CAN STANDARD MAGNETIC RESONANCE IMAGING RELIABLY DISTINGUISH RECURRENT TUMOR FROM RADIATION NECROSIS AFTER RADIOSURGERY FOR BRAIN METASTASES? A RADIOGRAPHIC-PATHOLOGICAL STUDY.

CLINICAL STUDIES

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Abstract:
OBJECTIVE: Stereotactic radiosurgery is a commonly used treatment method in the management of metastatic brain tumors. When lesions enlarge after radiosurgery, it may represent tumor regrowth, radiation necrosis, or both. The purpose of this study was to determine whether standard magnetic resonance imaging (MRI) sequences could reliably distinguish between these pathological possibilities.

METHODS: A total of 619 patients, reported in a previous study, were treated with radiosurgery for metastatic brain tumors. Of those patients, 59 underwent subsequent craniotomy for symptomatic lesion enlargement. Of those 59 patients, 32 had complete preoperative MRI studies as well as surgical pathology reports. The following MRI features were analyzed in this subset of patients: arteriovenous shunting, gyriform lesion or edema distribution, perilesional edema, cyst formation, and pattern of enhancement. A novel radiographic feature, called the lesion quotient, which is the ratio of the nodule as seen on T2 imaging to the total enhancing area on T1 imaging, was also analyzed.

RESULTS: Sensitivity, specificity, and predictive values were computed for each radiographic characteristic. Lesions containing only radiation necrosis never displayed gyriform lesion/edema distribution, marginal enhancement, or solid enhancement. All lesions exhibited perilesional edema. A lesion quotient of 0.6 or greater was seen in all cases of recurrent tumor, a lesion quotient greater than 0.3 was seen in 19 of 20 cases of combination pathology, and a lesion quotient of 0.3 or less was seen in 4 of 5 cases of radiation necrosis. The lesion quotient correlated with the percentage of tumor identified on pathological specimens.

CONCLUSION: The lesion quotient appears to reliably identify pure radiation necrosis on standard sequence MRI. Other examined radiographic features, including arteriovenous shunting, gyriform lesion/edema distribution, enhancement pattern, and cyst formation, achieved 80% or greater predictive value but had either low sensitivity or low specificity.

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