

Two-staged Stereotactic Radiosurgery (2-SSRS) for 2cm Brain Metastases

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Introduction

Radiosurgical treatment of brain metastases (BM) >= 2cm is associated with suboptimal local control (LC) rates. To enhance LC while limiting toxicity in these patients we utilized a 2-staged stereotactic radiosurgery (2-SSRS) approach.

Methods

An IRB-approved retrospective review evaluated 2-SSRS treatment in 54 patients with 63 BM >= 2cm. Clinical outcomes and volumetric measurements before treatment and subsequent 3 month intervals were determined. Study outcomes were response at 3-month MRI, time to failure (TTF related to either progression or acute radiation effects [ARE]) and overall survival.



Figure 1. Kaplan-Meier analysis of Overall Survival (OS) demonstrating an estimated median OS of 10.8 months in the patient cohort.

Results

2-SSRS was performed on 46 (85%) patients with one BM; 7 (13%) with two BMs; 1 (2%) patient with three BMs >= 2cm. Median age was 63 (23 -83) yrs. 23 (43%) patients had NSCLC and 14 (26%) had radioresistant tumors (renal/melanoma). Median 2-SSRS treatment interval was 34 days. Median dose delivered/treatment was 15 Gy (12-18Gy). Median tumor volumes at 1st and 2nd 2-SSRS were 10.5 cm3 (2.4-31.3) and 7.0 cm3 (1.0-29.7) respectively [p<.0001]. 3-month follow-up imaging was available for 43 lesions, median volume 4.0 cm3 (0.1-35.9), median change in volume -54.9% (-98.2-66.1) [p<.0001] with a 95% (n=41) LC rate. Overall, 18 (29%) lesions failed, median 3.4 months; 11 (17%) due to local progression and 7 (11%) demonstrated ARE (8% Grade1/2 toxicity; 3% Grade 3). TTF was associated with greater baseline volume of disease (p=.03, cut-off =9cm3) and smaller relative decreases in tumor volume from baseline to the second SRS (p < .005, cut-off =20%). Estimated cumulative incidence of failure at 6-months was 29%+6%; 12-months was 35%+7%.

Conclusions

2-SSRS is an effective treatment modality resulting in a significant response in BM >= 2cm, excellent 3month (95%) and overall (83%) LC with 11% ARE rate. Prospective studies with larger cohorts and longer follow-up are necessary to further assess the durability and toxicity of 2-SSRS treatments.



Figure 2. Kaplan-Meier curves of time to local treatment failure stratified by absolute decrease in tumor volume. Multivariable analysis of TTP demonstrated absolute decrease in tumor volume after 1st 2-SSRS to be the only independant predictor of TTP (**p= 0.04**)

References

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Figure 3. MRI of the brain (T1 axial views with gadolinium) demonstrating the response to 2-SSRS (a) before initial 2-SSRS (volume = 14.49 cm3), (b) at time of the 2nd 2-SSRS (volume = 2.64 cm3), (c) 3 months post 2-SSRS (volume = 1.09 cm3), (d) 6 months post 2-SSRS (volume = 0.66 cm3),(e) 12 months post 2-SSRS (volume = 0.06 cm3) ,(f) final follow-up 21.4 months post 2-SSRS (volume = 0.02 cm3)

Learning Objectives

1.Discuss radiosurgical management of BM >= 2cm
2.Evaluate efficacy of 2-SSRS
3.Review 2-SSRS toxicity and its management