

Specialty area: Imaging Muscle Structure and Function

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Highlights

1. MRS may be combined with anatomic and functional MRI sequences, to provide complementary information regarding muscle composition and insights into underlying biochemical mechanisms of myopathy.
2. MRS may be performed with qualitative or quantitative methodology.
3. MRS is sensitive to intramuscular biochemical changes in metabolite content (of creatine, choline, fat), even in the absence of signal abnormalities by conventional MRI
4. There are a number of applications for MRS, including the detection, characterization and assessment of severity of muscle disease.

Title: MR Spectroscopy

Target audience: – Scientists and physicians studying muscle physiology and muscle disorders

Objectives: To understand the complementary information provided by MRS over other MRI sequences, and the potential applications of MRS for assessing muscle physiology and disease.

PURPOSE: Conventional anatomic imaging methods are often limited for the assessment of muscle disorders. New non-invasive tools such as MRS can impact clinical care by detecting metabolic aberrations in normal-appearing muscle, and may allow a better estimation of the extent of disease than current methods.

METHODS: A variety of MRS techniques have been utilized, including phosphorous MRS and proton MRS, qualitative and quantitative methodologies, and single voxel and multivoxel procedures.

RESULTS/DISCUSSION: Phosphorous MRS has been applied to the study of exercise physiology as well as various disorders, showing changes in inorganic phosphate and phosphocreatine metabolism with energy utilization. Proton MRS is more easily integrated into a routine clinical MRI scan than phosphorous MRS, and allows better determination of lipid content. As such, proton MRS has been utilized for the assessment of lipid content aberrations in the muscles of patients with chronic back pain, those with internal derangement of the joints, and those with endocrinologic disorders. In addition, for chronic neurologic abnormalities and inflammatory myopathies, alterations in creatine and trimethylamine content have been shown.

CONCLUSION: As MRS methodologies are refined, standard clinical practice may incorporate MRS findings into treatment planning algorithms for patients with chronic disorders that affect muscle function.

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