Clinical pilot study for the automatic segmentation and recognition of abdominal adipose tissue compartments from MRI data.

Abstract:
In the diagnosis and risk assessment of obesity, both the amount and distribution of adipose tissue compartments are critical factors. We present a hybrid method for the quantitative measurement of human body fat compartments. MRI imaging was performed on a 1.5 T scanner. In a pre-processing step, the images were corrected for bias field inhomogeneity. For segmentation and recognition a hybrid algorithm was developed to automatically differentiate between different adipose tissue compartments. The presented algorithm is designed with a combination of shape and intensity-based techniques. To incorporate the presented algorithm into the clinical routine, we developed a graphical user interface. Results from our methods were compared with the known volume of an adipose tissue phantom. To evaluate our method, we analyzed 40 clinical MRI scans of the abdominal region. Relatively low segmentation errors were found for subcutaneous adipose tissue (3.56 %) and visceral adipose tissue (0.29 %) in phantom studies. The clinical results indicated high correlations between the distribution of adipose tissue compartments and obesity. We present an approach that rapidly identifies and quantifies adipose tissue depots of interest. With this method examination and analysis can be performed in a clinically feasible timeframe.