

# MR Imaging Predictors of Molecular Profile and Survival: Multi-institutional Study of the TCGA Glioblastoma Data Set (TCGA-GBM-Radiogenomics)

## Summary

### PURPOSE:

To conduct a comprehensive analysis of radiologist-made assessments of glioblastoma (GBM) tumor size and composition by using a community-developed controlled terminology of magnetic resonance (MR) imaging visual features as they relate to genetic alterations, gene expression class, and patient survival.

### MATERIALS AND METHODS:

Because all study patients had been previously deidentified by the Cancer Genome Atlas (TCGA), a publicly available data set that contains no linkage to patient identifiers and that is HIPAA compliant, no institutional review board approval was required. Presurgical MR images of 75 patients with GBM with genetic data in the TCGA portal were rated by three neuroradiologists for size, location, and tumor morphology by using a standardized feature set. Interrater agreements were analyzed by using the Krippendorff statistic and intraclass correlation coefficient. Associations between survival, tumor size, and morphology were determined by using multivariate Cox regression models; associations between imaging features and genomics were studied by using the Fisher exact test.

### RESULTS:

Interrater analysis showed significant agreement in terms of contrast material enhancement, nonenhancement, necrosis, edema, and size variables. Contrast-enhanced tumor volume and longest axis length of tumor were strongly associated with poor survival (respectively, hazard ratio: 8.84,  $P = .0253$ , and hazard ratio: 1.02,  $P = .00973$ ), even after adjusting for Karnofsky performance score ( $P = .0208$ ). Proneural class GBM had significantly lower levels of contrast enhancement ( $P = .02$ ) than other subtypes, while mesenchymal GBM showed lower levels of nonenhanced tumor ( $P < .01$ ).

### CONCLUSION:

This analysis demonstrates a method for consistent image feature annotation capable of reproducibly characterizing brain tumors; this study shows that radiologists' estimations of macroscopic imaging features can be combined with genetic alterations and gene expression subtypes to provide deeper insight to the underlying biologic properties of GBM subsets.

#### Data Access

#### Data Access

Some data in this collection contains images that could potentially be used to reconstruct a human face. To safeguard the privacy of participants, users must sign and submit a [TCIA Restricted License Agreement](#) to [help@cancerimagingarchive.net](mailto:help@cancerimagingarchive.net) before accessing the data.

Data Type	Download all or Query/Filter	License
Clinical data, radiologist observations, and genomics analysis (30kB, XLSX)	<a href="#">Download</a>	CC BY 3.0

Please contact [help@cancerimagingarchive.net](mailto:help@cancerimagingarchive.net) with any questions regarding usage.

### Other Resources

- Clinical data, radiologist observations, and genomics analysis : <https://docs.google.com/spreadsheets/d/1zuN4PSTNOQN1BbfbVvIEzJ4jyHBPY6ddqxGQ-FRR9qo/edit?usp=sharing>

### Collections Used in this Third Party Analysis

Below is a list of the Collections used in these analyses:

Source Data Type	Download	License
Original Image Data manifest subset from TCGA-GBM (DICOM, 71 subjects, 198,578 files, 21.52 GB)	<a href="#">Download</a> Requires <a href="#">NBIA Data Retriever</a>	TCIA Restricted

- TCGA-GBM

#### Detailed Description

#### Detailed Description

No images were created in this analysis.

#### Citations & Data Usage Policy

## Citations & Data Usage Policy

Users must abide by the [TCIA Data Usage Policy and Restrictions](#). Attribution should include references to the following citations:



### Data Citation

Gutman DA, Cooper LA, Hwang SN, Holder CA, Gao J, Aurora TD, Dunn WD Jr, Scarpance L, Mikkelsen T, Jain R, Wintermark M, Jilwan M, Raghavan P, Huang E, Clifford RJ, Mongkolwat P, Kleper V, Freymann J, Kirby J, Zinn PO, Moreno CS, Jaffe C, Colen R, Rubin DL, Saltz J, Flanders A, Brat DJ. (2014). **MR Imaging Predictors of Molecular Profile and Survival: Multi-institutional Study of the TCGA Glioblastoma Data Set**. The Cancer Imaging Archive. <https://doi.org/10.7937/K9/TCIA.2014.4HTXYRCN>



### Publication Citation

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### TCIA Citation

Clark K, Vendt B, Smith K, Freymann J, Kirby J, Koppel P, Moore S, Phillips S, Maffitt D, Pringle M, Tarbox L, Prior F. (2013) **The Cancer Imaging Archive (TCIA): Maintaining and Operating a Public Information Repository**, Journal of Digital Imaging, Volume 26, Number 6, pp 1045-1057. DOI: <https://doi.org/10.1007/s10278-013-9622-7>

## Other Publications Using This Data

TCIA maintains [a list of publications](#) that leverage TCIA data. If you have a manuscript you'd like to add please [contact TCIA's Helpdesk](#).

### Versions

#### Version 1 (Current): Updated 2014/11/12

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Original Image Data manifest subset from TCGA-GBM (DICOM, 71 subjects, 198578 files, 21.52 GB)	<a href="#">Download</a> Requires <a href="#">NBIA Data Retriever</a>	TCIA Restricted