

En Plaque Meningioma Beyond the Ordinary: Radiological and Surgical Insights from a Rare Case

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Abstract

En plaque meningioma is a rare subtype of meningioma characterized by sheet-like growth, infiltrative behavior, and frequent hyperostosis, often affecting the orbit and skull base. A 55-year-old man presented with right-sided proptosis and headache. MRI demonstrated a dural-based right sphenoid-orbital lesion infiltrating orbital fat and temporalis muscle, with associated sphenoid-orbital hyperostosis. Subtotal resection with bony decompression of the superior orbital fissure and optic canal was performed, followed by adjuvant radiotherapy due to the tumor's infiltrative nature and extension into critical structures. At 3-year follow-up, MRI revealed no recurrence, and the patient achieved favorable functional and cosmetic outcomes. En plaque meningiomas are surgically challenging, but multimodal management combining surgery and radiotherapy can provide durable disease control with satisfactory outcomes.

Keywords: En Plaque Meningioma; Exophthalmos; Sphenoid Wing; MRI

Introduction

En plaque meningiomas (EPMs) are an uncommon subtype of meningioma, accounting for approximately 2% - 9% of all cases [1,2]. These tumors show a marked female predominance and are most frequently diagnosed in the fifth decade of life. The present case illustrates the relevance of clinical findings and cerebral magnetic resonance imaging (MRI) in establishing the diagnosis. Typical imaging features include a "carpet-like" pattern of growth with extensive hyperostosis and diffuse dural thickening. The diagnostic process may be challenging due to their atypical radiological presentation, while surgical treatment is often complex because of their propensity to infiltrate osseous structures and extend through adjacent fissures and foramina [3].

Case Report

A 55-year-old male presented with a several-month history of progressive headaches, orbital pain, and swelling of the right temporal region. He was admitted to the emergency department due to worsening visual disturbances and severe headache. On examination, he was hemodynamically stable with preserved neurological status. Ophthalmological assessment revealed reduced visual acuity and pronounced right-sided proptosis.

Magnetic resonance imaging (MRI) demonstrated an extra-axial, dural-based right spheno-orbital lesion, isointense on T1-weighted sequences and mildly hyperintense on T2-weighted images (Figure 1). Following gadolinium administration, the mass exhibited intense and homogeneous enhancement, in keeping with a spheno-orbital meningioma (Figure 2).

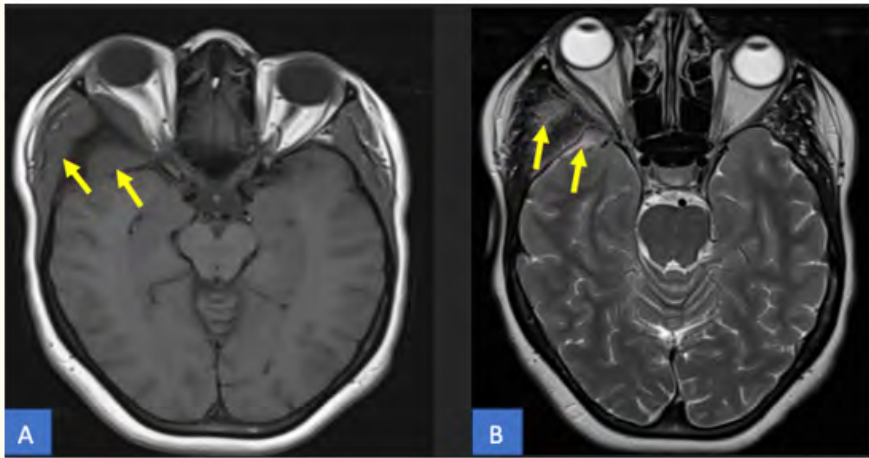


Figure 1: Axial T1-weighted (A) and T2-weighted (B) MRI images showing an extra-axial, dural-based right spheno-orbital lesion (yellow arrows). The lesion is isointense on T1 and mildly hyperintense on T2 sequences.

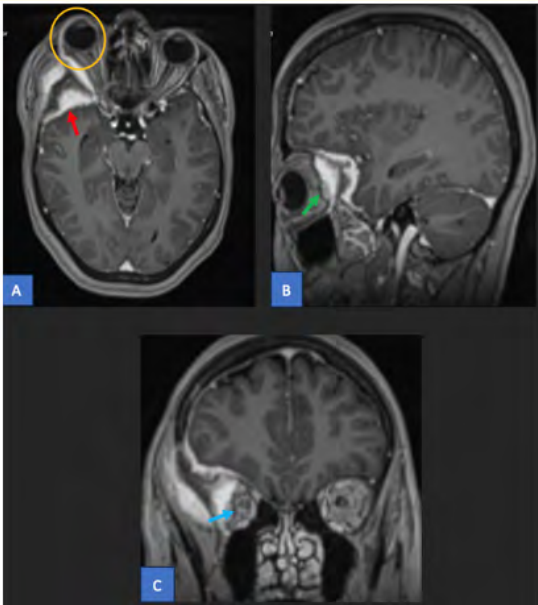


Figure 2: Axial (A) sagittal (B) and coronal (C) post-gadolinium images showing an extra-axial right spheno-orbital lesion with intense homogeneous enhancement. The mass extends posteriorly toward the mesial temporal lobe (red arrow), infiltrates extraconal fat (green arrow), displaces the lateral rectus muscle (blue arrow), and causes moderate proptosis without optic nerve compression (yellow circle).

Posteriorly, dural thickening extended toward the endocranium, abutting the ipsilateral mesial temporal lobe without evidence of parenchymal invasion. Medially, the lesion infiltrated the extraconal fat and displaced the right lateral rectus muscle, while preserving a thin demarcation plane (Figure 2). This intraorbital extension resulted in moderate proptosis of the right globe, with no radiological evidence of optic nerve compression.

Laterally, the tumor extended into the right temporal fossa, associated with thickening and infiltration of the ipsilateral temporalis muscle.

Considering the extensive osseous involvement, differential diagnoses initially included fibrous dysplasia and Paget's disease. An endoscopic transsphenoidal biopsy was performed, and histopathological examination confirmed the diagnosis of meningioma with bone infiltration.

The patient subsequently underwent subtotal surgical resection combined with extensive bony decompression of the optic canal and superior orbital fissure. Postoperatively, he was referred for adjuvant radiotherapy. Cranioplasty was postponed, with consideration for reconstruction after confirmation of long-term disease stability.

The patient was monitored with MRI at 3-month intervals. Over an 18-month follow-up period, no radiological evidence of recurrence was identified, and the patient remained clinically stable after completion of radiotherapy.

Discussion

En plaque meningiomas (MEPs) are typically flat lesions with minimal elevation above the dural surface, yet they demonstrate a marked tendency to infiltrate adjacent bone, producing pronounced hyperostosis. Their extension often occurs through natural foramina and fissures, as well as along vascular channels, which are frequently increased in number.

Unlike the more common en masse meningiomas, MEPs exhibit a characteristic "carpet-like" growth pattern, with extensive dural thickening and osseous involvement. They most frequently arise in the spheno-orbital region, while less common sites include the cerebral convexity, temporal bone, and foramen magnum [2,3]. Their radiological appearance is often atypical, complicating diagnosis, while their osseous infiltration and encasement of fissures and foramina make surgical management particularly demanding [4].

The clinical spectrum of MEPs depends largely on location and the degree of infiltration. Symptoms may result from direct neural compression, dural invasion, or secondary effects of hyperostosis that narrow critical foramina. For instance, sphenoid wing lesions frequently lead to visual impairment, while orbital hyperostosis is associated with proptosis, retrobulbar pain, orbital pressure, and headache.

Magnetic resonance imaging (MRI) and computed tomography (CT) remain the cornerstone diagnostic modalities. Thin-slice CT with bone windows is particularly valuable for assessing skull base hyperostosis, whereas MRI provides superior characterization of dural and intradural extension. Post-contrast T1-weighted sequences, especially with fat suppression, delineate soft tissue infiltration and dural enhancement, and are essential for evaluating orbital and cavernous sinus involvement, as was observed in our patient [5].

Radiologically, hyperostosis in MEPs is recognized by irregular bony contours and inward protrusions, features that help distinguish it from other entities such as primary intraosseous meningioma, plasmacytoma, lymphoma, fibrosarcoma, cerebral metastases, and Paget's disease [6].

Preoperative imaging plays a critical role in delineating anatomical boundaries, anticipating bony and muscular invasion, and identifying structures requiring decompression, including the optic canal and superior orbital fissure. The standard surgical approach involves fronto-temporo-sphenoidal craniotomy with excision of all infiltrated dura, orbital tissues, and bone, followed by reconstruction when necessary. The surgical technique must be tailored to the tumor's extension, and wide osteotomies are recommended to achieve adequate decompression and symptomatic relief. In cases of orbital involvement, removal of the orbital wall or roof may be required, with or without reconstruction depending on the degree of periorbital invasion [7].

The extent of surgical resection must always be balanced against the risk of morbidity. Subtotal resection is frequently considered for tumors involving the cavernous sinus, superior orbital fissure, or infratemporal fossa. In such cases, decompression combined with postoperative radiotherapy represents the preferred therapeutic strategy [8].

The literature shows considerable variability in recurrence rates and management approaches, particularly in tumors with cavernous sinus involvement [9,10]. While complete resection reduces recurrence risk, it may not always be feasible due to the risk of functional deficits. Similarly, the necessity of orbital reconstruction remains debated. Earlier practice favored reconstruction following removal of multiple orbital walls; however, more recent studies suggest that preserving the periorbita may be sufficient to avoid enophthalmos or cosmetic deformities, with some reports even showing resolution of proptosis without reconstruction. When reconstruction is required, available options include titanium mesh, autologous bone grafts, or porous polyethylene implants designed to promote fibrous ingrowth [10].

In the present case, subtotal resection combined with adjuvant radiotherapy achieved satisfactory clinical and radiological outcomes, with no recurrence observed during 18 months of follow-up. Bone reconstruction has been deferred, pending long-term evaluation of disease stability.

Conclusion

In cases where MEP is suspected, MRI is indispensable to establish an accurate diagnosis and to avoid misclassification with other osseous or dural pathologies. Surgical resection remains the cornerstone of treatment, aiming both to achieve maximal tumor clearance and to prevent cosmetic deformity. Complete removal of involved dura and decompression of neural foramina are crucial intraoperative steps to minimize recurrence.

With recent advances in neuroimaging, microsurgical techniques, and reconstructive options, management of MEP has evolved significantly. Nevertheless, further studies are warranted to establish tailored strategies that account for tumor location, degree of osseous infiltration, and individual patient characteristics.

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