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Clinical Investigation

Incidence of Brain Atrophy and Decline in Mini-Mental State Examination Score After Whole-Brain Radiotherapy in Patients with Brain Metastases: A Prospective Study

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Purpose

To determine the incidence of brain atrophy and dementia after whole-brain radiotherapy (WBRT) in patients with brain metastases not undergoing surgery.

Methods and Materials

Eligible patients underwent WBRT to 40 Gy in 20 fractions with or without a 10-Gy boost. Brain magnetic resonance imaging or computed tomography and Mini-Mental State Examination (MMSE) were performed before and soon after radiotherapy, every 3 months for 18 months, and every 6 months thereafter. Brain atrophy was evaluated by change in cerebrospinal fluid–cranial ratio (CCR), and the atrophy index was defined as postradiation CCR divided by preradiation CCR.

Results

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Of 101 patients (median age, 62 years) entering the study, 92 completed WBRT, and 45, 25, and 10 patients were assessable at 6, 12, and 18 months, respectively. Mean atrophy index was 1.24 ± 0.39 (SD) at 6 months and 1.32 ± 0.40 at 12 months, and 18% and 28% of the patients had an increase in the atrophy index by 30% or greater, respectively. No apparent decrease in mean MMSE score was observed after WBRT. Individually, MMSE scores decreased by four or more points in 11% at 6 months, 12% at 12 months, and 0% at 18 months. However, about half the decrease in MMSE scores was associated with a decrease in performance status caused by systemic disease progression.

Conclusions

Brain atrophy developed in up to 30% of patients, but it was not necessarily accompanied by MMSE score decrease. Dementia after WBRT unaccompanied by tumor recurrence was infrequent.

Author Keywords: Whole-brain radiation; Brain metastasis; Brain atrophy; Dementia; Mini-Mental State Examination

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