

Efficacy and safety of higher dose stereotactic radiosurgery for functional pituitary adenomas: A preliminary report

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Introduction

Gamma Knife radiosurgical treatment of secretory pituitary adenomas results in normalization of hormone levels faster than fractionated radiotherapy, and can normalize hormone levels in patients who have failed prior fractionated radiotherapy. The additional benefit of limiting radiation to extra-pituitary tissues has therefore resulted in single fraction stereotactic radiosurgery (SRS) becoming a common adjuvant to surgery for hormonally active pituitary adenomas. However, success in achieving hormonal normalization in these secretory tumors has been highly variable with reported rates of 35-83% for Cushing's Disease, 42-60% for acromegaly, and 26-43% for prolactinomas.

The literature is varied with regards to the effect of prescription dose, tumor volume, secretory type and/or initial hormonal levels as predictors of treatment outcome. Regardless, it is not unreasonable to presume that higher treatment doses might achieve both more rapid endocrine responses as well as a higher rate of hormonal normalization. Indeed, there are some reports to suggest that higher marginal doses may result in faster tumor shrinkage. Marginal doses of 20 – 24 Gy are used at many centers and hormonal normalization commonly occurs in about 50% of patients by 30 – 50 months. We report our outcome data for patients treated with a higher marginal dose of 35 Gy.

Methods

31 patients with secretory pituitary adenomas (ACTH: n = 15, GH: n = 13, PRL: n = 2, TSH: n = 1) were treated with 35 Gy to the 50% isodose surface, with a mean follow-up of 39.2 months. All patients were evaluated post-SRS for time to normalization of hormonal secretion, time to relapse, and incidence of radiation-induced hypopituitarism and cranial neuropathies.

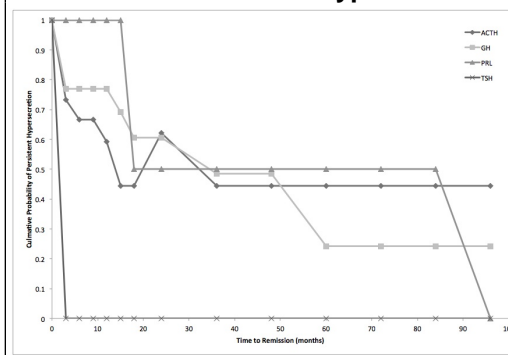
Results

Normalization of hypersecretion was achieved in 22 patients (70.1%) with a median time to remission of 17.7 months. There was 100% tumor control and 7 patients (31.8%) experienced an endocrine relapse, with a mean relapse time of 21 months. There was a small positive correlation between the percent of tumor receiving > 48 Gy and remission time ($r = 0.28$). New endocrine deficiency within any hormonal axis was observed in 10 patients (32.3%), with a mean time to any endocrine deficiency of 11.7 months. Three patients (9.7%) reported transient frontal headaches of unclear etiology following the procedure, with 1 of these patients (3.2%) reporting pain in a V1-V2 distribution.

Learning Objectives

Stereotactic gamma-knife radiation for secreting pituitary adenomas can be given at higher doses, with faster remission rates without an increase in morbidity.

Kaplan-Meier curve demonstrating the cumulative probability of persistent hypersecretion versus time to remission for the 35 Gy cohort in terms of each tumor type.



Conclusions

Time to endocrine remission was more rapid in our patients treated with 35 Gy to the tumor margin when compared to the previously reported literature using marginal doses of 20-24 Gy. Rates of endocrine remission and relapse, post-SRS hypopituitarism, and radiation-induced sequelae were not increased when using the higher dose treatment.

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