Role of mass effect, tumor volume and peritumoral edema volume in the differential diagnosis of primary brain tumor and metastasis.

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Abstract

INTRODUCTION: The differentiation of metastatic and primary brain tumors with certainty is important since clinical management and treatment of these two types of tumors are radically different. The purpose of the present study was to evaluate the effect of peritumoral edema volume, tumor volume and mass effect of tumor on differential diagnosis of metastatic and primary brain tumors. Also we have planned to investigate if the relationship between edema volume and mass affect can contribute to the differential diagnosis.

MATERIAL AND METHODS: We retrospectively reviewed MR images of patients with primary (n=40) and metastatic (n=40) intra-axial supratentorial brain tumor. Supratentorial primary solitary brain tumor group was also subdivided as GBM subgroup (n=24) and other than GBM subgroup (n=16) for statistical analysis. Metastasis at suitable localization which can lead to midline shift (due to mass effect) were selected. Tumor volume, peritumoral edema volume and mass-edema index (peritumoral edema volume/tumor volume) were calculated. Displacement of the midline structures (subfalcian herniation) was measured. Metastasis, GBM and other than GBM groups were evaluated for subfalcian shift, shift grade, tumor volume, peritumoral edema volume and mass-edema index by using Kruskal-Wallis test after Bonferroni correction. Mann-Whitney U test was used to analyse subfalcian shift, tumor volume, peritumoral edema volume and mass-edema index of primary tumor and metastasis groups since the data was not normally distributed. Shift grade of the two groups was analysed with chi-square test.

RESULTS: Midline shift, tumor volume and mass-edema index were significantly different between metastasis and primary tumor groups (p=0.001, p<0.001, p=0.001 respectively). Midline shift and tumor volume of the primary tumor group were greater than metastasis group while mass-edema index was less. Shift grade of metastasis and primary tumor groups was also significant (p=0.041). A midline shift more than 5mm (grade 2) was more common in primary tumors. There was no significant difference between GBM and other than GBM groups.

CONCLUSION: Measurement of midline shift, tumor volume and mass-edema index may contribute to the differential diagnosis of brain metastasis from primary brain tumors. Also mass-edema index can be a useful tool for differential diagnosis in the future. But further studies with larger series are needed.
KEYWORDS: Brain neoplasms; Magnetic resonance imaging; Metastasis; Volume measurement

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