Magnetic resonance imaging (MRI) is a technique with versatile applications. From its initial use in imaging the anatomy of the central nervous system, it has found its place in both clinical practice and research for studying the heart, liver, prostate, muscle, and other tissues. In addition to classical T1-, T2-, and proton-density-weighted imaging, other techniques such as spectroscopy, diffusion-weighted imaging, perfusion imaging, angiographic methods, and more have also been utilized.

The aim of this dissertation was to study skeletal muscle using MR spectroscopy and MR imaging techniques.

In the first study described in the experimental part of this dissertation, texture analysis techniques were successfully used for classifying MR images of skeletal muscles from patients and healthy volunteers. We demonstrated that texture analysis can serve as a supportive tool in classifying the degree of skeletal muscle involvement in patients with myopathies. This study employed classical T1- and T2-weighted imaging, which has been used routinely at our institution as a clinical examination method for several years. Our research group is collaborating within the European COST B21 project, whose main objective is to study the application of texture analysis techniques on MR images. This study was an important part of this international project.

The second part of the dissertation focused on the use of ^{1}H MR spectroscopy for studying skeletal muscle metabolism. MR spectroscopy enables the study of metabolites that play a significant role in the pathogenesis of insulin resistance and type 2 diabetes mellitus—specifically, intramyocellular lipids (IMCL). This part of the work dealt primarily with the methodological procedure for measuring and evaluating IMCL concentrations. Measurement sequences were optimized, and a new data processing technique was introduced to achieve the highest possible reliability in determining the concentrations of CH_2 and CH_3 groups within IMCL.

It was found that significant improvements in result quality can be achieved when measurements are performed using MR systems with higher magnetic field strength.