The purpose of the present study was to test the relative performance of chemical shift-based water-fat imaging in measuring bone marrow fat fraction in the presence of trabecular bone, having as reference standard the single-voxel magnetic resonance spectroscopy (MRS). Six-echo gradient echo imaging and single-voxel MRS measurements were performed on the proximal femur of seven healthy volunteers. The bone marrow fat spectrum was characterized based on the magnitude of measurable fat peaks and an a priori knowledge of the chemical structure of triglycerides, in order to accurately extract the water peak from the overlapping broad fat peaks in MRS. The imaging-based fat fraction results were then compared to the MRS-based results both without and with taking into consideration the presence of short T2* water components in MRS. There was a significant underestimation of the fat fraction using the MRS model not accounting for short T2* species with respect to the imaging-based fat fraction. A good equivalency was observed between the fat fraction using the MRS model accounting for short T2* species and the...
imaging-based fat fraction \( (R(2) = 0.87) \). The consideration of the short T2* water species effect on bone marrow fat quantification is essential when comparing MRS-based and imaging-based fat fraction results. Magn Reson Med 71:1158-1165, 2014. © 2013 Wiley Periodicals, Inc.