

# Citrobacter Meningitis with Encapsulated Brain Abscesses in a 6 day Old Neonate

**Running Title:** Citrobacter meningitis with encapsulated brain abscesses

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**Abstract:** *We present a 6 day old neonate who was detected to have Citrobacter meningitis with encapsulated brain abscesses. Such early encapsulation of brain abscesses is a very rare entity. This case highlights the importance of neuro-imaging in any case of meningitis in newborn. In absence of this neuro-imaging, the detection of multiple brain abscesses would have been missed as the neonate never presented with any focal neurological signs or seizures. On detection of brain abscesses in neonate, urgent neurosurgical evaluation should be undertaken in addition to ongoing medical management.*

**Keywords:** Citrobacter; meningitis; brain abscess; neonate; encapsulated

## 1. Introduction

Brain abscess in newborns is a very rare disease.[1] Citrobacter species are an uncommon cause of bacterial meningitis in neonates, but are associated with brain abscesses in a majority of cases.[2] Capsulation of brain abscess is seen in 10–13 days at the earliest.[3] We report a case of multiple large well-encapsulated brain abscesses diagnosed in a 6 day old neonate. Such a large well-encapsulated brain abscess in a 6 days old neonate is very rare.

## 2. Case Report

A 6 days old term neonate born was brought to our center with with 2-day history of fever, multiple seizures and poor feeding. The neonate was born at term through normal vaginal delivery. Birth weight of the neonate was 3320 g. Baby had cried immediately after birth and was started on breastfeeding within 1 hour of birth. The neonate was discharged on day 2 of life and was continued on exclusive breastfeeding. There were no risk factors for sepsis as per mother's antenatal history.

On arrival in emergency, the neonate was noticed to have clonic seizures which were aborted with iv Midazolam, The neonate was started on Phenobarbitone maintenance dose in view of recurrent seizures. The neonate was lethargic and had bulging anterior fontanelle but had no focal neurodeficit. Blood sugar and serum calcium levels were normal. The serological markers were negative for toxoplasma, cytomegalovirus, rubella, and herpes viruses. The lumbar puncture yielded turbid cerebro-spinal fluid (CSF) with 210 cells including 60% polymorphs. The glucose and the protein contents were 30 mg/dL and 120 mg/dL respectively. The baby was started on intravenous antibiotics (Cefotaxime and Amikacin). The CSF smears showed Gram-positive cocci and the culture taken on day 6<sup>th</sup>

of life was positive for Citrobacter species (Fig 3 & 4). Antibiotics were upgraded to Meropenem and Vancomycin based on culture sensitivity. A contrast cranial computerized tomography (CT) scan (Fig 1) showed two large encapsulated brain abscesses. The neonate underwent multiple USG guided aspiration of brain abscesses. Repeat CT scan at 7 days follow up (Fig 2) showed slight enlargement of both the abscesses despite repeated aspirations of brain abscesses along with intravenous antibiotics therapy following which the baby was taken home against medical advice.

## 3. Discussion

Globally, meningitis has a death rate of around 10%, rising to 30% when Citrobacter is the agent.[4] *Citrobacter* is a very rare cause of neonatal meningitis and infection is frequently associated with cerebral abscesses.<sup>2</sup> In the present case, the neonate had no risk factors for sepsis but Citrobacter was isolated from CSF culture taken on day 6 of life. The reason why Citrobacter particularly affects neonates is not known, nor why it preferentially involves the central nervous system (CNS). A specific 32-kD outer membrane protein may play a role as a neuro-virulent factor, providing Citrobacter tropism for the CNS and thus causing meningitis and cerebral abscesses.[5]

The concurrence of Citrobacter meningitis along with presence of multiple encapsulated brain abscesses in 6 day old neonate is a rare finding. This case highlights the importance of neuroimaging in any case of meningitis in newborn. In absence of this neuroimaging, the detection of multiple brain abscesses would have been missed as the neonate never presented with any focal neurological signs or seizures. Once brain abscesses are diagnosed, urgent neurosurgical evaluation is required so that all accessible cerebral abscesses and drainage should also be considered when there is no response to antibiotics.

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#### 4. Conclusion

In any neonate with clinical signs of late onset sepsis, thorough sepsis screen along with lumbar puncture must be carried out even in absence of risk factors for sepsis. In addition, all neonates with meningitis should undergo neuro-imaging. In case brain abscesses are picked up on neuro-imaging, urgent neurosurgical evaluation is required in addition to ongoing medical management.

#### References

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Figures:

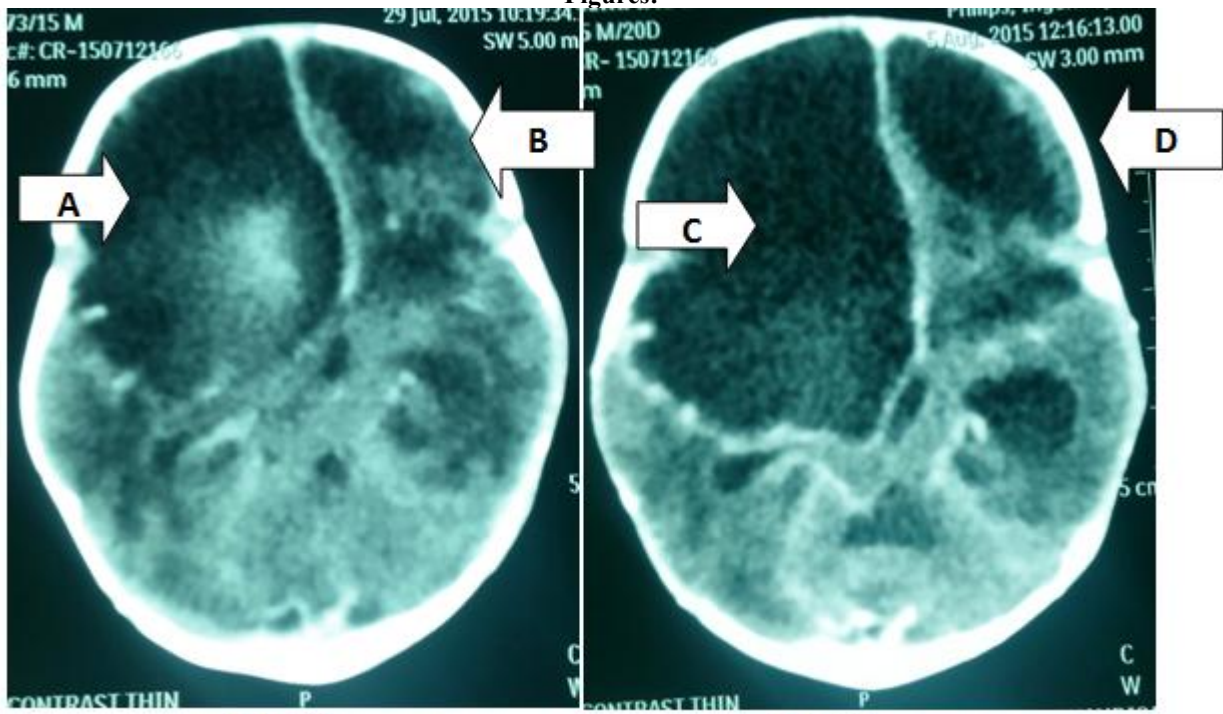


Figure 1

Figure 2

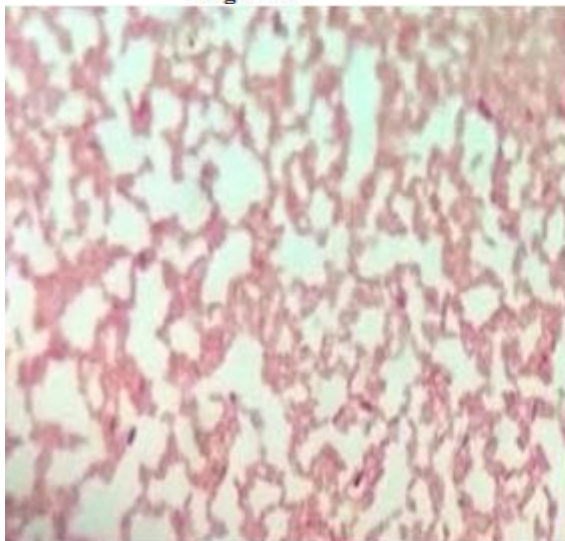


Figure 3

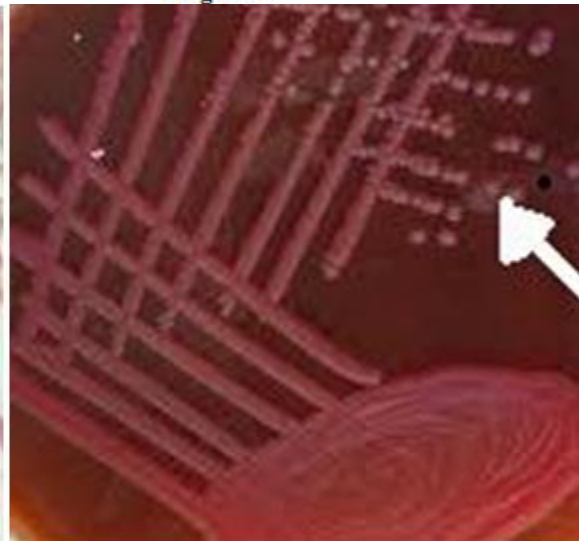


Figure 4

**Figure Legends:**

**Fig 1:** Computed tomographic scan (with contrast) of the head of 6 days old term neonate showing large hypodense cystic mass measuring 4.5 X 6.2 X 6.8 mm with peripheral enhancement in right fronto-parietal region (Arrow A) causing compression of right lateral ventricle (frontal horn) and a significant midline shift of 13 mm. Hyperdense areas are seen within the cystic mass. Similar small cystic mass measuring 3.1 X 4.1 X 2.2 mm (Arrow B) is noted in left frontal region.

**Fig 2:** Computed tomographic scan (with contrast) of the head of same neonate at 7 days follow up showing well defined hypodense peripherally enhancing lesion in right fronto-parietal measuring 7.2 X 4.5 X 4.9 mm (Arrow C) compressing the right half of midbrain causing midline shift to left of 9 mm. Similar lesion is seen in left frontal region measuring 3.2 X 4.8 X 2.4 mm (Arrow D). There is resultant communicating hydrocephalus of lateral, third and fourth ventricles (L > R).

**Fig 3:** Lactose fermenting pink colonies of *Citrobacter* on Mac Conkey Agar

**Fig 4:** CSF smear showing Gram negative bacilli of *Citrobacter* under 100 X magnification

