Fat signal

As fat tissues have a short relaxation time T1 they appear as a hypersignal in T1-weighted sequences. The relaxation time T2 of fat is also short, but the fat still appears as a relative high signal intensity in multi-echoes T2-weighted sequences (TSE, FSE). This fat high signal intensity can hide enhancement after Gadolinium injection in T1-weighted sequences, or an edematous hypersignal in fatty organs in T2-weighted sequences. It may be difficult to distinguish fat from other tissues with high T1 and T2 signal intensities (blood degradation products in a hematoma for example). Furthermore fat is responsible for chemical shift artifacts and is also clearly visible in motion artifacts.

Fat signal suppression

There are two families of techniques to reduce or even suppress the signal from fat tissue, whatever the signal weighting:

those based on the particular T1 of fat: inversion-recovery with short inversion time (STIR)

those based on the differences in hydrogen resonance frequency in fat molecules compared to hydrogen resonance frequency in water and other soft tissues: fat saturation and selective excitation of water.

There are many applications of fat suppression methods: Identification of fat tissue, differentiation from blood clots, edema detection, enhancement after Gadolinium injection, reduction of chemical shift artifacts, MR spectroscopy, background suppression in MR angiography...