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CASE REPORT **OPEN ACCESS**

A 'DEADLY' BENIGN TUMOR: RAPIDLY FATAL RECURRENCE OF ATYPICAL MENINGIOMA

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ABSTRACT

Background: Meningioma is the most common primary CNS tumor. While most are benign (WHO grade I), approximately 15–20% are grade II (atypical) and 1-2% are grade III (anaplastic), carrying a higher recurrence risk. Rapidly fatal recurrence of grade II meningioma remains infrequently reported, particularly in resource-limited settings such as Indonesia.

Case Report: A 65-year-old woman with a history of atypical meningioma (WHO grade II) resection eight months earlier presented with decreased consciousness, severe headache, projectile vomiting, and left-sided hemiparesis. Due to the unavailability of the operative report and postoperative imaging from the initial procedure, the Simpson grade and extent of resection could not be determined. Non-contrast head CT revealed a recurrent extra-axial mass in the right temporal region with edema and a midline shift of ±15 mm, suggestive of malignant progression. The patient received supportive therapy without reoperation or adjuvant radiotherapy. Despite a transient improvement, the clinical course deteriorated progressively and led to death on day 19.

Discussion: Rapid decompensation is explained by the Monro-Kellie doctrine, whereby the expanding recurrent mass exhausted intracranial compensatory reserve, culminating in fatal herniation. The absence of documented Simpson grade, serial postoperative MRI, adjuvant radiotherapy, and molecular profiling contributed to delayed detection and fatal outcome. Geographic inaccessibility, financial constraints, and low health literacy further impeded surveillance.

Conclusion: Grade II meningioma should not be regarded as benign. A structured surveillance protocol; MRI within 48 hours postoperatively, at 4 months, and annually thereafter, combined with Simpson grade documentation and consideration of adjuvant radiotherapy, is essential to prevent fatal recurrence.

Keywords: atypical meningioma, early recurrence, fatal outcomes, rapid deterioration

Introduction

Meningioma is the most common primary tumor of the central nervous system (CNS), accounting for approximately 36–40% of all primary CNS tumors, with an estimated incidence of about 7.86 cases per 100,000 persons per year.[1,2] These tumors originate from arachnoid cells on the inner surface of the dura mater and may arise at intracranial, spinal, or ectopic sites. Risk factors include age, female sex, genetic predisposition, hormonal exposure, and radiation.[1–3] Most meningiomas (80-85%) are classified as World Health Organization (WHO) grade I and exhibit slow growth with minimal symptoms; however, 15–20% are grade II (atypical) and 1-2% are grade III (anaplastic), which demonstrate more aggressive behavior and a higher risk of recurrence.[1] The 2021 WHO classification increased the prevalence of grade II meningiomas to 20–30% based on molecular criteria,

with reported five-year recurrence rates of up to 50% for grade II and 90% for grade III tumors.[3]

Recent evidence suggests that atypical meningiomas may demonstrate aggressive biological behavior associated with molecular alterations, including TERT mutations, which are linked to increased recurrence risk and poorer clinical outcomes.[3–5] The European Association of Neuro-Oncology (EANO) guideline also emphasizes that WHO grade II meningiomas require closer postoperative monitoring because of their significantly higher recurrence potential compared with grade I tumors.[5] Prognosis is influenced by histological grade, extent of resection (Simpson grading), tumor size and location, and patient age. In grade I meningiomas, five-year recurrence rates after gross total resection range from 0–2.36%, increasing to 7.35–11.46% in grade II tumors, even after subtotal resection.[3] Therefore, long-term postoperative surveillance with serial imaging is essential.[1,3] The extent of surgical resection, commonly assessed using the Simpson grading system, remains an important prognostic factor for tumor recurrence. EANO recommendations suggest that postoperative MRI should ideally be performed within 48 hours after surgery to confirm the extent of resection and establish a radiological baseline for future surveillance.[5]

Although meningiomas are frequently regarded as benign tumors, atypical meningiomas may exhibit aggressive behavior characterized by rapid recurrence, progressive neurological deterioration, and fatal outcomes.[2,6] Rapidly fatal recurrence of atypical meningioma, however, remains infrequently documented in the literature, partly due to the poorly characterized natural history of repeated recurrences beyond the initial episode, short follow-up durations in most published cohorts, and heterogeneity in reporting standards across institutions.[6–8] Delayed recurrence detection and inconsistent postoperative follow-up may further contribute to poor clinical outcomes in high-risk patients.[9] This case report describes a rapidly fatal recurrence occurring approximately eight months after initial surgery, emphasizing the importance of structured postoperative imaging, documentation of resection extent, and timely multidisciplinary management.

Case Report

A 65-year-old woman presented to the emergency department with decreased level of consciousness for one day. Prior to admission, she had experienced a severe headache for four days accompanied by projectile vomiting and left-sided weakness. A similar episode had occurred eight months earlier; however, the current symptoms were more severe. The patient had a history of brain tumor resection in December 2024, with histopathological findings consistent with atypical meningioma WHO (Grade II). The initial surgery was performed at a neurosurgical referral center in Jakarta, as the local hospital did not have neurosurgical capability. Following the procedure, the patient returned to her place of origin. At the time of the current admission, no operative report or complete surgical records from the initial procedure were available; the extent of resection and Simpson grade could therefore not be determined. The only documentation available from the prior hospitalization consisted of preoperative scan images and the histopathological report confirming WHO Grade II atypical meningioma. Following surgery, she was able to resume normal daily activities. Family history revealed that her younger sibling had died due to a brain tumor, and the patient had a history of chronic charcoal smoke exposure.

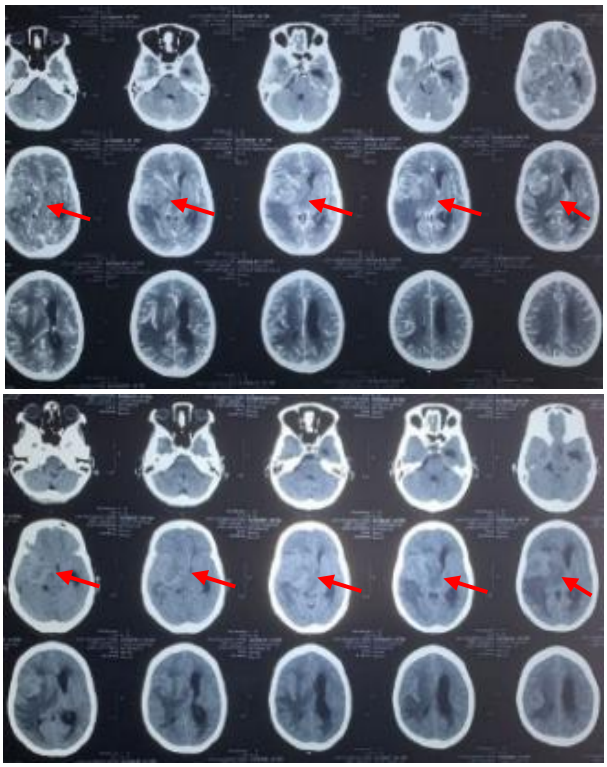

Figure 1. Preoperative contrast-enhanced head scan (December 2024) showing an extra-axial mass in the right temporal region (red arrow) prior to the first surgical intervention

Initial examination revealed a critically ill condition with a Glasgow Coma Scale (GCS) score of E1V1M2. Vital signs showed blood pressure of 156/105 mmHg, heart rate of 112 beats per minute, respiratory rate of 22 breaths per minute, body temperature of 36.9 °C, and oxygen saturation of 87%. Neurological examination demonstrated isochoric pupils with intact light reflexes, left-sided motor lateralization, and central-type paresis of the left facial (VII) and hypoglossal (XII) nerves, without other focal neurological deficits. The patient received intensive supportive and neuroprotective management. The head was positioned at a 30° head-and-trunk elevation. Oxygen therapy was administered at 8 L/min via face

mask. Intravenous fluids consisted of 0.9% sodium chloride (NaCl) at 1000 mL/24 hours, along with correction of hypokalemia using potassium chloride (KCl) 25 mEq diluted in 500 mL of 0.9% NaCl over 24 hours.

Pharmacological therapy included intravenous omeprazole 40 mg every 12 hours and sucralfate syrup 10 mL every 8 hours for gastrointestinal mucosal protection, citicoline 1 g every 12 hours as neuroprotective support, an initial bolus of dexamethasone 10 mg followed by a maintenance dose of 5 mg every 8 hours, and an initial bolus of mannitol 200 mg followed by maintenance infusion of 600 mL every 6 hours to reduce cerebral edema. Analgesia was provided with intravenous paracetamol 1 g every 8 hours and ketorolac injection 30 mg every 12 hours. Valsartan 80 mg orally once daily was administered as antihypertensive therapy if systolic blood pressure exceeded 140 mmHg. The patient was kept nil per os initially, with enteral nutrition provided via nasogastric tube at 150 mL every 4 hours when gastric residuals were clear.

On the second day of hospitalization, the patient's neurological condition improved, with a GCS score of E3V4M6. She was able to follow simple commands, with residual neurological deficits in the form of decreased sensation in the left upper extremity. Laboratory evaluation revealed recurrent hypokalemia despite corrective therapy. A non-contrast head computed tomography scan performed on day six demonstrated an extra-axial mass in the right temporal region at the site of the previous surgery, suspicious for malignant meningioma, accompanied by extensive perilesional edema and significant mass effect causing approximately 15 mm of leftward midline shift.

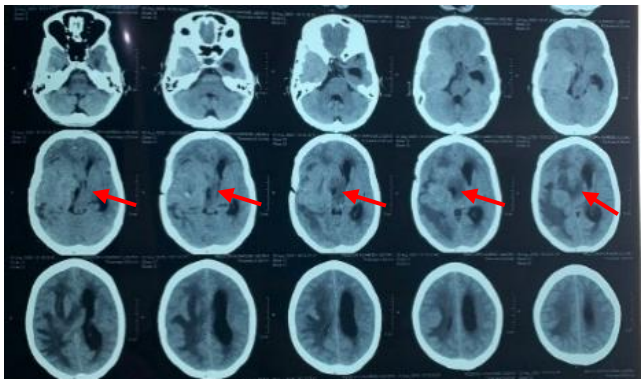

Figure 2. Non-contrast head scan (August 2025) demonstrating a recurrent extra-axial lesion in the right temporal region (red arrow) with extensive perilesional edema and an approximately 15-mm midline shift, consistent with suspected malignant meningioma

The subsequent clinical course was marked by sharp fluctuations. On hospital day eight, the patient experienced neurological deterioration characterized by loss of eye contact, involuntary movements of the right fingers, and a GCS score of E3V2M5. Phenytoin infusion was initiated at a dose of 100 mg every 8 hours. On day ten, clinical improvement was observed; the patient was able to respond to simple questions, and the GCS improved to E3V5M6. The doses of mannitol and dexamethasone were gradually tapered to 100 mL every 5 hours and 5 mg every 12 hours, respectively.

On day fourteen, the patient experienced sudden and marked deterioration, progressing to coma (GCS E1V1M5) with recurrent vomiting and dark-colored aspirate from the nasogastric tube (NGT), raising suspicion of upper gastrointestinal bleeding. Management was modified with the addition of intravenous ceftriaxone 2 g once daily, ondansetron 4 mg every 12 hours, tranexamic acid 500 mg every 8 hours, and sucralfate 15 mL every 6 hours. Omeprazole was administered as an 80 mg intravenous bolus followed by 40 mg every 12 hours. Mannitol was reduced to 100 mL every 12 hours, the patient was kept nil per os, and gastric lavage was performed every 4 hours.

On day eighteen, the patient again exhibited decreased consciousness (GCS E1V1M4) accompanied by left-sided oculomotor (III), facial (VII), and hypoglossal (XII) nerve palsies, progressive hemiparesis, and recurrent hypokalemia on laboratory evaluation. Additional therapy included potassium chloride infusion 25 mEq every 24 hours and oral acetazolamide 250 mg every 12 hours. Despite comprehensive medical management, the patient's condition continued to deteriorate, and on day nineteen, she developed oxygen desaturation and was pronounced deceased.

Discussion

Meningioma is the most common primary intracranial tumor, accounting for approximately 20–40% of all primary CNS neoplasms, with an estimated incidence ranging from 6.59 to 7.86 cases per 100,000 population per year.[1–3] The incidence increases with advancing age, peaking after 60 years, and shows a female predominance with a female-to-male ratio of approximately 3:2.[8] Identified risk factors include age, female sex, genetic predisposition, hormonal exposure, and environmental factors such as radiation and pollutants.[1–3] In the present case, the patient was a 65-year-old woman with a family history of brain tumors and long-term exposure to charcoal smoke, all of which align with established meningioma risk profiles.

Multivariate studies have demonstrated that clinical onset with symptoms of intracranial hypertension increases the risk of recurrence by up to eightfold, while tumor locations such as the petroclival region are associated with lower recurrence-free survival.[2] In our patient, the recurrent lesion was located in the right temporal region; although this is not a complex

petroclival location, the substantial tumor burden and extensive perilesional edema produced a degree of mass effect that is clinically comparable in terms of poor prognostic risk. This is reflected in the patient's manifestations of severe headache, projectile vomiting, and focal neurological deficits, which are classic signs of elevated intracranial pressure. These findings are consistent with a retrospective report from Indonesia, in which female patients predominated in the recurrence group (81%), and most had a good preoperative Karnofsky Performance Scale (KPS) score (>70), yet still experienced tumor recurrence.[3]

The 2021 WHO classification categorizes meningiomas into three grades: grade I (benign), grade II (atypical), and grade III (anaplastic/malignant), incorporating both histopathological and molecular criteria. The majority of meningiomas (80-85%) are grade I, whereas grade II accounts for approximately 15–20%, and grade III for about 1–2%.[1,2,8] Grade II and III meningiomas exhibit more aggressive clinical behavior, including faster growth rates, a greater tendency for brain invasion, and a higher risk of postoperative recurrence.[3] In the present case, non-contrast head CT revealed findings described as "suspected malignant meningioma," characterized by a recurrent extra-axial mass in the right temporal region at the previous surgical site, associated with extensive perilesional edema and a 15-mm leftward midline shift. These findings are consistent with an imaging-based suspicion of aggressive tumor behavior, although definitive grading still requires histopathological and immunohistochemical confirmation.

The rapid neurological deterioration observed in this patient can be mechanistically explained through the Monro-Kellie doctrine, a foundational principle of intracranial physiology first synthesized by Harvey Cushing from the earlier observations of Alexander Monro, George Kellie, and George Burrows.[11,12] In its classic formulation, the doctrine states that within the rigid, fixed-volume cranial vault, the total combined volume of brain parenchyma, blood, and cerebrospinal fluid (CSF) must remain constant; therefore, any pathological increase in the volume of one component must be offset by a reciprocal reduction in the others.[11,12] The primary compensatory mechanisms available are the displacement of venous blood from the intracranial compartment and the translocation of CSF into the spinal subarachnoid space.[11] However, as Stein et al. (2023) emphasized, this compensatory reserve is inherently limited: once it becomes exhausted, even a small additional increase in intracranial volume can produce a steep and disproportionate rise in intracranial pressure (ICP).[13] This critical point of decompensation marks the transition from a compensated to a decompensated state, beyond which cerebral herniation, brainstem compression, and cardiorespiratory failure become imminent.[12]

In the present case, the recurrent extra-axial mass in the right temporal region, associated with extensive perilesional edema and a 15-mm leftward midline shift on non-contrast CT, represents precisely this scenario of exhausted compensatory reserve. The expanding tumor mass progressively displaced the compensatory venous blood pool and the available CSF buffer, eventually overwhelming the intracranial adaptive capacity. The resulting severe intracranial hypertension, reflected clinically by progressive coma, ipsilateral oculomotor nerve palsy, progressive hemiparesis, and ultimately cardiorespiratory arrest, follows the cascade predicted by the Monro-Kellie doctrine when all compensatory mechanisms are depleted.[11,13] Recent conceptual updates to this doctrine, referred to as Monro-Kellie 4.0, further emphasize that intracranial decompensation should be understood not merely as a threshold phenomenon based on static ICP values, but as a dynamic failure of cerebrovascular autoregulation and intracranial compliance, which compounds the risk of secondary brain injury in cases with large space-occupying lesions.[12] In this patient, the absence of ICP monitoring, surgical decompression, or any intervention to restore compensatory reserve meant that the intracranial compartment progressively approached and surpassed the critical closing pressure of cerebral perfusion, resulting in a fatal outcome.

These radiological findings are consistent with reports in the literature indicating that atypical meningiomas may rapidly progress to anaplastic forms, particularly when the recurrence interval is less than one year.[7,8] In the study, tumor recurrence was observed in 28.8% of surgically treated patients, with a mean recurrence-free interval of only 17.95 months.[3] This finding is consistent with our case, in which tumor recurrence occurred within less than one year. Notably, grade II meningiomas demonstrated a significantly high recurrence rate (39.6%), with mortality due to recurrence reaching 11.1%.[3] These data reinforce that, despite being classified as "atypical," grade II meningiomas exhibit aggressive biological behavior and should not be underestimated. Consistent evidence indicates that recurrence within ≤1 year is a strong predictor of rapid progression and high mortality, as observed in this patient.[3,7]

Multiple studies have shown that the risk of recurrence is influenced by histopathological factors (WHO grade), tumor location, extent of resection based on Simpson grading, and the use of adjuvant radiotherapy.[2,8] Retrospective and multicenter studies have reported recurrence rates of 20–25%, which increase sharply in patients undergoing subtotal resection (Simpson grades III–V, up to 70%)

compared with those receiving gross total resection (6–8%).[1,3,8] A critical quality-of-care issue highlighted by this case is the absence of documented Simpson grading in the available surgical records. The Simpson grading system, first described in 1957, classifies the extent of meningioma resection into five grades based on the completeness of tumor removal and management of the dural attachment: Grade I (complete resection including dural origin), Grade II (complete resection with coagulation of the dural origin), Grade III (complete intradural resection without dural management), Grade IV (subtotal resection), and Grade V (biopsy or decompression only).[14] Simon and Gousias demonstrated in a series of 901 consecutive patients that the Simpson grade directly correlates with recurrence-free survival, with a Simpson Grade II resection more than doubling the 10-year recurrence risk compared to Grade I (18.8% vs. 8.5%); this difference was substantially larger in WHO grade II tumors, where all studies consistently describe a marked impact of the extent of resection on recurrence rates.[14]

From a neuro-oncological quality-of-care perspective, failure to document the Simpson grade in an operative report represents a significant lapse. Inoue et al. (2023), in a retrospective review of 245 meningioma resections, demonstrated that the extent of resection, objectified by postoperative MRI within 48 hours, was the only independent risk factor for early recurrence (OR 11.4; 95% CI 3.54–36.0; $p < 0.0001$), underscoring that surgical documentation must be complemented by objective radiological confirmation, not solely by the surgeon's intraoperative judgment.[15] Simon and Gousias further noted that the Simpson grading scheme is inherently subjective when based on intraoperative assessment alone, particularly in deep-seated tumors, and advocated for integrating postoperative imaging and, where available, somatostatin receptor PET scanning to objectively verify resection extent.[14] In the present case, the absence of both the operative report and any postoperative MRI precluded determination of the Simpson grade, depriving the treating team of the single most clinically actionable predictor of recurrence risk. This experience reinforces the recommendation that documentation of Simpson grade should be treated as a mandatory quality-of-care metric in every neurosurgical report for meningioma, analogous to resection margin documentation in oncological surgery of other organs.

The absence of postoperative MRI surveillance in this patient over the eight-month interval between initial surgery and the current presentation reflects a multifactorial problem that warrants explicit analysis. Several interacting barriers likely contributed to this failure of follow-up. First, geographic access is a significant structural constraint in Indonesia, where neurosurgical care is concentrated at referral centers in major urban areas; this patient underwent her initial surgery at a referral center in Jakarta but subsequently returned to her region of origin, where access to MRI facilities and to the neurosurgical team that performed the procedure was limited. This mirrors the findings, who identified that not all patients in their Indonesian cohort underwent routine postoperative MRI, which they attributed in part to facility limitations and geographic disparities in healthcare access.[3]

Second, the financial dimension cannot be overlooked. In Indonesia, the national health insurance scheme (Jaminan Kesehatan Nasional/BPJS Kesehatan) theoretically covers MRI for specific indications; however, coverage is often subject to referral mechanisms, administrative approvals, and regional availability of MRI equipment, all of which can create practical barriers for patients returning to peripheral facilities following care at a tertiary center.[16,17] . Although Indonesia has one of the world's largest single-payer national health insurance systems, insurance registration does not necessarily translate into effective coverage when health services are not locally available, and lack of service availability remains a major constraint on service use, insurance claims, and out-of-pocket spending.[17] Early postoperative MRI within 48 hours has been shown to be feasible and clinically valuable as a baseline for recurrence surveillance, but institutional protocols, resource availability, and patient stability must all align for this to be achievable routinely.[15] Based on a comparative analysis of 3,982 surgically resected meningiomas across multiple independent studies, Owusu-Adjei et al. proposed an evidence-based surveillance framework specifically for WHO grade II meningiomas: an initial contrast-enhanced MRI within 48 hours of surgery to determine the extent of resection and establish a baseline, followed by a second MRI at 4 months postoperatively to detect rapid regrowth, and annual contrast-enhanced MRI indefinitely thereafter, given that recurrence rates for grade II meningiomas remain elevated well beyond 5 years of follow-up and do not plateau as observed in grade I tumors.[10] In resource-limited settings, even when MRI is physically available, the cost of repeated serial imaging, particularly at 6-month to 12-month intervals as recommended by EANO guidelines may represent a prohibitive out-of-pocket burden if insurance reimbursement is incomplete or delayed.[6]

Third, patient awareness and health literacy represent an equally important yet often underappreciated barrier to follow-up adherence. Patients who experience meaningful clinical improvement following surgery, as observed in this case, where the patient resumed normal daily activities within weeks of the procedure, may not perceive

themselves as requiring ongoing surveillance, particularly in the absence of explicit post-discharge counseling regarding recurrence risk and the necessity of serial imaging. This is especially problematic for grade II meningiomas, where the interval between surgery and symptomatic recurrence may span months, during which the patient appears and feels functionally well. In Indonesia, evidence indicates that many patients remain unaware of their entitlements under the national insurance system and of the importance of specialist follow-up, a problem compounded by low health literacy in peripheral and rural populations.[16,18] This challenge is further exacerbated by the documented shortage of specialist physicians outside major urban centers, where provincial and regional hospitals frequently lack the subspecialty workforce necessary to provide ongoing post-operative surveillance and to reinforce the importance of compliance with serial imaging protocols, a gap that is particularly consequential for patients with high-risk tumors such as grade II meningioma who require long-term specialist-guided follow-up.[18] In this patient's case, the combination of geographic relocation following surgery, the absence of a structured discharge plan linking her to a local follow-up provider, and the lack of awareness regarding recurrence risk likely converged to produce the eight-month gap in surveillance that preceded her fatal deterioration.

Early multidisciplinary reassessment is essential when a WHO grade II meningioma recurs within a short interval, particularly when recurrence is accompanied by mass effect and neurological deterioration. According to the updated EANO guideline, surgical resection remains the first therapeutic option for growing or symptomatic meningiomas, as it provides both decompression of mass effect and tissue confirmation for histopathological and molecular reassessment.[6] When complete resection is not feasible because of tumor location, patient condition, or surgical risk, radiosurgery or fractionated radiotherapy may be considered as complementary or alternative treatment strategies.[6] In the present case, the recurrent lesion appeared within eight months after the initial surgery and was associated with extensive perilesional edema, a marked midline shift, and progressive decline in consciousness. These findings should be regarded as red flags requiring urgent neuro-oncological review, contrast-enhanced MRI when feasible, and early discussion among neurosurgery, radiation oncology, neurology, and radiology teams. Unfortunately, by the time of presentation, the patient's critical neurological condition and limited local resources narrowed the therapeutic window, resulting in management being restricted to supportive therapy.

Management in this case was limited to supportive therapy without repeat surgical intervention or adjuvant RT, reflecting the constraints imposed by the patient's critical condition at presentation. However, current evidence and international guidelines provide important clarification regarding the threshold at which adjuvant radiotherapy becomes necessary for WHO grade II meningiomas, a point directly relevant to this case. EANO and the National Comprehensive Cancer Network (NCCN) both recommend RT following subtotal resection of WHO grade II meningiomas, and advise consideration of RT even following gross total resection.[6,19]

Additional comparative evidence further supports early consideration of adjuvant RT rather than passive surveillance in atypical meningioma. In a cohort of 230 patients with resected atypical meningioma, Lee et al. reported that upfront adjuvant RT was independently associated with a lower risk of progression or recurrence compared with surveillance (HR 0.21; 95% CI 0.11–0.41), and that patients initially managed with surveillance who later required salvage RT had a shorter median time to local progression after RT than those treated with upfront RT (19 vs. 64 months).[20] Similarly, a systematic review and meta-analysis of 30 studies involving 2904 patients found that adjuvant RT after gross total resection significantly reduced local recurrence compared with observation (OR 0.50; 95% CI 0.36–0.68) and improved progression-free survival across multiple follow-up intervals, although no overall survival benefit was demonstrated.[21] These findings are directly relevant to the present case, in which the absence of postoperative MRI and unknown Simpson grade prevented accurate postoperative risk stratification and may have delayed referral for adjuvant therapy.

This consensus is supported by prospective evidence from EORTC 22042-26042, in which WHO grade II meningioma patients with Simpson grade I–III resection received postoperative high-dose RT of 60 Gy and achieved an estimated 3-year progression-free survival of 88.7% and 3-year overall survival of 98.2%.[22] Nevertheless, the threshold for RT after gross total resection remains debated. A large multicenter cohort of 1,452 WHO grade II meningioma patients reported a consistent reduction in recurrence risk after adjuvant fractionated RT among subtotal resection patients, whereas recurrence risk estimates after gross total resection were inconsistent and did not show robust evidence of benefit.[23] Therefore, for patients undergoing subtotal or incomplete resection, particularly Simpson grades IV–V, adjuvant fractionated RT is generally favored because residual disease confers a high recurrence risk.[19,22–24] In contrast, for patients achieving gross total resection, commonly Simpson grades I–III, both

a "wait-and-see" approach with close MRI surveillance and early adjuvant RT remain acceptable strategies, with the choice ideally individualized according to recurrence risk, extent of resection, Ki-67 index, molecular features, patient age, and feasibility of reliable follow-up.[19–21,23,25]

Evidence from high-risk meningioma cohorts further reinforces this concern. In the high-risk arm of NRG Oncology/RTOG 0539, high-risk disease included recurrent WHO grade II meningioma of any resection extent and newly diagnosed WHO grade II meningioma after subtotal resection. Patients treated with postoperative IMRT to 60 Gy in 30 fractions achieved a 3-year progression-free survival of 58.8%, local control of 68.9%, and overall survival of 78.6%.[24] Although outcomes remained suboptimal, these data support postoperative radiotherapy as an important component of management in recurrent or incompletely resected grade II meningiomas. In the present patient, recurrence within eight months, extensive edema, and a 15-mm midline shift represented a high-risk clinical phenotype that should have prompted urgent reassessment for repeat surgery, radiotherapy, or combined multimodal treatment before neurological decline became irreversible.

This case provides an important clinical lesson. Grade II meningiomas should not be regarded as benign entities but rather as tumors with aggressive biological behavior requiring proactive, multidisciplinary management.[1,2] The absence of documented Simpson grading, serial MRI evaluations, and histopathological and molecular profiling (e.g., MIB-1, p53, ATRX, TERT, 1p/14q) limits the ability to determine whether the recurrence represented aggressive behavior or malignant transformation; repeat histopathological and molecular evaluation is strongly recommended to guide appropriate multimodal therapy.[1,8] Molecular alterations including TERT promoter mutations, chromosome 1p/14q loss, and specific DNA methylation profiles are strongly associated with early recurrence and poor prognosis, surpassing the predictive accuracy of WHO grading alone.[1]

Recent molecular evidence also suggests that postoperative decision-making in meningioma should no longer rely solely on WHO grade and anatomical extent of resection. Nassiri et al. demonstrated that gross total resection was associated with longer progression-free survival across molecular groups, while treatment of the dural margin, corresponding to Simpson grade I/II, prolonged progression-free survival compared with complete macroscopic tumor removal without dural treatment, corresponding to Simpson grade III.[25] Moreover, molecular group classification predicted response to radiotherapy and provided information beyond standard clinicopathological classification.[25] This finding supports the clinical importance of documenting Simpson grade, confirming resection extent with early postoperative MRI, and pursuing molecular profiling whenever feasible, particularly in recurrent WHO grade II meningiomas with unexpectedly rapid progression.

Unfortunately, molecular testing could not be performed for this patient due to limitations in facility availability and financial constraints, leaving this biological dimension unexplored. This case reinforces that grade II meningiomas exhibit aggressive biological behavior and require a multidisciplinary approach with strict surveillance. Recurrence within less than 12 months accompanied by a significant midline shift should serve as a red flag prompting urgent evaluation with contrast-enhanced MRI, consideration of radiotherapy or radiosurgery, and, when feasible, repeat histopathological and molecular confirmation. From a systems perspective, this case highlights the urgent need for structured postoperative surveillance protocols in Indonesian neurosurgical practice, mandatory Simpson grade documentation in operative reports, and advocacy for expanded BPJS (Indonesian Mandatory Healthcare & Social Security) coverage of serial brain MRI in high-risk neuro-oncological patients; measures that, taken together, may prevent similarly fatal outcomes in the future.[9,10,16,18]

Conclusion

Grade II meningiomas should not be considered benign, as they exhibit aggressive biological behavior with a high risk of recurrence and malignant transformation. This case demonstrates that early recurrence occurring within less than 12 months after surgery, manifesting as a recurrent extra-axial mass with extensive perilesional edema and significant midline shift, can lead to rapidly fatal outcomes even in patients with initially good functional status. Delayed recurrence detection resulting from the absence of structured postoperative imaging surveillance, the lack of adjuvant radiotherapy, and the inability to perform repeat histopathological and molecular evaluation were the dominant factors contributing to the fatal clinical deterioration observed in this patient.

Based on current evidence, a structured postoperative surveillance protocol for WHO grade II meningiomas should include: contrast-enhanced MRI within 48 hours of surgery to confirm the extent of resection and establish a radiological baseline; a follow-up MRI at 4 months to detect early rapid regrowth; and annual MRI indefinitely thereafter. Simpson grade documentation must be treated as a mandatory surgical quality metric, adjuvant

radiotherapy should be considered when resection is subtotal or molecular high-risk features are present, and molecular profiling should be pursued whenever resources permit. This case underscores the paradox of the "deadly benign tumor"; when not adequately surveilled and proactively managed, a grade II meningioma carries a mortality risk that belies its histological designation.

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Declaration of Interests

The authors declare that there are no financial interests, personal relationships, or affiliations that could have influenced the work reported in this manuscript. This case report was conducted without any commercial or financial support that could be construed as a potential conflict of interest. All authors have contributed significantly to the preparation of this manuscript and approve the final version for publication.

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