

Introduction

Brain metastases present a significant therapeutic challenge. Whereas data regarding the role of surgery for solitary metastasis is established, the impact of surgery in the setting of multiple brain metastases is less defined.

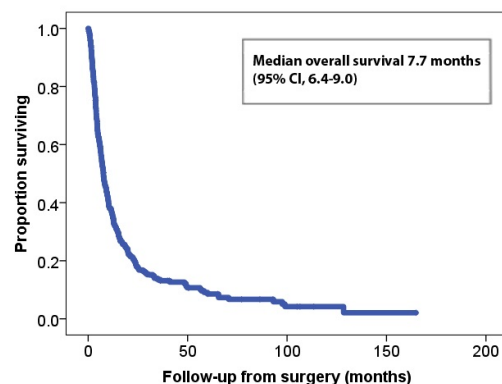
Methods

An IRB-approved, retrospective chart review was conducted of patients with previously untreated multiple brain metastases who underwent resection of a single dominant brain lesion at MD Anderson Cancer Center between 1/1998 and 2/2016 to determine predictors of survival. Volumetric analysis of pre-operative and post-operative total tumor burden (cumulative volume) was performed. Post-operative percentage volume reduction was calculated. Univariate and multivariate analysis were performed.

Results

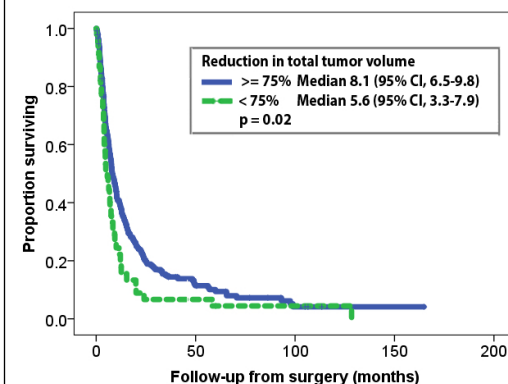
Data on 274 patients with multiple metastases were analyzed. Median patient age and pre-operative Karnofsky Performance Scale (KPS) score were 59 years and 90, respectively. Most common histologies were lung (32%), melanoma (23%) and breast (14%) (Fig.1). At surgery, there was evidence of systemic disease in 64%. Median number of brain metastases was 2.5 (range, 2-10), with a median pre-operative cumulative tumor volume of 18.8 cm³. Median volume of the resected single dominant lesion was 15.7 cm³ and 94% of patients had a complete resection. Median follow-up among alive patients was 36 months. 30-day perioperative mortality was 4%. 72% underwent post-operative radiation within 6 weeks of resection. Median Kaplan-Meier postoperative survival estimate was 7.7 months (Fig.2). Multivariate cox proportional hazard model revealed lower KPS, GI or melanoma primary, evidence of primary disease and larger pre-operative cumulative tumor volumes were negative predictors of survival. Increased surgical reduction of total tumor volume was found to be a predictor of survival in patients with multiple brain metastases (p<0.05) (Table 1). Specifically, a 75% reduction in cumulative tumor volume significantly improved patient survival (Fig.3).

Figure 2: Overall Post-Operative Survival



Kaplan Meier curve showing overall survival for patients with multiple metastasis undergoing surgery for a single dominant lesion. Median overall survival was 7.7 months

Figure 3: Impact of Tumor Volume Reduction on Patient Survival

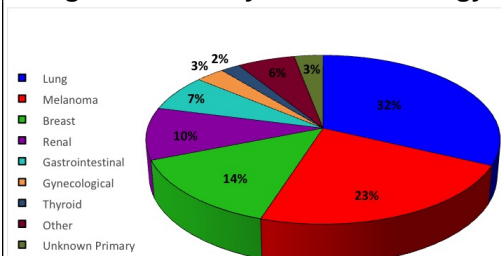


Kaplan Meier Curve showing impact of surgical reduction in tumor volume on survival in patients with multiple brain metastases.

Table 1: Multivariate analysis of factors associated with survival

Characteristic	Multivariate rate ratio	95% CI	P value
KPS			
<60	2.59	1.48-4.52	0.001
≥60	1.00	-	-
Melanoma histology			
Yes	1.57	1.14-2.14	0.005
No	1.00	-	-
GI histology			
Yes	2.21	1.33-3.67	0.002
No	1.00	-	-
Evidence of primary disease			
Yes	1.02	1.01-1.03	0.003
No	1.00	-	-
Total Preoperative Tumor Volume	1.005	1.001-1.01	0.05
Surgical Reduction in Tumor Volume			
<75%	1.56	1.09-2.26	0.02
≥75%	1.00	-	-

Figure 1: Primary Tumor Pathology



Pie chart showing distribution of primary tumor pathology in analyzed cohort of 274 patients

Conclusions

In addition to known prognostic factors (KPS, primary disease status), cumulative pre-operative tumor volume and surgical reduction of overall tumor burden significantly impacted the survival of patients with multiple brain metastases.

Learning Objectives

By the conclusion of this session participants should be able to: 1) Discuss the role of surgery in patients with multiple brain metastases 2). Describe the impact of cumulative tumor volume on patient outcome.