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Long-Term Outcomes of Radiographic and Symptomatic Control in Cavernous Sinus Meningiomas Treated with External Beam Radiation Therapy

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Abstract
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Abstract

Objectives:

Meningiomas commonly arise in the cavernous sinus, presenting a significant clinical challenge. This study evaluates the efficacy of fractionated stereotactic radiation therapy (fSRT) and fractionated stereotactic radiosurgery (fSRS) in achieving local control and symptomatic relief in patients with cavernous sinus meningiomas. We aim to compare the long-term outcomes of these two treatment modalities.

Methods:

We conducted a retrospective analysis of patients diagnosed with cavernous sinus meningiomas at our institution, who underwent fSRT (1.8-2 Gy per fraction) or fSRS (5 fractions). We collected clinical data on tumor characteristics, previous treatments, demographics, radiation dosimetry, treatment response, and survival. Kaplan-Meier curves assessed local control, and chi-squared analysis compared local control rates between the two treatment groups. For the larger fSRT cohort, clinical responses were evaluated at various follow-up intervals (⩽36 months, 36-60 months, 60-120 months, 120-180 months, and ⩾180 months), calculating frequencies of symptom improvement, stability, and worsening amongst patients with follow-up at these time-points.

Results:

Our study identified 63 patients treated with fSRT (54 Gy in 1.8 Gy fractions); 53 were included in the analysis after excluding 10 due to inadequate follow-up. Fourteen patients received fSRS. The average age across cohorts was 60 (range 21-90), with a Karnofsky Performance Score (KPS) of 90 for both treatment groups. The median tumor volume was 9.05 cc for the fSRS cohort (range 0.8-45.7 cc) and 12.06 cc for the fSRT cohort (range 2.3-52.3 cc). Local control rates for the fSRT cohort at 1, 3, 5, and 10 years were 100%, 95.00%, 89.38%, and 85.50%, respectively. The fSRS cohort achieved 100% local control at 1, 3, and 5 years. Chi-squared analysis revealed no statistically significant difference in local control between the two treatment modalities (χ^2=3.654, p=0.56). Clinical responses for the fSRT cohort showed symptom improvement frequencies of 54%, 47%, 63%, 62.5%, and 60% at the respective follow-up intervals, with stability rates of 35%, 39%, 33%, and 31%, and worsening symptoms at rates of 11%, 13%, 3%, and 6%.

Conclusion(s):

Both fSRT and fSRS demonstrate effective local control and symptomatic relief for cavernous sinus meningiomas. Our findings indicate no significant difference in local control rates between the two therapies, likely due to limited patient numbers in the fSRS cohort. Notably, failures in local control were found to occur past 10 years post-treatment, and over half of the fSRT patients experienced sustained clinical improvement for more than 15 years. These results underscore the importance of long-term follow-up in this patient population.