Identifying The Progression Pattern Of Glioblastoma By Using Quantitative Radiomics Imaging Characteristics

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Purpose
The phenotypes of the progression in glioblastoma after treatment are heterogeneous in both imaging presentation and clinical prognosis. This study aims to identify the correlation of the progression pattern and its imaging characteristics by using quantitative radiomics features.

Materials and Methods
We retrospectively reviewed our adult glioblastoma patients from 2009 to 2016. All patient received standard surgical resection followed by temozolomide chemoradiotherapy. The preoperative MRI includes structure MRI (T1-weighted, T2-weighted, FLAIR, contrast-enhanced T1-weighted), diffusion-weighted imaging, and diffusion tensor imaging. Radiomics features including first order, shape and texture analysis were calculated for analysis. The progression phenotypes were classified into diffuse/ localised (extend > 2cm/ < 2 cm from surgical margin), multi-directions/ uni-direction, distal, and contact of ventricle.

Results
41 patients (mean Â± SD of age = 57.4Â±13.4) were included in this study. The progression-free survival was 182Â±206 days and the overall survival was 463Â±263. Among all progression phenotypes, the diffuse type was correlated with worse overall survival ($p = 0.048$). Further analysis of the radiomics features showed 18 of the 103 have distinct imaging characteristics and most of these features indicate heterogeneity of the gray level, the coarseness, flatness of the surface and the tumor volume.

Conclusion
The quantitative radiomics features can characterize progression pattern of glioblastoma which can be associated with the prognosis. Further study of these features and application to the diagnosis is needed.