Successful Minimally Invasive Drainage of a Large Right Sided Brain Abscess in a 12-Month-Old Child; Case Report and literature review

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Abstract

Background: Brain abscess in infancy is a rare but life-threatening condition associated with high morbidity and mortality if diagnosis or treatment is delayed. Advances in neuroimaging and minimally invasive neurosurgical techniques have significantly improved outcomes.

Case Presentation: We report the case of a 12-month-old boy who presented with a two-week history of fever, vomiting, seizures, irritability, and progressive left sided hemiparesis. Brain computed tomography (CT) revealed a giant abscess occupying a large portion of the right cerebral hemisphere with mass effect. The patient underwent successful minimally invasive CT-guided drainage through a small burr hole. Post-operatively, he showed rapid neurological improvement with complete resolution of hemiparesis. Follow-up imaging confirmed total abscess evacuation, and the patient remained neurologically intact at two-month follow-up.

Conclusion: Early diagnosis and minimally invasive CT-guided drainage represent a safe and effective approach for managing giant brain abscesses in infants, leading to excellent neurological recovery and minimal surgical morbidity.

Keywords

- Brain abscess
- Infant
- Hemiparesis
- CT-guided drainage
- Minimally invasive neurosurgery

Introduction

Brain abscesses in infants are rare but serious. They are collections of pus in the brain tissue caused by uncontrolled infections, leading to inflammation, tissue breakdown, and eventual capsule formation.[1-4] In newborns, the disease is harder to spot because their immune systems are immature and symptoms are vague, such as fever, irritability, poor feeding, or lethargy, making early diagnosis challenging.[5-7] Most infant brain abscesses are related to meningitis or sepsis, with meningitis being the most common predisposing factor.[5,6,8] However, infants with cardiac malformations, especially those causing right-to-left

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shunts, are at higher risk because bacteria can bypass the pulmonary circulation and reach the cerebral circulation more easily.[9] The infection usually reaches the infant brain through the bloodstream, especially during sepsis or meningitis.[8] Newborns' weaker blood-brain barrier allows pathogens to invade more easily, triggering inflammation, tissue destruction, necrosis, and capsule formation.[4,7,10,11] Abscesses can grow quickly and become large before detection, and infants' brain anatomy, with open fontanelles and sutures, delays classic signs like headache or neurological deficits.[6-7]

Infants at higher risk include premature babies, those with congenital heart disease, low birth weight, immunodeficiency, or prolonged NICU stays.[6-7] Meningitis accounts for most cases (64%), with sepsis and Gram-negative bacteria such as *Citrobacter koseri*, *Proteus*, and *E. coli* also common.[5,8] Diagnosis is often delayed due to non-specific symptoms and limitations of lab tests and imaging, with MRI with DWI being the gold standard.[1,12-15] Management requires prolonged IV antibiotics, possible surgical drainage, intensive supportive care, and serial imaging, but mortality and long-term neurological sequelae remain significant.[5,8,16-18]

In this report, we describe a case of brain abscess in a 12-month-old boy, focusing on how it was diagnosed, treated, and what the outcome was.

Case Presentation

A 12-month-old boy was admitted with a two-week history of fever, recurrent vomiting, and seizures. His parents reported progressive irritability, decreased spontaneous movements, and worsening weakness involving the entire left side of the body. There was no history of head trauma.

One month prior to this admission, the child had been hospitalized for approximately two months due to severe diarrhea and fever, suggesting a prolonged systemic infection and possible immunological vulnerability.

On physical examination, the child was irritable but conscious. Vital signs were within normal limits. Neurological examination revealed left-sided hemiparesis, increased muscle tone, and reduced spontaneous movements on the affected side. No signs of meningeal irritation were present.

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Given the focal neurological deficits and seizures, an urgent non-contrast brain CT scan was performed. Imaging demonstrated a large, well-defined hypodense lesion with peripheral enhancement occupying a significant portion of the right cerebral hemisphere, associated with mass effect and midline shift consistent with a giant brain abscess **(Figure 1)**.

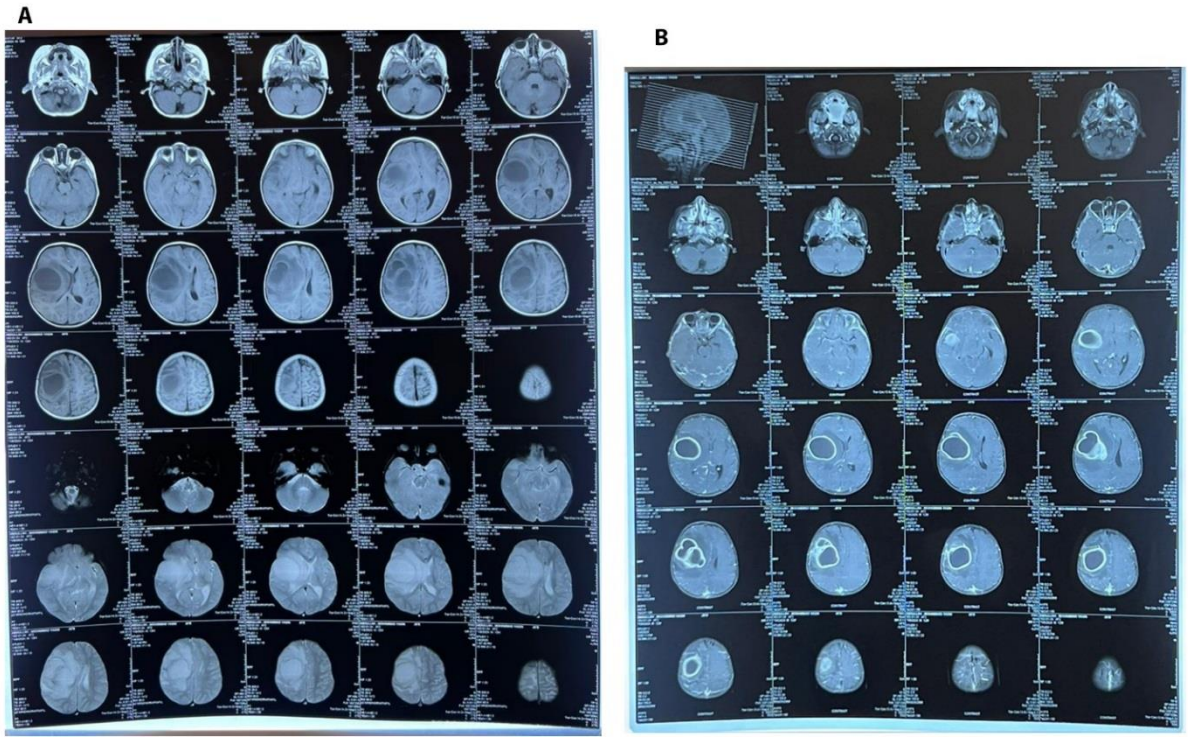


Figure 1: Before operation imaging.

A: Axial brain MRI showing a large intra axial lesion in the frontoparietal region, accompanied by surrounding vasogenic edema and significant mass effect, including compression of the lateral ventricle and midline shift. Findings are consistent with a space-occupying intracranial pathology.

B: Axial contrast-enhanced MRI of the brain demonstrating a well-defined ring enhancing lesion in the right cerebral hemisphere, consistent with a brain abscess, with surrounding vasogenic edema.

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After thorough counseling with the parents regarding the diagnosis, prognosis, and treatment options, urgent surgical intervention was planned.

Under general anesthesia, the patient underwent minimally invasive CT-guided abscess drainage. A 1 cm scalp incision and a 5 mm burr hole craniotomy were made. Using real-time CT guidance, the abscess cavity was accessed, and complete evacuation of purulent material was achieved.

The procedure was completed without intraoperative complications. The child was transferred to the postoperative unit in stable condition. Post-operative CT imaging confirmed complete resolution of the abscess with relief of mass effect **(Figure 2)**.

Clinically, the patient demonstrated rapid neurological improvement, Seizures ceased, Irritability resolved, Left-sided hemiparesis improved progressively and resolved completely.

The child regained normal motor activity and behavior appropriate for his age. He was discharged with appropriate intravenous and oral antibiotic therapy based on institutional protocol. At one-month and two-month follow-up, the patient remained neurologically intact, with no recurrence of symptoms or radiological abnormalities. His growth and developmental milestones were appropriate for age.

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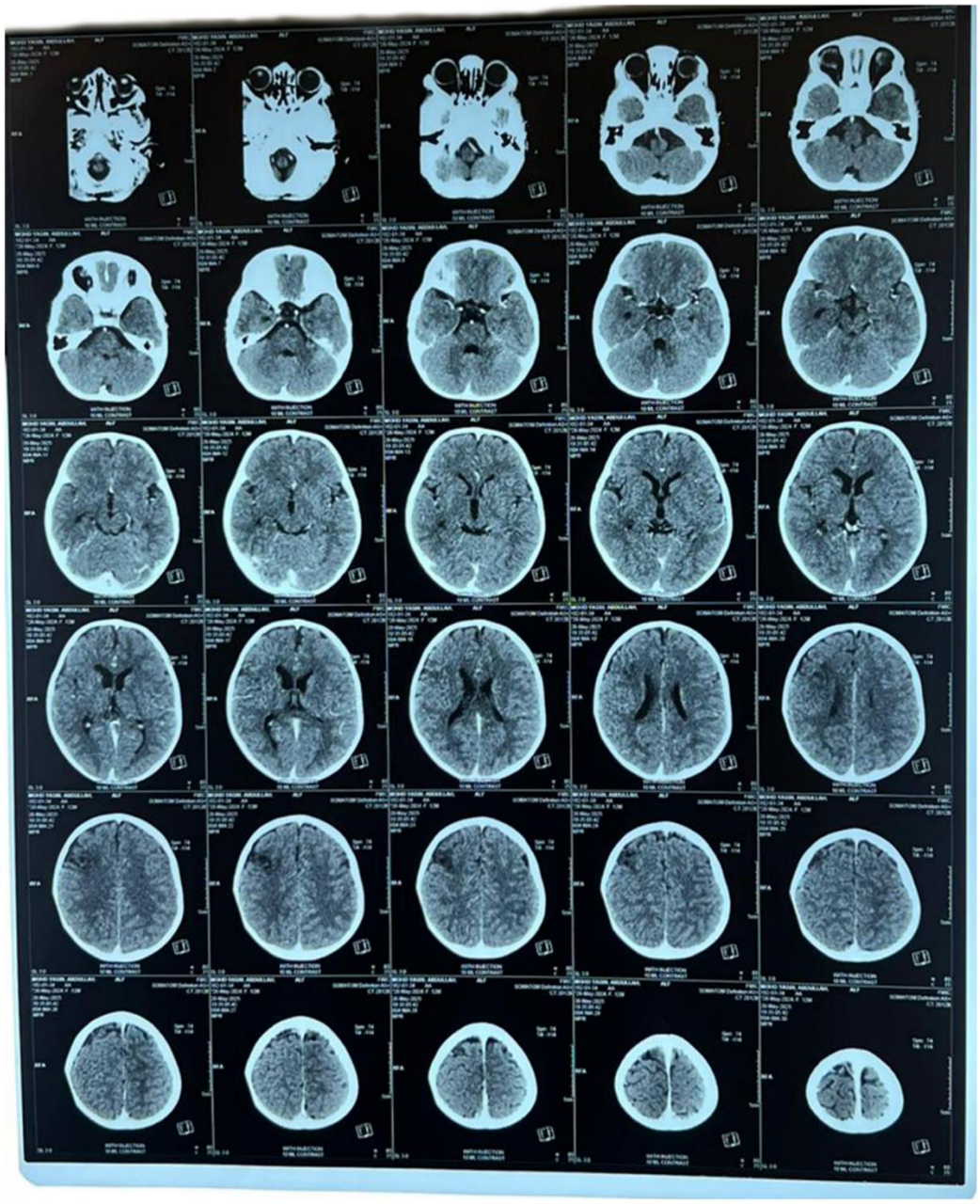


Figure 2: Follow up non-contrast axial brain CT demonstrating resolution of the previously observed mass effect. The ventricles appear symmetrical, gray white matter differentiation is preserved, and there is no evidence of residual focal lesion, hemorrhage, or midline shift.

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Discussion

Brain abscess in infants is uncommon, and the diagnosis is often delayed because the early signs are vague. Our patient had fever, vomiting, seizures, and progressive weakness on the left side, which eventually led us to perform urgent imaging. The CT scan showed a large abscess with mass effect. What makes this case different is that the child had no known congenital heart disease (CHD), which is one of the most common risk factors in pediatric brain abscess.

In children with cyanotic CHD, right-to-left shunts allow bacteria to bypass the lungs and reach the brain. Kudo-Kubo et al. reported a 15-month-old with cyanotic CHD who developed multiple abscesses but recovered well after aspiration and antibiotics.[13] Utama AS et al. described a 5-year-old with CHD and a giant abscess who unfortunately died soon after surgery.[14] Ghafoor et al. presented a 10-month-old with transposition of the great arteries and nearly 40 abscesses; antibiotics controlled the infection but the child was left with hemiparesis.[15] Joshi et al. emphasized that any focal neurological signs in cyanotic CHD should raise suspicion for brain abscess.[16]

Compared to these cases, our patient had a single giant lesion without CHD, likely related to his prolonged systemic illness. The management with CT-guided drainage was effective and the child remained stable after surgery. This case shows that while CHD is a major risk factor, infants without cardiac malformations can also develop severe brain abscesses, and early imaging plus minimally invasive drainage can improve outcomes.

Imaging plays a crucial role in diagnosis. In our case, a non-contrast CT scan revealed a large, well defined hypodense lesion with peripheral enhancement and midline shift features consistent with a mature encapsulated abscess. This is in line with findings from Pan S et al., who reported a preterm infant with multiple abscesses showing similar ring-enhancing lesions on MRI.[17] While MRI is more sensitive, CT remains the first-line modality in urgent settings due to its speed and availability.

Management strategies vary depending on the size, location, and number of abscesses. Our patient underwent CT-guided minimally invasive drainage, which allowed for complete evacuation with minimal disruption to surrounding brain tissue. This approach has been increasingly favored in pediatric cases. For instance,

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Gilard et al. reviewed 42 pediatric brain abscess cases and found that stereotactic or image guided aspiration was associated with good outcomes and fewer complications compared to open craniotomy.[1] In our case, the child tolerated the procedure well and showed early postoperative improvement.

Neurological outcomes in infant brain abscess cases are variable and depend largely on the timing of diagnosis and intervention. In our patient, early surgical drainage and antibiotic therapy helped prevent further deterioration, although long-term follow-up is needed to assess for potential sequelae. Seizures and motor deficits are among the most common complications reported in survivors.[18] Mameli et al. noted that up to 70% of children with brain abscesses may recover fully if treated promptly, but the risk of epilepsy or hemiparesis remains significant, especially in cases involving the frontal or parietal lobes.[8]

Overall, our case adds to the limited but growing body of literature on infant brain abscesses. It reinforces the need for early neuroimaging in infants with unexplained neurological symptoms, especially when there is a history of recent systemic infection. Prompt diagnosis and minimally invasive surgical management can lead to favorable outcomes, even in cases with large abscesses and mass effect.

Conclusion

Giant brain abscess in infancy is a medical and surgical emergency. Early diagnosis and CT-guided minimally invasive drainage, combined with appropriate antimicrobial therapy, can result in complete neurological recovery with minimal morbidity. This approach should be considered a first-line surgical option in suitable pediatric cases.

Ethical Consideration

Ethics approval was not required for this case report in accordance with the policies of our institution. Written informed consent to publish this case report was obtained from the patient.

Acknowledgment

Not applicable

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Conflict of interests

There is no conflict of interest

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