ABSTRACT

Neuroradiology. 2022 Jul 25. doi: 10.1007/s00234-022-03015-7. Online ahead of print.

Imaging-based stratification of adult gliomas prognosticates survival and correlates with the 2021 WHO classification.

Kamble AN(1)(2), Agrawal NK(3)(4), Koundal S(5), Bhargava S(6), Kamble AN(7), Joyner DA(8), Kalelioglu T(8), Patel SH(8), Jain R(9)(10).

Author information:

(1)University Hospitals Coventry & Warwickshire, Coventry, UK.

drakshaykumarkamble@gmail.com.

(2)Deep Learning Institute of Radiological Sciences (DeLoRIS), Mumbai, India. drakshaykumarkamble@gmail.com.

(3)Deep Learning Institute of Radiological Sciences (DeLoRIS), Mumbai, India. (4)Max Super-Specialty Hospital, Mohali, India.

(5)Department of Radiology, Institute of Nuclear Medicine & Allied Sciences (INMAS), New Delhi, India.

(6)Sir Ganga Ram Hospital, Delhi, India.

(7)Saraswati College of Engineering, Mumbai, India.

(8)Department of Radiology, University of Virginia Health System,

Charlottesville, VA, USA.

(9)Department of Radiology, New York University Grossman School of Medicine, New York, NY, USA.

(10)Department of Neurosurgery, New York University Grossman School of Medicine, New York, NY, USA.

BACKGROUND: Because of the lack of global accessibility, delay, and cost-effectiveness of genetic testing, there is a clinical need for an imaging-based stratification of gliomas that can prognosticate survival and correlate with the 2021-WHO classification.

METHODS: In this retrospective study, adult primary glioma patients with pre-surgery/pre-treatment MRI brain images having T2, FLAIR, T1, T1 post-contrast, DWI sequences, and survival information were included in TCIA training-dataset (n = 275) and independent validation-dataset (n = 200). A flowchart for imaging-based stratification of adult gliomas(IBGS) was created in consensus by three authors to encompass all adult glioma types. Diagnostic features used were T2-FLAIR mismatch sign, central necrosis with peripheral enhancement, diffusion restriction, and continuous cortex sign. Roman numerals (I, II, and III) denote IBGS types. Two independent teams of three and two radiologists, blinded to genetic, histology, and survival information, manually read MRI into three types based on the flowchart. Overall survival-analysis was done using age-adjusted Cox-regression analysis, which provided both hazard-ratio (HR) and area-under-curve (AUC) for each stratification system(IBGS and 2021-WHO). The sensitivity and specificity of each IBSG type were analyzed with cross-table to identify the corresponding 2021-WHO genotype.

RESULTS: Imaging-based stratification was statistically significant in predicting survival in both datasets with good inter-observer agreement (age-adjusted Cox-regression, AUC > 0.5, k > 0.6, p < 0.001). IBGS type-I, type-II, and type-III gliomas had good specificity in identifying IDHmut 1p19q-codel oligodendroglioma (training - 97%, validation - 85%); IDHmut 1p19q non-codel astrocytoma (training - 80%, validation - 85.9%); and IDHwt glioblastoma (training - 76.5%, validation- 87.3%) respectively (p-value < 0.01).

CONCLUSIONS: Imaging-based stratification of adult diffuse gliomas predicted patient survival and correlated well with 2021-WHO glioma classification.

 $\textcircled{\mbox{$\odot$}}$ 2022. The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature.

DOI: 10.1007/s00234-022-03015-7 PMID: 35876874