Concerning the preoperative clinical diagnostic work-up of glioma patients, tumor heterogeneity challenges the oncological therapy. The current study assesses the performance of a multimodal imaging approach to differentiate between areas in malignant gliomas and to investigate the extent to which such a combinatorial imaging approach might predict the underlying histology. Prior to surgical resection, patients harboring intracranial gliomas underwent MRIs (MR-S, PWI) and (18)F-FET-PETs. Intratumoral and peritumoral biopsy targets were defined, by MRI only, by FET-PET only, and by MRI and FET-PET combined, and biopsied prior to surgical resection and which then received separate histopathological examinations. In total, 38 tissue samples were acquired (seven glioblastomas, one anaplastic astrocytoma, one anaplastic oligoastrocytoma, one diffuse astrocytoma, and one oligoastrocytoma) and underwent histopathological analysis. The highest mean values of Mib1 and CD31 were found in the target point “T” defined by MRI and FET-PET combined. A significant correlation between NAA/Cr and PET tracer uptake (-0.845, p<0.05) as well as Cho/Cr ratio and cell density (0.742, p<0.05) and NAA/Cr ratio and MIB-1 (-0.761, p<0.05) was disclosed for this target.
point, though not for target points defined by MRI and FET-PET alone. Multimodal-imaging-guided stereotactic biopsy correlated more with histological malignancy indices, such as cell density and MIB-1 labeling, than targets that were based solely on the highest amino acid uptake or contrast enhancement on MRI. The results of our study indicate that a combined PET-MR multimodal imaging approach bears potential benefits in detecting glioma heterogeneity.