Case report

Recurrence of an olfactory groove meningioma: clinical and radiological findings from a six-year follow-up

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ABSTRACT

Introduction and importance: Surgical resection of olfactory groove meningioma remains the cornerstone of treatment, with the goal of gross total resection (GTR) to minimize the risk of recurrence. This study details the presentation, surgical management, and long-term (six-year) follow-up of a 45-year-old female patient with large olfactory groove meningioma.

Case presentation: A 45-years female presented urinary and fecal incontinence, apathy, disinhibition, and progressive visual decline. Preoperative MRI revealed an extra-axial mass in the left frontal region measuring 4.5 × 5.7 × 5.7 cm, producing significant mass effect. The tumor was successfully resected via a bicoronal subfrontal approach, and histopathological analysis confirmed a WHO Grade I meningioma. Serial postoperative MRI and CT scans over a six-year follow-up period (2019–2025) demonstrated marked initial tumor regression. However, a small residual lesion visible on the first postoperative scan showed gradual regrowth, culminating in a substantial recurrence by September 2025. At that time, the recurrent mass measured 5.2 × 3.4 × 4.55 cm and exhibited aggressive radiological features, including bone invasion and hyperostosis.

Clinical discussion: This case underscores the impact of residual tumor on long-term outcomes in olfactory groove meningioma's. Although initial resection was a GTR that achieved substantial cytoreduction, the presence of postoperative residue led to delayed but progressive recurrence, including bone invasion, despite benign histology.

Conclusion: These findings highlight that recurrence risk is shaped not only by WHO grade but also by residual tumor burden and local anatomical behavior. Long-term and careful radiological follow-up is therefore essential when GTR cannot be achieved.

Key words: meningioma, olfactory groove, recurrence, skull base, bicoronal approach, long-term follow-up, Simpson grade

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INTRODUCTION

Olfactory groove meningioma's (OGMs) are a distinct subtype of anterior skull base tumors originating from the arachnoid cap cells near the cribriform plate and frontoethmoidal suture. They account for 8% to 13% of all intracranial meningiomas [1–4]. A hallmark of OGMs is their insidious growth within a neurologically "silent" area, often allowing them to attain a considerable size before becoming symptomatic [5, 6]. The classic clinical triad includes anosmia, visual impairment, and frontal lobe personality changes, though anosmia is frequently an overlooked early sign [7–10].

Despite being predominantly benign (WHO Grade I), their proximity to critical structures, such as the optic apparatus and frontal lobes, makes their management complex [11, 12]. Surgical resection remains the cornerstone of treatment, with the goal of gross total resection (GTR) to minimize recurrence. The choice of surgical approach, whether traditional transcranial (e.g. bifrontal craniotomy) or endoscopic endonasal, is tailored to tumor characteristics and surgical expertise [13, 14]. This report presents a six-year radiological follow-up of a recurrent OGM, illustrating the natural history of residual tumor and emphasizing the imperative of long-term monitoring, adhering to the Revised Surgical Case Report (SCARE) 2025 guidelines [15].

CASE PRESENTATION

A 45-year-old female presented in January 2019 with a several-month history of progressive behavioral changes, including apathy and disinhibition, urinary and fecal incontinence, and deteriorating vision. Cranial nerve examination revealed bilateral anosmia and reduced visual acuity.

Pre-operative magnetic resonance imaging (MRI) revealed an extra-axial mass along the left frontal convexity, measuring approximately 4.5 × 5.7 × 5.7 cm (fig. 1). The mass was isointense to grey matter on T1- and T2-weighted sequences and demonstrated homogeneous contrast enhancement with a small central necrotic area. It exerted severe mass effect, compressing both frontal lobes, causing significant vasogenic edema, and resulting in a notable midline shift to the right. These findings were highly suggestive of a meningioma. The patient underwent a bicoronal craniotomy and subfrontal approach for microsurgical tumor resection. The procedure was successful in achieving a significant (>95%) resection of the mass. Histopathological examination confirmed the diagnosis of a WHO Grade I meningioma. The patient's post-operative course was uncomplicated. At discharge, her incontinence had resolved, and her family reported improvement in her behavior.

Radiological follow-up and progression

The patient was monitored with serial imaging over a six-year period. The findings are summarized in table 1.

First follow-up (July 2019): A postoperative MRI showed that most of the mass had been grossly totally removed. A small remnant was noted in the inferior frontal region (fig. 2). The remnant showed slight enhancement, and an underlying area of encephalomalacia with edematous changes was noted in the left frontal region.

Second follow-up (November 2019): An MRI comparison showed no significant changes in the size or features of the residue. The remnant measured 3.8 cm in transverse diameter, 1.7 cm in antero-posterior diameter, and 2 cm in cranio-caudal diameter (fig. 3). It exhibited diffuse enhancement with slightly thickened overlying meninges.

Third follow-up (August 2022): The MRI revealed focal porencephaly and gliosis of the left frontal lobe. A dural-based enhancing mass, measuring 4.8 × 3.7 × 2 cm, was noted (fig. 4). The mass was mostly meningioma-related and did not cause significant mass effect or ventricular compression.

Fourth follow-up (March 2023): The MRI showed an increase in the size of the dural-based enhancing mass, measuring

Table 1. Summary of radiological follow-up (2019–2025).

Date (Month/Year)	Modality	Key findings & tumor dimensions (AP x TR x CC in cm)
Jan 2019 (Pre-op)	MRI	Large extra-axial mass (4.5 x 5.7 x 5.7 cm). Severe mass effect, midline shift.
Jul 2019 (1st FU)	MRI	Residual tumor (2.9 x 1.7 x 3.5 cm). Underlying encephalomalacia.
Nov 2019 (2nd FU)	MRI	Stable residual tumor (1.7 x 3.8 x 2.0 cm).
Aug 2022 (3rd FU)	MRI	Regrowth noted. Dural-based mass measuring 4.8 x 3.7 x 2.0 cm.
Mar 2023 (4th FU)	MRI	Further increase in size. Mass measures 5.0 x 4.0 x 2.6 cm.
Nov 2023 (5th FU)	MRI	Stable recurrence. Mass measures 2.5 x 5.0 x 4.0 cm.
Sep 2025 (6th FU)	MRI/CT	Significant recurrence (5.2 x 3.4 x 4.55 cm). Bone invasion (frontal sinus, orbit), hyperostosis, vasogenic edema, and 3-4 mm midline shift.

AP – antero-posterior; CC – cranio-caudal; CT – computed tomography; FU – follow-up; MRI – magnetic resonance imaging; TR – transverse.

Figure 1. Preoperative cranial MRI. T1-weighted post-contrast coronal (A), T2-weighted axial (B), and FLAIR axial (C) MRI, depicting a 4.5 × 5.7 × 5.7 cm left frontal extra-axial lesion (white arrows) and perilesional edema (red star).

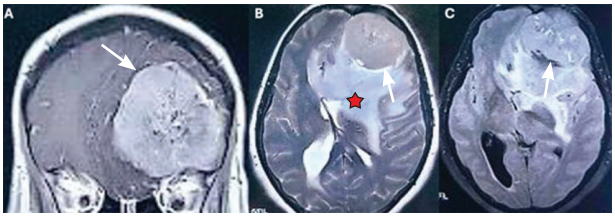
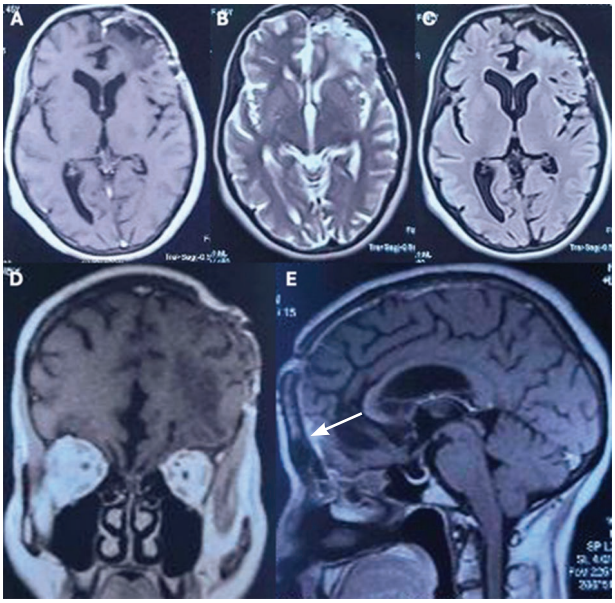


Figure 2. Postoperative cranial MRI, first follow-up (July 2019). T1-weighted post-contrast (A), T2-weighted (B), and FLAIR axial (C) scans, along with T1-weighted post-contrast coronal (D) and sagittal sections depicting gross-total removal of the left frontal lesion with a small inferior frontal remnant (white arrow).



5 × 4 × 2.6 cm (fig. 5). Focal porencephaly and gliosis of the left frontal lobe were still present, with no significant mass effect or ventricular compression.

Fifth follow-up (November 2023): The final examination showed a homogenous, enhanced focal extra-axial lesion under the craniotomy site (fig. 6). Compared with the March 2023 study, there were no significant changes. The scan also revealed mild atrophic brain changes, including ventriculomegaly and widening of cortical sulci.

Sixth follow-up (September 2025): The brain MRI and CT scan showed an extra-axial mass in the left frontal region (fig. 7). This mass, measuring approximately 5.2 × 3.4 × 4.55 cm, has increased slightly in size since the previous scan on November 15, 2023. It`s noted that the mass is invading several surrounding structures, including the left frontal sinus, the roof of the left orbit (with a small extension into the orbital cavity), the fovea ethmoidalis,

Figure 3. Cranial MRI, the second follow-up (November 2019). T2-weighted sagittal (A) and coronal (B), T1-weighted post-contrast axial (C), FLAIR axial (D), and T1-weighted post-contrast coronal (E) MRI scans depicting a dural-based homogenously enhancing left frontal mass (white arrow), suggestive of a growth of the residual component, measuring 3.8 × 1.7 × 2 cm.

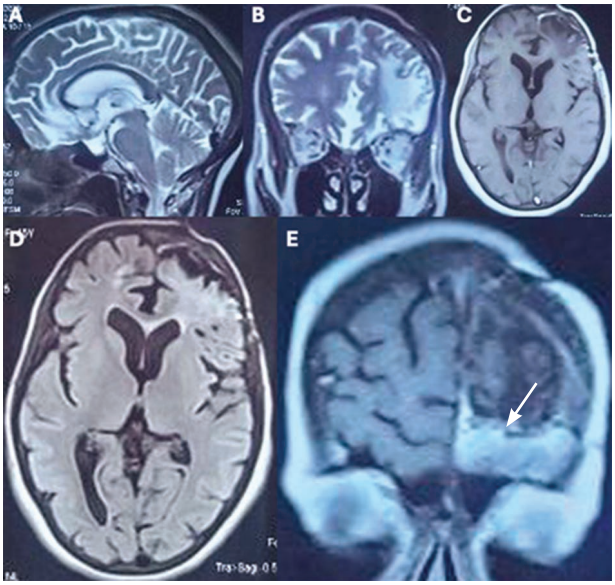
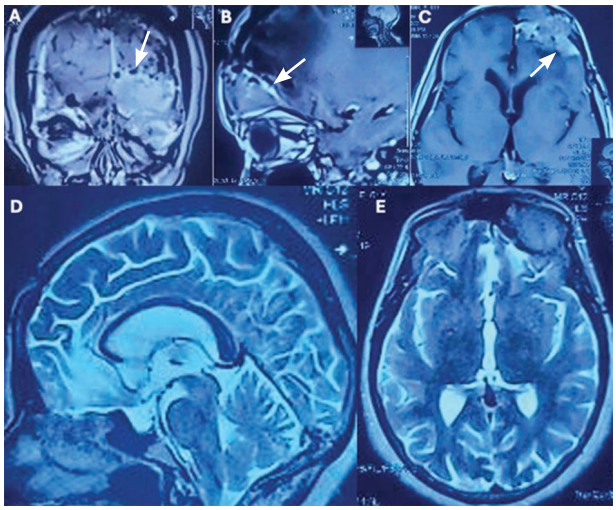


Figure 4. Cranial MRI, the third follow-up (August 2022). T1-weighted post-contrast coronal (A), sagittal (B), and axial (C) MRI, along with T2-weighted sagittal (D) and axial (E) sections depicting left frontal gliosis and dural-based contrast-enhancing mass (white arrows), measuring 4.8 × 3.7 × 2 cm, increased in size when compared to the previous follow-up.



and the olfactory bulb. The scans also reveal significant bone thickening (hyperostosis) in the frontal bone and damage to the bone itself. The mass is causing moderate fluid buildup in the surrounding tissue (vasogenic edema) and compressing the left lateral ventricle, resulting in a slight midline shift of about 3–4 mm. At this last follow-up, given the increasing size of the lesion, the

Figure 5. Cranial MRI, the fourth follow-up (March 2023). T1-weighted post-contrast axial (A), sagittal (B), and coronal (C) MRI scans, along with a T2-weighted sagittal section (D), depicting a dural-based contrast-enhancing left frontal mass (white arrows), measuring 5 × 4 × 2.6 cm, increased in size when compared with the previous follow-up.

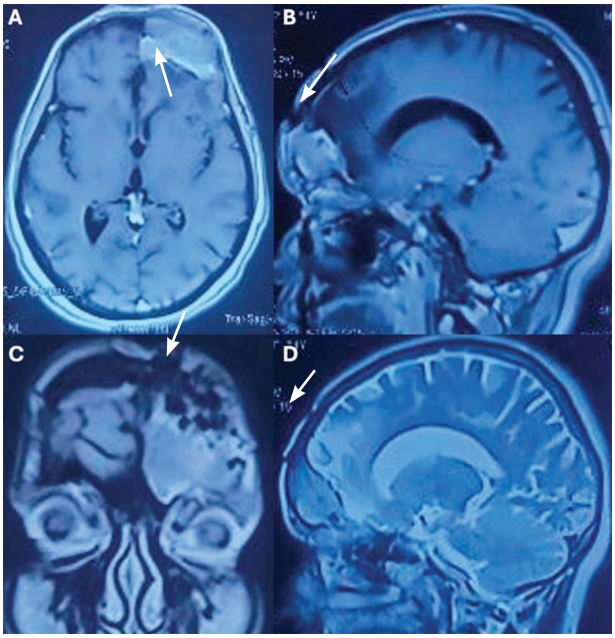
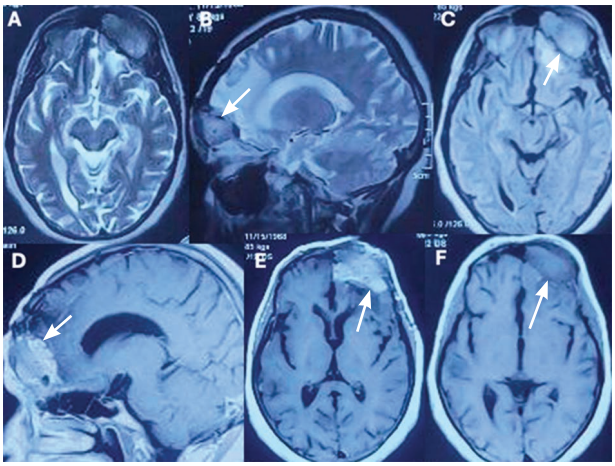
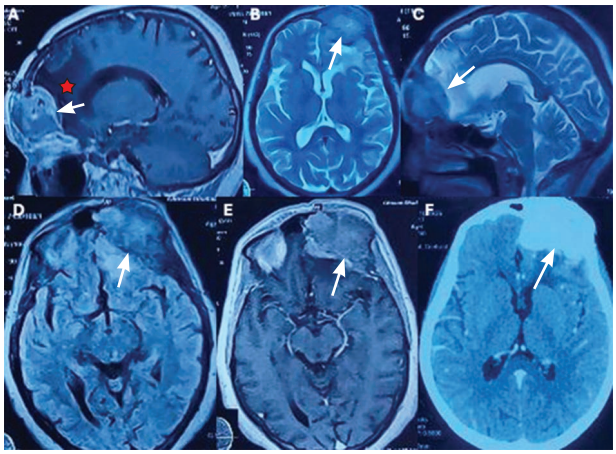


Figure 6. Cranial MRI, fifth follow-up (November 2023). T2-weighted axial (A) and sagittal (B), FLAIR axial (C), T1-weighted post-contrast sagittal (D) and axial (E), T1-weighted non-contrast-enhanced axial (F) MRI scans depicting a left frontal, homogenous contrast-enhancing lesion (white arrows), not significantly changed in size, when compared to the previous follow-up.



patient was offered surgery but declined for now due to the absence of symptoms; therefore, she continues to be monitored under close radiological surveillance.

Figure 7. Cranial MRI, sixth follow-up (September 2025). T1-weighted, post-contrast sagittal (A), T2-weighted axial (B) and sagittal (C), FLAIR axial (D), T1-weighted post-contrast axial (E) MRI scans and contrast-enhanced CT scan (F) depicting a left frontal lesion (white arrows) and a surrounding edema (red arrow). The lesion measured 5.2 × 3.4 × 4.55 cm, increasing in size compared to the previous follow-up.



DISCUSSION

This case provides a valuable long-term radiological narrative of a recurrent OGM over a six-year period. The initial surgical intervention, performed via a bicoronal subfrontal approach, was effective in achieving significant cytoreduction and alleviating the patient's severe mass effect. However, the presence of a post-operative residual tumor, as seen on the July 2019 MRI, inherently carried a risk of future recurrence.

The pattern of recurrence observed here aligns with established principles in the treatment of meningioma. The Simpson Grading classifies the completeness of resection; the presence of a coagulated dural attachment and residual tumor in our case corresponds to a Simpson Grade II or III resection [12, 16, 17]. It is well-documented that Simpson Grade II/III resections are associated with significantly higher recurrence rates compared to Grade I (complete resection of tumor, dura, and bone) [18]. The residual tumor cells, though initially dormant and stable for over 2 years, retained their proliferative potential, leading to documented regrowth. The recurrent tumor displayed aggressive local behavior, including bone invasion and hyperostosis, features consistent with meningioma progression even in histologically benign tumors. This underscores that the biological behavior of a meningioma is not solely defined by its WHO grade but also by its anatomical interactions and potential for subclinical infiltration [2, 12].

Benign meningioma's have a reported recurrence rate of approximately 7–25% [12, 19, 20]. The findings of Nakasu et al., who evaluated 135 benign meningioma's, including 120 cases

that underwent total removal (Simpson Grade I–III), underscore the importance of long-term follow-up, as demonstrated in our case. In their series, with a median follow-up of 9.7 years (range: 1–21 years), the recurrence rate after total removal was 7.5% at 10 years and 9.3% at 20 years. Similarly, our patient developed a significant recurrence within 6 years, emphasizing that even benign meningioma's can recur despite gross total resection and Simpson Grade I–III removal. Therefore, prolonged radiological surveillance remains essential. Nakasu et al. also showed that not all recurrent or residual tumors received adjuvant treatment; re-treatment rates were 9.8% at 10 years and 25.6% at 20 years [21]. In their cohort, only 5 of the 120 total-removal cases required reoperation, while among the 15 subtotal-removal cases, 6 underwent reoperation and 1 received stereotactic radiosurgery. These findings indicate that management options for recurrent meningioma's generally include stereotactic radiosurgery, observation, or repeat surgery. In our case, surgery was offered upon detection of recurrence; however, the patient declined due to the absence of symptoms and is currently being monitored with continued radiological follow-up.

This case highlights several key management principles. First, the bicoronal subfrontal approach provides excellent visualization and access for de-bulking large OGMs, as demonstrated by the initial successful resection. Second, and more importantly, it highlights the absolute necessity of long-term, close radiological follow-up for patients with meningiomas, particularly when a Simpson Grade I resection is not achieved. The slow growth rate of these tumors means that recurrence may not become clinically apparent for many years, by which time surgical re-intervention may be more complex due to scar tissue and tumor adhesion [13– 30]. Our patient's recurrence was identified radiologically years before it would have likely caused significant new symptoms, allowing for the timely planning of future management. Notably, this case also highlights that even WHO Grade I meningioma's may demonstrate aggressive regrowth when situated in anatomically complex regions or when associated with dural invasion, underscoring the need for careful long-term surveillance [21].

This case report has several limitations. As with all single-patient reports, its findings are not generalizable and cannot define broader patterns of recurrence in OGMs. The available operative notes did not include sufficient intraoperative detail, limiting our ability to describe technical aspects such as bony involvement and dural attachments. Furthermore, the pathology reports lacked additional markers, including Ki-67 and molecular profiling, which would have offered deeper insight into the tumor's biological characteristics. Finally, there was a follow-up gap between 2019 and 2022 due to the patient's noncompliance, and more frequent imaging during this period might have provided a clearer understanding of the tumor's growth trajectory.

CONCLUSIONS

The management of OGMs requires long-term radiological follow-up. While maximal safe resection remains the primary treatment goal, this case highlights that even minimal residual tumor necessitates extended surveillance. Early detection of recurrence enables timely intervention and improves long-term outcomes.

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AI Statement:
Artificial intelligence was used solely for refining grammar and language. No AI-assisted content generation, data interpretation, or scientific analysis was performed.

Informed consent:
The patient provided written informed consent for the publication of this case report and all accompanying images.

Authors' contributions:
All authors contributed equally to the work.

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The authors declare no conflict of interes

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None.

Ethics:
The paper complies with the Helsinki Declaration, EU Directives and harmonized requirements for biomedical journals.