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Brain Abscess as a Life-Threatening Condition — A Case Report

Ropień mózgu jako stan zagrożenia życia — opis przypadku

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Abstract

Introduction. Brain abscess is a severe focal infection of the central nervous system (CNS) that, despite advances in diagnostic imaging and treatment, may result in permanent neurological sequelae or death. Early diagnosis based on neuroimaging and prompt initiation of appropriate treatment are crucial for improving clinical outcomes.
Aim. The aim of this study was to describe the diagnostic evaluation and management of a patient with a brain abscess and to emphasize the importance of early recognition of this condition.
Case Report. We present the case of a 42-year-old man admitted to the hospital on an emergency basis following a first-ever seizure accompanied by loss of consciousness. Neuroimaging revealed a brain abscess. During hospitalization, particular attention was paid to the risk of seizure recurrence, injury and aspiration, as well as to neurological status, pain assessment, and the patient's psychological well-being.
Discussion. The clinical presentation of brain abscess is variable and depends on several factors, including lesion location and size, the extent of perilesional cerebral edema, the presence of mass effect, and the patient's overall clinical condition.
Conclusions. Brain abscess is a potentially life-threatening condition requiring prompt diagnostic evaluation and comprehensive management. Neuroimaging, identification of the causative pathogen, and appropriate antimicrobial therapy are essential components of treatment. Regular neurological assessment and patient safety measures are integral to comprehensive patient care. **(JNNN 0000;0(0):0–0)**
Key Words: brain abscess, case report, central nervous system infection, neuroimaging, seizure

Streszczenie

Wstęp. Ropień mózgu jest ciężkim, ogniskowym zakażeniem ośrodkowego układu nerwowego, które pomimo postępu w diagnostyce i leczeniu nadal może prowadzić do trwałych następstw neurologicznych oraz zgonu. Wczesne zastosowanie diagnostyki neuroobrazowej oraz odpowiedniego leczenia ma zasadnicze znaczenie dla rokowania.
Cel. Celem pracy było przedstawienie diagnostyki i leczenia pacjenta z ropniem mózgu na podstawie indywidualnego studium przypadku oraz zwrócenie uwagi na znaczenie szybkiego rozpoznania choroby.
Opis przypadku. Przedstawiono przypadek 42-letniego mężczyzny przyjętego do szpitala w trybie nagłym z powodu pierwszego w życiu napadu padaczkowego z utratą przytomności. W toku diagnostyki neuroobrazowej rozpoznano ropień mózgu. W trakcie hospitalizacji zwracano szczególną uwagę na ryzyko kolejnego napadu padaczkowego, możliwość wystąpienia urazu i aspiracji, stan neurologiczny pacjenta, dolegliwości bólowe oraz jego stan emocjonalny.
Dyskusja. Obraz kliniczny ropnia mózgu jest zróżnicowany i zależy m.in. od lokalizacji oraz wielkości zmiany, stopnia obrzęku otaczającej tkanki mózgowej, obecności efektu masy, a także ogólnego stanu pacjenta.

Wnioski. Ropień mózgu jest stanem wymagającym szybkiej diagnostyki i kompleksowego leczenia. Szczególne znaczenie ma diagnostyka neuroobrazowa, identyfikacja czynnika etiologicznego oraz odpowiednio dobrane leczenie przeciwdrobnoustrojowe. Systematyczna obserwacja stanu neurologicznego i zapewnienie bezpieczeństwa pacjentowi stanowią istotne elementy postępowania. **(PNN 0000;0(0):0–0)**

Słowa kluczowe: ropień mózgu, studium przypadku, zakażenie ośrodkowego układu nerwowego, diagnostyka, napad padaczkowy

Introduction

A brain abscess is a localized focus of infection within the brain parenchyma. It is characterized by a localized inflammatory response, tissue necrosis, and the formation of a purulent collection surrounded by a capsule. This process may lead to cerebral edema, mass effect, and increased intracranial pressure, posing a potentially life-threatening risk to the patient [1,2].

Brain abscesses may develop through hematogenous spread, contiguous extension of infection from adjacent structures, such as the paranasal sinuses or middle ear, or following traumatic brain injury and neurosurgical procedures. Predisposing factors include immunosuppression and certain chronic medical conditions [1,2].

In recent years, changes in the epidemiology of brain abscesses have been observed, associated with odontogenic infections, otorhinolaryngological infections, immunosuppression, and previous neurosurgical interventions. Despite advances in diagnostic techniques and therapeutic management, brain abscesses remain associated with a risk of mortality and permanent neurological sequelae [2].

The clinical presentation of brain abscess is variable and may include headache, nausea, vomiting, fever, altered mental status, speech disturbances, motor weakness, and other focal neurological deficits. Seizures may also occur [1,3]. The classic triad of headache, fever, and focal neurological deficits is not present in all patients, which may delay diagnosis.

Brain abscess poses a diagnostic challenge because its clinical manifestations may resemble those of other neurological disorders. Prompt clinical assessment and neuroimaging are therefore essential. According to the European Society of Clinical Microbiology and Infectious Diseases (ESCMID) guidelines, magnetic resonance imaging (MRI) is the preferred diagnostic imaging modality in patients with suspected brain abscess [1–3].

Treatment primarily involves antimicrobial therapy and, in appropriately selected patients, neurosurgical intervention. Surgical aspiration or excision of the abscess also enables the collection of specimens for microbiological identification of the causative pathogen and subsequent optimization of targeted antimicrobial therapy [1,2].

Given the risk of complications, including permanent neurological deficits, seizures, and altered consciousness, early diagnosis and prompt initiation of appropriate treatment are crucial. Patients with suspected brain abscess require comprehensive multidisciplinary care.

Thus the aim of this study was to analyze the diagnostic process, therapeutic management, and patient care in a patient diagnosed with a brain abscess, based on an individual case report.

Case Study

The patient was a 42-year-old right-handed man admitted to the Department of Neurology following his first-ever seizure. The seizure had a focal onset with progression to a bilateral tonic-clonic seizure, accompanied by tongue biting and a period of postictal confusion. Before losing consciousness, the patient experienced transient speech disturbances and involuntary deviation of the head and limbs to the right, without impaired awareness. These symptoms lasted approximately 10–20 seconds.

On admission, the patient was conscious, alert, and able to communicate coherently, with intact orientation to person, place, and time. His overall clinical condition was stable. Blood pressure was 141/82 mmHg, indicating mildly elevated systolic blood pressure, while the remaining vital signs were within normal limits (heart rate: 79/min; body temperature: 36.4°C). The patient was hemodynamically and respiratory stable, with no signs of respiratory insufficiency. He was independently mobile, able to eat without assistance, and reported no swallowing difficulties or bowel or bladder dysfunction.

Peripheral perfusion was normal, with no peripheral edema. Examination of the oral cavity revealed no pathological findings. Appetite and thirst were normal, urine output was preserved, and no difficulties with urination were reported. Bowel and bladder continence were maintained. The skin was intact, without clinically significant abnormalities. Hearing was normal, while visual acuity was reduced and corrected with glasses. The patient reported an allergy to animal dander but denied any known drug allergies. He maintained an active lifestyle, including resistance training three to four times per week.

During the clinical interview, the patient reported low mood associated with his sudden and unexpected hospitalization. He expressed anxiety and concern regarding his first-ever seizure and the need for further diagnostic evaluation.

Neurological examination revealed expressive aphasia and mild flattening of the right nasolabial fold. The pupils were equal and reactive to light. Extraocular movements were intact, with no nystagmus. Facial movements during teeth showing were symmetrical. Muscle strength in the upper and lower extremities was normal, with no evidence of paresis. Deep tendon reflexes were symmetrical. Coordination testing, including finger-to-nose and heel-to-shin tests, as well as the Romberg test, revealed no abnormalities. Gait was normal.

As part of the initial diagnostic evaluation, non-contrast computed tomography (CT) of the head was performed and showed no evidence of intracranial hemorrhage. However, a corticosubcortical hypodense area was identified in the left frontal lobe, initially suggesting a vascular lesion. Subsequent CT perfusion imaging revealed minor perfusion abnormalities in the left cerebral hemisphere. As there were no indications for reperfusion therapy, the patient was not considered eligible for intravenous thrombolysis or endovascular treatment, and conservative management was initiated.

Contrast-enhanced MRI of the brain was crucial for further diagnostic evaluation. The examination revealed a poorly demarcated focal lesion in the superolateral region of the left frontal lobe, characterized by marked contrast enhancement, fluid-containing areas demonstrating restricted diffusion, and extensive vasogenic edema (Figures 1 and 2). The imaging findings were primarily suggestive of an inflammatory process with brain abscess formation, consistent with the clinical presentation and the occurrence of a seizure as the initial manifestation of the disease.

Approval for the preparation and publication of this case report was obtained from the Research Ethics Committee of the Faculty of Health Sciences, Collegium Medicum in Bydgoszcz (approval No. KEBN WNoZ 150/2026).

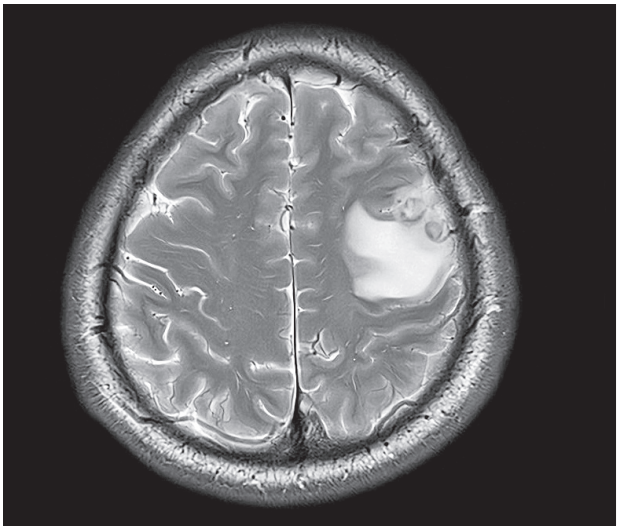


Figure 1. Brain Abscess Lesions on Contrast-Enhanced Magnetic Resonance Imaging

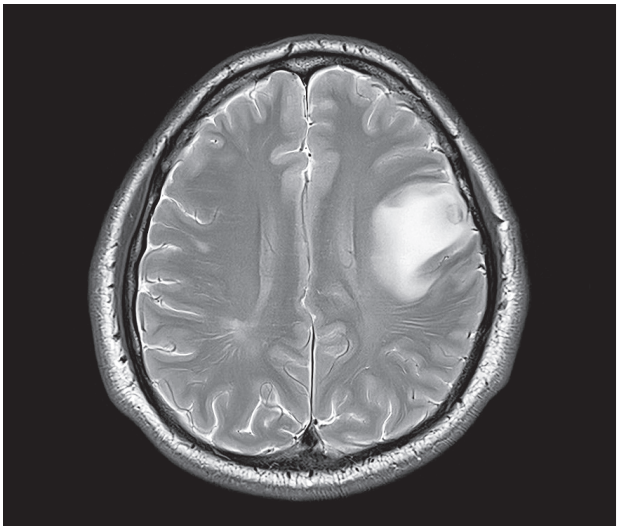


Figure 2. Brain Abscess with Surrounding Edema on Contrast-Enhanced Magnetic Resonance Imaging

Problem 1. Risk of Neurological Deterioration Associated with Brain Abscess and Potential Progression of Intracranial Pathology

Purpose of nursing care: Early identification of neurological deterioration and prompt initiation of appropriate interventions.

Nursing interventions:

1. Regular assessment of the patient's level of consciousness.
2. Observation of behavior, verbal communication, and responses to stimuli.
3. Assessment for new or worsening neurological symptoms, including speech disturbances, visual impairment, motor asymmetry, paresis, and impaired coordination.
4. Assessment of pupillary symmetry and light reflexes as part of neurological monitoring.
5. Monitoring of vital signs.
6. Documentation of observed changes and comparison with previous neurological assessments.
7. Preparation of the patient for prescribed diagnostic examinations.

Assessment: The patient's neurological status remains stable, or any deterioration is promptly identified and reported.

Problem 2. Risk of Seizure Recurrence Associated with a Focal Central Nervous System Lesion and a History of Seizure

Purpose of nursing care: To ensure patient safety and appropriate management in the event of seizure recurrence.

Nursing interventions:

1. Observation for signs of seizure activity or changes in neurological status.
2. Ensuring conditions that allow rapid intervention by healthcare personnel.
3. Protecting the patient from injury during a seizure.
4. Observation and documentation of seizure characteristics, duration, and associated symptoms.
5. Monitoring respiratory function and level of consciousness following a seizure.
6. Positioning the patient appropriately to maintain safety and airway protection according to clinical condition.
7. Assessment of the patient's condition during the postictal period.

Assessment: In the event of seizure recurrence, the patient receives immediate and appropriate care without preventable complications.

Problem 3. Risk of Airway Compromise and Aspiration Associated with Loss of Consciousness or Seizure Activity

Purpose of nursing care: To maintain airway patency and prevent respiratory complications.
Nursing interventions:

1. Regular assessment of the level of consciousness.
2. Monitoring respiratory rate and breathing pattern.
3. Monitoring peripheral oxygen saturation (SpO_2).
4. Observation for signs of respiratory distress or respiratory failure.
5. Assessment of the patient's ability to maintain airway patency in the presence of impaired consciousness.
6. Ensuring the availability of emergency airway management equipment in accordance with ward procedures.
7. Implementation of appropriate interventions in the event of impaired consciousness or seizure activity, according to established clinical protocols.
8. Reassessment of respiratory status following seizure termination.

Assessment: The patient maintains airway patency without clinical signs of aspiration.

Problem 4. Risk of Increased Intracranial Pressure Associated with Brain Abscess and Perilesional Cerebral Edema

Purpose of nursing care: Early recognition of clinical signs suggestive of increased intracranial pressure and neurological deterioration.
Nursing interventions:

1. Regular assessment of the level of consciousness.
2. Monitoring of vital signs.
3. Observation for new or worsening neurological deficits.
4. Monitoring for sudden behavioral changes, increasing somnolence, or reduced responsiveness.
5. Ensuring conditions that facilitate regular clinical and neurological assessment.

Assessment: No signs of acute neurological deterioration are observed, and any abnormalities are promptly identified and reported.

Problem 5. Anxiety Associated with the Sudden Onset of Neurological Symptoms and Diagnosis of a Serious Medical Condition

Purpose of nursing care: To reduce anxiety and enhance the patient's sense of safety and security.
Nursing interventions:

1. Assessment of the patient's emotional state.
2. Encouraging the patient to express concerns and ask questions.
3. Providing information about nursing procedures and planned care within the nurse's scope of practice.
4. Maintaining a calm and safe environment.
5. Supporting the patient's adaptation to hospitalization.
6. Facilitating contact with family members or significant others, according to ward regulations and the patient's clinical condition.
7. Evaluating the effectiveness of emotional support interventions.

Assessment: The patient reports reduced anxiety and an increased sense of safety and security.

Problem 6. Need for Continuous Clinical Monitoring Due to the Risk of Rapid Changes in the Patient's Condition

Purpose of nursing care: To ensure continuity of clinical observation and prompt identification of changes requiring intervention.
Nursing interventions:

1. Regular assessment of the patient's general and neurological condition.
2. Monitoring vital signs at intervals appropriate to the patient's clinical status and established care plan.
3. Assessment of the level of consciousness and ability to communicate.
4. Documentation of clinical observations and assessment findings.

5. Comparison of current findings with previous assessments.
6. Communication of relevant clinical information during nursing handovers to ensure continuity of care.
7. Prompt response to acute changes in the patient's clinical condition.

Assessment: The patient receives regular, documented clinical monitoring, enabling early identification of adverse changes and timely intervention.

Discussion

Brain abscess is a severe form of central nervous system (CNS) infection that, despite advances in neuroimaging, antimicrobial therapy, and neurosurgical management, remains associated with a risk of serious neurological sequelae [2–5]. Effective management requires early diagnosis, identification of the potential source of infection, and prompt initiation of appropriate treatment [1,2].

The present case highlights the variable clinical presentation of brain abscess. In the reported patient, the initial manifestation was a seizure accompanied by loss of consciousness, with no documented history of preceding typical symptoms of infection. The heterogeneous clinical presentation of brain abscess and the possibility of neurological symptoms being its first manifestation have also been described in the literature [3–6].

A first-ever seizure in an adult requires appropriate diagnostic evaluation to identify or exclude structural abnormalities of the central nervous system [3,7]. In the present case, neuroimaging enabled the identification of a brain abscess and guided further clinical management.

The selection of appropriate neuroimaging modalities plays a crucial role in the diagnostic process. Current guidelines recommend MRI as the preferred imaging modality in patients with suspected brain abscess [1]. However, CT remains particularly useful in clinical situations requiring rapid assessment of intracranial structures [1,2].

Identification of the causative pathogen is another important component of clinical management. Specimens obtained during surgical aspiration or excision of the abscess allow microbiological examination and the selection of targeted antimicrobial therapy [1,2]. When conventional cultures yield negative results, molecular diagnostic techniques may provide additional diagnostic value [1].

Treatment of brain abscess requires a comprehensive approach tailored to the patient's individual clinical condition. Appropriately selected antimicrobial therapy is the cornerstone of treatment, while neurosurgical intervention may be necessary in selected cases [1–3].

In the present case, regular clinical monitoring was also an essential component of patient care. Particular attention was paid to the risk of seizure recurrence, injury, aspiration, and neurological deterioration. Regular assessment of the level of consciousness and vital signs facilitates early identification of changes in clinical status and timely implementation of appropriate interventions [2,7–10].

Cheng and Yi [11] also reported a case of brain abscess caused by Listeria monocytogenes. The patient initially received empirical broad-spectrum antibiotic therapy for 12 days at a dose of 2 g every 8 hours while awaiting culture results, after which treatment was switched to oral antibiotic therapy. Clinical symptoms, including slurred speech, numbness, and reduced muscle strength in the right lower limb, gradually improved. Follow-up CT and MRI performed two weeks after surgery demonstrated a reduction in abscess size and perilesional edema. The remaining dysfunction of the right hand subsequently resolved. At six-month follow-up, the patient had returned to normal daily activities, with only residual weakness of the fingers of the right hand.

Furthermore, published reports demonstrate considerable diversity in the etiology of brain abscess. Liu et al. [12] described an unusual clinical presentation and etiology involving a retained intracranial bamboo foreign body that resulted in brain abscess formation. An adolescent female presented with a newly developed eyelid mass. Neuroimaging revealed a foreign body that had penetrated the frontal lobes through a transorbital route, leading to brain abscess formation. The foreign body was successfully removed using a transnasal endoscopic approach. Inflammatory tissue surrounding the foreign body was collected for microbiological culture and metagenomic next-generation sequencing, which identified Clostridium celerecrescens as the causative pathogen. The patient achieved complete recovery following surgical debridement and a two-week course of antimicrobial therapy.

The present case also emphasizes the importance of addressing the patient's psychological needs. The sudden onset of neurological symptoms and diagnosis of a serious medical condition may cause anxiety and a sense of vulnerability. Providing clear information, emotional support, and opportunities for contact with family members constitutes an important component of comprehensive care for patients hospitalized with severe neurological conditions.

Conclusions

Brain abscess is a severe central nervous system infection requiring prompt diagnosis and comprehensive treatment. Neuroimaging, identification of the causative pathogen, and appropriately selected antimicrobial therapy, combined with neurosurgical intervention when indicated, are essential components of management. Regular neurological monitoring, prevention of complications, and consideration of the patient's individual needs are integral to comprehensive patient care.

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