

## How to Make Size Not Matter: Control and Toxicity Outcomes of Hypofractionated Gamma Knife Radiosurgery for Large Brain Metastases

### Open Access

### Abstract

Published 04/02/2023

### Copyright

© Copyright 2023

Mishra et al. This is an open access abstract distributed under the terms of the Creative Commons Attribution License CC-BY 4.0., which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Distributed under

Creative Commons CC-BY 4.0

Akash Mishra<sup>1</sup>, Daniel Koffler<sup>2</sup>, Vikram Bajaj<sup>3</sup>, Sirisha D. Viswanatha<sup>4</sup>, Michael Schulder<sup>5</sup>, Anuj Goenka<sup>6</sup>

1. Department of Neurosurgery, Donald and Barbara Zucker School of Medicine at Hofstra/Northwell, Manhasset, USA  
2. Radiation Medicine, Northwell Health, Lake Success, USA  
3. Radiation Medicine, Northwell Health Cancer Institute, Lake Success, USA  
4. Radiation Oncology, Northwell Health, Lake Success, USA  
5. Neurosurgery, Hofstra Northwell School of Medicine, New York City, USA  
6. Radiation Medicine, Northwell Health, New York, USA

**Corresponding author:** Akash Mishra, amishra4@northwell.edu

**Categories:** Medical Physics, Radiation Oncology, Neurosurgery

**Keywords:** brain metastases, large brain metastases, gamma knife (gk) radiosurgery

### How to cite this abstract

Mishra A, Koffler D, Bajaj V, et al. (April 02, 2023) How to Make Size Not Matter: Control and Toxicity Outcomes of Hypofractionated Gamma Knife Radiosurgery for Large Brain Metastases. *Cureus* 15(4): a847

## Abstract

### Objectives:

Following RTOG 9005, brain metastases greater than 3cm in diameter (roughly 14cc volume) are limited to 15Gy single fraction SRS, a dose known to yield relatively poor local control, out of concern of excessive risk of radionecrosis. There is limited literature describing implementation of hypofractionated SRS for the treatment of large metastatic brain lesions. We report our institutional experience using the Gamma Knife Icon platform to deliver hypofractionated treatment to large intact brain metastases  $\geq 10$ cc. This study aims to identify clinical outcomes (rates of local failure, radionecrosis, and progression-free survival). Clinical and treatment parameters were investigated for prognostic value.

### Methods:

Records were retrospectively obtained for all patients treated with hypofractionated Gamma Knife radiosurgery (HF-GKRS) from January 2017 to July 2022 for the treatment of metastatic brain tumors greater than 10cc from an IRB-approved database. Clinical, treatment planning, and radiological data was collected. Local failure (LF), radionecrosis (RN), and progression-free survival (PFS) outcomes for each HF-GKRS prescription were determined. Clinical and treatment parameters were investigated for potential predictive value relative for subsequent LF and RN. Inferential statistics were employed using IBM SPSS to generate Kaplan-Meier curves of LC, RN, and PFS. Cox univariate analysis was used for association tests. A p-value of 0.05 was used to determine statistical significance.

### Results:

97 patients were treated to 105 lesions greater than 10cc. Median GTV was 15.8cc (range: 10.1-62.4). Median prescription dose was 27 Gy prescribed in 3 fractions to the 50% isodose line. CTV and PTV expansions were typically not used (GTV=PTV), with coverage of 100% and mean gradient index of 2.80 (range 2.45-3.18). The most common tumor subtypes included lung (n=33) and breast (n=17). Median follow-up was 10.1 months. 6- and 12-month LF rates were 8.5% and 18.6%, respectively, while comparable RN rates were 1.8% and 11.3%. GTV  $\geq 15.8$  cc had a notable trend towards significance for RN (HR 7.899, p=0.063). No other clinical or treatment characteristics were found to associate with LF or RN.

### Conclusion(s):

We present our institutional experience treating large brain metastases  $>10$  cc using mask based HF-GKRS typically to a dose of 27 GY in 3 fractions, representing one of the largest reported in the literature. Our data is unique in that we typically do not add a PTV margin when prescribing SRS. We found tumor control rates and toxicity outcomes that compare quite favorably with the literature, supporting our practice.