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Factors related to the local treatment failure of gamma knife surgery for metastatic brain tumors.

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Abstract

PURPOSE: Radiosurgery (RS) is regarded as a standard therapy for metastatic brain tumors, but local failure requiring repeated therapy for the same lesion remains an unsolved problem. The authors analyzed outcomes of gamma knife surgery (GKS) for metastatic lesions to identify factors of local treatment failure.

MATERIALS AND METHODS: The hospital records of 103 patients with a metastatic brain tumor and monitored for more than 6 months were analyzed. Lesion response to RS was analyzed in 77 patients with available gamma plan data. Local treatment failure was defined as lesion regrowth or repeat GKS within 6 months. In cases with multiple lesions, largest masses were evaluated. Primary sites, metastatic location, Karnofsky scale, tumor size, number of metastatic lesions, and various radiosurgical prescription parameters, namely, Paddick's conformity index (CI), Radiation Therapy Oncology Group (RTOG)-CI, and gradient index, were analyzed.

RESULTS: Of the 103 study subjects, 58 were male and 45 were female. Primary sites were lung (n = 58), breast (n = 12), colon (n = 6), kidney (n = 7), rectum (n = 6), and others (n = 14). Median survival duration from the diagnosis of brain metastasis was 25 months. Local treatment failure occurred in 14 of 77 the patients (77 lesions) with available gamma plan data. A lung cancer primary site was found to have a lower GKS failure rate than a breast or a renal site ($p < 0.05$). Lesions with a high Paddicks' CI or a low RTOG-CI had a higher rate of treatment failure ($p < 0.05$). Multivariate analysis revealed that primary tumor site and Paddick's CI were related to treatment failure ($p < 0.05$).

CONCLUSION: Brain metastases from renal and breast cancers had higher rates of local GKS treatment failure than those from lung cancer. Furthermore, high Paddick's CI revealed higher rate of local recurrence, and was not contributory to prevent local treatment failure. However, the enlargement of the diameter of the tumor after RS in the early follow-up period does not necessarily represent the poor outcome or need of retreatment.

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