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Cavity-directed radiosurgery as adjuvant therapy after resection of a brain metastasis.

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Abstract

Object As a strategy to delay or avoid whole-brain radiotherapy (WBRT) after resection of a brain metastasis, the authors used high-resolution MR imaging and cavity-directed radiosurgery for the detection and treatment of further metastases. **Methods** Between April 2001 and October 2009, 112 resection cavities in 106 patients with no prior WBRT were treated using radiosurgery directed to the tumor cavity and for any synchronous brain metastases detected on high-resolution MR imaging at the time of radiosurgical planning. A median dose of 17 Gy to the 50% isodose line was prescribed to the gross tumor volume, defined as the rim of enhancement around the resection cavity. Patients were followed up via serial imaging, and new brain metastases were generally treated using additional radiosurgery, with salvage WBRT typically reserved for local treatment failure at a resection cavity, numerous failures, or failures occurring at short time intervals. Local and distant treatment failures were determined based on imaging results. Kaplan-Meier curves were generated to estimate local and distant treatment failure rates, overall survival, neurological cause-specific survival, and time delay to salvage WBRT. **Results** Radiosurgery was delivered to the resection cavity alone in 57.5% of patients, whereas 24.5% of patients also received treatment for 1 synchronous metastasis, 11.3% also received treatment for 2 synchronous metastases, and 6.6% also received treatment for 3-10 additional lesions. The median overall survival was 10.9 months. Overall survival at 1 year was 46.8%. The local tumor control rate at 1 year was 80.3%. The disease control rate in distant regions of the brain at 1 year was 35.4%, with a median time of 6.9 months to distant failure. Thirty-nine of 106 patients eventually received salvage WBRT, and the median time to salvage WBRT was 12.6 months. Kaplan-Meier estimates showed that the rate of requisite WBRT at 1 year was 45.9%. Neurological cause-specific survival at 1 year was 50.1%. Leptomeningeal failure occurred in 8 patients. One patient had treatment failure within the resection tract. Seven patients required reoperation: 2 for resection cavity recurrence, 3 for radiation necrosis, 1 for hydrocephalus, and 1 for a CSF cutaneous fistula. **On multivariate analysis, a preoperative tumor diameter > 3 cm was predictive of local treatment failure. Conclusions** Cavity-directed radiosurgery combined with high-resolution MR imaging detection and radiosurgical treatment of synchronous brain metastases is an effective strategy for delaying and even foregoing WBRT in most patients. This technique provides acceptable local disease control, although distant treatment failure remains significant.

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