Use of multimodality-neuroimaging for differentiation between recurrent glioblastoma and radiation necrosis

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Abstract

Differentiation between recurrent glioblastoma and radiation necrosis after the initial treatment is difficult using routine neuroimaging such as CT or MRI. ^{11}C-methionin PET（MET-PET）has been recognized to be the most useful for this issue, but is not always available. ^{1}H-Magnetic resonance spectroscopy (MRS) provides information of metabolic changes within lesions. The aim of this study is to determine whether data from MRS is equivalent to MET-PET for differentiation between recurrent glioblastoma and radiation necrosis. Subjects comprised 13 regions, which are contrast-enhanced lesions on MRI with contrast medium, in 9 adult patients who underwent a treatment with radiation. For all patients, both MET-PET and MRS were performed within 2 weeks. We calculated normalized mean of standardized uptake value (^{mean}SUV) ratio in MET-PET, and normalized choline containing compounds (Cho)/ total creatine (Cr) in MRS. Normalized ^{mean}SUV ratio and normalized Cho/Cr ratio were compared between recurrent lesions and radiation necrosis lesions. Accuracy for predicting recurrent glioblastoma was evaluated in normalized ^{mean}SUV and normalized Cho/Cr ratios. Both normalized ^{mean}SUV ratio and normalized Cho/Cr ratio were significantly higher in recurrent glioblastoma than in radiation necrosis. Sensitivity and specificity for predicting recurrent glioblastoma were 100% and 100%, respectively, in normalized ^{mean}SUV, and were 77.8% and 75%, respectively, in normalized Cho/Cr ratio. In this study, MET-PET was more beneficial for differentiating recurrent glioblastoma from radiation necrosis than MRS. Further studies evaluating different metabolites from Cho/Cr and including a larger number of subjects are needed.