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Case Report

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Klebsiella-Induced Neonatal Brain Abscess: A Case Report of Rare Pathogen

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Abstract

Background: Brain abscess is a serious infection within the cranial space characterized by an encapsulated accumulation of purulent exudates. This report presents a case of a 14-day-old neonate with a brain abscess caused by *Klebsiella pneumoniae*.

Case Report: The neonate, who had been treated with a traditional remedy involving bread dough and spices on the umbilical cord, presented with fever, poor feeding, and lethargy and later experienced seizures. Laboratory investigations confirmed the presence of *K. pneumoniae* in the blood and cerebrospinal fluid (CSF). Brain magnetic resonance imaging (MRI) demonstrated multiple ring-enhancing lesions in the bilateral frontal and left parietal regions, suggestive of brain abscesses. After treatment, the patient's condition improved, and he was referred to another equipped center for further treatment.

Discussion: Previous cases were linked to idiopathic or maternal causes, such as urinary tract infections. There was no evidence that the causes of these abscesses were community-acquired. This case, the first reported outside of India, may indicate a community-acquired brain abscess.

Conclusion: This case report highlights the need for awareness and appropriate management of brain abscess caused by *K. pneumoniae*.

Keywords: Neonate, *Klebsiella pneumoniae*, Brain abscess

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Introduction

Neonates are at a higher risk of developing central nervous system infections caused by bacteremia and sepsis (1). Brain abscesses are lethal complications involving central nervous system (CNS) infection or sepsis. However, they rarely occur during the neonatal period (2). A brain abscess is an infection that develops within the intracranial space and is characterized by an encapsulated accumulation of purulent exudates (3). Few reports have identified klebsiella as responsible for brain abscesses. In the current report, we present a case of neonatal abscess induced by *Klebsiella pneumoniae*.

Case Report

A 14-day-old male neonate was brought to our emergency department because of fever, poor feeding, and lethargy. He was born vaginally at the gestational age of 36 weeks from a 32-year-old mother. The neonate had an uneventful pregnancy. The infant had one and five-minute Apgar scores of 9 and 10, respectively. The baby's birth weight was 3000 g, and his head circumference and length were 48 cm and 36 cm, respectively. The baby and his mother were discharged from the hospital the next day. On the fourth day after birth, the umbilical cord fell off. The parents stated that they applied a mixture of bread dough and local spices to the base of the cord. On physical examination at the emergency department, he was lethargic, jaundiced, and hypotonic. He had a heart rate of 170 bpm and a respiratory rate of 65 breaths/min. His temperature was 38.1 °C. On admission, his weight, head circumference, and length were 2805 g, 37.5 cm, and 48 cm, respectively. The anterior fontanel measured 2 cm × 2 cm and was neither bulging nor pulsatile. Limb movement was symmetric, and deep tendon reflexes were 2+.

The initial complete blood count (CBC) showed a white blood cell count (WBC) of 9200 µL, with 61% neutrophils and 33% lymphocytes. The hemoglobin level was 13.9 g/dL, and the platelet count was 632 000/µL. Additionally, the C-reactive protein (CRP) level was 34.9 mg/L, which is considered positive. The total bilirubin level was 10.0 mg/dL, while the conjugated bilirubin level was 0.7 mg/dL. The blood sugar level was 222 mg/dL. The sodium

(Na) and calcium (Ca) levels were 131 and 9.3 mEq/L, respectively. A chest X-ray was also obtained, but no prominent pathological findings were found.

Empirical antibiotic treatment with cefotaxime and ampicillin was initiated due to a positive sepsis screen. During the treatment, the patient had some abnormal movements suggestive of seizures. The patient was transferred to the neonatal intensive care unit (NICU). In the NICU, the neonate experienced another clonic seizure attack, prompting the initiation of levetiracetam to manage his seizures. Meanwhile, the neonate's fever persisted.

Due to the recurrence of seizures, phenobarbital was added to the patient's treatment regimen, which successfully controlled the seizures. Brain ultrasonography was performed, but the radiologist did not report any abscesses.

The blood culture (BD BACTEC) was positive for *K. pneumoniae*, which was sensitive to levofloxacin and ciprofloxacin and resistant to amikacin and piperacillin. The cerebrospinal fluid (CSF) analysis revealed a semi-clear appearance with a red blood cell (RBC) count of 90/cubic millimeters (cumm) and a WBC of 830/cumm, with 30% neutrophils and 70% lymphocytes. The protein level was 253.0 mg/dL, and the sugar level was 2 mg/dL. The culture results were positive for *Klebsiella*. The CSF antibiogram was consistent with the blood culture antibiogram. Magnetic resonance imaging (MRI) revealed two bilaterally heterogeneous lesions with clear borders in the frontal area. The brain MRI also demonstrates multiple ring-enhancing lesions in the bilateral frontal and left parietal regions, suggesting brain abscesses (Figure 1). This finding suggests the presence of an abscess or necrosis in the white matter.

Appropriate antibiotics were prescribed based on the antibiogram results, leading to the successful control of the patient's fever. Eventually, the patient was transferred to a more specialized center for further treatment.

Discussion

A 14-day-old male neonate was admitted to the emergency department due to the primary complaint of poor feeding. Subsequent evaluation led to the diagnosis of underlying sepsis, and further investigation, including blood and CSF analyses, revealed the presence of *K. pneumoniae*. Additionally, a cerebral MRI scan illustrated the presence of two distinct brain abscesses.

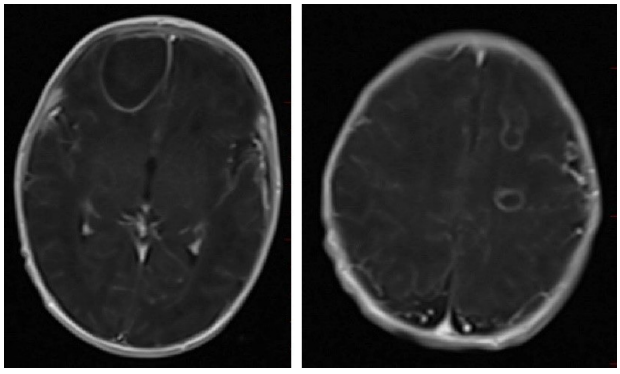

Figure 1. The brain MRI of the patient showed ring-enhancing lesions in the frontal regions

Streptococcus spp. is the most common pathogen responsible for brain abscesses in pediatrics, accounting for 36% of the cases.[4] Few reports have documented klebsiella as the etiological agent of brain abscesses in this population.[5-11] This could be attributed to klebsiella's inability to form necrotizing lesions.[12]

Basu et al reported a case study of a 28-day-old neonate who developed a brain abscess in the left frontal lobe. The patient presented with sepsis symptoms, including poor feeding, fever, and crying. No neurological findings were observed during the disease period, and the CSF culture was found to be sterile. However, the blood culture showed the growth of *K. pneumoniae*. The patient's condition improved significantly with intravenous cefotaxime and amikacin administration and abscess aspiration.[11]

In contrast, our case developed neurological symptoms and generalized tonic-clonic seizures. Our patient's CSF culture also yielded positive results, isolating *K. pneumoniae* as the causative agent. Interestingly, our patient was resistant to amikacin, tobramycin, and piperacillin but showed sensitivity to levofloxacin and ciprofloxacin.

The clinical presentation of brain abscesses can vary significantly, as demonstrated in a study of two neonates with brain abscesses, each presenting differently.[6] Brain abscesses may develop via hematogenous seeding or through the blood-brain barrier (BBB), as reported by Sundaram et al. One patient had a positive CSF culture, while the other did not.[6] However, in some instances, both blood and CSF cultures have yielded positive results.[7,8,10]

While the evidence regarding brain abscesses caused by klebsiella is limited, it has been observed that most patients without neurological deficits have negative CSF cultures and no meningitis.[6,7,10,11] To our knowledge, only one case has been reported with neurological deficit, facial palsy, and sterile CSF.[9]

Most studies have shown that brain abscesses tend to occupy the brain's frontal lobe and are often multiple.[6,9,10,12] However, in rare cases, they may be solitary or occupy other sites.[7,11]

Interestingly, all reported cases of neonatal brain abscesses caused by *K. pneumoniae* have been from India.[6-11] Our case is the first neonatal brain abscess reported outside India.

Conclusion

In conclusion, the number of reported cases of neonatal brain abscesses remains limited (Table 1). In recent years, no cases of brain abscesses caused by *K. pneumoniae* have

Table 1. All reported neonatal brain abscesses

Author	Year	Blood culture	CSF culture	Chief complaint	Neurological deficit	Site of abscess	Treatment
Basu et al[11]	2001	+	_	Excessive crying, fever, and poor feeding	None	Left frontal region	Aspiration + cefotaxime QID and amikacin TDS
Sundaram et al[6]	2009	1) + 2) +	1) _ 2) +	1) Respiratory distress 2) Fever, lethargy, and poor feeding	1) None 2) Seizure	1) Right frontal region 2) Right frontal region	1) Aspiration + piperacillin daily and tazobactam BD (6 weeks) 2) Meropenem TDS (6 weeks)
Qureshi et al[7]	2010	+	+	High-grade fever	Focal seizures	Right parieto-occipital region	Aspiration and antibiotic therapy
Louis et al[9]	2012	+	_	Respiratory distress, hypoglycemia, and feed intolerance	Right-sided lower motor neuron facial palsy	Right frontal and right basal ganglia regions	Vancomycin and piperacillin-tazobactam (6 weeks)
Biswas et al[10]	2014	+	+	High-grade fever, lethargy, and poor feeding	Left-sided focal seizures	Right and left frontal region	Aspiration + meropenem and amikacin (patient left the hospital against medical advice)
Pant et al [8]	2008	1) + 2) +	1) + 2) _	1) Lethargy and failure to suck 2) Lethargic and mildly tachypneic	1) Persistent lethargy and head circumference 2) Convulsions	1) Bilateral frontal and parietal lobes 2) Right occipital region	1) Meropenem and amikacin (patient left the hospital against medical advice) 2) Surgical drainage + IV antibiotics for 21 days (the antibiotics were not specifically mentioned)

been identified. While most cases have had an identifiable source of infection, some studies, including our own, have shown the development of brain abscesses in otherwise healthy neonates from normal pregnancies, suggesting a possible community-acquired origin.[6,10]

Although previous cases were related to idiopathic or maternal urinary tract infections, and there was no evidence that the causes of these abscesses were community-acquired, this case may indicate a community-acquired brain abscess.

Authors' Contribution

Conceptualization: Alireza Saadati.
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Formal analysis: Masoud Hassanvand Amouzadeh.
Investigation: All authors.
Methodology: Alireza Saadati, Masoud Hassanvand Amouzadeh.
Supervision: Alireza Saadati, Masoud Hassanvand Amouzadeh.
Validation: Alireza Saadati.
Writing-original draft: Seyed Mojtaba Alavi, Mohammadamin Shabani.
Writing-review & editing: Seyed Mojtaba Alavi, Mohammadamin Shabani.

Competing Interests

The authors declare no conflict of interest.

Ethical Approval

Informed consent was obtained from the patient's parents for the publication of this report.

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