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Clinical and pathological characteristics of brain metastasis resected after failed radiosurgery.

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OBJECTIVE: This study evaluates the tumor histopathology and clinical characteristics of patients who underwent resection of their brain metastasis after failed gamma knife radiosurgery. **METHODS:** This study was a retrospective review from a prospective database. A total of 1200 brain metastases in 912 patients were treated by gamma knife radiosurgery during a 7-year period. Fifteen patients (1.6% of patients, 1.2% of all brain metastases) underwent resective surgery for either presumed tumor progression (6 patients) or worsening neurological symptoms associated with increased mass effect (9 patients). Radiographic imaging, radiosurgical and surgical treatment parameters, histopathological findings, and long-term outcomes were reviewed for all patients. **RESULTS:** The mean age at the time of radiosurgery was 57 years (age range, 32-65 years). Initial pathological diagnoses included metastatic non-small cell lung carcinoma in 8 patients (53%), melanoma in 4 patients (27%), renal cell carcinoma in 2 patients (13%), and squamous cell carcinoma of the tongue in 1 patient (7%). The mean time interval between radiosurgery and surgical extirpation was 8.5 months (range, 3 weeks to 34 months). The mean treatment volume for the resected lesion at the time of radiosurgery was 4.4 cm³ (range, 0.6-8.4 cm³). The mean dose to the tumor margin was 21Gy (range, 18-24 Gy). In addition to the 15 tumors that were eventually resected, a total of 32 other metastases were treated synchronously, with a 78% control rate. The mean volume immediately before surgery for the 15 resected lesions was 7.5 cm³ (range, 3.8-10.2 cm³). Histological findings after radiosurgery varied from case to case and included viable tumor, necrotic tumor, vascular hyalinization, hemosiderin-laden macrophages, reactive gliosis in surrounding brain tissue, and an elevated MIB-1 proliferation index in cases with viable tumor. The mean survival for patients in whom viable tumor was identified (9.4 months) was significantly lower than that of patients in whom only necrosis was seen (15.1 months; Fisher's exact test, P < 0.05). **CONCLUSION:** Radiation necrosis and tumor radioresistance are the most common causes precipitating a need for surgical resection after radiosurgery in patients with brain metastasis.

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