Technical factors for fat quantification

Diego Hernando, PhD
University of Wisconsin-Madison

Course name: ***Fat quantification in MSK imaging***

Lecture: ***Technical factors***

Speaker: ***Diego Hernando, PhD***
University of Wisconsin – Madison
dhernando@wisc.edu

Target audience: ***MSK radiologists and MR scientists***

Objectives:
- ***Understand methods for fat quantification***
- ***Identify main confounding factors and solutions***
- ***Understand choices in protocol design***

Introduction

MR-based fat quantification is often performed using chemical shift encoded techniques, ranging from multi-echo imaging with a few echo times (high spatial resolution, low spectral resolution) to single voxel spectroscopy (high spectral resolution).

Fat quantification: technical aspects

Fat quantification techniques in general, and in MSK applications in particular, are faced with a number of technical challenges, including:
- B0 field inhomogeneity
- Spectral complexity of the fat signal
- T2 or T2* relaxation
- T1 bias
- Noise-related effects
- Different lipid compartments, eg: extramyocellular vs intramyocellular

If not accounted for, these challenges ("confounding factors") can introduce bias and poor robustness in fat quantification. These confounding factors can be addressed through a combination of acquisition and reconstruction techniques.

Conclusion

Chemical shift encoded fat quantification can provide accurate and robust fat quantification in MSK applications as long as relevant confounding factors are addressed.

References

Glover, GH, et al, J Magn Reson Imaging. 1991; 1:521–530
Yu H, et al, Magn Reson Med 2008; 60:1122-1134
Bydder, M, et al, Magn Reson Imaging. 2008; 26:347–59
Karampinos DC, et al, Magn Reson Med 2011; 66:1312:1326
Liu CY, et al, Magn Reson Med. 2007; 58:354–364