

Novel Imaging Software Diagnostic to Determine Survival in Glioblastoma Multiforme



Currently only 25% of patients diagnosed with high grade glioma respond to standard therapy with the remaining patients requiring alternative therapies. Predicting patient survival or therapy response is difficult in many tumor types due to heterogeneity between patients with the same tumor type and stage, as well as heterogeneity within a single tumor. Using pretreatment standard of care imaging, our diagnostic can determine patient survival in Glioblastoma multiforme (GBM) patients and likely predict response to standard of care therapy.

COMMERCIAL OPPORTUNITY

- GBM accounts for about 15% of the more than 22,000 Americans diagnosed with brain and nervous system cancers per year. Patients with GBM have a poor prognosis and usually survive less than 15 months with no long-term treatments available. Some patients will respond well to the adjuvant standard of care (radiation therapy +/- temozolomide) while others (about 75%) will be refractory to the standard of care and should be prescribed alternative or investigational salvage chemotherapy.
- Diagnostic assays that allow for prospective risk-stratification of patients enable more individualized and potentially effective therapy options to be considered earlier during treatment.
- The market is attractive as evidenced by the DecisionDX-GBM diagnostic product available from Castle Biosciences, Inc., which determines mortality risk in GBM patients based upon gene expression in tissue removed during initial surgery.
- However, imaging studies, such as computed tomography (CT) and magnetic resonance imaging (MRI), are the standard method of diagnosis and classification for brain tumors and offer a less invasive approach for determining mortality risk.
- Moreover, imaging diagnostics would be helpful for inoperable tumors or tumors in locations where surgery would be risky such as the brainstem. Our imaging diagnostic could be easily integrated into the current diagnostic process, increasing ease of physician adoption, especially for the approximately 320 children diagnosed with brainstem gliomas annually.

TECHNOLOGY

The inventors analyzed a dataset of 32 patients from The Cancer Genome Atlas that had complete pretreatment MRI studies where each small region of the tumor was characterized by its local contrast enhancement and edema/cellularity (“habitat”). The patients were divided into two groups that had survival <400 days (n=16) or >400 days (n=16). These groups had distinctly different patterns of vascularity and cellular density with patients with shorter survival harboring more heterogeneous tumors. A leave-one-out validation scheme demonstrated that individual patients could be correctly assigned to the short or long survival group with 81% accuracy, 78% specificity, 86% sensitivity, and an area under the curve of 0.86.

PUBLICATION/PATENT

- Zhou, M. et al., Radiologically defined ecological dynamics and clinical outcomes in glioblastoma multiforme: preliminary results. *Translational oncology*, 2014. 7(1): 5-13.
- Two US provisional applications were filed on 3/10/2014 for Drs. Gillies, Gatenby, Goldgof, and Hall

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