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Reproducibility of relative cerebral blood volume measurement from perfusion-weighted imaging in glioblastoma: comparison study between manual and semi-automatic segmentation method

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PURPOSE: To compare the intra- and interobserver reproducibility of manual and semi-automatic segmentation method in terms of measurement of relative cerebral blood volume (rCBV) from magnetic resonance (MR) perfusion imaging.

MATERIALS AND METHODS: Twenty-two patients (11 male, 11 female; mean age, 52.5 years; age range, 20–72 years; 27 tumors, 5 patients with two masses) with histologically confirmed glioblastoma (WHO grade IV) were examined with conventional MR imaging and dynamic susceptibility contrast-enhanced imaging at 3T before surgery. Normalized rCBV (means and standard deviations) in each tumor were measured by using two MR perfusion analysis methods including manual (Nordic ICE, NordicNeuroLab, Bergen, Norway) and semi-automatic segmentation method (Nordic TumorEx), in which contrast-enhanced T1-weighted imaging (CE-T1WI) and T2-weighted imaging (T2WI) were used as structural imaging. Interclass correlation coefficient (ICC), Bland-Altman plot, and coefficient of variation (CV)were used to evaluate reproducibility on each MR perfusion analysis method. We compared the values of reproducibility between manual and semi-automatic segmentation method in each structural imaging setting (e.g., (CE-T1WI and T2WI).

RESULTS: Intraobserver reproducibilies were 0.85–0.94 of ICC and 20.39–36.83% of CV on manual method, and 0.97–0.99 of ICC and 8.53–16.19% of CV on semi-automatic segmentation method. Interobserver reproducibililities were 0.86–0.94 of ICC and 19.67–35.15% of CV on manual method, and 0.74–1.0 of ICC and 5.48–49.38% of CV on semi-automatic segmentation method.

CONCLUSION: Reproducibilities of rCBV measurements were clinically acceptable on two MR perfusion analysis methods or structural imaging. The best reproducibility was seen on semi-automatic segmentation method with CE-T1WI.