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Case Report

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Brain abscess mimicking an intracranial mass on radiologic examinations: a case report

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ABSTRACT

A 49-year-old woman who had a headache for ten days was evaluated in the emergency department. Because the physical examination was normal, an intracranial mass was suspected, and brain computed tomography (CT) revealed an edematous intracranial lesion with an 8.3-millimeter shift in the right occipito-parietal region. In venous blood samples, leukocyte count was 17360 uL (normal range:4000-10000 uL), C-reactive protein level was 9.42 mg/L (normal range:0-5 mg/L), procalcitonin 0.027 ng/ml (normal range:0-0.05 ng/ml). Choline/NAA (N-acetyl aspartate) peaks that may be in favor of malignancy were obtained in the mentioned lesion in brain MR-spectroscopy images. Contrast-enhanced CT scan of the thorax, abdomen, and pelvis revealed no tumor focus. She underwent a right occipital craniotomy. After opening the mass capsule, a yellow-green, thick, odorless purulent material discharged. Gram-positive diplococci were detected in the emergency smear preparations of this purulent material and "Streptococcus porcinus" growth was detected in the subsequent culture. After the normalization of blood biochemistry values and marked improvement in brain MR images, the Infectious Diseases Department terminated antibiotic treatment at the end of the fifth month. As seen in this patient, radiologic imaging may sometimes not be sufficient to make the correct diagnosis and may lead to different diagnoses.

Keywords: Headache, brain abscess, MR-spectroscopy

INTRODUCTION

Brain tumors are mainly divided into primary tumors and metastases. Metastases constitute 20-40% of central nervous system (CNS) tumors in different series. Other lesions that occupy intracranial space and can be confused with tumors on radiological imaging are brain abscesses.[1] Clinical evaluation, laboratory analyses, and radiological imaging methods are used in the differentiation and diagnosis of brain tumors and other intracranial space-occupying lesions.[2] Radiologic imaging is very helpful for diagnosis, but they are insufficient to diagnose definitively when evaluated alone.[3] Among laboratory analyses, tumor markers can be used to support the diagnosis of brain tumors. Still, most of them are elevated in benign and malignant diseases and do not allow the differentiation of these conditions.[4] Therefore, it is still difficult to distinguish between these three entities today.In this case report, we discuss a patient who was thought to have a glial brain tumor after all laboratory analyses and radiological imaging but was found to have a brain abscess during surgery.

CASE

A 49-year-old woman who had a headache for ten days and whose pain had intensified for the last day was evaluated in the emergency department. Neurologic examination revealed that vital values were normal, consciousness was clear, coherent, and oriented, Glasgow Coma Scale (GCS) score was 15/15, pupils were isochoric, and reactive, cranial nerve examination was normal, nuchal rigidity was absent, but she had hemiparesis on the left side of the body (left upper and lower extremity muscle strengths total 4/5). Physical examination of the patient revealed that lung sounds were natural, with no rales or rhonchi; the abdominal examination was comfortable, with no signs of tenderness, defense, or rebound. In addition, oropharyngeal redness or postnasal discharge suggestive of upper respiratory tract infection was not detected. In addition, it was learned that there was no foul-smelling urine or dysuria suggestive of urinary tract infection, but he had left upper 1st molar caries for a long time but had not received any treatment for it.

Intracranial mass was suspected with the present findings and brain computed tomography (CT) performed in the emergency department revealed an edematous intracranial lesion with an 8.3-millimeter shift in the right occipito-parietal region (Figure 1A). In venous blood samples, hemoglobin (HGB) level was 11.7 g/dl (normal range 11-15 g/dL), leukocyte (WBC) count was 17360 10 3ul (normal range 4000-10000 uL), C-reactive protein (CRP) level was 9.42 mg/L (normal range 0-5 mg/L), procalcitonin 0.027 ng/ml (normal range 0-0.05 ng/ml), serum sodium (Na) 125 mmol/L (normal range 136-145 mmol/mL). The patient received 16 mg dexamethasone, 1000 mg levetiracetam, and 40 mg pantoprozole intravenously in the emergency department.

Diffusion MRI images show an area of diffusion restriction in the right occipital region (Figure 1B, Figure 1C). Contrast-enhanced MR revealed a large cystic tumor in the right occipital lobe, with diffuse edema around it, measuring approximately 4 cm in diameter at its widest point, with a heterogeneous internal structure and peripheral weighted contrast enhancement (Figure 1D, Figure 1E, Figure 1F). In addition, ventricular compression secondary to edema and leftward shift of midline structures were observed.

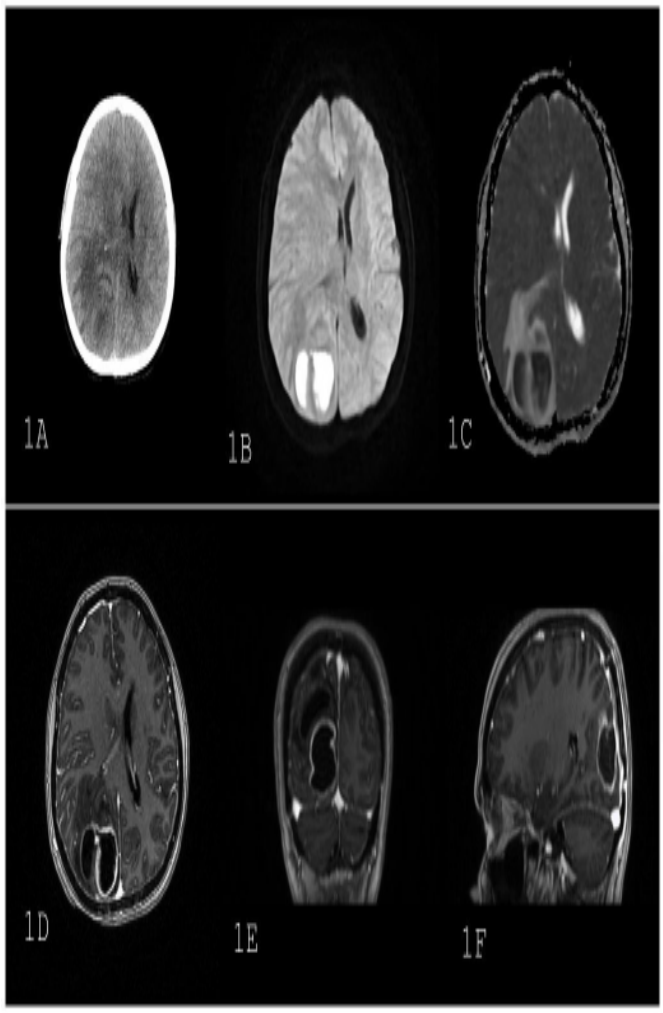

Figure 1. Preoperative brain CT shows a mass lesion located in the right occipital lobe, hypodense in the middle, surrounded by edema, and causing effacement of the right lateral ventricle. (1A). Diffusion MRI images show an area of diffusion restriction in the right occipital region (1B, 1C). Contrast-enhanced brain MRI images show widespread edema in the posterior section of the right cerebral hemisphere and an appearance consistent with a cystic mass lesion with contrast enhancement of the walls at this area level (1D, 1E, 1F)

In brain MR-spectroscopy images performed, significant choline-creatinine, and choline/NAA (N-acetyl aspartate deficiency) peaks that may be in favor of malignancy were obtained in the mentioned lesion area in the left occipital lobe. In addition, TTP (peak time), CBV (cerebral blood volume), CBF (cerebral blood flow), and MTT (mean transit time) values were obtained in the right occipital lobe on brain MR-perfusion images, and a patchy diffusion restriction area was detected in the right occipital region on brain MR-diffusion images (Figure 2). With all these MR findings, the mass was interpreted as a malignant tumor. However, considering that the existing malignant tumor might be metastatic, a contrast-enhanced CT scan of the thorax, abdomen, and pelvis revealed no tumor focus. Venous blood samples obtained from the patient showed that carcinoembryonic antigen level was 0.5 ng/ml, Ca 19-9 level was 17 U/ml (normal range 0-39 U/ml), Ca 15-3 was 5 U/ml (normal range 0-28.5 U/ml), Ca 125 level was 19 U/ml (normal range 0-35 U/ml), alpha-fetoprotein level was 2. 3 ng/ml (normal range 0-7 ng/ml) and beta-HCG level was <0.1 mlU/ml (normal range 0-10 mlU/ml).

With the above-mentioned results, the tumor was primarily considered a glial tumor, and the patient underwent surgery under neuro-navigation. Through the right occipital craniotomy, the localization of the tumor was reached, and as soon as the tumor capsule was penetrated, yellow-green, thick, odorless purulent discharge was seen draining from the mass, and samples taken from the discharge were sent to the relevant departments for urgent smear, culture, and pathological examination. After the fluid content of the tumor was completely drained, the tumor capsule and surrounding gliotic tissues were completely excised. Gram-positive diplococci were detected in the emergency smear preparations and "*Streptococcus porcinus*" growth was detected in the subsequent culture slides. Cytologic examination showed negative cytology for malignancy. Pathological examination revealed inflammatory necrosis, gliosis, foci of necrosis surrounded by increased vascularization in glial tissue, reactive dendroglial proliferation and lymphatic infiltration, and inflammatory cell infiltration rich in polymorphonuclear leukocytes on necrobiotic background which may be compatible with abscess content. With these findings, the Infectious Diseases Department started a vancomycin and meropenem regimen, intravenously.

The patient underwent control contrast-enhanced brain MR imaging in the early postoperative period and a heterogeneous contrast-enhancing parenchymal area of 23 millimeters in diameter was found in the right occipital region with edema around it. Venous blood samples taken one week after the operation showed a leukocyte count of 13530 uL, CRP level of 0.72 mg/L, procalcitonin level of 0.026 ng/ml, and vancomycin treatment was discontinued by the Infectious diseases department.

The Ophthalmology Department examined the patient in the second month after surgery and the visual field was found to be normal as a result of the confrontation test. In venous blood samples taken during this period, leukocyte count was 6960 uL, CRP level was 0.4 mg/L, and procalcitonin level was 0.032 ng/ml. Contrast-enhanced brain MRI performed four months after surgery revealed a 10x7 millimeter area of diffusion restriction in the right occipital lobe. In venous blood samples

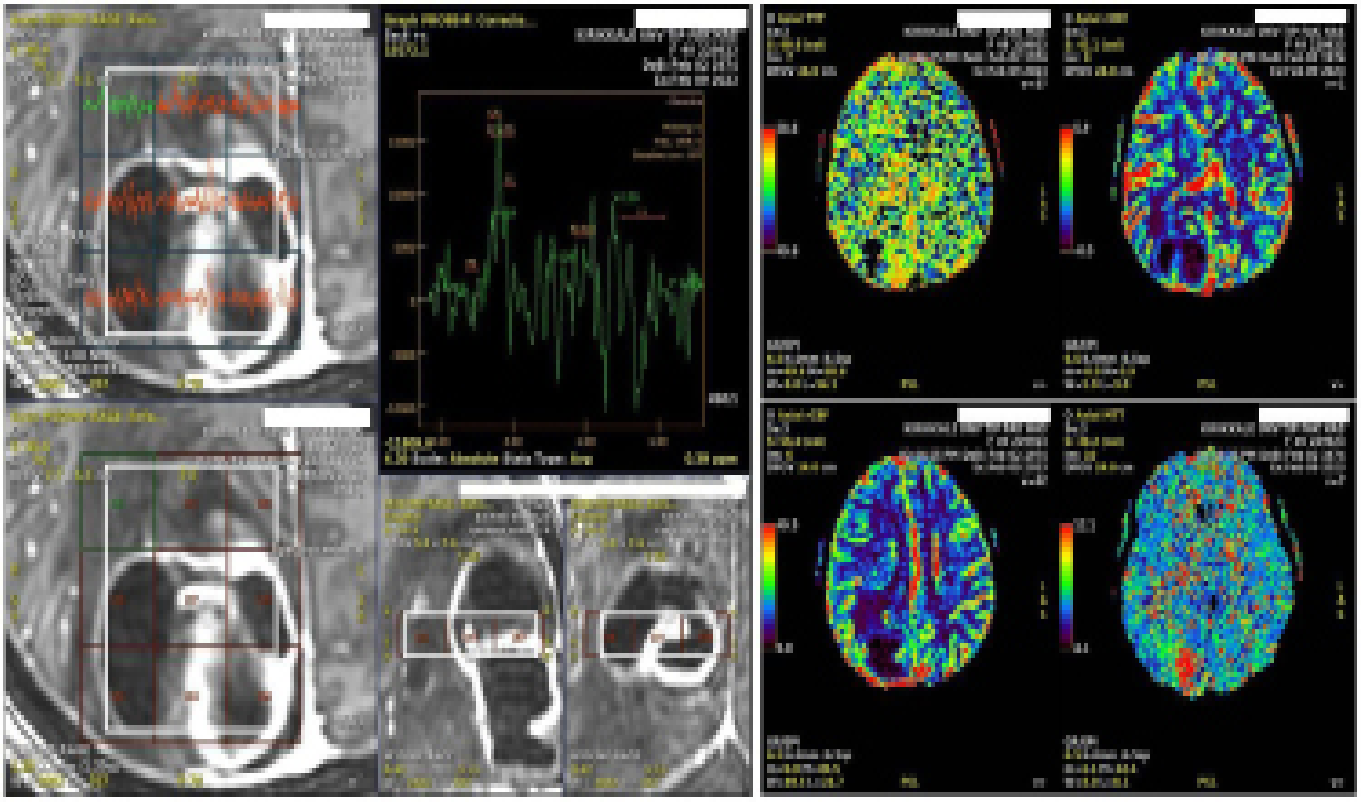

Figure 2. In the MR spectroscopy images (left side of the figure), significant choline-creatinine and choline-NAA peaks in favor of malignancy are seen in the right occipital lobe. In the MR perfusion images (right side of the figure), TTP, CBV, CBF, and MTT values that show changes in favor of malignancy are observed in the same region.

obtained simultaneously, leukocyte count was 6540 ul, CRP level was 0.86 mg/L, and procalcitonin level was <0.020 ng/ml. The Infectious Diseases Department terminated intravenous meropenem treatment at the end of the fifth month due to the normalization of blood biochemistry values and marked improvement in brain MR images. Ten months after the operation, contrast-enhanced brain MR images showed a sequel encephalomalacia area in the periventricular region of the right occipital lobe extending towards the parietal lobe (Figure 3).

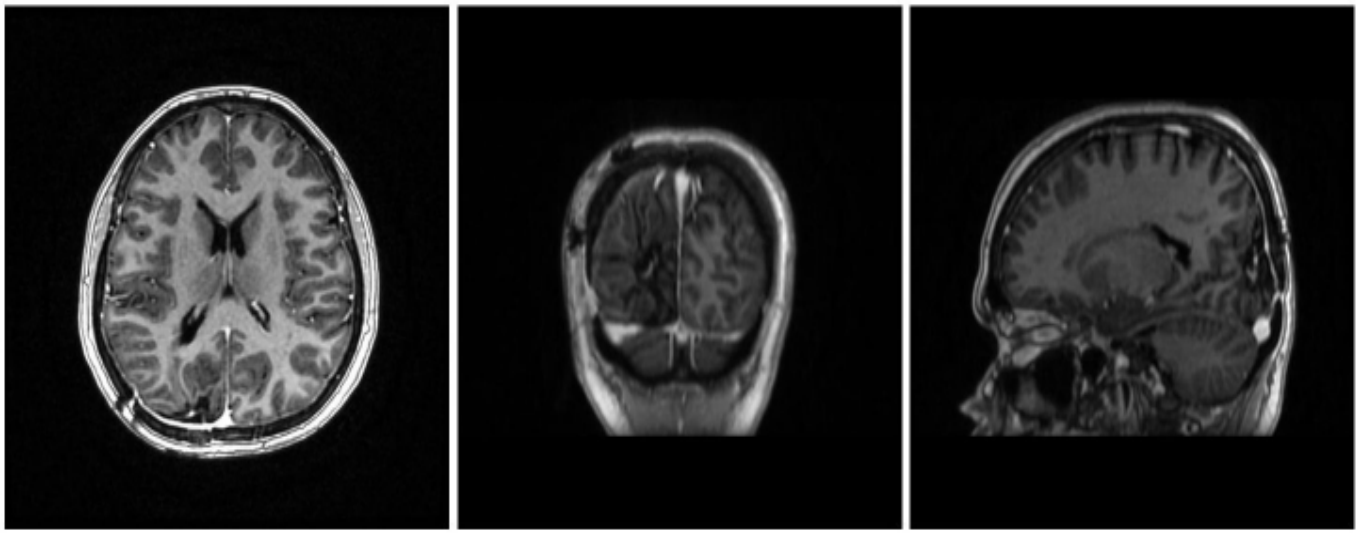

Figure 3. Contrast-enhanced MR images taken at the 10th postoperative month show encephalomalacia changes and peripheral gliosis in a location corresponding to the right posterior cerebral artery irrigation area.

DISCUSSION

Brain tumors are mainly divided into primary brain tumors and metastases. Another group of space-occupying lesions that may be similar to these tumors are brain abscesses. Brain abscesses are intracranial masses with focal collections and suppurative processes in the brain parenchyma that occur as a complication of various infections such as bacteria, mycobacteria, fungi or parasites, trauma, or surgical interventions.[1,2] It has been suggested in the literature that it would be appropriate to analyze these masses with diffusion MR sequences (DWI), perfusion-weighted MR imaging (DSCE-PWI), and MR-spectroscopy to characterize this lesion, since the appearance on conventional MR images is unclear in the differentiation of intracranial abscess from tumor or metastasis.[5] In a study, it has been reported that

MR-spectroscopy had moderate diagnostic performance in distinguishing high-grade gliomas from low-grade gliomas. The Choline/NAA ratio obtained in this study showed higher sensitivity and specificity than the Choline/Creatinine and NAA/Creatinine ratios and should be combined with other advanced imaging techniques such as MR-diffusion and MR-perfusion to improve diagnostic accuracy.[6] On the other hand, a meta-analysis study reported that the diagnostic value of MR-spectroscopy in differentiating glial tumors from metastatic brain tumors was average and that the Choline/NAA ratio should be used to increase this diagnostic value.[7] In addition, it has been reported that the ADC values and ADC ratios of MR-perfusion examination can also help differentiate metastases from high-grade gliomas, but it is not very successful in differentiating high-grade gliomas from lymphomas and lymphomas from metastases.[8]

In addition, serum tumor-specific biochemical markers may also be diagnostic aids, especially in the differentiation of metastatic brain tumors and other intracranial space-occupying lesions. However, it is also known that serum levels of these markers may be elevated in most benign and malignant diseases. Similarly, these markers alone are not sufficient to make an early diagnosis of most diseases and even to detect recurrence or advanced disease, therefore, it is recommended that they should be used together with other evaluation methods in clinical practice.[4]

Based on the physical and neurological examination performed when the patient was admitted to the emergency department, it was thought that the patient might have an intracranial lesion (such as a stroke, tumor, etc.), and a brain CT was performed. The brain CT image showed a mass with edematous surroundings. Contrast-enhanced brain MR and MR-spectroscopy were performed for the differential diagnosis of the intracranial mass. Upon detection of Choline/NAA peaks, this mass was thought to be a malignant tumor, since decreased choline, creatine, and NAA levels are expected in non-neoplastic lesions such as brain infarction and brain abscess.5 In addition, brain MRI-diffusion images showed a patchy diffusion restriction in the localization of the tumor, and brain MR-perfusion images showed that TTP, CBV, CBF, and MTT values showed changes in favor of malignancy in the localization of the tumor and this tumor was thought to be a malignant intracranial tumor. Contrast-enhanced CT scan of the thorax, abdomen, and pelvis was performed to determine whether the intracranial tumor was a primary brain tumor or a metastasis. No other foci were detected in the scans. Since the serum tumor markers were also negative, a primary malignant brain tumor (most likely a glial tumor) was considered.

Contrary to all these considerations, when the capsule of the mass was penetrated during the surgical intervention, a yellow-green colored, thick, odorless purulent discharge was seen coming out of the mass and all pathological examinations revealed that the mass was a brain abscess. In conclusion, although the patient's clinical presentation and detailed radiological imaging studies suggested a primary malignant brain tumor, the patient was diagnosed with a brain abscess as a result of pathological examinations. Considering the etiology of brain abscess, it was concluded that untreated tooth decay may be the cause of brain abscess, although no obvious focus of infection was detected in the patient's body.

In conclusion, as seen in this patient, radiologic imaging may sometimes not be sufficient to make the correct diagnosis and may lead to different diagnoses. Therefore, it was thought that it would be appropriate to keep in mind the margin of error of the examinations when making a preliminary diagnosis in patients with brain tumors and to take precautions by keeping in mind the less probable preliminary diagnoses as well as the probable preliminary diagnoses.

ETHICAL DECLARATIONS

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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