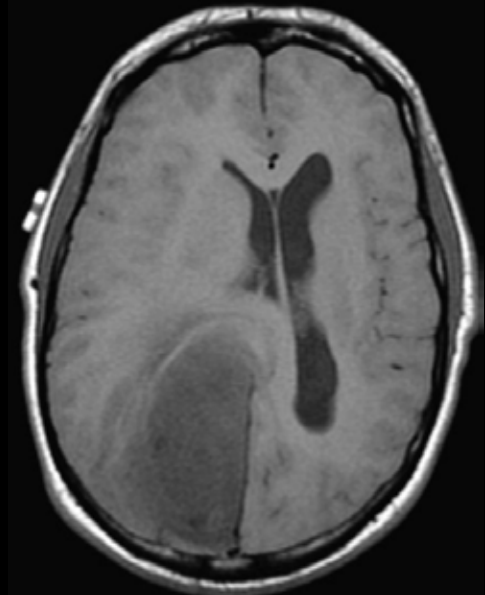
- § Typically multiple different sequences are obtained during an MR scan of the brain
- § Each sequences gives different information about the structure of the brain and the lesion



T2 weighted image



FLAIR T2 weighted image



T1 weighted image

Imaging Goals

- § Find the abnormality
- § Provide an accurate differential diagnosis
- § Localize critical structures which may change therapeutic approach
- § Provide pre- or intraoperative imaging guidance
- § Assess post treatment effects

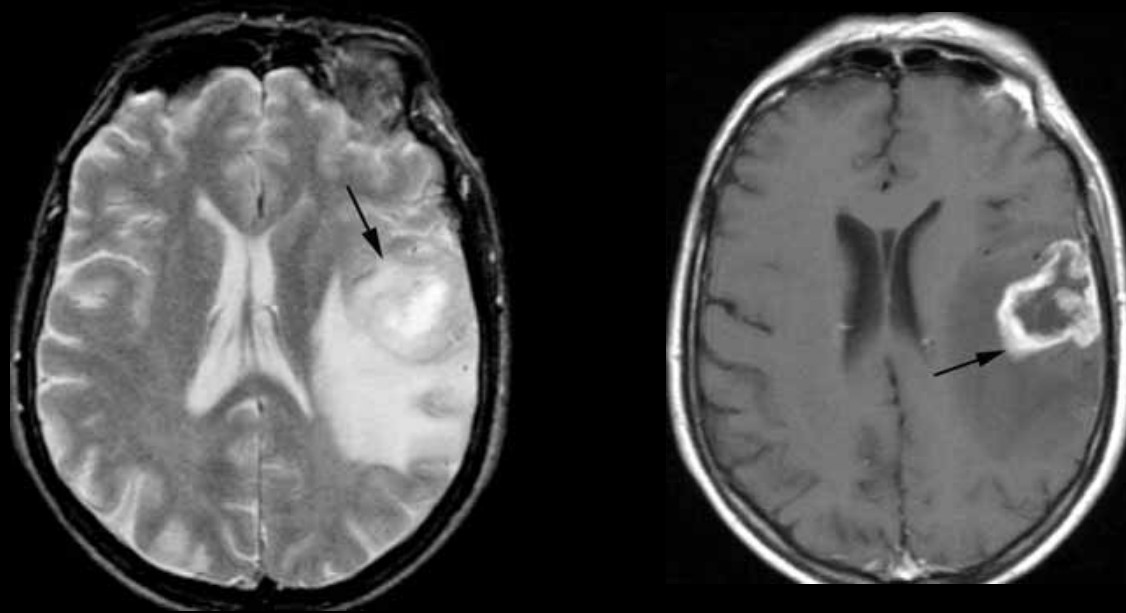
Imaging Features

- § **Location**
- § **Signal characteristics**
- § **Enhancement**
- § **Number of lesions**

Imaging Features

§ Location

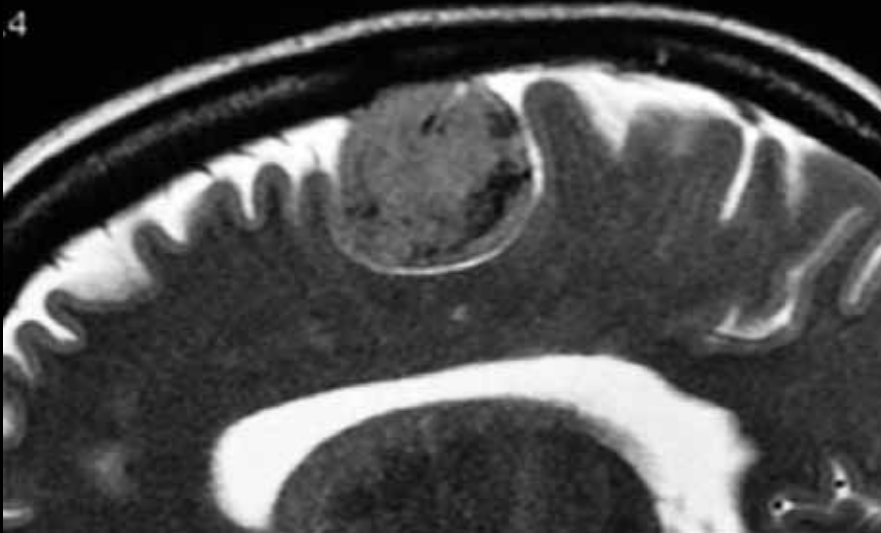
- **Involvement of eloquent areas of the brain**
- Intra- or extra-axial



Imaging Features

§ Location

- Involvement of eloquent areas of the brain
- **Intra- or extra-axial**



Imaging Features

§ Signal characteristics

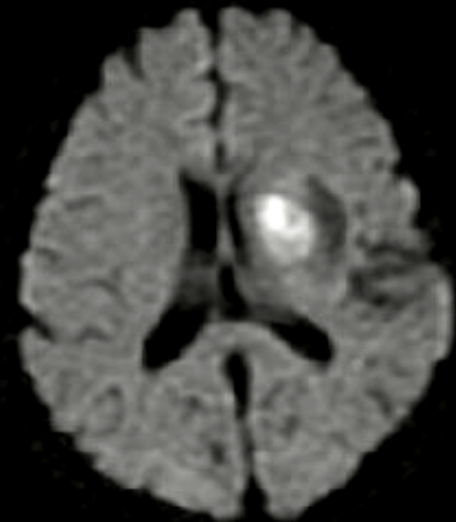
- May help differentiate types of tumors and also evaluate for other lesions



FLAIR T2



T1 post Gadolinium



Diffusion weighted

Imaging Features

§ Signal characteristics

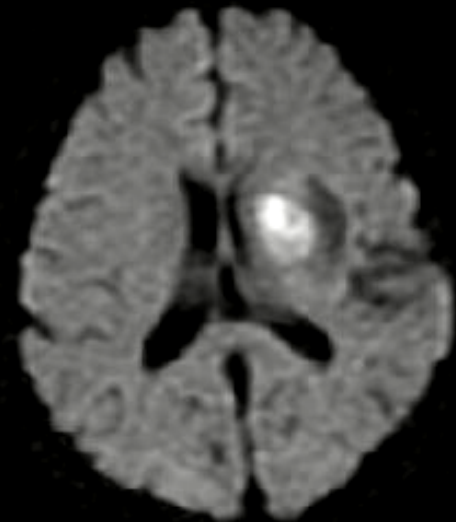
- May help differentiate types of tumors and also evaluate for other lesions



FLAIR T2



T1 post Gadolinium



Diffusion weighted

Abscess

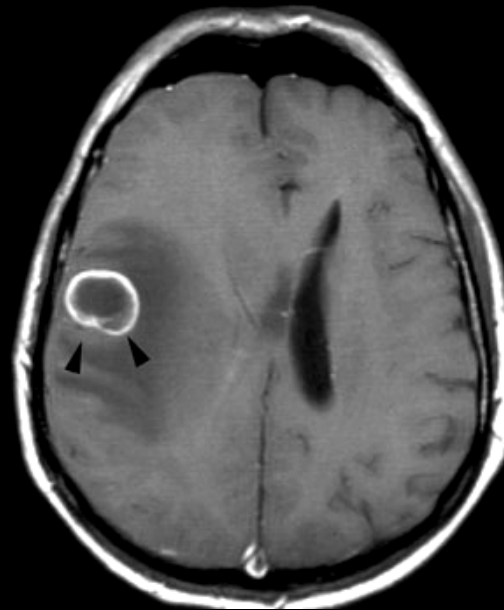
Imaging Features

§ Enhancement

- Gadolinium is injected intravenously
- Normal brain does not enhance due to the Blood Brain Barrier
- Presence of enhancement will affect the differential diagnosis



T1 weighted without Gad



T1 weighted with Gad

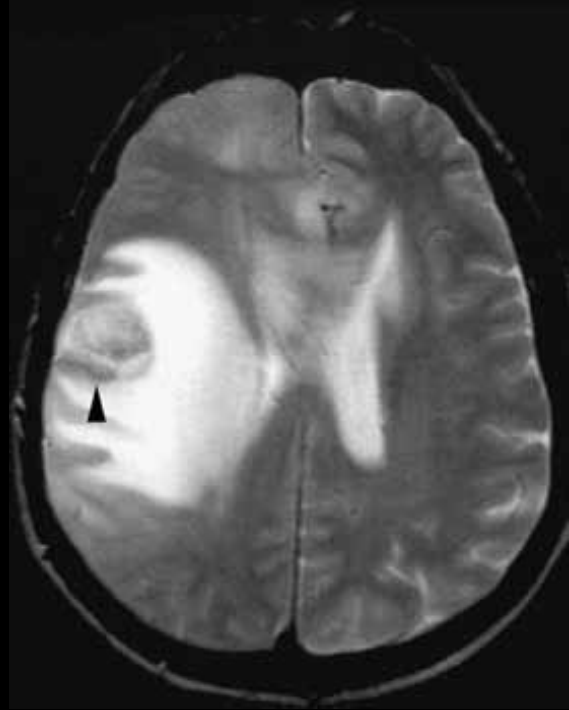
Imaging Features

§ Number of lesions

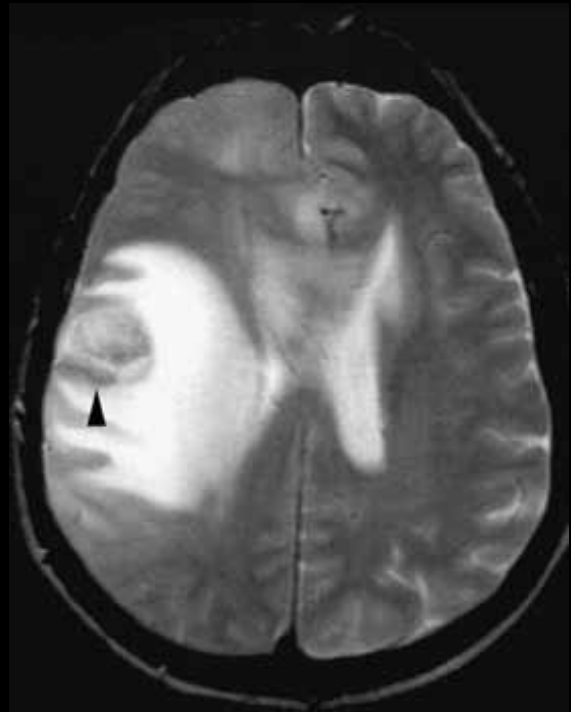
- Multiple lesions are more consistent with metastatic disease



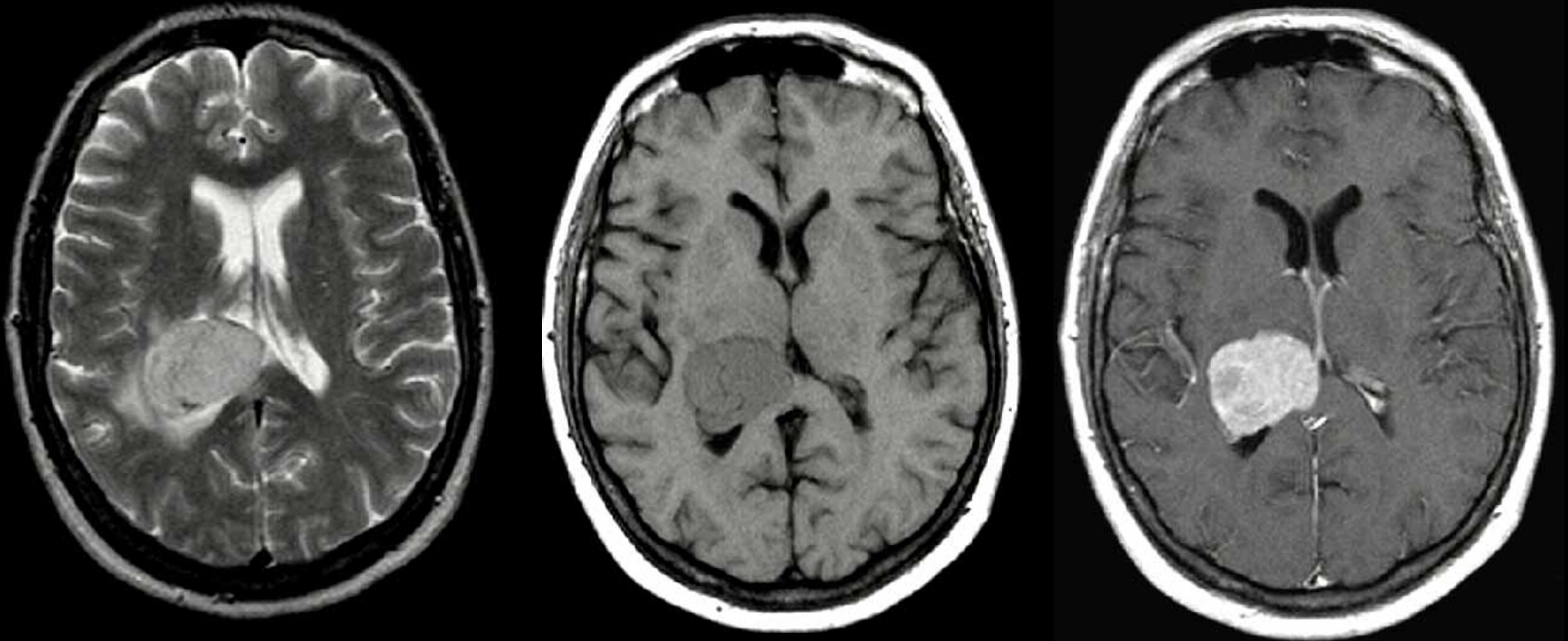
CASES



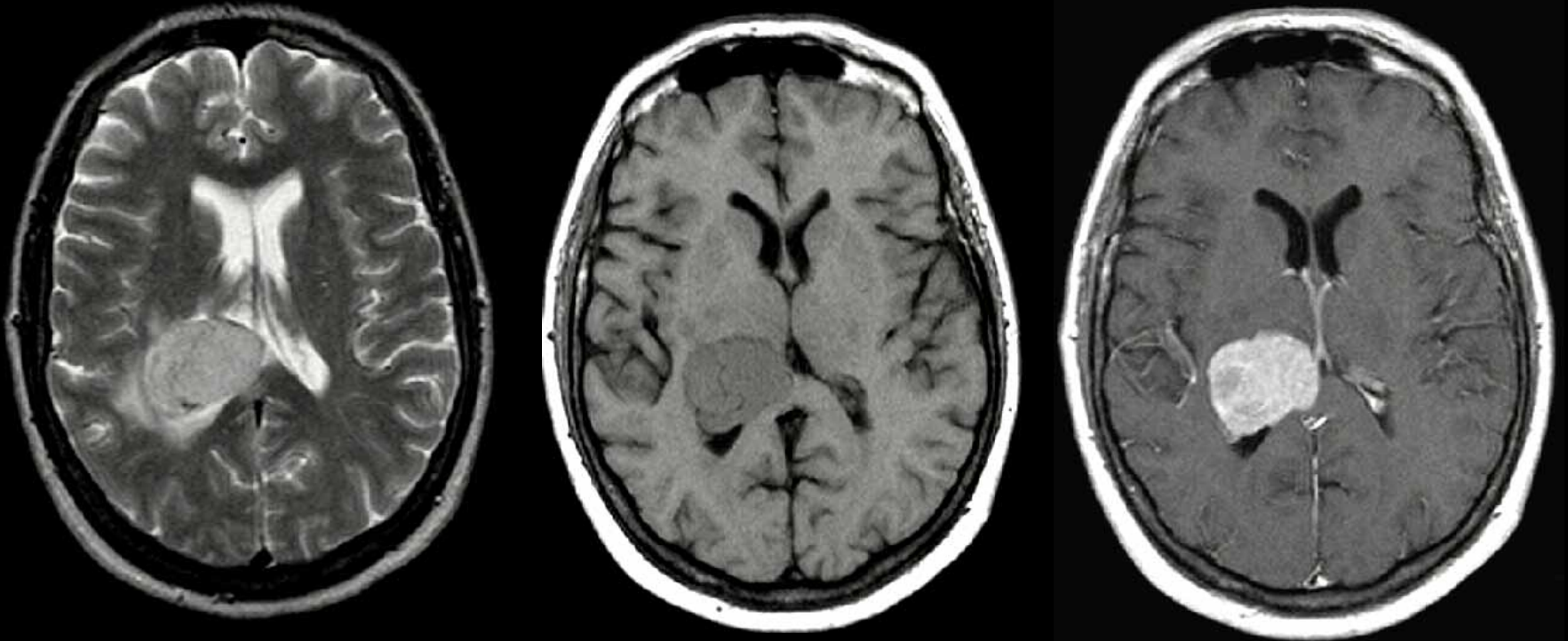
54 year old gentleman
with left arm weakness



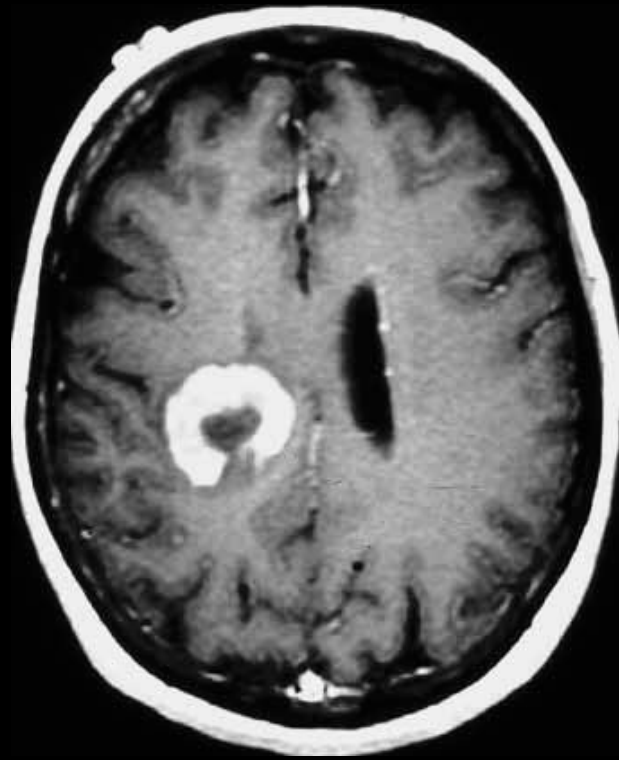
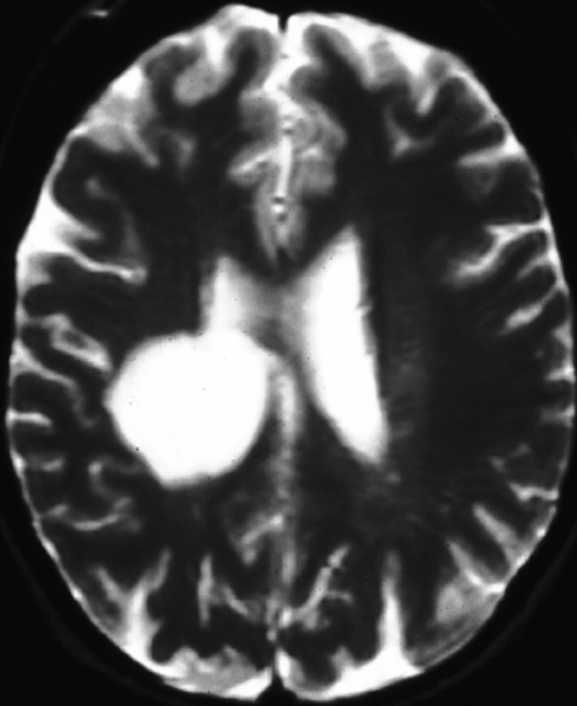
Glioblastoma multiforme



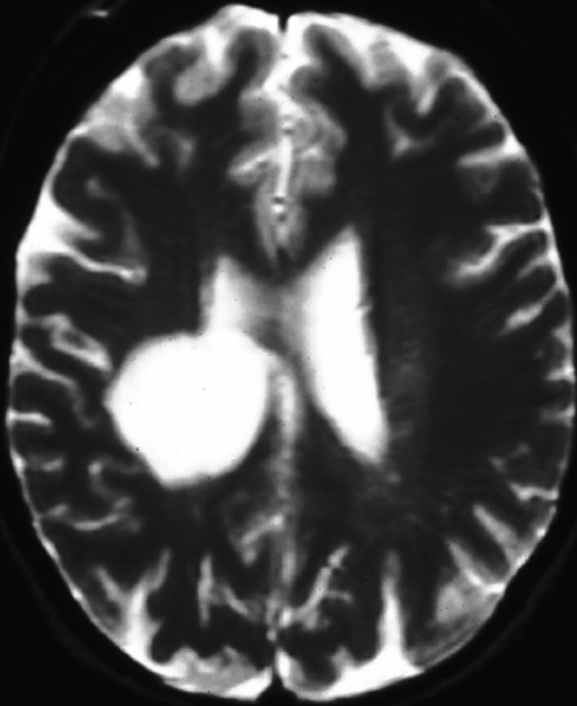
42 year old woman with a headache



Intraventricular meningioma



36 year old woman with new onset of numbness and tingling in her left body



Multiple sclerosis

Advanced Metabolic Imaging

§ Assess metabolic activity of the lesion

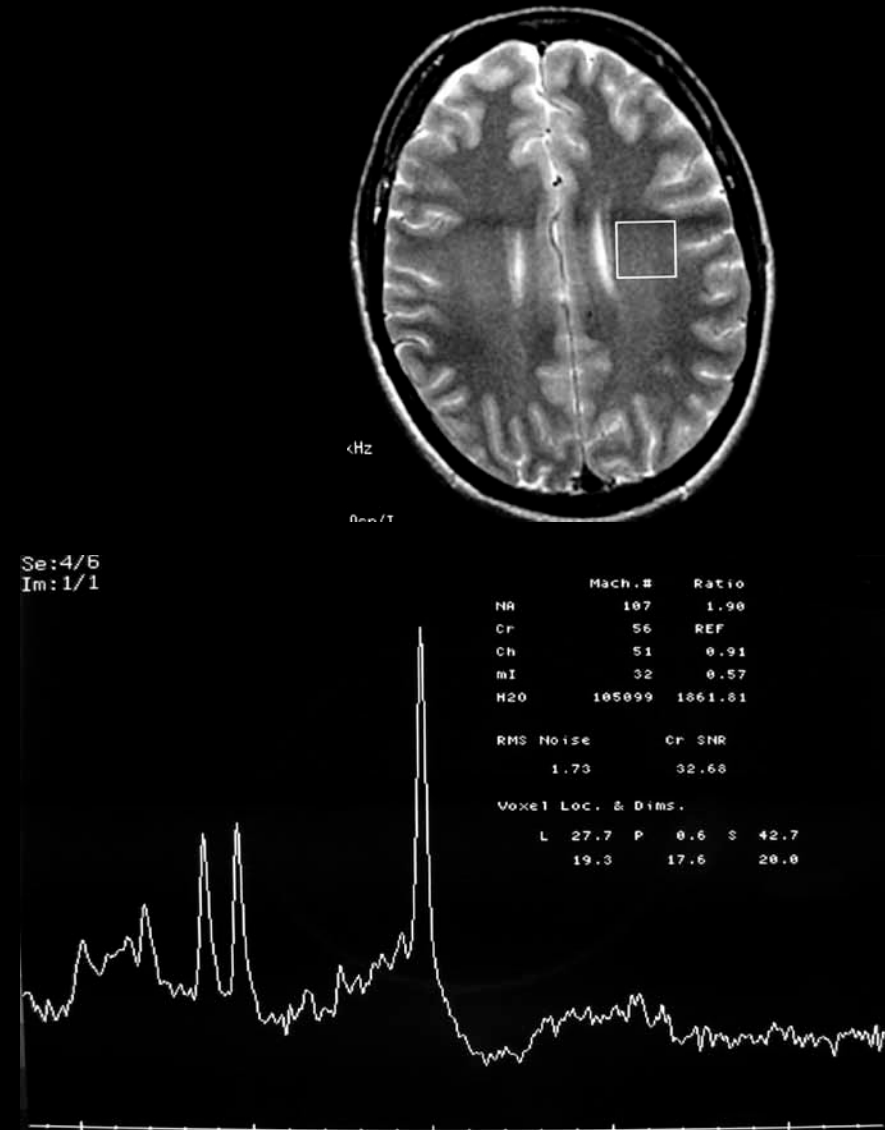
- May help understand the bioactivity

§ Assess treatment

- Post treatment response
- Post treatment complications

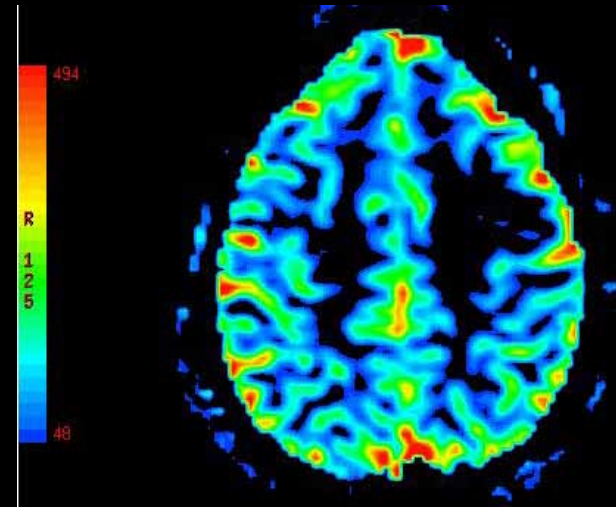
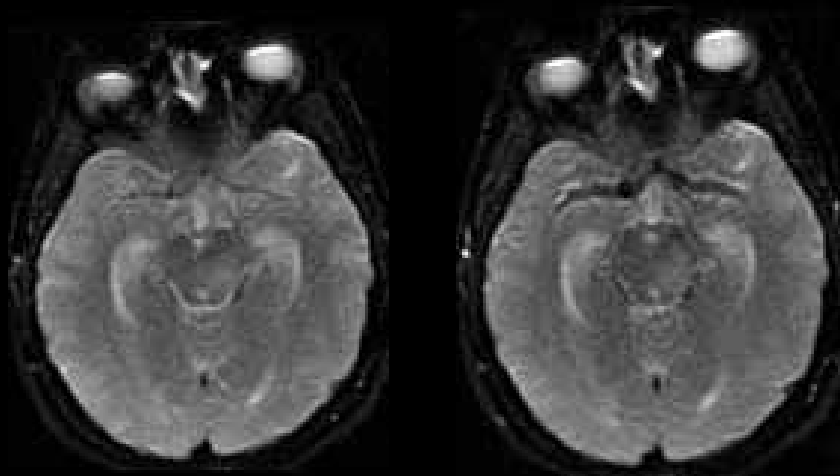
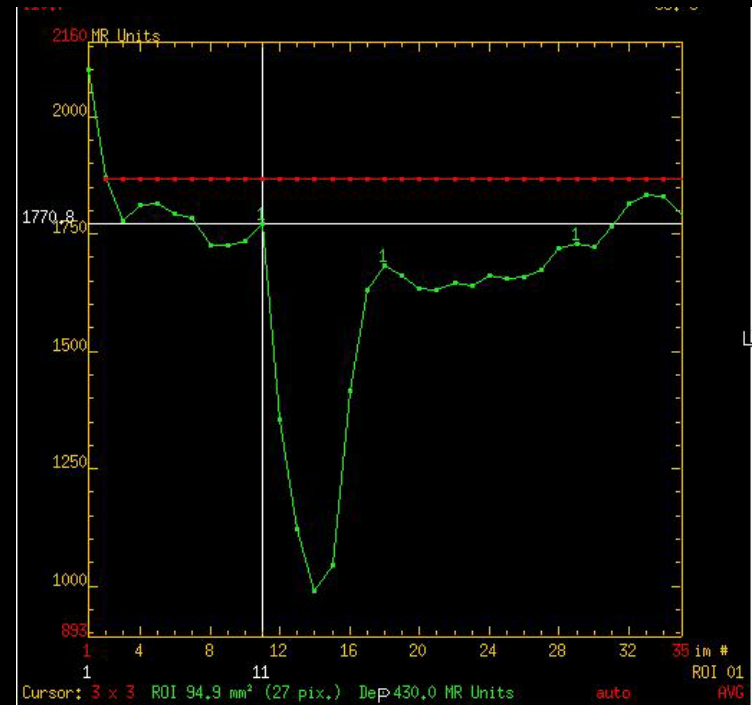
MR Spectroscopy

- § Allows analysis of specific metabolites in brain
- § EM energy applied to tissue which will then either absorb or emit energy. This energy is then measured
- § Proton (H) scanning most common



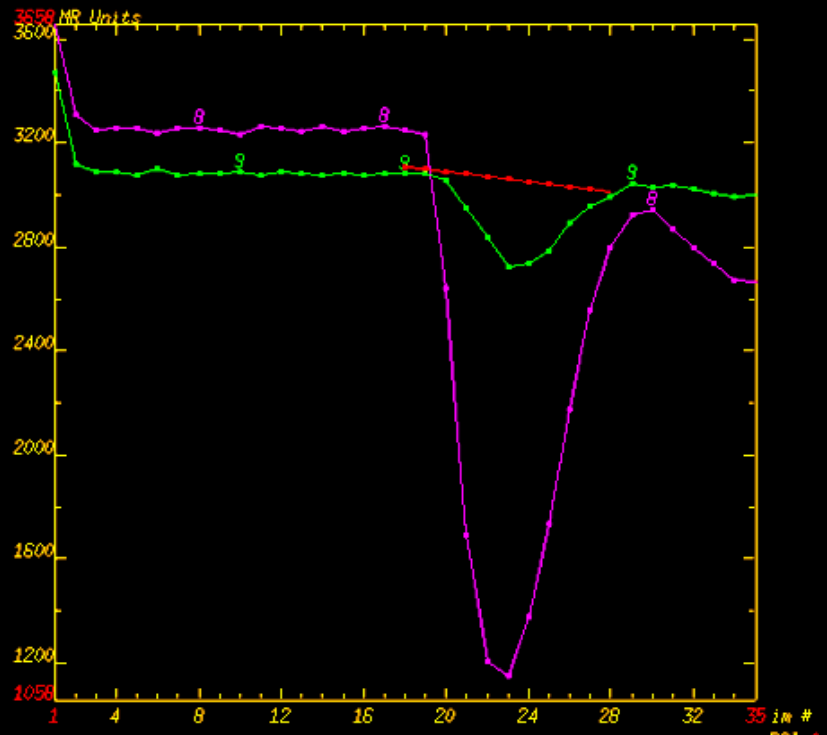
MR Perfusion

- § Noninvasive means of evaluating cerebral perfusion
- § Malignant tumors typically increase blood flow



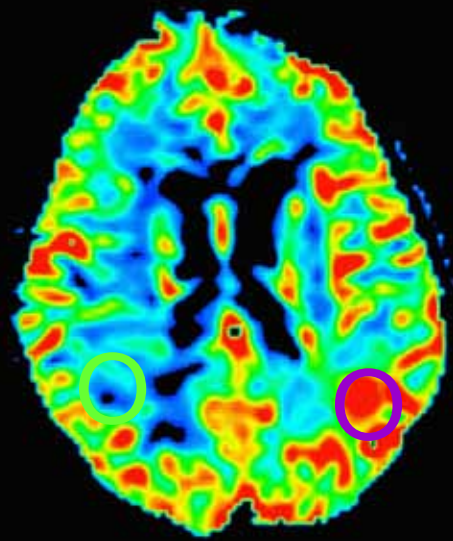
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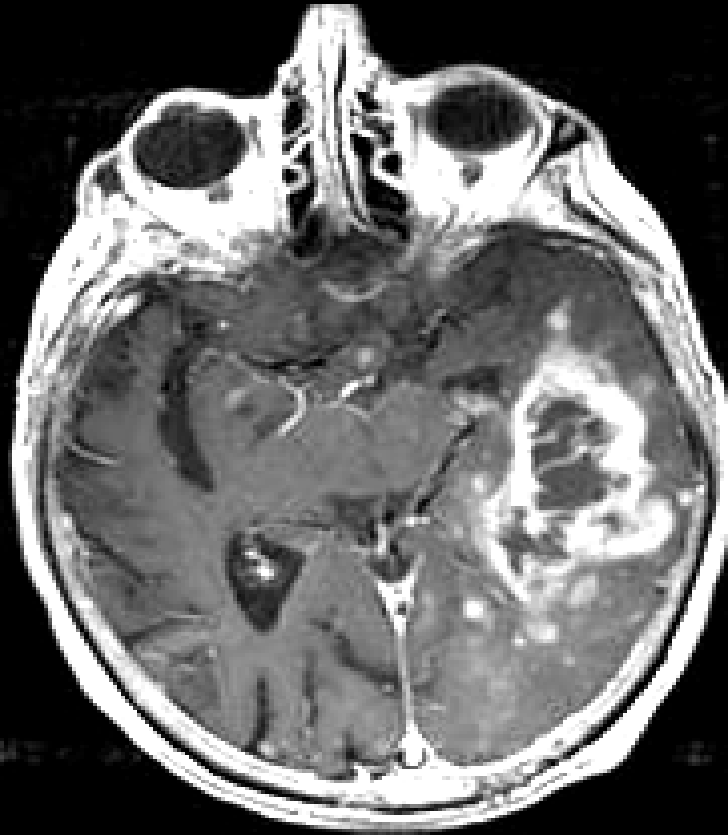


Cursor: 3 x 3 ROI 147.7 mm² (42 pix.)

auto 1x1 AV

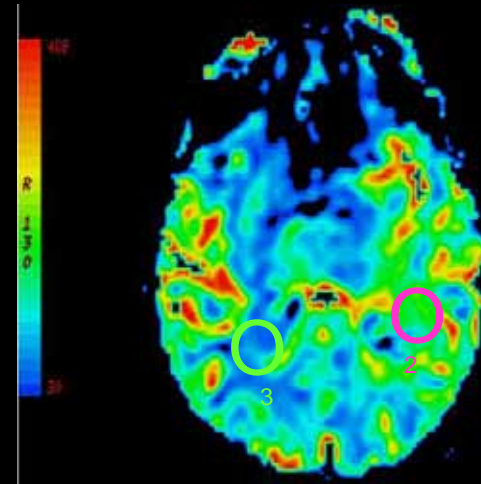
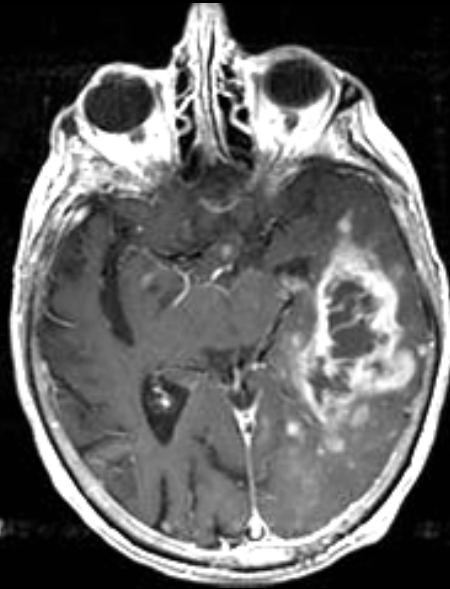


63 year old gentleman with history of GBM now presents with large irregular enhancing mass

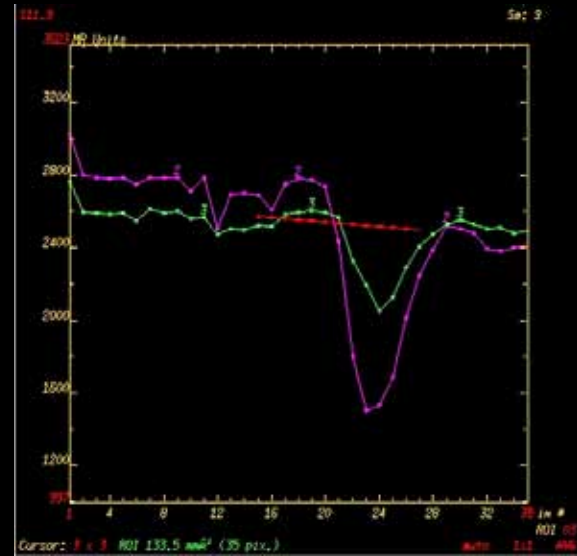
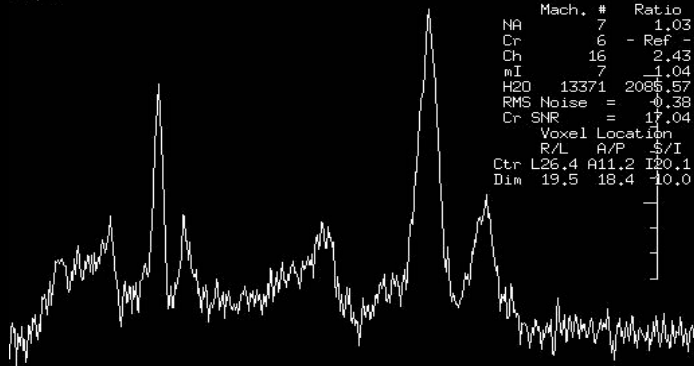


Is this tumor recurrence or necrosis from treatment, i.e. radiation??

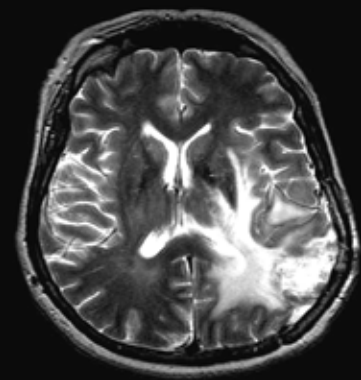
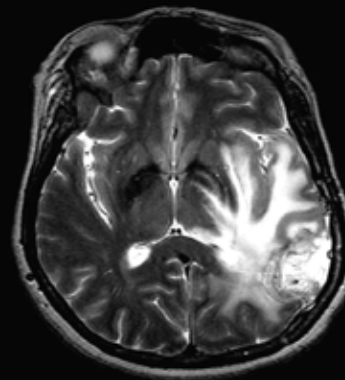
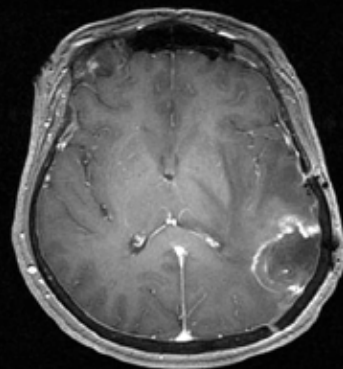
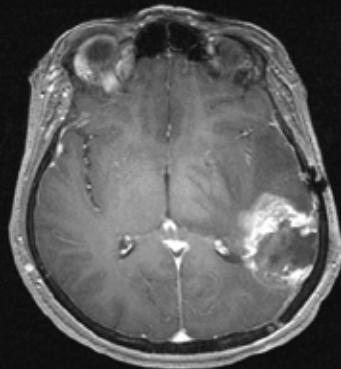
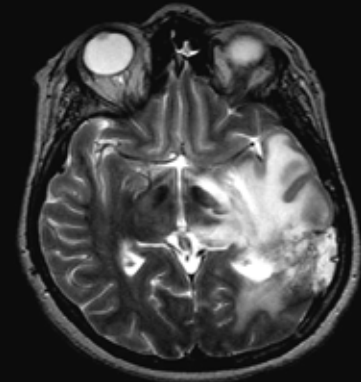
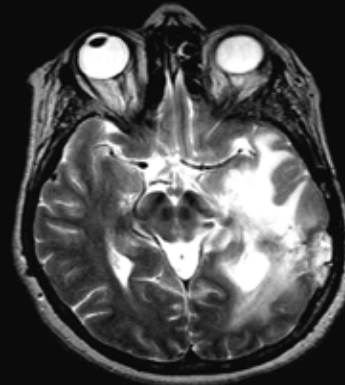
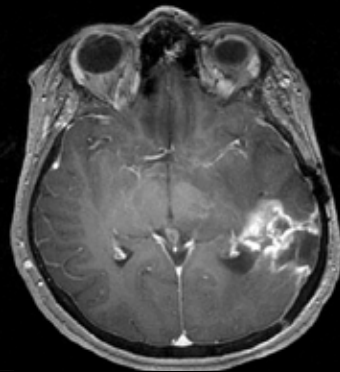
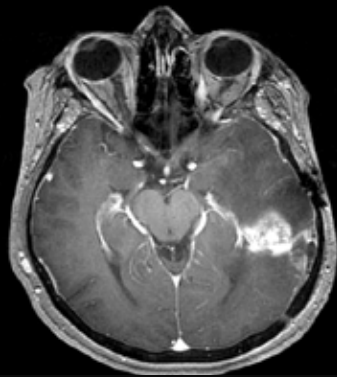
TUMOR



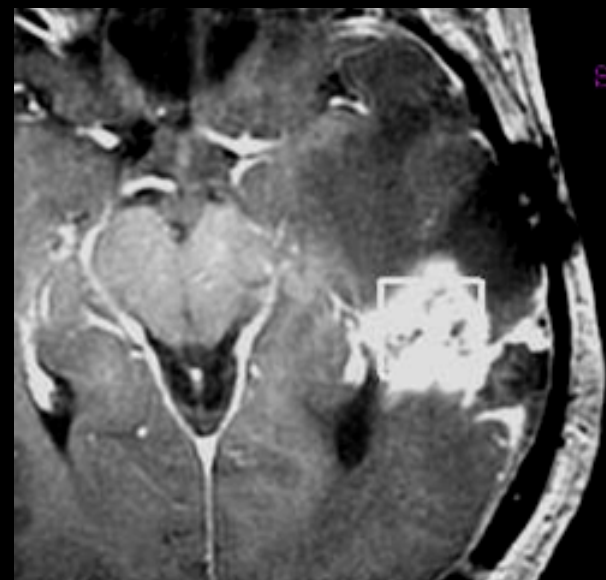
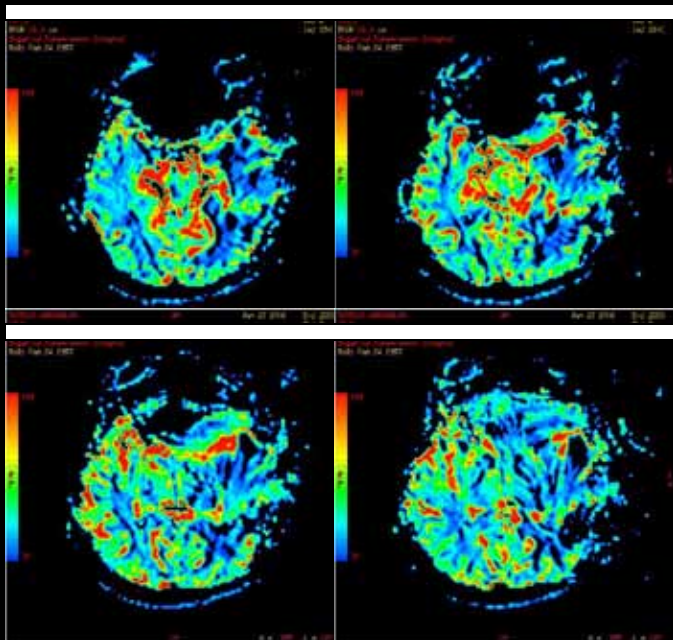
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TUMOR VS. NECROSIS?



NECROSIS



TE:35

