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An objective measure of disease burden is a prerequisite for the accurate assessment of the efficacy of therapy. This is especially critical in the evaluation of brain tumor therapies where conventional imaging is confounded by co-existing pathology. In this study we followed tumor sub-component volumes as determined by the Eigenimage Filter technique to assess response to therapy in patients with malignant glioma. The Eigenimage Filter technique is sensitive to small contrast changes and accounts for partial volume averaging effects. This allows the assessment of the tumor infiltration into normal brain and its heterogeneous components.

Using images from patients being followed after initial treatment, we have been able to observe changes within Gd-enhanced and other tumor sub-component regions (zones). The volume variation seen in these zones demonstrated changes indicative of tumor progression or treatment response more clearly than the conventional Gd-enhanced changes. As an example in a study where the conventional Gd and all zone volumes increased over a 5 week period the patient's condition declined and died 6 weeks later. In another example the conventional Gd volume increased, yet the zone volumes all decreased. This patient has surgically confirmed radiation necrosis and appears clinically stable, consistent with resolving radiation necrosis seen by the zone changes.

This analysis suggests that despite progressive increase in the Gd volume the internal changes in signal characteristics may be clinically significant, i.e. reflective of treatment response, and these changes can be followed using the Eigenimage Filter technique.