Vyshak Chandra MS, BSc.; Kingston Kang; Charles Frederick Opalak MpH, MD; Adam Sima; William C. Broaddus MD

Department of Neurosurgery, Virginia Commonwealth University Health System, Medical College of Virginia, Richmond, VA, USA

Department of Biostatistics, Virginia Commonwealth University, Richmond, VA, USA

Introduction

Treatment refractory and recurrent pituitary adenomas often require radiation therapy or stereotactic radiosurgery. Long-term control with radiation treatment is well known, but the pattern of volume response after radiation has not been characterized in detail. We sought to characterize tumor response to radiation therapy in order to improve clinical decision-making.
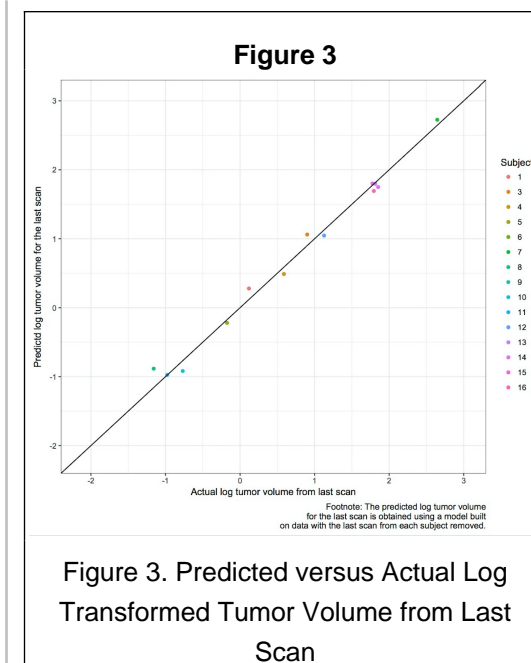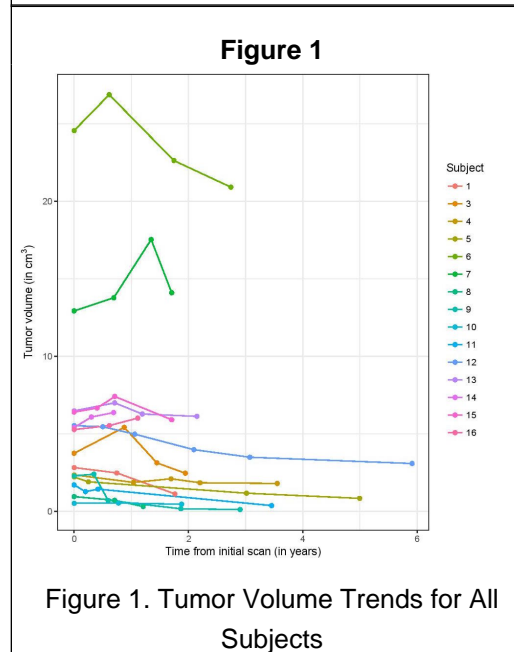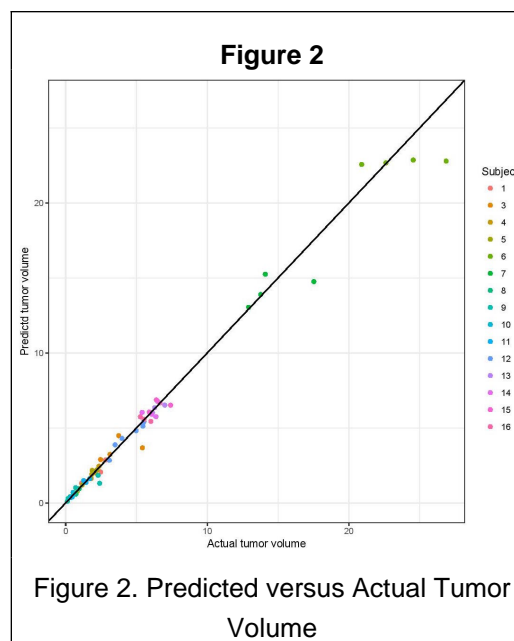
Methods

Patients with biopsy-proven pituitary adenomas were identified from pathology diagnoses at one institution between 2004 and 2014. Inclusion criteria were patients who had received radiation therapy for a pituitary adenoma, who had been followed for a minimum of 3 or more MRI scans, and were over 18 years in age. T1-weighted 3-plane post-contrast MR images were used; tumor dimensions were measured with orthogonal diameters and volumes using the ABC/2 method (simplified ellipsoid volume). In this series, all patients were treated with fractionated radiation therapy.

Results

Sixty-one MRI scans for 7 males (44%) and 9 females (56%) were evaluated. Tumor diameters ranged from 0.7cm to 4.22cm. Tumor volumes ranged from 0.12cc to 26.8cc. The median and mean volumes were 3.08cc and 5.25cc, respectively. Follow-up ranged from 8 to 70 months, with a median follow-up of 23 months. Among the 15 tumors that were included, trend of tumor volume growth over time is shown in figure 1.1. Three (20%) patients had progressive tumor growth after radiation, and the remainder (80%) had stable or decreasing volumes over time. A Bayesian linear mixed effect model was applied to predict future tumor volume. The comparisons between model prediction and the actual tumor volumes are shown in figure 2.1. The mean predicted volume change was -0.244 (SD=0.290) cc per month.

Conclusions

Analysis of scans showed that the majority of tumors respond to fractionated radiation treatment, and this treatment is effective for pituitary adenomas. Using our modeling, tumor response after radiation treatment can be effectively predicted.

Figure 2. Predicted versus Actual Tumor Volume

Figure 1. Tumor Volume Trends for All Subjects

Figure 3. Predicted versus Actual Log Transformed Tumor Volume from Last Scan

References
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