Abstract:
The aim of this study was to characterise and compare widely used acquisition strategies for hyperpolarised (13)C imaging. Free induction decay chemical shift imaging (FIDCSI), echo-planar spectroscopic imaging (EPSI), IDEAL spiral chemical shift imaging (ISPCSI) and spiral chemical shift imaging (SPCSI) sequences were designed for two different regimes of spatial resolution. Their characteristics were studied in simulations and in tumour-bearing rats after injection of hyperpolarised [1-(13)C]pyruvate on a clinical 3-T scanner. Two or three different sequences were used on the same rat in random order for direct comparison. The experimentally obtained lactate signal-to-noise ratio (SNR) in the tumour matched the simulations. Differences between the sequences were mainly found in the encoding efficiency, gradient demand and artefact behaviour. Although ISPCSI and SPCSI offer high encoding efficiencies, these non-Cartesian trajectories are more prone than EPSI and FIDCSI to artefacts from various sources. If the encoding efficiency is sufficient for the desired application, EPSI has been proven to be a robust choice. Otherwise, faster spiral acquisition schemes are recommended. The conclusions found in this work can be applied directly to clinical applications.
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