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Acquisition and Reconstruction Techniques for Diffusion Weighted Imaging

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- Options for fat suppression
- · Diffusion imaging options
- · Synthetic b-values
- Advanced Acquisition Techniques

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Fat Suppression

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Making Cancer History

- Why do we need it?
- Very low effective bandwidth in phase encode directionChemical shift of fat causes shift
- Standard fat suppression techniques
- · Chem Sat (Fat Sat) pulse
- Slice Selective Inversion Recovery (Adiabatic)
- Spectral Inversion Recovery (Adiabatic)
- GE: Special
- Siemens: SPAIR





	Mode of action	Maintains Water SNR (For Homogeneous B0)	Robust to B0	Robust to B1
Chem Sat	Saturate Fat	Yes	No	No
Inversion Recovery	Invert all spins	No	Yes	Yes
Spectral Inversion Recovery	Invert fat spins	Yes	No	Yes
Spatial Spectral Excitation	Excite only water	Yes	No	No















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DW-EPI tends to be T2-weighted • Lesion conspicuity = T2 weighting + Diffusion weighting

· T2-bright lesions are more conspicuous



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T2 Shine-Through

· Check ADC to confirm

Bright on T2 and DWI but not ADC? • T2 weighting causes hypointensity on DWI



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Synthetic b-values

- T2 hypo-intense tumors: T2 weighting counters diffusion weighting
- Increasing b-value (diffusion weighting) can help
- Lower SNR > more averages, longer scan time

Synthetic DWI

- ADC map can be constructed from higher SNR (lower) b-values
- Synthesize higher b-value images from ADC map



















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Advantages

- · No distortion, shifts along phase encoding
- · Reduced need for consistent fat suppression
- Robust to B0
- Disadvantages
- Less SNR efficient -> noisy or very long scan times
- Non-zero spin phase inconsistent with CPMG conditions
 Even/odd echo oscillations, rapid signal decay



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