Up-Front Boost Gamma Knife “Leading Edge” Radiosurgery (LERS) to MR FLAIR-Defined Tumor Migration Pathways in 174 Patients with Glioblastoma Multiforme: A 15-Year Assessment of a Novel Therapy.

Christopher M. Duma MD FACS; Brian Kim MD; Peter Chen MD; Ralph Mackintosh PhD; Robert O. Dillman MD; Michael Brant-Zawadzki; Burton Eisenberg MD; Ryan Casserly MD; Chad Caraway; Gustavo Adolfo Mendez; Marlon S. Mathews MD; Daniel Furman; Ruslana Cannell; Garrett Smith; Azzura-Sky Riley; Lian Stemler

CNS 2016 ANNUAL MEETING San Diego CALIFORNIA SEPTEMBER 24-28, 2016

Introduction

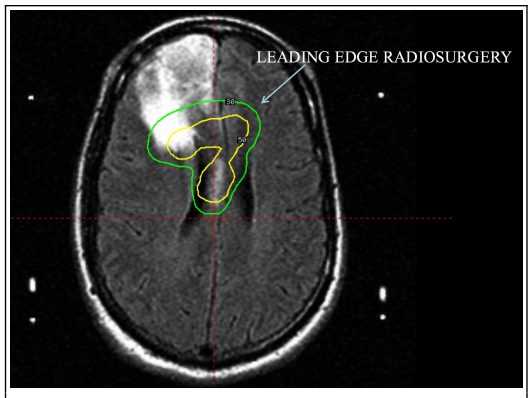
Glioblastoma multiforme (GBM) is composed of cells that migrate through the brain along predictable white matter pathways. Targeting white matter pathways adjacent to, and leading away from, the original contrast enhancing tumor site (“Leading Edge” Radiosurgery,” (LERS)) with single -fraction stereotactic radiosurgery as a boost to standard therapy could limit the spread of glioma cells and improve clinical outcomes.

Methods

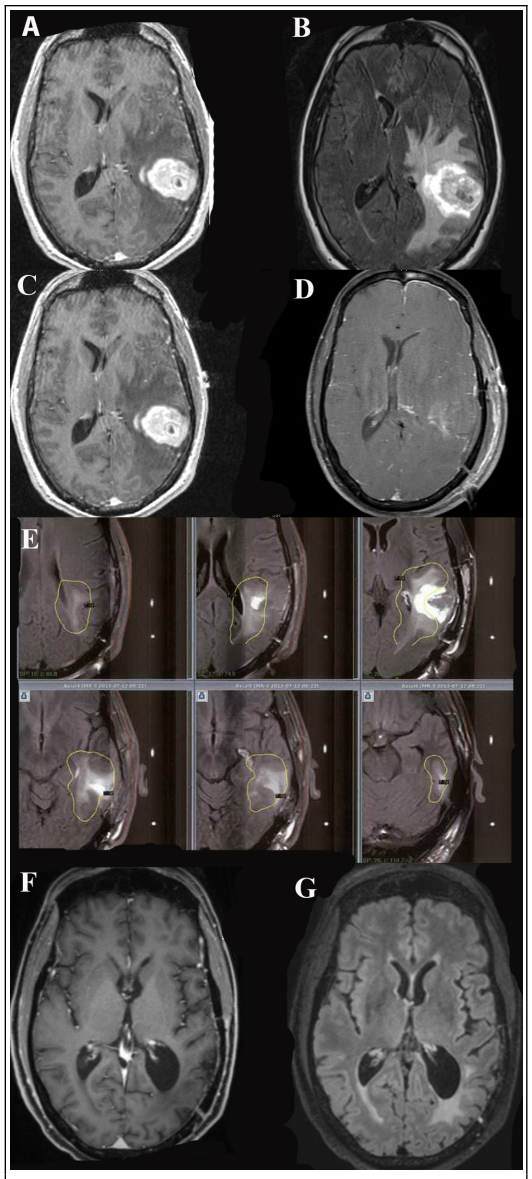
Between December 2000 and May 2016, after an initial diagnosis of GBM, and prior to standard radiation therapy and chemotherapy, 174 patients treated with radiosurgery to the “Leading Edge” (LE) of tumor cell migration were reviewed. The LE was defined as a region outside the contrast-enhancing tumor nidus, defined by FLAIR MRI. The median age was 59 years (range: 22-87). Patients underwent LERS a median of 18 days from original diagnosis. The median target volume of 48.5 cm3 (range: 2.5-220) of LE tissue was targeted using 8 Gy (range: 6-14) at the 50% isodose line.

Results

The median overall survival was 23 months (mean: 43 months) from diagnosis. The 2, 3, 5, 7, and 10-year overall survival rates post LERS were 39%, 26%, 16%, 10% and 4% respectively. Nine percent of patients developed radiation necrosis. Thirty-three patients were hospitalized for management of edema. Surgical resection of a tumor cyst, new tumor bulk, or hydrocephalus occurred in 42 patients. Of the patients with stable disease KPS remained stable in 90% and decreased 1-2 grades in 10%.



Leading edge of GBM is already in the corpus callosum. If this is not treated, tumor migration throughout the brain will continue



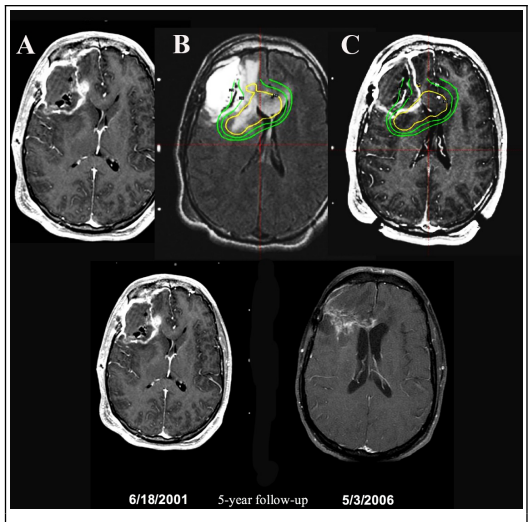
C,D pre- and post- resection. E. GK plan. F,G 3 year followup post contrast and FLAIR images showing no residual tumor

Conclusions

LERS is a safe and effective upfront adjunctive therapy for patients with newly diagnosed GBM. Limitations of this study include a single center experience and single institution determination of the LE tumor target. A “leading edge algorithm” will be described to achieve a consistent approach to defining the LE target for general use, as will future use of diffusion tensor imaging. A multicenter trial is warranted.

Learning Objectives

Understand the rationale of a novel treatment for a disease which has had very little change in efficacy of current treatments. To understand white matter migration and pathways and how GBM invades.



Five-year follow-up of right frontal GBM leading edge treatment across corpus callosum and down corona radiata