nosed oligodendroglioma tumors which are having molecular characteristics of astrocytoma. There is a trend that diagnosed grade II LrGGs are actually grade III based on re-assessment diagnosis.

Key words: Neuropathology | WHO2016 criteria | Molecular diagnosis

MPC-17

2021 WHO CLASSIFICATION OF TUMORS OF THE CNS, 5TH ED.

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The grading of gliomas based on histological features has been a subject of debate for several decades. While the traditional grading system has failed to stratify the risk of IDH-mutant astrocytoma, canonical histological and proliferative markers may be applicable to the risk stratification of IDH-wildtype astrocytoma. Numerous studies have examined molecular markers to obtain more clinically relevant information that will improve the risk stratification of gliomas. The CDKN2A/B homozygous deletion for IDH-mutant astrocytoma and the following three criteria for IDH-wildtype astrocytoma: the concurrent gain of whole chromosome 7 and loss of whole chromosome 10, TERT promoter mutations, and EGFR amplification, were identified as independent molecular markers of the worst clinical outcomes. Therefore, the 2021 World Health Organization (WHO) Classification of Tumors of the Central Nervous System adopted these molecular markers into the revised grading criteria of IDH-mutant and -wildtype astrocytoma respectively, as a grading system within tumor types. For diffuse gliomas in children, molecular alteration-based classification was adopted, dividing low-grade and high-grade subcategories. New tumor types and subtypes were introduced, some based on DNA methylation profiling. To achieve this novel classification in a resource-limited setting, an integrated diagnosis combining clinical, histological, and molecular information became more important.

Key words: WHO classification | genetics | patholgy

NEUROIMAGING (NI)

NI-2

USE OF NEURITE ORIENTATION DISPERSION AND DENSITY IMAGING(NODDI)FOR EARLY DISTINCTION BETWEEN INFILTRATING TUMOR AND VASOGENIC EDEMA IN NON-ENHANCING LESIONS WITH GLIOBLASTOMA PATIENTS

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Background: Glioblastoma is a highly infiltrative tumor. In the non-enhancing T2-weighted hyperintense area, differentiating between non-enhancing tumors (NETs) and vasogenic edema is challenging. Neurite orientation dispersion and density imaging (NODDI) is a new diffusion MRI technique that reveals the inhomogeneity of the brain microstructure. The aim of this study is to differentiate between NETs and edema in glioblastomas using NODDI. Methods: Data were collected from 20 patients with glioblastoma as well as three patients with metastasis and two with meningioma (control), who underwent MRI as part of pre-surgical examination. The MRI data included T2- and T1-weighted contrast-enhanced images and NODDI images. Three neurosurgeons manually placed the volume of interest (VOI) on the NETs and edema based on the previous reports. ICVF, ODI, ISOVF, FA, and ADC were calculated for each VOI. Results: Fifteen and 13 VOIs were placed on NETs and edema, respectively. Each parameter was measured and the unpaired t-test revealed a significant difference between NETs and edema ($p < 0.0001$). The ROC curve analysis revealed a large difference in the ADC, FA, and ISOVF between NETs and edema compared to ICVF and ODI. Principal component analysis of the five parameters showed that ADC, ISOVF, and FA contributed to the differentiation between NETs and edema. Multiple logistic regression analysis was performed with the three aforementioned parameters. A predictive formula could be created to discriminate between NETs and edema, following the use of which, the ROC curve revealed an AUC value of 0.8891. Furthermore, this formula was applied to the edematous regions of the images of the negative control group, and the prediction degree of the tumor was well below 0.5, thus enabling differentiation as edema.Conclusions: NODDI may prove to be a useful tool to discriminate between NETs and edema in the non-contrast T2 hyperintensity region of glioblastoma.

Key words: glioblastoma | non-enhancing tumor | NODDI

NI-3

MAGNETIC RESONANCE RELAXOMETRY FOR TUMOR CELL DENSITY IMAGING FOR GLIOMA: AN EXPLORATORY STUDY VIA 11C-METHIONINE PET AND ITS VALIDATION VIA STEREOTACTIC TISSUE SAMPLING

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Objective: While visualization of non-enhancing tumors for glioma is crucial for planning the most appropriate surgical or non-surgical treatment of the disease, current MRI cannot achieve this goal. This study aims to test the hypothesis that quantitative and diffusion MRI can estimate tumor burden with the brain. Materials and Methods: Study 1: Ten patients who have undergone Methionine PET (Met-PET), quantitative MRI (qMRI), and diffusion MRI (DWI) were included for analysis. A cut-off of a tumor-to-normal ratio (T/Nr) 1.5 was set on Met-PET, and the values from qMRI and DWI were compared. Study 2: Seventy-nine stereo-tactically sampled tissues from 22 glioma patients were correlated with Met-PET, qMRI, and DWI measurements regarding tumor cell density. qMRI acquisition: Imaging was performed on either a 1.5 or 3 T MR scanner (Prisma or Aera; Siemens Healthcare, Erlangen, Germany). T1-relaxometry was achieved by first acquiring MP2RAGE images, then converting those images into T1-relaxation time maps. At the same time, T2-relaxometry was achieved by first acquiring multi-echo T2-weighted images and then converting those images into T2-relaxation time maps, with both relaxometries performed via Bayesian inference modeling (Olea Nova+; Canon Medical Systems, Tochigi, Japan). **Results:** Study 1 revealed that regions of 1850ms < T1-relaxation time < 3200ms and 115ms < T2-relaxation time < 225ms tended to be Met-PET T/Nr > 1.5. DWI was not useful to separate areas between low and high Met-PET. Study 2 showed that regions of 1850ms < T1-relaxation time < 3200ms showed high tumor cell density than other areas ($p=0.04$). **Conclusions:** Our results supported the hypothesis that qMRI is useful for predicting the tumor load within the brain among glioma patients. T1-relaxation time was notably useful for this means. On the other hand, ADC measured from DWI was limited for tumor load prediction.

Key words: glioma | MRI | tumor cell density

NI-6

PREOPERATIVE DIFFERENTIAL DIAGNOSIS OF GRADE II AND GRADE III IN CASES WITH ASTROCYTOMA, IDH MUTANT

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Purpose: We attempted to differentiate between IDH-mutant astrocytoma Grade II and grade III by using methionine (MET) positron emission tomography (PET) and magnetic resonance spectroscopy (MRS). Subjects and Methods: We retrospectively analyzed 41 adult supratentorial glioma cases with confirmed histological diagnosis and IDH status from June 2015 to June 2020. These included 21 males, with an average age of 38.5 years (19–59 years), including seven astrocytoma grade II (A-II) and 34 grade III (A-III) cases. We determined the accumulation value rate of the maximum tumor to normal cortex accumulation value (T/N ratio) in MET-PET. We obtained the peak ratios of N-acetyl aspartate (NAA)/ creatine (Cr), choline (Cho)/ Cr, and Cho/NAA. We investigated the correlation between the T/N ratios and MRS parameters and examined the contrast effects on MRI. Results: There were no significant differences in the T/N ratio and MRS parameters between A-IIs and A-IIIs. Only Cho/NAA ratios were significantly correlated with the T/N ratios ($r = 0.443$, $P = 0.0037$). We divided the distribution map into four areas with the highest T/N ratio of AII (1.59) and the highest Cho/NAA ratio (3.66). That is, 1) T/N ratio ≤ 1.59 & Cho/NAA ≤ 3.66,