SS 11 NR-12 17:50

Differentiation of tumor progression from pseudoprogression in patients with glioblastoma using multiparametric voxel-based analysis

Jihoon Cha, Sung Tae Kim, Hyung-Jin Kim, Hye Jeong Kim, Hye Na Jung, Byung-joon Kim, Pyoung Jeon, Keon Ha Kim, Hong Sik Byun
Samsung Medical Center, Korea.
st7.kim@samsung.com

PURPOSE: The aim of this study was to differentiate tumor progression from pseudoprogression in patients with glioblastoma using multiparametric voxel-based analysis with DWI and PWI.

MATERIALS AND METHODS: In this retrospective study, 35 consecutive patients with glioblastoma with new or increased size of enhancing lesion within 180 days after CCRT with Temozolomide after surgical resection were included. All patients underwent two consecutive MRIs with DWI and PWI at the time of increased size and within 3 months after initial MRI. The pseudoprogression and tumor progression was determined from pathologic diagnosis (n = 3) or two or more consecutive MRI follow-up (n = 32). The voxel-based 3D histograms were made using therCBVs and ADC values of enhancing area for initial and follow-up MRI and voxel population change map (VPC) was made. The mean rCBV and ADC value of major voxel population in the initial, follow-up MRI and VPC were calculated. The histogram parameters (mean, standard deviation, maximum frequency, mode, kurtosis, and skewness) between two groups were compared. The diagnostic performance of tumor progression based on the increased size of enhancing lesion, major voxel population of initial, follow-up MRI and voxel population change map were compared using ROC curve analysis.

RESULTS: Twenty-four pseudoprogressions and 11 tumor progressions were determined. Tumor progression shows increased mean and standard deviation of rCBV on follow-up MRI. The sensitivity / specificity / accuracy of diagnosing tumor progression based on the size change of enhancing lesion was 72.7% / 83.3% / 80.0%, respectively. The diagnosis based on VPC was more accurate (AUC = 0.875) than major population of initial (AUC = 0.536) or follow-up MRI (AUC = 0. 830). Based on the voxel population change, with cutoff value of rCBV more than 1.8, the sensitivity / specificity / accuracy were 81.8% / 100% / 94.3%, respectively ($p < 0.001$).

CONCLUSION: The differential diagnosis of tumor progression from pseudoprogression based on VPC was more accurate than the diagnosis based on the size change of enhancing lesion, and especially the specificity was increased.