Purpose/Objective(s): Recent studies have suggested that stereotactic radiosurgery (SRS) treatment for glomus jugulare tumors is an effective treatment for glomus jugulare tumors with minimal morbidity and mortality. However, these studies are flawed by small patient numbers and focused exclusively on either the Gamma Knife (GK) or LINAC and CyberKnife (CK) treatment modalities. We performed a meta-analysis on the reported series of glomus jugulare tumors treated with SRS to assess the role of this technology for tumor control and clinical outcomes.

Materials/Methods: We performed a systematic search of all glomus jugulare tumors treated with radiosurgery reported in PubMed, SCOPUS, and EMBASE using the keywords ''glomus jugulare,'' ''radiosurgery,'' ''gamma knife,'' ''LINAC,'' and ''CyberKnife.'' Reviews were excluded. The most recent article was selected from institutions or groups that published multiple articles. Seventeen studies were included in the meta-analysis. Thirteen studies used Gamma Knife therapy, and 4 studies used LINAC or CK. Data on 320 glomus jugulare patients were extracted, including 263 patients who received GK and 57 patients who received LINAC or CK. 8 studies had mean or median follow-up times greater than 36 months. Included reports were jointly reviewed to achieve accuracy. The meta-analysis was performed by transforming proportions into Freeman-Tukey variant of the arcsine square root transformed proportions. The pooled proportion was calculated by back transforming the weighted mean of the transformed proportions. I2 statistic was used to assess heterogeneity. Bias was assessed by the Egger funnel plot test. All analysis was performed using StatsDirect3 statistical software.

Results: Overall, 97% (95% confidence interval = 95-99%) of patients treated with any radiosurgery modality exhibited tumor regression or unchanged tumor size at follow-up. A total of 95% (95% confidence interval = 92-97%) of patients treated with any radiosurgery modality exhibited improved or stable clinical status.

Conclusions: Our meta-analysis demonstrates that SRS is an effective treatment for glomus jugulare tumors with minimal morbidity and mortality. While a prospective study with larger patient numbers is the next step, our results suggest that SRS should be considered for primary treatment for glomus jugulare tumors.

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2191 Safety and Efficacy of Fractionated Stereotactic Radiotherapy (FSR) and Stereotactic Radiosurgery (SRS) in the Treatment of Functioning and Non-functioning Pituitary Tumors

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Purpose/Objective(s): To evaluate the safety and efficacy of SRS and FSR for the treatment of both functioning and non-functioning pituitary adenomas.

Materials/Methods: Between July of 1990 and June 2009, 147 patients who received SRS or FSR at The Emory Clinic for an initial diagnosis of pituitary adenoma were identified. Of these, complete records were available on 135 patients. Median follow-up was 2.3 years with a range of 0.2-14.5 years with 56 patients having a minimum of 2 years follow-up. Differences between groups were analyzed using Chi-square test for categorical variables and t-tests for continuous variables.

Results: The decision to employ SRS or FSR was based on the distance from the tumor edge to the optic chiasm. If the distance was $\geq$ 4 mm, SRS was used. Median patient age was 50.6 years (range, 17 to 82); 58 were female, 77 male. 42 (31.1%) were hormone secreting. Of these 17 (40%) were growth hormone (GH) secreting, 14 (33%) were adrenocorticotropic hormone (ACTH) producing, 6 (15 %) were prolactin (PRL) producing, 3 (7.4%) were both GH and PRL producing and 1 patient each were thyroid stimulating hormone (TSH) producing, and follicle stimulating hormone (FSH) producing. One hundred thirty-two of the patients had prior surgical treatment with 58.8 % having had 1 prior surgery, 32.5% having had 2 operations, 6.6% having had 3 operations, and 2.1% were treated with radiation alone. Of the 42 functioning patients 21 underwent SRS and 21 were treated with FSR. Of the non-functioning patients 26 underwent SRS and 67 underwent FSR. The mean radiation (RT) dose of the SRS group was 15.5 Gy (12-18.4 Gy) given in one fraction and the mean RT dose of the FSR group was 49.8 Gy (45-50.4 Gy) delivered over an average of 27.6 fractions. Of the total patient population, only 1 patient relapsed with the 2-year relapse free survival rate being 99 %. There were no grade III, IV, or V toxicities from treatment. Compared with baseline, at two years' post treatment, 56% of the FSR group and 45% in the SRS group required additional hormone replacement therapy. In the functioning tumors at 2 years after treatment, only 23.8% and 19.4% of patients treated with SRS and FSR respectively were off all medical therapy ($p = 0.19$).

Conclusions: Both SRS or FSR are very effective at inhibiting further growth of both functioning and non-functioning pituitary adenomas, even among patients who have had multiple prior surgeries. With either treatment there is a substantial risk of radiation-induced hypopituitarism as soon as 2 years after treatment. The likelihood of normalization of excess hormone secretions with either treatment remains small at early time-points. Additional means to accelerate the effect of radiation for hormone secreting tumors need to be explored.

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2192 Recurrence Patterns of Glioblastoma Treated with Postoperative Radiation Therapy: Relationship between Extent of Resection and Progression-free Interval

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Purpose/Objective(s): Patients with glioblastoma multiforme (GBM) are usually treated with surgery followed by a combination of radiation therapy (RT) and chemotherapy. When deciding on the appropriate local treatment of surgery or RT, it is important to understand the factors that can influence local outcome. The central tumor core, due to its visibility on contrast-enhanced magnetic resonance imaging (MRI), has evolved into an indicator for the gross tumor volume (GTV) and is used as a marker for extent of resection. Early postoperative MRI within 72 h after surgery has been believed to yield reliable and accurate information for the