HealthManagement.org
Promoting Management and Leadership

Multicontrast MRI radiomics can predict glioma subtypes and behaviour

New research from China explored the feasibility and diagnostic performance of radiomics based on anatomical, diffusion and perfusion MRI in differentiating among glioma subtypes and predicting tumour proliferation. Researchers found that multicontrast radiomics provides complementary information on both geometric characters and molecular biological traits, which correlate significantly with tumour grade and proliferation.

"Combining all-contrast radiomics models might precisely predict glioma biological behaviour, which may be attributed to presurgical personal diagnosis," according to the researchers from Chinese Academy of Sciences and Huazhong University of Science and Technology.

Glioma is the most common neuroepithelial tumour of the cerebral nervous system, and the prognoses of these lethal brain cancers differ among gliomas due to their various biological tissue types. Among the numerous reported biomarkers, histological grade and the Ki-67 labelling index (Ki-67 LI) are two vital biological behaviour biomarkers. Ki-67 nuclear antigen is present only in proliferating cells, making it a reliable avenue for rapidly evaluating the growth fraction of normal and abnormal cells.

Since the conception of radiomics proposed in 2012, much attention has focused on its application in the management of malignant cancer. Radiomics offers a powerful and crucial approach for capturing intratumoural heterogeneity via abundant features obtained from radiological image data, which can potentially meet the demands of personalised medicine.

Considering the heterogeneous nature of most cancers, combining multicontrast MRI and radiomics may be critically important for diagnosing and treating glioma, according to the Chinese research team. This retrospective study included 220 pathology-confirmed gliomas and 10 contrasts. After being registered to T2FLAIR images and resampling to 1 mm3 isotropically, 431 radiomics features were extracted from each contrast map within a semi-automatic defined tumour volume. For single-contrast and the combination of all contrasts, correlations between the radiomics features and pathological biomarkers were revealed by partial correlation analysis, and multivariate models were built to identify the best predictive models with adjusted 0.632+ bootstrap area under the curve (AUC).

In univariate analysis, both non-wavelet and wavelet radiomics features were correlated significantly with tumour grade and the Ki-67 labelling index. The max R was 0.557 (p = 2.04E-14) in T1C for tumour grade and 0.395 (p = 2.33E-07) in ADC for Ki-67. In the multivariate analysis, the combination of all-contrast radiomics features had the highest AUCs in both differentiating among glioma subtypes and predicting proliferation compared with those in single-contrast images.

For low-/high-grade gliomas, the best AUC was 0.911. In differentiating among glioma subtypes, the best AUC was 0.896 for grades II II, 0.997 for grades II V, and 0.881 for grades III V. In predicting proliferation levels, multicontrast features led to an AUC of 0.936.

"Radiomics features from different MR contrasts can supply distinctive but complementary information in reflecting tumour character, and those combinations allow for a comprehensive evaluation of glioma biological behaviour," the researchers explain. "Multicontrast MRI radiomics offers highly advanced quantitative features, and highly predictive models integrate these features and might facilitate the precise diagnosis of glioma patients."

The models proposed in this study contain features from all included modalities, and both the non-wavelet features and wavelet-transformed features obtained improved classification performance in predicting glioma pathological behaviour.

Source: European Radiology

reference

Su C, Jiang J, Zhang S et al. (2018) Radiomics based on multicontrast MRI can precisely differentiate among glioma subtypes and predict tumour-proliferative behaviour. Eur Radiol. Published online 12 October 2018. https://doi.org/10.1007/s00330-018-5704-8

Published on : Wed, 17 Oct 2018