Glioblastoma multiforme (GBM) is the most common and most aggressive primary tumor of the brain. In recent years newer therapeutic approaches have been developed. To allow for an optimized treatment planning it is important to precisely delineate necrotic tissue, edema and vital tumor tissue and to identify the most aggressive parts of the GBM. The magnetic resonance (MR) portion of an MR-positron emission tomography (PET) examination in patients with GBM should consist of both structural and functional sequences including diffusion-weighted and perfusion sequences. The use of (18)F-fluorodeoxyglucose ((18)F-FDG) is limited in patients with gliomas as glucose metabolism is already physiologically high in parts of the brain but (18)F-FDG is nevertheless a commonly used radiopharmaceutical for neuro-oncological questions. (18)F-fluorothymidine reflects the cellular activity of thymidine kinase 1 and correlates with the expression of KI-67 as an index of mitotic activity. The nitroimidazole derivatives (18)F-fluoromisonidazole and (18)F-fluoroazomycin arabinoside ((18)F-FAZA) allow the detection of hypoxic areas within the tumor. In recent years amino acid tracers, such as (18)F-fluoroethyltyrosine are increasingly being used in the diagnosis of gliomas. The simultaneous PET-MR image acquisition allows new approaches, e.g. motion correction by the simultaneous acquisition of MR data.
with a high temporal resolution and an improved quantification of the PET signal by integrating the results of functional MR sequences. Moreover, the simultaneous acquisition of these two time-consuming methods leads to reduced imaging times for this, often severely ill patient group.