

Prognostic index for patients receiving CyberKnife-delivered stereotactic radiosurgery (SRS) for second brain metastatic event

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Abstract

Purpose

While there exist multiple diagnosis-specific survival prediction tools for patients presenting with initial brain metastasis, survival data for patients experiencing a second brain metastatic event is lacking. The purpose of the present study is to analyze prognostic factors affecting survival of patients receiving stereotactic radiosurgery (SRS) for second brain metastatic event (SBME) following initial treatment with whole brain irradiation (WBI), surgical resection, or previous SRS.

Methods/Materials

All patients treated for brain metastasis at Philadelphia CyberKnife between January 2006 and October 2013 were reviewed. Of the 229 patients treated for brain metastasis, only patients treated with SRS for SBME were included in the study group, resulting in a final study group of 88 patients. Patient demographics, FBME treatment history, and SRS treatment parameters were compiled along with follow-up/survival data. Cox proportional-hazards regression was used to identify prognostic factors that significantly impacted survival from the time of SRS for SBME. Independent variables considered in analysis included primary disease, FBME treatment type, age, gender, number of brain metastases at SBME, Karnofsky performance status (KPS), Recursive-partitioning analysis (RPA) and presence of extracranial metastasis.

Results

The median survival for all patients was 7.31 months. Primary cancers included lung (n=50), breast (n=16), colorectal (n=8), melanoma (n=6), renal cell (n=3), gynecologic (n=3), mesothelioma (n=1), and sarcoma (n=1). Median patient age was 59.3 years at time of SBME treatment with 35% male (n=31) and 65% female (n=57) patients. Median PTV dose was 20Gy (13.5Gy-30Gy) delivered in 1 fraction (1-5 fractions) with a 1.25mm margin around the CTV. Log-rank comparison of Kaplan-Meier survival curves revealed significant impact by Karnofsky performance status (p=0.003), RPA class (p=0.008), age (p=0.014), and FBME treatment type (p=0.010). No effect by number of brain metastases or primary cancer type was observed. Survival estimates using the two most relevant prognostic factors, KPS and FBME treatment type, are stratified and discussed below. Median survival was longer for patients who had not previously received WBI (14.7 months). Median survival was further increased in patients who had not received previous WBI and demonstrated KPS scores of 70-100 (19.5 months). Patients who received WBI prior to SBME treatment experienced a pronounced decrement in median survival (5.7 months), yet patients in this group who demonstrated strong KPS scores (80-100) experienced significantly increased survival (15.5 months).

Conclusions

The outcomes of SRS for SBME are most favorable for patients who have not received previous WBI or who have maintained higher performance status despite previous WBI. Primary cancer type, number of brain metastases, and presence of extracranial metastasis were not found to be significant predictors of survival from SBME despite their impact on survival reported by the Disease-Specific Graded Prognostic Assessment for FBME. Further research is necessary to confirm the observed survival trends for patients receiving SRS for second brain metastatic event.