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Challenges in Managing Recurrent Grade I Parafalcine Meningiomas: A Case Report and Review of Survival and Radiotherapeutic Decisions in the Context of Genomic Alterations

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Abstract

Purpose: Grade I meningiomas are the most prevalent primary tumors of the central nervous system. While typically characterized by a slow-growing course and favorable prognosis, some Grade I meningiomas exhibit aggressive behavior and resistance to conventional treatment approaches. Recurrent Grade I meningiomas, in particular, are associated with a poorer prognosis despite their benign histological classification, underscoring the need for advanced genomic and radiomic analyses to refine diagnostic accuracy. Tumors located in anatomically challenging regions may further complicate treatment strategies, requiring individualized management considerations, preferably through multidisciplinary decision making. We present a case of a recurrent grade I parafalcine meningioma initially considered nonaggressive, highlighting the intricate surgical and radiotherapeutic decisions involved in its management.

Methods: A retrospective review of the patient's treatment course was conducted to present this case.

Results: A 52-year-old female with a Grade I parafalcine vertex meningioma underwent initial resection via craniotomy at an outside hospital. Ten years post-surgery, recurrence was noted in the left frontal region anterior to the original site, necessitating a second craniotomy due to the limitations of radiosurgery with pathology revealing grade 1 meningioma, Ki-67 1.3%. Two years later, MRI revealed a new growth predominantly within the left parasagittal region, prompting LINAC-based stereotactic radiosurgery (5400 cGy in 30 fractions). Despite post-treatment symptoms of headache and scalp discomfort, MRI follow-up demonstrated stable disease. Subsequently, a new 7mm lesion laterally adjacent to the primary tumor was detected, requiring single-fraction radiosurgery (1500 cGy). Six years post-intervention, progression of the left parietal convexity meningioma led to a third craniotomy, with pathology again confirming Grade I status and genetic analysis revealing new somatic NF2 alteration, Ki-67 12.7%. Seven months postoperatively, growth in the residual parasagittal tumor with superior sagittal sinus invasion necessitated further fractionated stereotactic radiotherapy (2.5 Gy per fraction for 22 fractions) to achieve optimal control with minimized toxicity.

Conclusion: Although classified as benign, Grade I meningiomas may exhibit recurrence and progression, particularly in anatomically complex regions, posing significant challenges in treatment planning. NF-2 alterations, alongside high Ki-67 proliferative indices and supratentorial location, have been associated with poor prognosis in terms of progression-free survival for patients presenting with grade 1 meningiomas. This case exemplifies the intricacies of managing recurrent Grade I meningiomas, emphasizing the importance of multidisciplinary evaluation and tailored treatment approaches. Continued research in genomics and radiomics is critical to advance the classification and therapeutic strategies for meningiomas, ultimately enhancing patient outcomes.