

## Evaluation of Relative Blood Volumes in Various Brain Tumors by Using CBV Mapping

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**Purpose:** To evaluate relative cerebral blood volumes(rCBV) in various brain tumors by using perfusion MRI.

**Materials and Method:** Twenty-three patients(18-66 years; mean, 51) with primary or metastatic brain tumors were enrolled in this study. The subjects consisted of high-grade glioma(n=6), low-grade astrocytoma(n=3), metastatic tumor(n=6), meningioma(n=4), Atypical meningioma (n=1), neurilemmomas(n=2) and hemangioblastoma (n=1). The conventional T1(TR/TE= 500ms/8ms) & T2(TR/TE=3500ms/100ms) weighted MRI and perfusion MRI(TR/TE/flip angle=2000ms /60ms/90°, 128x128 matrix, 5mm thickness, 24cm FOV, 0.02mmol/kg Gd-DTPA) were performed on a 1.5T Signa Horizon Echo-speed MR scanner(GE Medical Systems, Milwaukee, USA) using a standard bird-cage head coil. For every patient, a total of 240 perfusion MR images from 4 axial slices were obtained with gradient EPI pulse sequence after power injection of the contrast media, followed by postprocessing of the rCBV maps. In order to calculate the rCBV ratios of tumor to normal tissue, ROIs were defined on the tumor and its contralateral normal tissue on rCBV maps, and subsequently the rCBV ratios were calculated by dividing the mean of the tumor CBV by the mean of the normal area.

**Results:** The averages of relative CBV of the tumors to the contralateral normal tissue were arranged in the following order: hemangioblastoma > benign meningioma > high-grade glioma > metastasis > neurilemmoma > low-grade astrocytoma > atypical meningioma. As compared with low-grade gliomas, high-grade gliomas exhibited more hypervascularity, but with much larger range of the cerebral blood volumes. Especially, the solid portion of the high-grade glioma showed relatively high blood volume. The benign meningioma showed higher cerebral blood volumes than did the atypical meningioma with cystic degeneration. The average of the cerebral blood volumes of neurilemmoma characterized by heterogeneously enhanced mass was similar to that of

metastatic cancer. The rCBV maps of hemangioblastoma demonstrated the highest vascularity among the various tumors under investigation for this study, while those of the benign meningioma showed the lowest vascularity. The metastatic cancer exhibited the largest range of cerebral blood volumes.

**Conclusion:** The MR CBV mapping associated with perfusion MRI provides important information on vascularity of the various brain tumors, suggesting that the CBV map would be helpful for differential diagnosis and determination of treatment and progression strategies of brain tumors .