

# Diagnostic Overlap of Brain Abscess Symptoms with Methamphetamine Withdrawal Symptoms

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## ABSTRACT

From the perspective of forensic medicine, substance abuse is an important topic due to its nature and consequences. The usage of methamphetamine is a significant public health problem with deleterious side effects, one of the most serious of which is mimicking central nervous system infection. A 40-year man was brought to the emergency department with complaints of headache, vomiting, fever, and loss of consciousness. According to his relative, he had abstained from methamphetamine abuse for two weeks. The initial diagnosis was made of methamphetamine withdrawal symptoms. However, computed tomography of the head revealed sinusitis and a hypodense lesion with dimensions of 35 × 35 mm. Moreover, *Streptococcus agalactiae* (group B streptococcus) was grown in the blood culture. A diagnosis of brain abscess and ventriculitis was made. The aim of this report is to draw physicians' attention to substance abstinence symptoms that may mask more serious diseases.

**Key Words:** Brain abscess, Methamphetamine withdrawal, Sinusitis.

**How to cite this article:** Kilic S, Kaya HB, Sarikaya R, Guven FMK. Diagnostic Overlap of Brain Abscess Symptoms with Methamphetamine Withdrawal Symptoms. *JCPSP Case Rep* 2023; 1:80-82.

## INTRODUCTION

Methamphetamine is a stimulant that triggers the sympathetic nervous system to induce energy and causes euphoria. However, the use of methamphetamine may lead to withdrawal symptoms, such as agitation, depression, anxiety, and fatigue.<sup>1</sup> Moreover, methamphetamine abuse is a crucial public health problem worldwide. Although methamphetamine has not been shown to cause fatal infections alone, the repeated use causes neurotoxicity and psychiatric disorders.<sup>2</sup> Methamphetamine abuse results in memory deficits, depression, anxiety, and most importantly, psychosis.<sup>3</sup> A sudden cessation of abuse may cause the user to develop withdrawal syndrome, which is characterised by dysphoric mood, disordered sleeping patterns, changes in appetite, and lively or unlikeable dreams.<sup>4</sup>

Abstinence from methamphetamine can mask severe infection findings. Thus, this situation confuses the physician's mind. Although meningitis is not a widespread manifestation of *Streptococcus agalactiae* infection in adults, it is a common and severe disease for newborns. Comorbidities for invasive *Streptococcus agalactiae* disease in adults include alcohol abuse, smoking, obesity, heart diseases, kidney diseases, neurological disorders, malignancy, and immunosuppressed status.<sup>5</sup>

This case report aims to share three remarkable elements with our colleagues. First, sinusitis resulted in a brain abscess in an adult. Second, a rare bacterial disease caused by *Streptococcus agalactiae* caused brain abscesses. Finally, methamphetamine withdrawal symptoms may present similar findings with central nervous system (CNS) infection, as exemplified in the case study. Therefore, diagnosis of such cases may be difficult and requires a multidisciplinary approach.

## CASE REPORT

A 40-year man presented to the emergency department (ED) of a tertiary care hospital with vomiting, headache, hypertension, and confusion. According to his relative, 15 days had passed since the patient's last use of methamphetamine. He was febrile and somnolent but exhibited a flexion response to pain. There was unmeaningful spontaneous speech output. Due to his medical status, the level of consciousness test was not carried out. His Glasgow Coma Scale (GCS) score was 9 (eye opening: 3, verbal response: 2, motor response: 4). Initially, the treatment for methamphetamine withdrawal symptoms was administered. Blood and urine tests were not conducted to determine the presence of any substance, including methamphetamine. How the patient was taking methamphetamines, the route of administration, and the time period of abuse were unknown because the medical record of the patient was insufficient. However, no traces of injections were observed in the cubital regions of the patient. Thus, it was assumed that the patient administered methamphetamine nasally. Viral screening tests, including those for HIV and other transmissible infections for risky populations, were negative. Blood tests showed an increase in white blood cell count at 20,550/ $\mu$ L (normal range: 3,500-10,500/ $\mu$ L) and c-reactive

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Received: June 17, 2023; Revised: July 19, 2023;

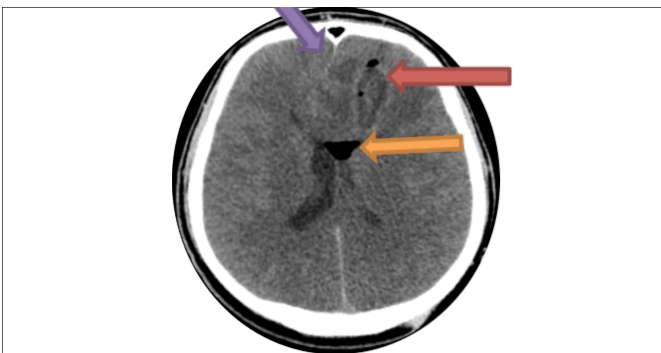
Accepted: July 21, 2023

DOI: <https://doi.org/10.29271/jcpspcr.2023.80>

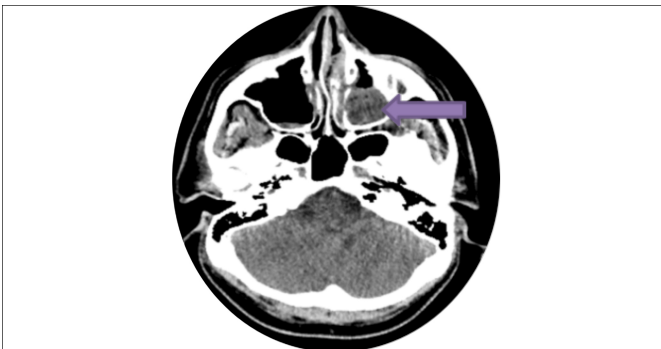
protein was 74 mg/L (normal range: 0–5 mg/L) (Table I). During the follow-up, both methamphetamine withdrawal symptoms and sinusitis were considered. The treatment was changed to sinusitis treatment. During the follow-up, cardiac arrest and respiratory arrest occurred. After five minutes of cardiopulmonary resuscitation on the patient, the blood circulation was restored. He was then intubated and stabilised.

**Table I: Blood parameters of the patient.**

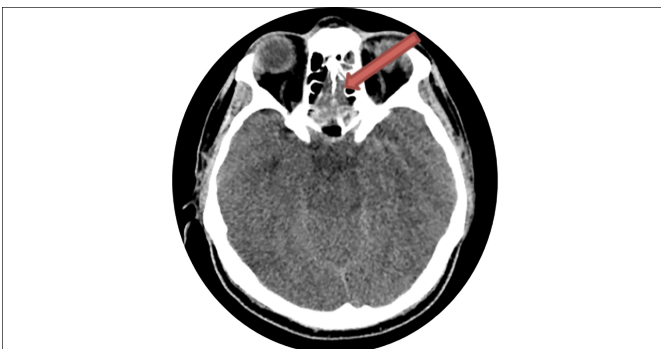
Variables	Value
Glucose	181 mg/dL
Lactate	6.7 mmol/L
Urea	32 mg/dL
Creatinine	0.46 mg/dL
Sodium	132 mEq/L
Potassium	5.4 mEq/L
Chloride	97 L mEq/L
C-reactive protein	75.8 mg/L
White blood cells	20.55×10 <sup>3</sup> /μL
Neutrophils	18.29×10 <sup>3</sup> /μL



**Figure 1: Head and brain shows midline shift (purple arrow), abscess formation involving air densities within (red arrow), and intraventricular air density (ventriculitis) (orange arrow).**



**Figure 2: CT scan of paranasal sinuses shows inflammation in the left maxillary sinus (sinusitis) (purple arrow).**



**Figure 3: CT scan of paranasal sinuses shows inflammation in the ethmoidal sinus (sinusitis) (red arrow).**

The head computed tomography (CT) demonstrated a hypodensity with dimensions of 35 × 35 mm on the left side of the frontal lobe of the brain. The CT also indicated a midline shift in the frontal site and liquid densities as well as mucosal thickening in paranasal sinuses. A diagnosis of frontal lobe abscess and ventriculitis was made (Figures 1-3). The patient was consulted to neurosurgery and infectious disease specialists. Afterwards, he was transferred to the ward. The patient was not approved for surgical intervention due to a low GCS score and fixed dilated pupils. He was started on empirical, broad-spectrum antibiotics for the brain abscess. The patient was placed on intravenous mannitol, vancomycin, and meropenem. Serial blood cultures were positive for *Streptococcus agalactiae*. Athoracic CT revealed paraseptal emphysematous air densities in both lobes of the lung. Band atelectases were also reported in both lungs. He was referred to the intensive care unit because of his worsened status. On the same day, the patient went into cardiac arrest and was declared dead.

## DISCUSSION

To the best of our knowledge, this presentation is one of the rare cases in the literature in which someone suffered from a brain abscess caused by *Streptococcus agalactiae*, which was initially misdiagnosed as methamphetamine withdrawal syndrome. According to his relatives, the patient gave up methamphetamine abuse a short time prior to presentation to the ED. The symptoms of the case were very similar to methamphetamine withdrawal findings. This unexpected situation caused suspicion of methamphetamine withdrawal in the physicians' minds while making the diagnosis. The head CT revealed a brain abscess. Brain abscess is a life-threatening disease. Additionally, brain abscesses caused by *Streptococcus agalactiae* are rare.

Although some publications have investigated cases of brain abscess in conjunction with opioid abuse, methamphetamine abuse was not clearly evaluated.<sup>6</sup> In a case report, a case of endophthalmitis and multiple brain abscesses caused by *Streptococcus agalactiae* was reported.<sup>7</sup> In another publication, the case of a 13-year boy who suffered from a brain abscess derived from paranasal sinusitis was presented.<sup>8</sup>

Methamphetamine withdrawal symptoms can mimic severe CNS infection findings. It has been suggested that 7–28 days after the use of methamphetamine, many methamphetamine abusers may have enough behavioural and cognitive skills to maintain daily activities.<sup>9</sup> Nevertheless, diagnosing such cases requires a multidisciplinary clinical approach. Immuno-compromised patients, as well as methamphetamine-addicted individuals, are vulnerable to severe diseases. Although the mechanisms are still unclear, the detrimental effects of methamphetamine on the immune system were shown.<sup>10</sup> Even sinusitis may develop into a CNS infection, as seen in this case. Physicians should always consider this situation so as to not miss a diagnosis of a fatal disease. On the other hand, it is

not easy to differentiate it from methamphetamine withdrawal symptoms in a crowded ED.

We have presented the difficulty to distinguish the brain abscess symptoms from methamphetamine withdrawal symptoms. This case is shared with the aim of drawing physicians' attention to the brain abscesses that mimic methamphetamine withdrawal findings. It is recommended that practitioners develop the medical knowledge about these cases, and they do not abandon multiple clinical approaches in the treatment.

#### **DISCLOSURE:**

An abbreviated version of portions of this paper was presented at the EMOS V 2023 Emergency Medicine Congress, Sivas, Turkey, on May 5, 2023.

#### **PATIENT'S CONSENT:**

A written informed consent was obtained from the patient's relatives.

#### **COMPETING INTEREST:**

The authors declared no competing interest.

#### **AUTHORS' CONTRIBUTION:**

SK, RS, HBK: Conception or design of the work; acquisition, analysis, and interpretation of data for the work.

SK, HBK, FMKG: Drafting the work and revising it critically for important intellectual content.

SK, HBK, RS, FMKG: Final approval of the version to be published; agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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