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Case Report

Unveiling an atypical meningioma amidst stroke symptoms: importance of accurate diagnosis and comprehensive follow-up: A case report☆,☆☆,★

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ABSTRACT

Meningiomas are common brain tumors that are classified as either benign, atypical, or malignant. This case involves a 75-year-old woman with a medical history of ischemic heart disease, hypertension, and diabetes. She was diagnosed with an atypical meningioma while being evaluated for symptoms related to a stroke. Upon her presentation at the hospital, the patient displayed symptoms such as loss of motor function on the right side of her body, weakness, dysphagia, and aphasia, indicating a possible stroke. Imaging tests confirmed both the stroke symptoms and the presence of an atypical meningioma. The primary focus of her treatment was addressing the stroke symptoms. Despite being asymptomatic for the meningioma, the patient opted for conservative treatment and declined invasive procedures. Her decision was respected, and a plan was put in place for regular monitoring and counseling regarding the meningioma. This case emphasizes the significance of tailored treatment decisions in complicated clinical situations involving incidental brain tumors.

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Introduction

Meningiomas are tumors that originate from specific cells of the central nervous system known as arachnoid cap cells. These tumors make up around 15%-25% of all brain tumors. The majority of meningiomas are noncancerous, but some can display aggressive behavior. In the revised 2016 WHO classification, meningiomas are categorized into grades I to III [1,2]. Grade I include benign meningiomas, Grade II

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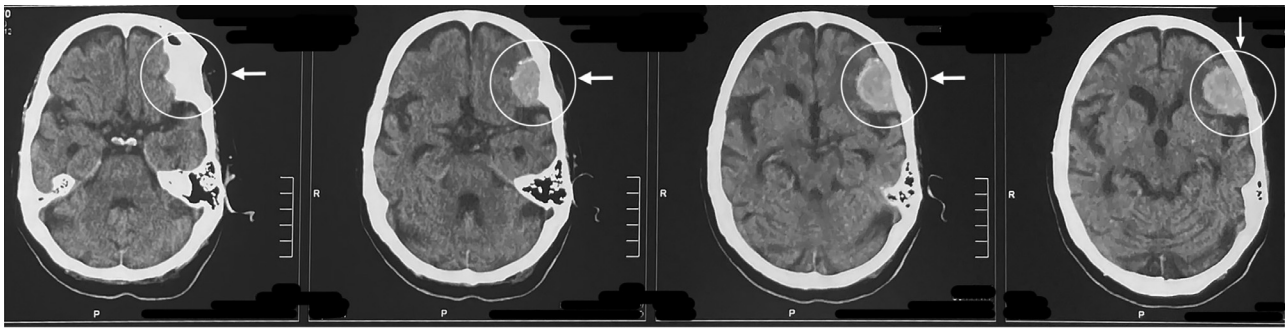

Fig. 1 – A plain CT scan of the brain demonstrated a hyperdense lesion in the left frontoparietal region, with calcified foci in its medical rim.

includes atypical meningiomas and Grade III includes malignant meningiomas. Histological subtypes such as clear cell and atypical meningiomas are classified as Grade II. Atypical meningiomas have a higher likelihood of recurrence and mortality compared to benign meningiomas.

Atypical meningiomas are considered to have intermediate aggressiveness. These are brain lesions that are diagnosed upon fulfillment of 1 of 2 major criteria (4–19 mitotic figures/10 high power fields or Brain invasion) or fulfillment of 3 of 5 minor criteria (Increased cellularity, small cells with a high N/C ratio, Large and prominent nucleoli, pattern-less or sheet-like growth (loss of lobular architecture), Foci of spontaneous or geographic necrosis) [3]. These tumors represent a common type of adult primary intracranial neoplasms and exhibit unique histological features, cytogenetics, and epigenetics. While many meningiomas do not cause symptoms, some can lead to issues based on their size and location, including headaches and problems with balance. Risk factors for meningiomas include age, sex, ethnicity, family history, genetic variations, and certain medical conditions like Turner's syndrome and neurofibromatosis 2 [4]. The type of surgical removal required for treatment depends on the grade of the meningioma, with Simpson Grades I-III considered as gross total resection and Grades IV-V as subtotal resection [5]. Adjuvant radiation therapy is typically advised for atypical meningiomas after a partial removal, but its necessity for completely removed atypical meningiomas is a topic of debate. Here, we discuss the situation of a 75-year-old woman whose brain CT scan and MRI revealed a mass outside the brain with frontal bone involvement in the left frontoparietal area. Despite the presence of this mass, invasive treatments were not pursued due to the patient's mild symptoms and her declining any invasive procedures. This particular case has been documented in accordance with the SCARE guidelines [6].

Case presentation

A 75-year-old woman who was known to have diabetes and hypertension and, presented to the emergency room with a complaint of sudden onset right-sided weakness and motor dysfunction in upper and lower limbs, dysphagia, and aphasia for past 6 hours. Additionally, she was known to have ischemic heart disease in the past. She suffered from a recent episode of respiratory tract infection and began taking macrolide antibiotics as prescribed by her primary care physician, At the time of presentation, the patient's blood pressure, pulse, and temperature were all 180/90 mmHg, 98 F, and 24 breaths per minute, respectively. She had normal blood sugar levels.

All baseline investigations including complete blood counts, C-reactive proteins, liver function tests, and CHEM 7 were ordered. Since she has a history of ischemic heart disease, tests such as pro-BNP, troponin-I, CK-MB, clotting profile, and ECG were also performed.

The CBC revealed mild microcytic hypochromic anemia and mild neutrophilia. The ECG revealed an anterior myocardial infarction with abnormal Q waves (V3, V4). C-reactive protein, CK-MB and troponin I were in the normal range. Pro BNP levels were elevated, which indicates the presence of cardiac dysfunction

Since the patient presented with symptoms suggestive of stroke, a CT scan and an MRI of the brain were ordered. A plain CT scan of the brain demonstrated a hyperdense lesion measuring 3.2×2.3 cm in the left frontoparietal region, with calcified foci in its medial rim. White matter edema was observed in the surrounding left frontoparietal region, along with minimal contralateral midline shift. An additional 7×7 mm calcified round focus was noted abutting the left frontal bone, raising suspicion of invasion by the atypical meningioma. Dilated extra- and intra-cerebral spaces were noted, suggesting an extra-axial lesion presentation. An incidental finding of empty sella was also observed, as shown in Fig. 1.

An MRI of the brain revealed a 3.5 × 2.4 cm extra-axial focus adjacent to the left frontoparietal bones. The lesion appeared isodense to gray matter on T1, hypointense on T2, along with FLAIR, with surrounding white matter edema. A minimal right-sided subfalcine herniation was also observed. A wedge-shaped abnormal signal intensity area was evident on T1, hyperintense on T2, FLAIR, and DWI within the left frontoparietal parasylvian lobes, as evident in Fig. 2.

Ventricles and basal cisterns appeared normal for the patient's age. A partial empty sella was noted. Cerebellopontine angles and orbits were unremarkable, while the paranasal si-

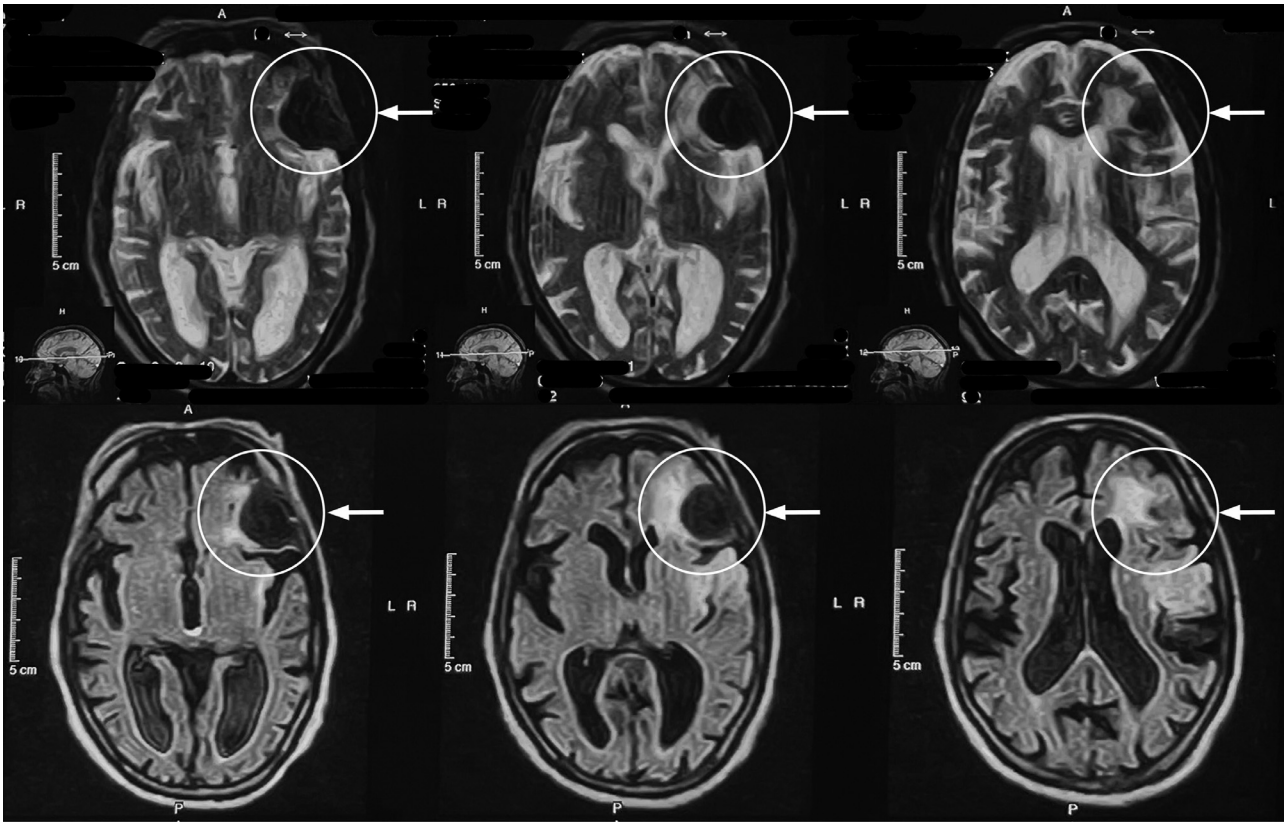

Fig. 2 – MRI of the brain showing an extra-axial focus adjacent to the left frontoparietal bones.

nuses remained intact. Through imaging and clinical examination, the patient was diagnosed with an ischemic stroke in the left middle cerebral artery. An incidental finding of an atypical meningioma was also discovered. As a part of initial management, the patient was started on IV fluids (ringer lactate), omeprazole and Panadol. In addition, to control the elevated blood pressure, IV labetalol was administered. Prophylactically, ceftriaxone was administered to prevent any bacterial infections. IV mannitol was administered to reduce intracranial hypertension. When the systolic BP of 160mm Hg was achieved, permissive hypertension was allowed for 24 hours to allow for effective treatment of the stroke. Afterward, the blood pressure lowered to 140/85 mmHg. The stroke was managed conservatively, and reviewed by medical specialists, a cardiologist, and the neurology department. During her stay in the hospital, she received services from a speech therapist and a dietician as well all aiming towards the stability of the patient.

The incidental finding of atypical meningioma on CT scan and MRI was not supported by any acute or chronic symptoms. Moreover, no invasive procedures for further investigation were employed as she was asymptomatic of the particular condition. Her age and comorbidities made her a poor surgical candidate for invasive procedures. However, given the unique characteristics of the meningioma, it was recommended that it be closely monitored with follow-up imaging to examine its growth and potential treatment choices if it produces any symptoms in the future.

After the management, the patient was hemodynamically stable, with no NG feeding (however, the swallowing was not good yet), and GCS improved to E4M2V6 12/15. Bedside mobilization was carried out by a physiotherapist. The patient was discharged on 16/08/23 with instructions on proper nursing care at home and medications. The medications included Insuget 70/30 (14 units B.D.) for managing diabetes, Loprin 75 mg (O.D.) as a blood thinner, Cipralex 10 mg (H.S.), Myocardin 250 mg (T.D.S.) for better cardiac and smooth muscle functioning, Spiromide 40/50 mg (O.D.) for its diuretic effects, Nitromint 2.6 mg (B.D.) for prevention of angina and treatment of congestive heart failure, Thyroxin 50 mg (O.D), Eskem 40 mg (O.D.) as a PPI, Co-Eziday 50/12 mg (O.D.) for treating hypertension, and Lipiget 10 mg (H.S.) for treating hyperlipidemic conditions.

Discussion

Meningiomas are the most commonly occurring primary brain tumors that originate from the meninges. Atypical meningiomas, a specific subtype of meningiomas, are typically non-cancerous growths that develop from the arachnoid cap cells of the meninges, which are protective layers that cover the brain and spinal cord. The ratio of male to female diagnosis is 3:2 in this condition [7]. Symptoms of meningiomas vary depending on their location in the brain. Some individu-

als may not experience any symptoms if the tumor is small or located in a less critical area. However, symptomatic meningiomas can manifest as headaches, seizures, hearing problems, coordination difficulties, or numbness. In imaging studies such as CT scans, meningiomas appear as well-defined masses. In an unenhanced CT scan, they are depicted as an extra-axial mass with a dense appearance, potentially showing features like calcifications, edema, and bleeding [8]. On MRI scans, meningiomas typically appear as lobular or well-defined masses. These tumors can also spread to neighboring areas like the bones, orbits, or sinuses. In terms of signal intensity, meningiomas usually show similar to slightly less intense signals compared to gray matter on T1-weighted sequences, and similar to slightly more intense signals on T2-weighted sequences [9]. The grading of meningiomas plays a crucial role in determining treatment and predicting outcomes. The Simpson grading system, established in 1957, categorizes meningiomas into different grades based on the extent of surgical resection. Grade I involve the complete removal of the tumor along with its dural attachment. Grade II entails excising the tumor and treating the dural connection to prevent recurrence. Grade III signifies complete tumor removal without addressing the dural attachment, increasing the risk of recurrence. Grade IV indicates subtotal resection with visible tumor remnants that might be visible or palpable [10]. Symptomatic meningiomas require different treatment approaches based on histological findings obtained through a biopsy and tumor grade assessment. The preferred treatment for symptomatic meningiomas is surgical resection [11]. Depending on the situation, either gross total resection or subtotal resection may be performed, followed by postoperative radiotherapy, although its efficacy after subtotal resection remains controversial [12]. Various genes have been identified as potential targets for molecular-focused therapy in meningiomas [13]. Mutations in the NF2 gene and other tumor suppressor genes like DAL-1 are commonly implicated in meningiomas. The KLF4 gene, a transcription factor, and the TRAF7 gene, located on chromosome 16p13, are also important targets for therapy, as mutations in TRAF7 are present in 24% of meningiomas [14].

Complete surgical removal is often the primary treatment for atypical meningiomas, although achieving total resection can be challenging due to the invasive nature of the tumor and its proximity to vital brain structures. Research into innovative surgical techniques and supplementary treatments is essential to improve resection rates while minimizing neurological damage. Following surgery for atypical meningiomas, adjuvant therapies such as chemotherapy or radiation therapy may be utilized. However, there is ongoing debate regarding the most effective adjuvant therapy options, dosages, timing, and patient-specific factors like age and co-morbidities.

Further investigation is needed to determine the efficacy of various treatment strategies and identify biomarkers that can guide treatment decisions. Atypical meningiomas have a higher likelihood of recurrence compared to benign tumors, and there are limited options for recurrent cases. Research into immunotherapies and personalized treatments is crucial to halt disease progression and prevent relapse. The genetic and molecular heterogeneity of atypical meningiomas can impact tumoral behavior and treatment response, underscoring the need for in-depth studies to identify therapeutic targets. Understanding the molecular mechanisms driving tumor growth and resistance is paramount in developing tailored treatments for atypical meningiomas. The tumor microenvironment plays a significant role in tumor biology and treatment outcomes, highlighting the importance of investigating how tumor cells interact with their surroundings to devise novel therapeutic approaches. Atypical meningiomas carry a higher risk of recurrence and potential malignant transformation compared to benign variants, emphasizing the urgency of advancing research in this field.

In this detailed case study, we present a rare situation involving the accidental discovery of an atypical meningioma in a patient who initially showed symptoms resembling a stroke. The initial course of treatment focused on reducing the patient's elevated blood pressure and intracranial pressure by administering intravenous fluids, beta-blockers, and IV mannitol, which ultimately resulted in the improvement of the patient's condition. IV Labetalol and Hydralazine were utilized to decrease the high blood pressure levels. Labetalol is known for its ability to block both alpha- and beta-adrenergic receptors, while Hydralazine acts as a powerful vasodilator that primarily relaxes arterial smooth muscles. Additionally, Paracetamol was included in the treatment plan as part of a comprehensive approach due to its anti-platelet properties (important for a patient with a history of ischemic heart disease), blood pressure-lowering effects, and for the management of any fever or pain the patient may experience. Furthermore, a prophylactic course of Ceftriaxone was administered to prevent potential infections, particularly superimposed bacterial chest infections, given the patient's diabetic and asthmatic status.

Routine blood tests were conducted, and a CT scan and MRI of the brain revealed the presence of an ischemic stroke in the left middle cerebral artery caused by an infarct. An unexpected discovery was also made - an extra-axial mass was identified during the imaging process. The identification of an atypical meningioma in a patient who showed no symptoms highlights the difficulties in making accurate diagnoses and the ethical considerations in treating such cases. The use of advanced neuroimaging techniques such as CT and MRI have resulted in an increase in the incidental findings detected, which has influenced the medical decision-making process. However, these imaging methods also have their limitations. It can be challenging to differentiate between atypical meningiomas and other types of meningiomas or non-meningioma brain tumors based solely on radiological imaging. In order to enhance diagnostic precision, more advanced imaging technologies or biomarkers are needed. The histopathological diagnosis of atypical meningiomas can vary among pathologists, which emphasizes the necessity for standardized criteria. Research focusing on molecular markers associated with atypical meningiomas or improving histopathological standards is crucial for enhancing diagnostic consistency.

The unexpected discovery of an asymptomatic atypical meningioma in our patient highlights the critical need to carefully evaluate the potential risks and benefits of any medi-

cal intervention. While interventions and invasive procedures hold the promise of providing a more precise diagnosis, controlling the tumor via surgery or radiation, relieving symptoms such as headaches or seizures, and preventing complications associated with the condition, there is always the looming possibility of surgery-related complications like bleeding, infection, or neurological deficits. In navigating these complex decisions, it is essential to involve the patient, their loved ones, and a team of specialists including endocrinologists, cardiologists, neurosurgeons, and neuro-oncologists. By collaboratively weighing the pros and cons of invasive procedures, taking into account the patient's individual preferences, values, and healthcare goals, a comprehensive treatment plan can be developed. Furthermore, it may be necessary to incorporate palliative care and supportive measures into the treatment plan, particularly in cases where invasive procedures pose a high risk or are deemed impractical. Ultimately, ensuring that every decision is made with the patient's best interests in mind is paramount in providing effective and compassionate care.

Elderly individuals with such conditions who do not exhibit any symptoms ought to be adequately educated about their condition, available treatments, possible side effects, and advantages. It is the responsibility of healthcare professionals to behave in their patients' best interests (beneficence) while preventing harm (non-maleficence). When making judgments concerning intervention for older individuals with atypical meningiomas who do not exhibit symptoms, it is important to weigh the possible advantages of treatment against any potential drawbacks. One of the main ethical precepts in healthcare allocation is equity and fairness. Any medical procedure requires informed consent, but this is especially true for addressing asymptomatic illnesses when the advantages and disadvantages of therapy may not always be obvious. It is important for clinicians to have attentive and compassionate conversations with patients and their families in order to find out about their preferences for medical interventions, end-of-life care, and goals of care.

In light of this, it is essential to provide patients with comprehensive information about the natural history of the disease and the potential implications of different management options. Furthermore, long-term follow-up with regular imaging studies is crucial to ensure timely detection of any changes that may necessitate intervention. Collaboration among neurosurgeons, neuroradiologists, oncologists, and ethicists is essential to guide the decision-making process and provide the best possible outcomes for the patient. Further research is warranted to better understand the natural history of asymptomatic atypical meningiomas and to develop evidence-based guidelines for their management.

Conclusion

This instance emphasizes the significance of a thorough diagnostic approach for individuals who appear to have neurological complaints. While the patient reported above first presented with stroke-like symptoms, investigations revealed an unusual meningioma. To handle both the acute stroke symptoms and the meningioma, a multidisciplinary strategy was used, emphasizing the importance of meticulous diagnosis and follow-up in similar situations.

Patient consent

We hereby confirm that written, informed consent for the publication of this case report has been obtained from the patient. The patient has been provided with comprehensive information regarding the purpose, content, and potential implications of the publication, and all their queries have been addressed to their satisfaction. They understand that their case details may be disseminated in a medical journal, on websites, or in other educational materials, while ensuring the maintenance of their confidentiality. The patient consents to the use of any necessary medical records and diagnostic images that may be pertinent to this case report. Their participation in this publication is entirely voluntary, and they retain the right to withdraw their consent at any time without any adverse consequences. The patient's identity and personal information will be protected throughout the publication process.

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