Prognostic value of 18F-FET PET imaging in re-irradiation of high-grade glioma: Results of a phase I clinical trial.

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Abstract

BACKGROUND AND PURPOSE: Positron emission tomography (PET) provides quantitative metabolic information and potential biomarkers of treatment outcome. We aimed to determine the prognostic value of early 18F-fluoroethyl-tyrosine (18F-FET) PET scans acquired during re-irradiation for recurrent high-grade glioma (HGG).

MATERIAL AND METHODS: A phase I clinical trial of re-irradiation of HGG was carried out. MRI and 18F-FET PET were used for target delineation and follow-up. Images were acquired at baseline, during radiotherapy and 4 weeks post-treatment and compared by measuring the metabolically active biological tumor volume (BTV) and maximal activity (T\text{max}/B). Correlations with outcomes were assessed by multivariate Cox regression analysis.

RESULTS: Thirty-one patients were included and all patients have died. The median overall survival was 7.0 mos. Both baseline BTV and baseline MRI volume (necrotic/cystic cavities subtracted) were prognostic for overall survival (OS) in multivariate analysis (HR=1.3 p<0.01 and HR=1.3 p<0.01, respectively). Early changes in BTV and T\text{max}/B were observed but they carried no independent prognostic information.

CONCLUSIONS: Baseline biological tumor volume (BTV) defined by 18F-FET PET was prognostic for OS in multivariate analysis, as was MRI volume (necrotic/cystic cavities subtracted). Tumor volume may aid in identifying patients whose life expectancy is too short to warrant re-irradiation.

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KEYWORDS: High-grade glioma; MRI; Metabolic imaging; Positron emission tomography; Prognostic markers; Re-irradiation

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