Brainstem Metastases Treated with Frame Based Stereotactic Radiosurgery: The IU Health Experience

Ajay Patel BS, BA; Homan Mohammadi MD; Tuo Dong MD; Kevin Ren-Yeh Shiue MD; Douglas Frye PhD; Yi Le; Shaheryar Ansari MD; Gordon A. Watson MD, PhD; James C. Miller MD; Tim Lautenschlaeger MD

[Indiana University School of Medicine]

CNS 2017 ANNUAL MEETING
BOSTON, MASSACHUSETTS
OCTOBER 7–11, 2017

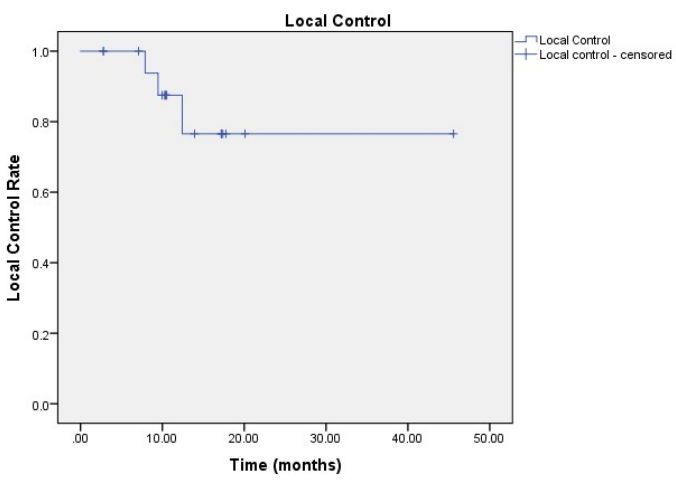
Introduction

Brainstem metastases offer a unique challenge in treatment, yet stereotactic radiosurgery (SRS) has proven to be an effective modality in treating these tumors. Our purpose was to report on the clinical outcomes of patients treated at our institution with Gamma Knife radiosurgery.

Methods

Patients with tumors metastatic to brainstem from 2008-2016 were analyzed. Nineteen (19) brainstem metastases from 14 patients who had follow-up brain imaging were identified. Patient and tumor characteristics, SRS parameters, local control, overall survival, and toxicity were assessed.

Kaplan-Meier analysis of local control after GK SRS treatment of brainstem metastatic lesions.



Local control at 6, 9, and 12 months was 100%, 93.8%, and 87.5% respectively, The number at risk at 0, 6, 9, and 12 months was 19, 17, 15, and 8 respectively. Data was censored to last oncologic follow up, last imaging follow up, or death; which ever occurred later.

Results

Median tumor volume was 0.04 cc (range 0.007-2.03 cc). Whole brain radiation therapy was administered before SRS in 35.7% of patients and after in 7.1% of patients. Median prescribed dose was 17.5 Gy to the 50% isodose line (range 14-22 Gy). Median max dose was 33 Gy (range 23.4-39.3 Gy) and median minimum dose was 18.2 Gy (range 13.8-30.6 Gy). Median survival after GK SRS treatment to brainstem lesion was 17.2 months (range 2.8-45.57 months) with 6, 9, and 12 months survival being 92.9%, 85.7%, and 69.3%, respectively. Local control at 6, 9, and 12 months was 100%, 93.8%, and 87.5%, respectively. One pons lesion, 0.2 cc, was treated with 20 Gy to 51% isodose line with last follow up imaging at 10 months and another pons lesion, 0.04 cc, with 22 Gy to 60% isodose line with last follow up imaging at 7.5 months, neither of which exhibited any toxicity.

Conclusions

Our institutional experience reports on the safety and efficacy of a range of GK SRS prescription doses (14-22 Gy) to brainstem metastases. We found no significant toxicities associated with these doses and improved local control and overall survival compared to prior studies. Our data imply value in prospectively evaluating local control and toxicity with higher margin doses than previously thought safe for brainstem metastases treated with GK SRS.

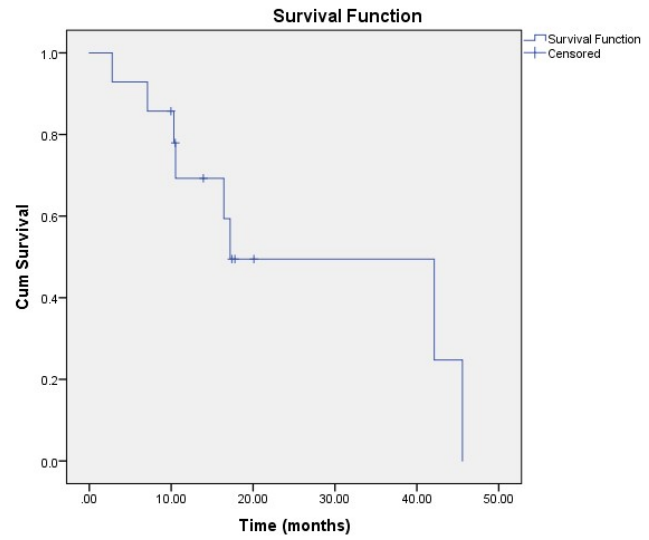
Learning Objectives

By the conclusion of this session, participants should be able to:

1) Understand the safety and efficacy of stereotactic radiosurgery in the brainstem.

2) Understand that relatively higher doses can be

Kaplan-Meier analysis of overall survival after GK SRS treatment of brainstem metastatic lesions.



Median overall survival was found to be 17.2 months. Overall survival at 6, 9, and 12 months was 92.9%, 85.7%, and 69.3% respectively. The number at risk at 0, 6, 9, and 12 months was 14, 13, 12, and 8 respectively. Data was censored to last oncologic follow up or last imaging follow up; which ever occurred later.

References

1. Trifiletti DM, Lee CC, Shah N, Patel NV, Chen SC, Sheehan JP. How Does Brainstem Involvement Affect Prognosis in Patients with Limited Brain Metastases? Results of a Matched-Cohort Analysis. World Neurosurg. 2016 Apr;88:563-8.

2. Trifiletti, D.M., et al., Stereotactic Radiosurgery for Brainstem Metastases: An International Cooperative Study to Define Response and Toxicity. Int J Radiat Oncol Biol Phys, 2016. 96(2): p. 280-8.