

Magnetic Resonance Imaging

Advantages

- Cross-section imaging w/o radiation
 - ✓ Multi-planar, good resolution
- Ability to distinguish soft tissue types
 - ✓ Brain: Strokes, Tumors, MRA, Function
 - ✓ Spine: Disks, Cord, Vertebrae
 - ✓ Vascular
 - ✓ Extremities
 - ❖ Knee: Menisci, Ligaments, Cartilage
 - ❖ Shoulder: Rotator Cuff, Labrum
 - ❖ Hips: Occult Fractures, AVN
 - ❖ Ankles: Tendons, Stress Fxs, OCD
 - ❖ Musculoskeletal Tumors & Infections




Magnetic Resonance Imaging

Disadvantages


- Cost
- Limited Field of View
 - ✓ Not good for “fishing”
- Requires experienced Radiologist
 - ✓ To interpret imaging subtleties
 - ❖ Need to know anatomy/pathology well
 - ❖ Many “pitfalls”
 - ✓ To optimize imaging protocols
- Claustrophobia
- Other hardware related issues



MRI Sequences			
	T1	PD	T2
T.R. (Time to Recovery)	SHORT <500ms	LONG >2000ms	LONG >2000ms
T.E. (Time to Echo)	SHORT 10-20ms	SHORT ~20ms	LONG >80ms



MRI Signal Characteristics			
	T1	PD	T2
FLUID edema effusions cysts	<u>LOW</u>	<u>INT</u>	<u>HI</u>
FAT sub-cutaneous yellow marrow	HI	HI	INT
“DENSE STUFF” cortical bone tendons ligaments menisci	LOW	LOW	LOW




MRI Signal Characteristics

What you need to know for musculoskeletal imaging:

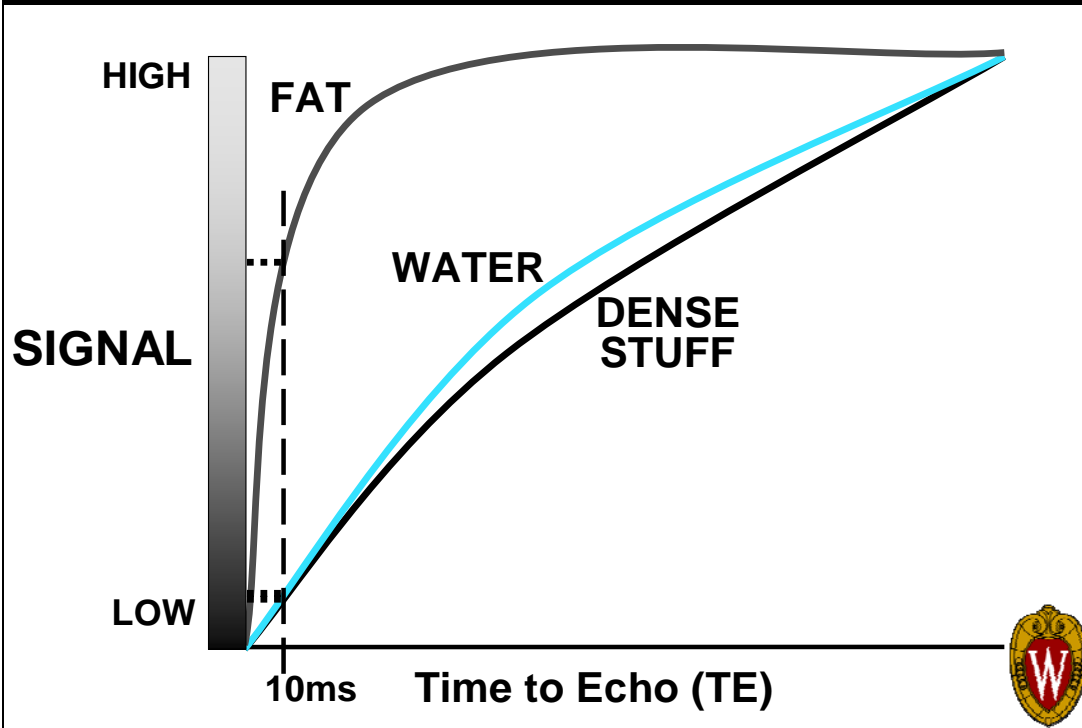
T1 - SHOWS FAT BEST

T2 - SHOWS WATER BEST

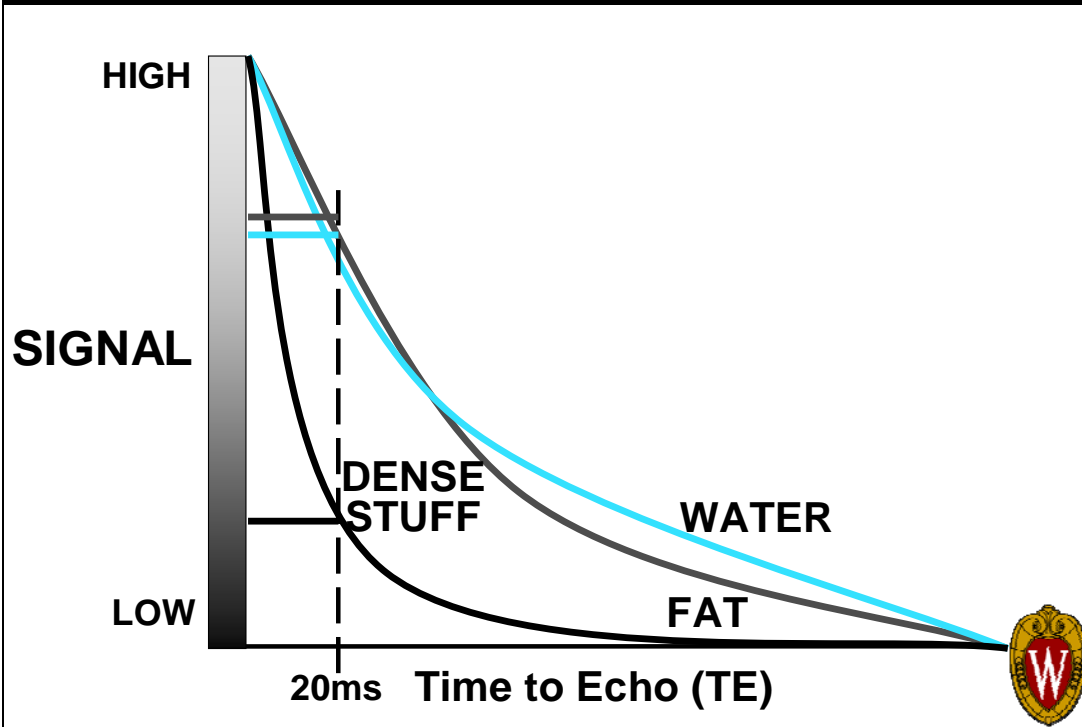
PD- SHOWS DENSE STUFF BEST



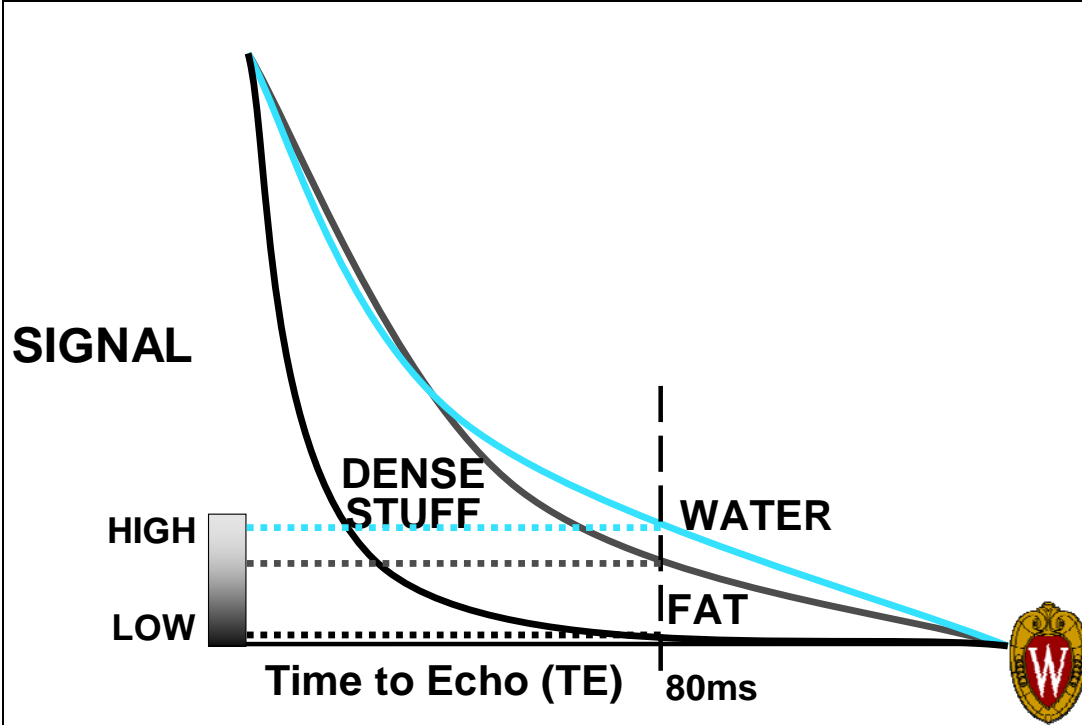
T1 Recovery Curve



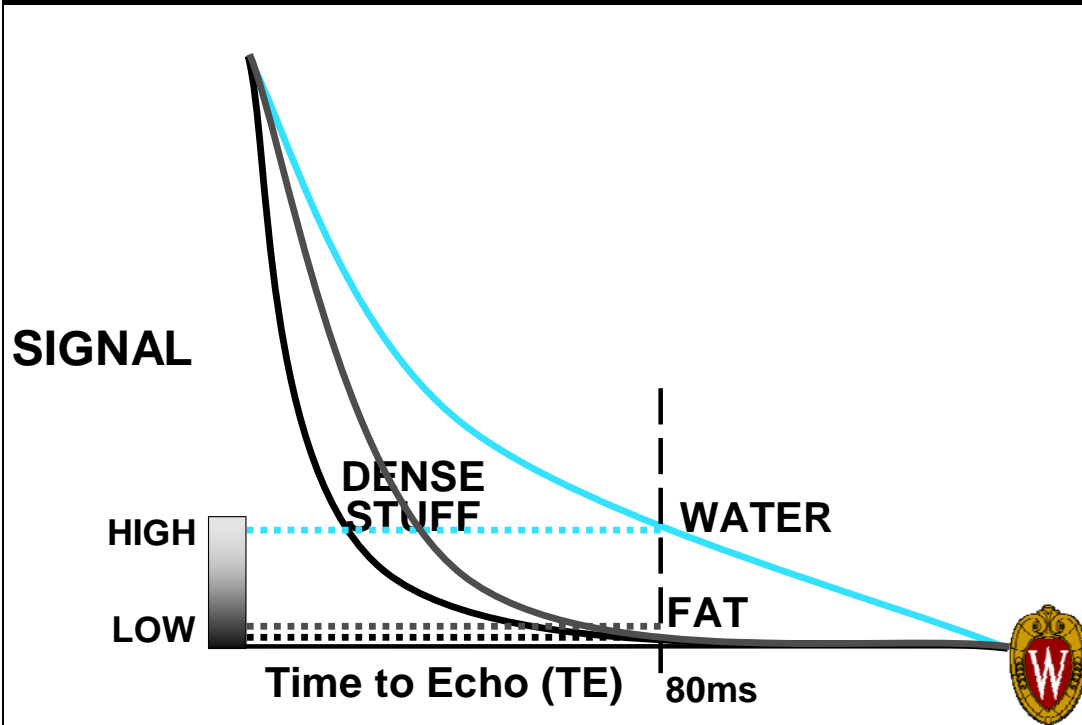
T2 Decay Curve: Proton Density



T2 Decay Curve



T2 Decay Curve: Fat-Suppression



The Problem with MRI

- It's a Big Magnet
- It's Always On



The Problems With MR

1) Patient Compatibility Issues

- Safety Issues
 - ✓ Absolute Contraindications
 - ✓ Relative Contraindications
- Magnetic Field \Rightarrow Metal

These are issues for YOU to address ←

2) Imaging Related Issues

- Metal \Rightarrow Magnetic Field

This issue is for ME to address



MRI: Absolute Contraindications

Most External Devices

- Monitors
- Pumps
- O₂ Tanks

Implanted Electronics

- Pacemakers
- Neural Stimulators
- Cochlea Implants

Metal that Could Move

- ANY Metal in the Eyes
- Some Aneurysm Clips



MRI: Absolute Contraindications

- Most External Devices
- Implanted Electronics
- Metal that Could Move
- Patient Too Big
- Can't Lie Still
 - Severe CHF
 - Unstable/Combative



MRI: Relative Contraindications

- Certain Implants
 - Aneurysm Clips
 - others...
- Claustrophobia
- Pregnant

When in doubt, call your MR center or check with your radiologist!



MR Contrast – MSK Cases

	IV Gd	IA Gd
Most Joints -----	N--	----N
➤ Labrum (shoulder, hip)		Y
➤ Post-op Knee		Y
➤ Wrist ligaments		(Y)
Spine -----	N--	----N
➤ Post-op L-spine (<10y)	Y	
➤ MS	Y	
Infections (Osteo, Diskitis)	Y!	
Inflammation (RA/pannus)	Y!	
Tumors (pre/post-op)	+/-	

