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### Clinical Investigation

## Proton Magnetic Resonance Spectroscopic Imaging in Newly Diagnosed Glioblastoma: Predictive Value for the Site of Postradiotherapy Relapse in a Prospective Longitudinal Study

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### Purpose

To investigate the association between magnetic resonance spectroscopic imaging (MRSI)–defined, metabolically abnormal tumor regions and subsequent sites of relapse in data from patients treated with radiotherapy (RT) in a prospective clinical trial.

### Methods and Materials

Twenty-three examinations were performed prospectively for 9 patients with newly diagnosed glioblastoma multiforme studied in a Phase I trial combining Tipifarnib and RT. The patients underwent magnetic resonance imaging (MRI) and MRSI before treatment and every 2 months until relapse. The MRSI data were categorized by the choline (Cho)/N-acetyl–aspartate (NAA) ratio (CNR) as a measure of spectroscopic abnormality. CNRs corresponding to T1 and T2 MRI for 1,207 voxels were evaluated before RT and at recurrence.

### Results

Before treatment, areas of CNR2 (CNR  $\geq 2$ ) represented 25% of the contrast-enhancing (T1CE)

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regions and 10% of abnormal T2 regions outside T1CE (HyperT2). The presence of CNR2 was often an early indicator of the site of relapse after therapy. In fact, 75% of the voxels within the T1CE+CNR2 before therapy continued to exhibit CNR2 at relapse, compared with 22% of the voxels within the T1CE with normal CNR ( $p < 0.05$ ). The location of new contrast enhancement with CNR2 corresponded in 80% of the initial HyperT2+CNR2 vs. 20.7% of the HyperT2 voxels with normal CNR ( $p < 0.05$ ).

## Conclusion

Metabolically active regions represented a small percentage of pretreatment MRI abnormalities and were predictive for the site of post-RT relapse. The incorporation of MRSI data in the definition of RT target volumes for selective boosting may be a promising avenue leading to increased local control of glioblastomas.

**Author Keywords:** Brain tumor; Glioblastoma; Proton magnetic resonance spectroscopy imaging; Prospective trial; Radiotherapy

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Conflict of interest: none



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