

OFFICIAL ABSTRACT and CERTIFICATION

Necrosis, Non-Enhancing, and Enhancing Tumor Features of Glioblastoma Tissue for Prediction of Overall Survival and Progression Free Survival

Miles Kim, Benjamin Alexander

Hills West, Dix Hills, N.Y, United States

Glioblastoma multiforme is an aggressive brain cancer. Only five percent of diagnosed patients live for longer than five years, with patients having an overall survival of only 14.2 months. The Stupp Protocol is the care standard used to treat glioblastoma, and it involves total resection of the tumor, chemotherapy, and radiation. The power of this protocol would be enhanced if we had a more accurate method of measuring the aggressiveness of the cancer. We can develop a more precise technique of measuring this aggressiveness by assessing a patient's predicted overall survival and progression-free survival. Linking these measurements to features of the cancer that can be measured by magnetic resonance imaging (MRI) would allow physicians to estimate prognosis according to glioblastoma's characteristics. This estimation would enable physicians to customize chemotherapy, providing for a better chance of survival as well as reduced side effects that could be caused by overtreatment. We wish to examine novel textural features of necrosis, non-enhancing, and enhancing tumor to evaluate their use as clinical outcome predictors. Using a dataset from the TCGA-GBM collection, We used T1-weighted contrast-enhanced MRI scans for a total of 212 patients. Algorithms were used to create segmentations for various heterogeneous histologic sub-regions, namely the necrosis, non-enhancing, and enhancing tumor. Clinical radiologists verified these segmentations. Textural readouts created using LifeX software for radiometric feature calculation in multimodality imaging were analyzed using a Receiver Operating Characteristic curve (ROC) and Kaplan-Meier analysis. Significant differences between diagnostic groups created by each textural parameter were found for the histologic sub-regions necrosis, non-enhancing, and enhancing tumor.

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