

## Publication

## Assessment of muscle oxygenation with balanced SSFP: a quantitative signal analysis

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**PURPOSE:** To investigate the feasibility of balanced steady-state free precession (b-SSFP) for blood oxygenation level-dependent (BOLD) MRI during a short-term ischemia/reactive hyperemia (RH) experiment on human calf muscles. **MATERIALS AND METHODS:** To investigate contributions to the b-SSFP signal during an RH experiment, the relaxation times  $T(1)$ ,  $T(2)$ , and  $T(2)^*$  were quantified in an interleaved fashion. Data from soleus, gastrocnemius, and tibialis muscle groups of five healthy subjects were evaluated. **RESULTS:** During ischemia a decreased b-SSFP signal amplitude as well as a decrease in  $T(2)$ ,  $T(2)^*$ , and the initial intensity  $I(0)$  was observed. RH provoked an overshoot of  $T(2)$ ,  $T(2)^*$ , and the b-SSFP signal. No paradigm-related changes in  $T(1)$  were observed. Comparing the evolution of transverse relaxation times, initial intensity, and b-SSFP signal amplitude, we concluded that the measured b-SSFP signal in muscle tissue is not only determined by  $T(2)$  variations but also significantly influenced by  $I(0)$  changes. These  $I(0)$  changes are attributed to spin density variations since inflow effects were suppressed by saturation bands. **CONCLUSION:** b-SSFP signal changes during a RH paradigm cannot unambiguously be assigned to oxygenation changes. Therefore, care has to be taken with their interpretation.

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