ISSN: 2584-0355
DOI: doi.org/10.51219/MCCRJ/Fadoua-El-Mourabit/469

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Medical & Clinical Case Reports Journal

https://urfpublishers.com/journal/case-reports

Vol: 4 & Iss: 2

Case Report

Endoscopic Endonasal Revision Surgery for Recurrent Ethmoidal Meningioma: A Case Report and Review of the Literature

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Citation: Ghouzlani I, El Mourabit F, Lahjaouj M, et al. Endoscopic Endonasal Revision Surgery for Recurrent Ethmoidal Meningioma: A Case Report and Review of the Literature. *Medi Clin Case Rep J* 2026;4(2):1720-1724. DOI: doi.org/10.51219/MCCRJ/Fadoua-El-Mourabit/469

Received: 03 April, 2026; **Accepted:** 04 May, 2026; **Published:** 06 May, 2026

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A B S T R A C T

Background: Ethmoidal meningiomas are rare anterior skull base tumors whose recurrence remains challenging after prior open surgery.

Case presentation: A 73-year-old woman, previously operated in 2013 via bicoronal craniotomy for an ethmoidal meningioma, presented with behavioural changes, loss of consciousness episodes, diplopia, right-eye visual decline and epileptic seizures. Endoscopy revealed a mass centred on the olfactory cleft. CT and MRI showed a 59 × 45 × 45 mm extra-axial basifrontal lesion with ethmoidal implantation, intracranial extension through an anterior skull base defect, bilateral extraconal orbital involvement and downward extension into the nasal cavities. A complete endoscopic endonasal resection was achieved using bilateral ethmoidectomy, Draf III frontal sinusotomy and sphenoidotomy. A cerebellar herniation through the eroded skull base was identified and a multilayer reconstruction (fascia lata, fat, Surgical, biological glue) was performed. Postoperative evolution was uneventful, without CSF rhinorrhea or recurrence.

Conclusion: Endoscopic endonasal revision surgery is a safe and effective option for recurrent ethmoidal meningiomas, offering excellent tumor control and low morbidity in experienced skull base centers.

Keywords: Endoscopic endonasal surgery, Revision surgery, Ethmoidal meningioma, Anterior skull base tumour, Skull base reconstruction, Recurrent meningioma

Introduction

Ethmoidal meningiomas are rare tumours arising from the anterior skull base, representing less than 2% of all extracranial meningiomas and typically originating from the cribriform plate or the frontoethmoidal junction[1,2]. Their clinical presentation is often insidious, dominated by nonspecific symptoms such as nasal obstruction, headaches, visual disturbances, behavioural changes or epileptic seizures, making early diagnosis challenging[3-5]. Radiologically, these tumours characteristically demonstrate intense and homogeneous enhancement, may induce hyperostosis and frequently extend toward the orbit or intracranially through defects of the anterior skull base[6].

Historically, the bicoronal transcranial approach was the reference technique for resection of anterior skull base

meningiomas, particularly those with intracranial extension[7]. Although effective, this approach is associated with significant morbidity, including anosmia, cosmetic sequelae, cerebral edema and risk of neurologic complications[7,8]. Over the past two decades, the development of endoscopic endonasal approaches (EEA) has revolutionized the management of anterior skull base tumors, offering panoramic visualization, avoidance of brain retraction, direct access to the tumor's point of attachment and reduced postoperative morbidity[9-11].

Recurrence remains a major concern, especially when initial resection was incomplete or when hyperostotic bone harbouring microscopic tumour infiltration was left in place[12]. Revision surgery is technically demanding due to distortion of anatomical landmarks, scarring and the proximity of critical structures such as the orbit and anterior cranial fossa. Nevertheless, several studies have confirmed the safety and efficacy of endoscopic resection in selected recurrent cases, with favourable long-term outcomes when combined with adequate skull base reconstruction[10,13].

We report here a case of large recurrent ethmoidal meningioma, initially treated via bicoronal craniotomy and successfully managed by complete endoscopic endonasal revision surgery with multilayer skull base reconstruction. This case highlights the diagnostic challenges, technical difficulties and therapeutic relevance of endoscopic approaches in complex anterior skull base recurrences.

Case Presentation

A 73-year-old woman, with no significant medical history, had been followed since 2010 for progressive neuropsychiatric symptoms characterized initially by behavioral disturbances, later complicated by episodes of loss of consciousness, diplopia and progressive visual decline of the right eye, without rhinorrhea. Imaging performed in 2013 revealed an ethmoidal meningioma, for which she underwent bicoronal transcranial resection by the neurosurgical team.

Clinical evolution

The postoperative course was initially favourable. However, over the following years, the patient progressively developed epileptic seizures, raising suspicion of tumour recurrence. She was referred to our department for further assessment.

Nasal endoscopy revealed a voluminous mass occupying the posterior ethmoid and centred on the olfactory cleft, extending into both nasal cavities, with greater involvement of the left side.

Imaging findings

A contrast-enhanced CT scan **(Figure 1)** demonstrated a large extra-axial basifrontal process arising from the ethmoidal region, showing intense and homogeneous enhancement and measuring 50.6 × 44.6 × 54.5 mm. The lesion exhibited:

- Intracranial extension through a lytic defect of the anterior skull base, more pronounced on the left side,
- Bilateral extraconal infraorbital extension,
- Inferior extension into the nasal cavities, predominantly on the left.

Brain MRI confirmed a recurrent ethmoidal meningioma measuring 59 × 45 × 45 mm, with isointense signal on T1/T2 and homogeneous enhancement, consistent with tumor recurrence at the previous site of craniotomy. **(Figure 2)**

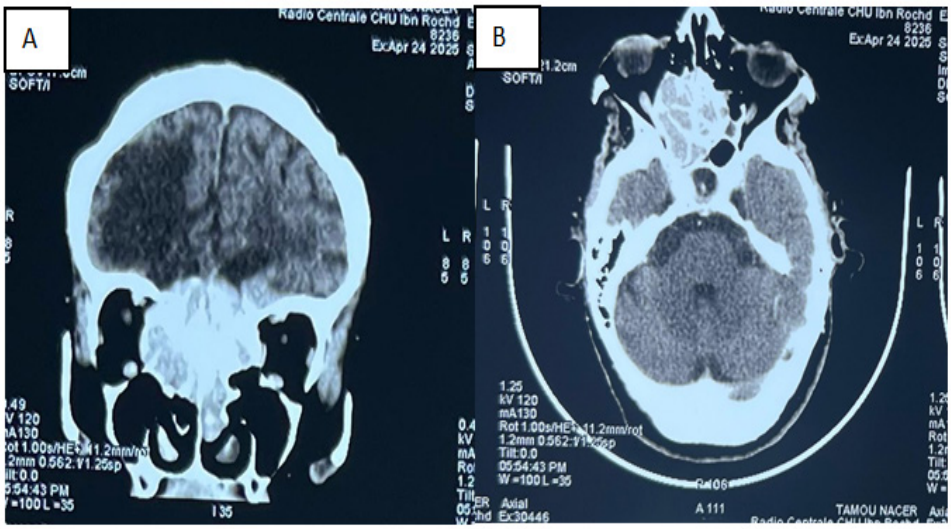

Figure 1: (A) Coronal CT scan showing a large, homogeneously enhancing ethmoidal mass occupying the posterior ethmoid, extending inferiorly into both nasal cavities-more pronounced on the left.

(B) Axial CT scan demonstrating a voluminous extra-axial basifrontal lesion with ethmoidal implantation, intracranial extension through an anterior skull base defect and bilateral extraconal intraorbital involvement.

Surgical management

Given the extent of recurrence and the patient's symptoms, a decision was made to proceed with endoscopic endonasal revision surgery.

The approach included:

- Bilateral middle turbinectomy,
- Wide bilateral meatal antrostomy,
- Complete anterior and posterior ethmoidectomy on both sides,
- Draf III (modified Lothrop) frontal sinusotomy,
- Bilateral type III sphenoidotomy.

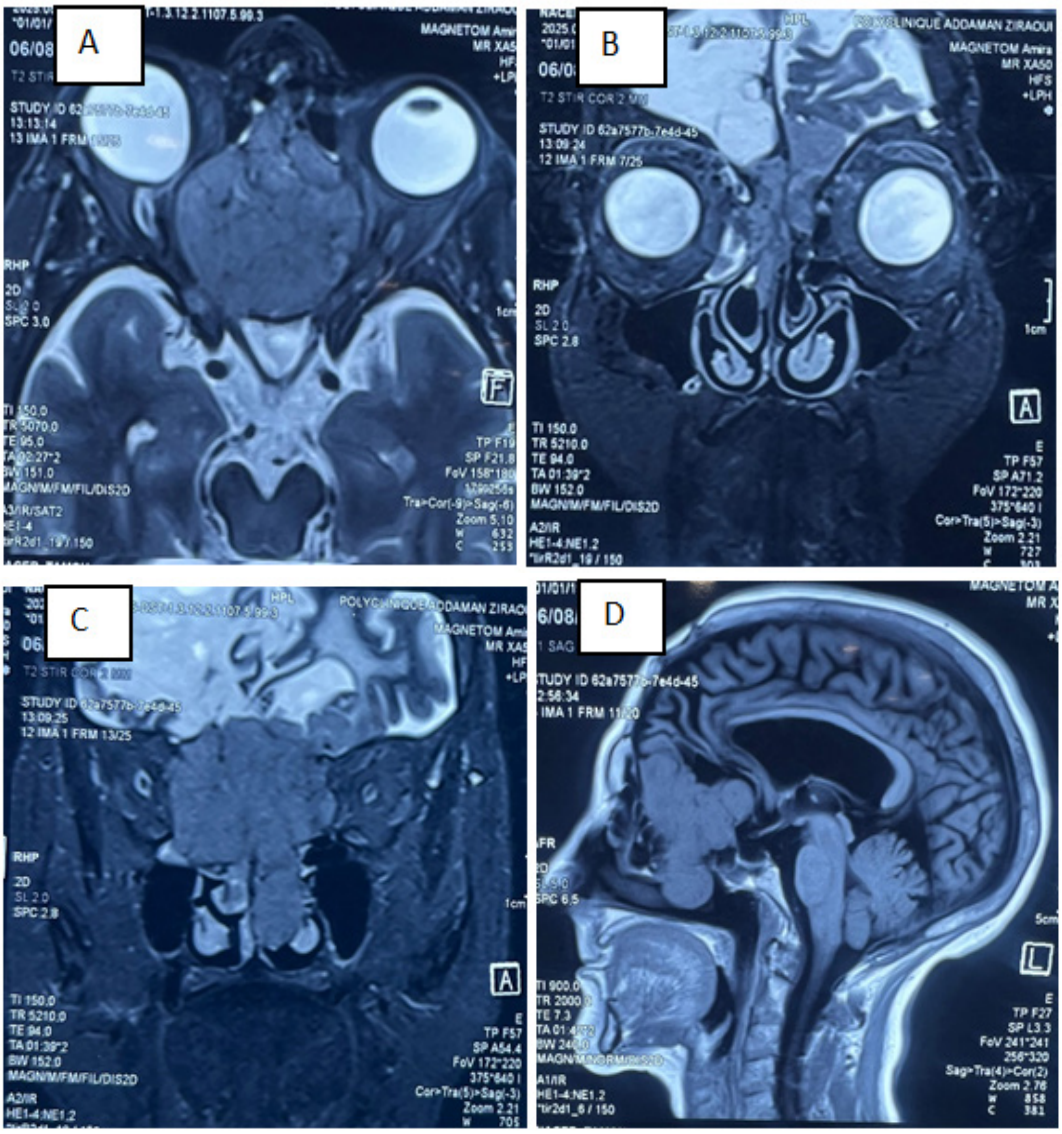

Figure 2:

(A) Axial T1-weighted post-contrast MRI showing a large, homogeneously enhancing ethmoidal meningioma with expansive basifrontal extension, compressing the frontal lobes and displacing the bilateral extraconal orbital fat.

(B) Coronal T2-weighted/STIR sequence demonstrating the tumour centred on the olfactory cleft, filling the posterior ethmoid and extending inferiorly into the nasal cavities, with bilateral intraorbital extraconal involvement.

(C) Coronal T1-weighted post-contrast MRI confirming intense and homogeneous enhancement of the recurrent meningioma, with erosion of the anterior skull base and intracranial extension.

(D) Sagittal T1-weighted post-contrast MRI showing the superior extension of the lesion into the anterior cranial fossa through a lytic defect of the skull base, with mass effect on the inferior frontal lobes and clear visualization of the tumor–dura interface

The tumor was carefully debulked, its dural attachment cauterized with bipolar coagulation and a complete macroscopic resection was achieved.

During dissection, a cerebral herniation was identified protruding through the eroded anterior skull base, corresponding to the area of bony lysis visualized on imaging.

No high-flow CSF leak was observed, though the skull base defect required reconstruction.

Skull base reconstruction

A multilayer reconstruction was performed using a combined technique consisting of:

- Fascia lata graft (inlay),
- Autologous fat graft for dead-space obliteration,
- Surgicel as a supportive layer,
- Biological glue for stabilization and sealing.

The nasal cavities were gently packed to maintain graft stability.

Postoperative outcome

The postoperative course was uneventful:

- No CSF rhinorrhea,
- No infectious or neurological complications,
- Stable visual function,
- Resolution of sinonasal symptoms.

At both short-term and mid-term follow-up, endoscopic examination showed complete mucosal healing and MRI demonstrated no evidence of residual tumour or recurrence.

Discussion

Ethmoidal meningiomas constitute a rare subset of anterior skull base tumours whose clinical behaviour and therapeutic challenges differ significantly from intracranial meningiomas. Their proximity to the olfactory cleft, frontal lobes and orbit explains the wide spectrum of presenting symptoms, ranging from nasal obstruction to neuropsychiatric disturbances and visual impairment. In our patient, the association of behavioural changes, seizures and progressive visual decline was highly suggestive of significant intracranial extension-an observation consistent with craniofacial meningioma series describing similar neurobehavioral manifestations in anterior skull base involvement[14].

Radiologically, these tumours typically exhibit intense and homogeneous enhancement, often associated with hyperostosis of the cribriform plate. Hyperostotic bone has been recognized as a major factor contributing to recurrence when not removed adequately during initial surgery, as it frequently harbours microscopic tumour infiltration rather than representing a simple reactive phenomenon. This concept, emphasized in classical skull base oncology literature, provides a plausible explanation for the delayed recurrence observed in our patient more than a decade after her bicoronal resection[15].

The traditional transcranial approach remains effective for large olfactory groove and ethmoidal meningiomas but presents well-documented limitations. Brain retraction, cosmetic morbidity, anosmia and reduced access to inferior ethmoidal recesses all contribute to the risk of residual tumour, particularly in regions beneath the frontal sinus floor or within remodelled bone. Several authors have highlighted the tendency of transcranial techniques to leave behind residual hyperostotic bone or dural implantation, which over time may lead to late recurrence, as occurred in this case[16].

The introduction of endoscopic endonasal approaches (EEA) has significantly redefined the management of anterior skull base tumors. These approaches offer panoramic visualization, direct access to the tumor's dural attachment, avoidance of brain manipulation and excellent exposure of ethmoidal and frontal recesses. The work of pioneering teams in endoscopic skull base surgery demonstrated that, in selected cases, EEA provides comparable oncological control to transcranial surgery while reducing morbidity and recovery time[17-19]. Endoscopic resection is particularly advantageous for midline and extracranial-predominant lesions, where direct visualization of the implantation zone facilitates complete resection.

Revision surgery, however, is inherently more complex due to scarring, distortion of anatomical landmarks and fragility of residual dura or bone. In such scenarios, extensive binarial exposure is essential. The Draf III (modified Lothrop) approach has been shown to significantly enhance access to the frontal base, bilateral olfactory clefts and superior ethmoid, thereby increasing the likelihood of achieving complete tumour removal even in previously operated fields[20]. In our patient, this extended exposure was crucial, allowing safe dissection of the recurrent tumor, including its intracranial and intraorbital extensions.

The presence of a small cerebral herniation through an anterior skull base defect in our case reflects chronic remodelling and bony lysis secondary to longstanding tumoral pressure. Endoscopic magnification facilitated precise identification of this herniation, allowing safe preservation of neural tissue and minimizing the risk of postoperative neurological deficits. Such findings reinforce the value of endoscopic visualization in complex skull base revision procedures.

Reconstruction remains a pivotal component of skull base surgery. Multilayer closure has consistently been identified as the most reliable strategy for preventing postoperative CSF leaks, particularly when dealing with large or revision defects. When vascularized flaps are unavailable due to previous surgery, tumor location or scarring, free graft–based reconstructions using fascia lata, fat grafts and biological sealants have proven effective in achieving watertight closure in experienced hands[21,22]. In our patient, this strategy provided excellent postoperative stability with no CSF rhinorrhea and complete mucosal healing at follow-up.

The favorable postoperative course and absence of recurrence at early and mid-term follow-up confirm the therapeutic value of endoscopic revision surgery in selected recurrent ethmoidal meningiomas. Current literature supports the notion that the key determinants of long-term control are:

- Complete removal of the dural attachment,
- Aggressive drilling of hyperostotic bone and
- Reliable skull base reconstruction, factors that were fully integrated into the surgical strategy in this case[15,20].

Overall, this case reinforces the growing evidence that endoscopic endonasal revision surgery is an effective, safe and less morbid alternative to transcranial re-operations, particularly in patients with midline, ethmoidal-based recurrences. It illustrates the importance of modern skull base techniques, multidisciplinary collaboration and long-term imaging surveillance for ensuring durable outcomes.

Conclusion

Recurrent ethmoidal meningiomas remain a challenging entity due to their insidious evolution, their tendency to infiltrate hyperostotic bone and the anatomical complexity of the anterior skull base. This case illustrates that, even after prior transcranial resection, endoscopic endonasal approaches offer an effective and less morbid alternative for obtaining complete tumor control. The combination of wide binarial exposure, meticulous dissection of the dural implantation, aggressive removal of hyperostotic bone and reliable multilayer skull base reconstruction allowed a safe and successful revision surgery in our patient. The absence of postoperative complications and the stable radiological follow-up further support the value of modern endoscopic skull base techniques in managing complex recurrences. Long-term surveillance remains essential, as recurrence may occur many years after initial treatment.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Written informed consent was obtained from the patient for publication of this case report and the accompanying images. A

copy of the written consent is available for review by the Editor-in-Chief of this journal.

Availability of data and materials

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors.

Authors' contributions

ML contributed to the conception and design of the work, data collection and drafting of the manuscript.

FEM contributed to data collection, literature review, manuscript preparation and writing.

MLh, WB, YO, SR and RA participated in patient management and provided critical revisions to the manuscript.

MR and MM supervised the work and approved the final version of the manuscript.

All authors read and approved the final manuscript.

Acknowledgements

The authors thank the Department of Otorhinolaryngology – Head and Neck Surgery of CHU Ibn Rochd for their support in the management of this case.

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