How to read your MRI

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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 sequence 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

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- 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](image1.png)  ![T1 post Gadolineum](image2.png)  ![Diffusion weighted](image3.png)
**Imaging Features**

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**Abscess**

- FLAIR T2
- T1 post Gadolineum
- Diffusion weighted
Enhancement

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