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Cancer
Volume 104, Issue 12, Pages 2784 - 2791
 Published Online: 15 Nov 2005
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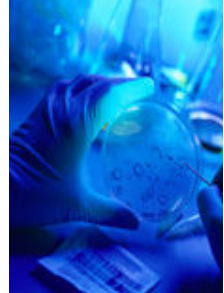
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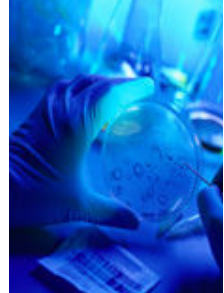
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Original Article

Long-term survivors after gamma knife radiosurgery for brain metastases

Douglas Kondziolka, M.D., M.Sc. ^{1 2 *†‡}, Juan J. Martin, M.D. ¹, John C. Flickinger, M.D. ^{1 2}, David M. Friedland, M.D. ³, Adam M. Brufsky, M.D., Ph.D. ³, Joseph Baar, M.D. ³, Sanjiv Agarwala, M.D. ³, John M. Kirkwood, M.D. ³, L. Dade Lunsford, M.D. ^{1†}

¹Department of Neurological Surgery, University of Pittsburgh School of Medicine, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania
²Department of Radiation Oncology, University of Pittsburgh School of Medicine, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania
³Division of Medical Oncology, University of Pittsburgh School of Medicine, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania

email: Douglas Kondziolka (kondziolkads@upmc.edu)

*Correspondence to Douglas Kondziolka, Department of Neurological Surgery, Suite B-400, University of Pittsburgh Medical Center, 200 Lothrop Street, Pittsburgh, PA 15213

†Drs. Kondziolka and Lunsford serve as consultants for Elekta Instruments, Inc.
[‡]Fax: (412) 647-0989

KEYWORDS
 radiosurgery • brain metastasis • survival • tumor control • radiotherapy

ABSTRACT

BACKGROUND
 Stereotactic radiosurgery, with or without whole-brain radiation therapy, has become a valued management choice for patients with brain metastases, although their median survival remains limited. In patients who receive successful extracranial cancer care, patients who have controlled intracranial disease are living longer. The authors evaluated all brain metastasis in patients who lived for ≥ 4 years after radiosurgery to determine clinical and treatment patterns potentially responsible for their outcome.

METHODS
 Six hundred seventy-seven patients with brain metastases underwent 781 radiosurgery procedures between 1988 and 2000. Data from the entire series were reviewed; and, if patients had ≥ 4 years of survival, then they were evaluated for information on brain and extracranial treatment, symptoms, imaging responses, need for further care, and management morbidity. These long-term survivors were compared with a cohort who lived for < 3 months after radiosurgery ($n = 100$ patients).

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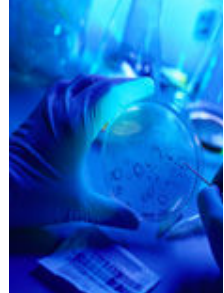
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¹Department of Neurological Surgery, University of Pittsburgh School of Medicine, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania
²Department of Radiation Oncology, University of Pittsburgh School of Medicine, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania
³Division of Medical Oncology, University of Pittsburgh School of Medicine, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania

email: Douglas Kondziolka (kondziolkads@upmc.edu)

*Correspondence to Douglas Kondziolka, Department of Neurological Surgery, Suite B-400, University of Pittsburgh Medical Center, 200 Lothrop Street, Pittsburgh, PA 15213

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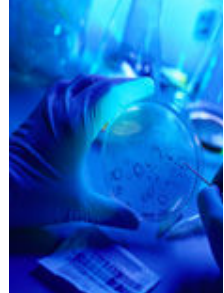
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RESULTS

Forty-four patients (6.5%) survived for > 4 years after radiosurgery (mean, 69 mos with 16 patients still alive). The mean age at radiosurgery was 53 years (maximum age, 72 yrs), and the median Karnofsky performance score (KPS) was 90. The lung ($n = 15$ patients), breast ($n = 9$ patients), kidney ($n = 7$ patients), and skin (melanoma; $n = 6$ patients) were the most frequent primary sites. Two or more organ sites outside the brain were involved in 18 patients (41%), the primary tumor plus lymph nodes were involved in 10 patients (23%), only the primary tumor was involved in 9 patients (20%), and only brain disease was involved in 7 patients (16%), indicating that extended survival was possible even in patients with multiorgan disease. Serial imaging of 133 tumors showed that 99 tumors were smaller (74%), 22 tumors were unchanged (17%), and 12 tumors were larger (9%). Four patients had a permanent neurologic deficit after brain tumor management, and six patients underwent a resection after radiosurgery. Compared with the patients who had limited survival (< 3 mos), long-term survivors had a higher initial KPS ($P = 0.01$), fewer brain metastases ($P = 0.04$), and less extracranial disease ($P < 0.00005$).

CONCLUSIONS

Although the expected survival of patients with brain metastases may be limited, selected patients with effective intracranial and extracranial care for malignant disease can have prolonged, good-quality survival. The extent of extracranial disease at the time of radiosurgery was predictive of outcome, but this does not necessarily mean that patients cannot live for years if treatment is effective. Cancer 2005. © 2005 American Cancer Society.

Received: 11 April 2005; Revised: 29 June 2005; Accepted: 16 July 2005

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