CASE REPORT

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Meningoencephalitis With Subdural Supratentorial Pyogenic Abscess: A Case Report

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Abstract

Meningoencephalitis is a serious infection involving both the meninges and the brain parenchyma, often associated with significant morbidity and mortality, particularly in infants. Pyogenic abscess formation within the cranial cavity is a rare but potentially life-threatening complication that requires prompt recognition and management. Subdural abscesses, especially in the supratentorial region, are uncommon in early infancy and may present with non-specific clinical features, making diagnosis challenging.

The case of a 2-month-old infant diagnosed with meningoencephalitis who subsequently developed a supratentorial subdural pyogenic abscess. The patient presented with fever, irritability, and poor feeding, followed by neurological deterioration. Neuroimaging played a crucial role in identifying the abscess, guiding timely surgical and medical intervention. Early diagnosis, appropriate antimicrobial therapy, and neurosurgical management were key factors in improving the clinical outcome.

This case underscores the importance of maintaining a high index of suspicion for intracranial complications in infants with meningoencephalitis, particularly when clinical improvement is delayed or neurological signs worsen. It also highlights the need for early imaging and multidisciplinary management to prevent adverse outcomes.

Keywords: subdural abscess, pyogenic abscess, pediatric neurology, meningoencephalitis, pediatric case report

Introduction

Subdural empyema (SDE) is characterized by the accumulation of purulent material between the arachnoid and dura mater within the cranial cavity. This condition predominantly affects pediatric population, with distinct etiologies according to age [1] . In infants, the primary cause is typically meningitis, whereas in older children, otitis media and sinusitis are the primary sources, which may disseminate through hematogenous spread or direct extension [2] . Notably, the mortality and morbidity rates associated with supratentorial SDE is comparatively lower than in infratentorial locations [1]. This case report illustrates the case of a 2-month-old boy who is diagnosed as meningoencephalitis. The main causative organisms identified were Escherichia coli and Cytomegalovirus, leading to a cascade of events that subsequently lead to the complication of subdural supratentorial pyogenic abscess. This case report provides information about its occurrence, clinical course, and management. Publishing the same serves to expand the medical literature, highlight the challenges in diagnosis and the importance of early intervention, share valuable clinical experiences, contribute to better patient outcomes, and potentially influence changes in healthcare systems' approaches to this condition.

Case Presentation

A 2 months-old male baby presented to the hospital, with the complaint of high-grade fever for 3 days. It was associated with abnormal movements, irritability, poor feeding and excessive cry. He had no other symptoms like nasal congestion, cough, vomiting or diarrhea. He was brought to the emergency department with fever and was advised admission, however, requested discharged against medical advice, and was given prescription for home. At home, he was treated with oral cefixime (100 mg-5mL suspension) for 2 days.

There were no similar complaints in the family. He was born at full term via normal vaginal delivery with hand presentation. His past medical history revealed a previously well baby with no known contact with tuberculosis(TB). His vaccinations were up to date. He was on exclusive breast feeding. He had no known allergies. No known travel history. Initial examination revealed an irritable infant with the following vitals: temperature of 38 degree celsius, capillary refill time 3 s, heart rate 161/min, respiratory rate 36/min, and oxygen saturation (SpO2) of 100% at room air. The patient weighed 5.3 kilo gram.

There was no pallor, icterus, cyanosis, clubbing or pedal edema. Neurological examination revealed intact primitive reflexes, patent anterior fontanelle, non bulging, non pulsatile, no signs of meningeal irritation. Rest of the systemic examination was unremarkable. On developmental assessment there was head lag, and social smile. He responded to sound, could see, fix and follow objects. Blood workup was done (as shown in the table 1). Blood investigation on admission had showed 8.7 g% hemoglobin. Total leukocyte count was 4.2 x10(3)/mcL and the differential count revealed 79% lymphocytes, 12.7% neutrophils. C-reactive protein (CRP)was 326mg/l. Cerebrospinal fluid (CSF) result was unremarkable. Chest X-Ray (CXR) and abdominal X-Ray were normal.

Table 1: Serial Blood Test Results

DATE	14 MAR 2022	16 MAR 2022	18 MAR 2022	20 MAR 2022	21 MAR 2022	25 MAR 2022	30 MAR 2022	5 APR 2022	27 APR 2022	4 MAY 2022
HB	10.3	8.7	9.1 L	8.10 L	-	7.5 L	10.5	8.3 L	9.4 L	-
WBC	5.58	4.2L	16.7 H	16.61 H	-	15.19	19.3 H	11.5	17.27	-
NEUTRO%	42.3H	12.7 L	40.40 H	27.8	-	65.90 H	64 H	50.9 H	51.3 H	-
LYMPHO %	51.6	79 H	36.9 L	51.3	-	19.9 L	24 L	32 L	51	-
MONO %	3.6	5	18 H	18.6 H	-	11.9 H	10.10	12.5 H	14.17 H	-
CRP	53 H	326.6 H	108.7 H	30.2H	-	143.1 H	169.6 H	73.8 H	0.2	-
PT	-	-	-	-	12.7	-	-	-	-	-
PTT	-	-	-	-	38.7 H	-	-	-	-	-
INR	-	-	-	-	1.12	-	-	-	-	-
CULTURE	-	-	-	-	-	-	-	-	-	CMV reactive

A provisional diagnosis of meningoencephalitis was made based on septic workup. The patient was started on cefotaxime, vancomycin and dexamethasone. After 48 hours of admission, he had right focal seizures with secondary generalization followed by refractory seizure for around three hours. Then, he was started on intravenous (IV) phenytoin 20mg/kg per day, phenobarbitone 30mg/kg per day and midazolam (loading dose followed by infusion to a maximum dose of 18mg/kg/min). He was intubated, shifted to high dependency unit (HDU) and put on ventilator support after thiopental sedation. The following day, he was extubated as he was stable and was kept on phenobarbitone maintenance dose of 5mg/kg per day. During the course of this period, the fever persisted.

On the eighth day, magnetic resonance imaging (MRI) brain with contrast revealed the presence of left fronto-parieto-temporal extra axial pachymeningeal and to less extent leptomeningeal pathological enhancement denoting meningitis. Bilateral subdural hygroma more on the left side was seen [Fig 1].

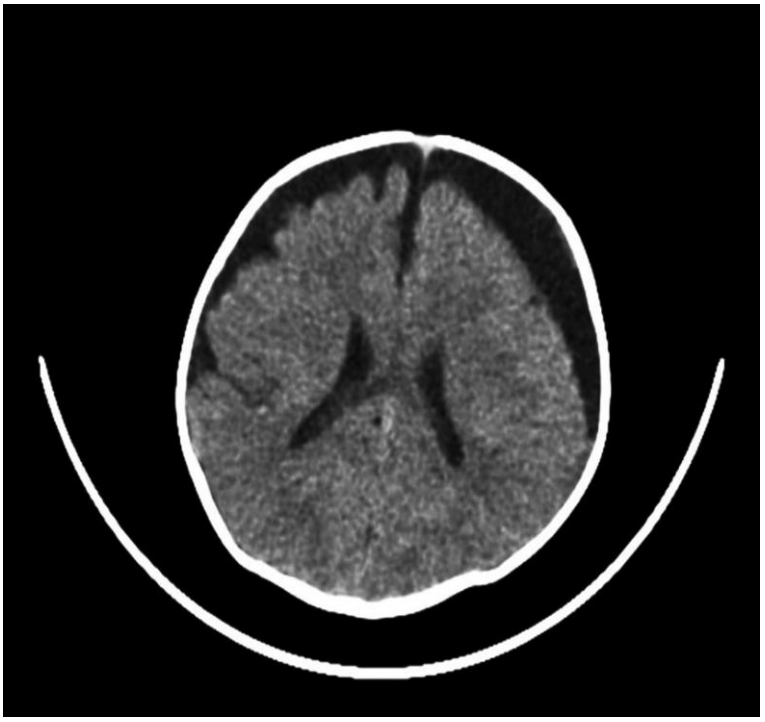

FIGURE 1: Magnetic resonance imaging (MRI) brain study with contrast revealing left fronto-parieto-temporal extra axial pachymeningeal and to less extent leptomeningeal pathological enhancement denoting meningitis. Bilateral subdural hygroma more on the left side.

On the tenth day, lumbar puncture was repeated and CSF was sent for analysis. It showed no growth.Two days later, US Neonatal Brain Scan was done that revealed a small fluid echogenicity below the level of corpus callosum measuring about 1.3x1.5 cm. Second opinion from Infectious Diseases, concluded that this is a complicated case of meningoencephalitis which went into stormy course of the illness, despite maximum medical therapy, most likely due to microbial virulence rather than antibiotics failure. It was advised to drain the subdural fluid collection immediately and then to send the drain for the following test (gram stain/culture and sensitivity (c/s)/Acid Fast Bacillus (AFB)/TB Polymerase Chain Reaction (PCR) and culture/ viral study for Herpes Simplex Virus (HSV) and enteroviruses). It was also recommended to keep the child on meropenem alone. On the 15th day, the patient developed a brief generalized tonic clonic convulsions. He was febrile with temperature39.5C. The convulsion was aborted after giving IV Diazepam with loading dose of phenobarbital (10mg/kg) followed by 5mg/kg/BID. Hence 13 mg per dose was given BID. He remained stable with no more convulsions.

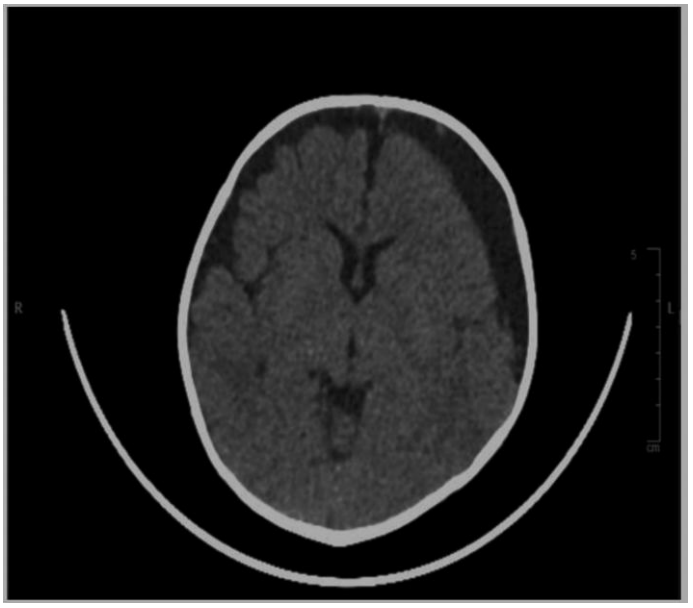

FIGURE 2: CT brain study done before burr hole procedure to check if there is increase in size of the hygroma.

A neurosurgical consultation was done to rule out any abscess which could be a complication of meningoencephalitis. Close observation was ordered and computed tomography (CT) scan as needed was advised for burr hole procedure if there is increase in size of the hygroma [fig 2].

On day 16, the infant underwent transfontanelle aspiration of the subdural collection, yielding approximately 13 mL of pus for microbiological analysis. CSF examination revealed markedly elevated protein, low glucose, and a WBC count of 24.146 × 10^3/µL. Post-procedure, the patient developed a brief right upper limb convulsion associated with a high-grade fever (39.5°C), which resolved following rectal diazepam. Brain CT demonstrated a stable left fronto-temporo-parietal extra-axial subdural collection with bilateral frontal hygroma/external hydrocephalus. The infant received intravenous meropenem for 42 days, along with phenobarbital and levetiracetam, which were gradually tapered according to the clinical response. Supportive therapy included multivitamins, vitamin D, and iron supplementation. Repeat lumbar puncture on day 44 showed marked normalization of CSF parameters, while CBC, CRP, liver function, and renal function tests were within normal limits. The child recovered well and was subsequently discharged with follow-up advice.

TABLE 2: CSF RESULTS

DATE	16 MAR 2022	25 MAR 2022	27 MAR 2022	31 MAR 2022	02 APR 2022	28 APR 2022
Protein	651.3 C	1260.6 C	--	33,394.3 C	--	496.9 C
Glucose	2 L	2.1 L	--	0.2 C	--	2.7
Total WBC	1.581 X 10^3 uL	0.123 X 10^3 uL	--	24.146 X 10^3 uL	--	0.051 X 10^3 uL
IL-6	--	--	46.4 H	--	--	--
CSF Culture	Negative	Negative	--	E.Coli growth	E.Coli growth	--

Serial blood test results are given in table 1 and CSF results in table 2. On day 44, the child was active, in good general condition, vitally stable and maintaining oxygen saturation in room air. There was no fever since the last 3 weeks. He was passing urine and stool normally and was tolerating feed.

Hence, the patient was discharged on the following home medications- Keppra 21 mg/kg/dose BID [levetiracetam, 120 mg, Soln-Oral, q12hr, Oral] for 2 months and oral keppra at tapered doses, 6 mg twice daily for 1 week, then 3 mg twice daily for 1 week , then to stop. The parents were also instructed that if the child developed convulsion during tapering, they should resume previous dose. On discharge the plan was to repeat CBC and High-Performance Liquid Chromatography after 1 month along with follow up in the pediatric clinic and neurosurgical clinic. EEG and MRI brain appointment were given after 2 months, which were concluded as normal.

Discussion

Brain abscess and subdural empyema (SDE) in pediatric patients are neurological emergencies with significant morbidity and mortality. About one-quarter of brain abscesses occur in children, most commonly between ages 4–7 years, with a male predominance. SDE, accounting for over half of intracranial infections, involves pus accumulation between the dura and arachnoid mater. In infants, it commonly follows meningitis, while in older children it is associated with sinusitis or otitis media. Risk factors include infancy (<6 months) and male sex. Causative organisms vary by age: neonates are commonly affected by group B streptococci, Enterobacteriaceae, and Listeria, whereas older children are more often infected by Streptococcus pneumoniae, Haemophilus influenzae, and Neisseria meningitidis.

Clinical presentation is often nonspecific. Seizures are the most common symptom (≈40%), along with fever, headache, altered consciousness, and focal neurological deficits. The classic triad (fever, headache, focal deficits) appears in only a minority of cases. Laboratory findings may show elevated CRP, ESR, and leukocytosis, but blood and CSF cultures often have low diagnostic yield.

Neuroimaging is critical for diagnosis. CT scans are widely available and used initially, but may be normal in early stages. MRI with contrast is the gold standard, with higher sensitivity (~93%), especially for detecting early or small lesions.

Management includes prompt initiation of broad-spectrum intravenous antibiotics (e.g., cefotaxime/ceftriaxone with metronidazole), followed by prolonged therapy. Supportive care includes seizure prophylaxis and management of intracranial pressure. Surgical intervention (burr holes or craniotomy) is indicated in cases of deterioration, sepsis, or poor response to antibiotics.

Early diagnosis and treatment significantly improve outcomes, with survival rates exceeding 90% when managed promptly. However, survivors may experience long-term neurological deficits, emphasizing the need for rapid recognition and intervention.

Summary

This case report describes a 2-month-old male infant with meningoencephalitis complicated by a supratentorial subdural pyogenic abscess, a rare but potentially fatal intracranial complication in infancy. The infant initially presented with high-grade fever, irritability, poor feeding, and seizures, followed by neurological deterioration despite empirical broad-spectrum antibiotic therapy. Magnetic resonance imaging (MRI) revealed bilateral subdural hygroma and features of meningitis, while subsequent aspiration confirmed an *Escherichia coli* pyogenic abscess. The patient underwent prompt neurosurgical drainage, received prolonged intravenous meropenem therapy along with anticonvulsants and supportive care, and demonstrated gradual clinical recovery with normalization of laboratory, cerebrospinal fluid, EEG, and

MRI findings before discharge. This case highlights the importance of maintaining a high index of suspicion for intracranial complications in infants with persistent or worsening meningoencephalitis and emphasizes that early neuroimaging, timely surgical intervention, multidisciplinary management, and prolonged targeted antimicrobial therapy are essential for achieving favorable clinical outcomes.

Conclusion

In conclusion, the management of meningoencephalitis complicated by a subdural supratentorial pyogenic abscess in this infant exemplifies the critical role of multidisciplinary care and timely surgical intervention. Despite initial challenges in diagnosis and treatment, including the identification of ESBL-negative Escherichia coli as the causative agent, early drainage and targeted antibiotic therapy led to a successful clinical outcome. The case highlights the importance of vigilance in recognizing rare but serious complications, such as convulsions and altered CSF dynamics, and underscores the necessity for thorough post-treatment monitoring, including EEG and MRI evaluations. By sharing this experience, we aim to contribute to improved awareness, diagnostic accuracy, and therapeutic strategies for similar cases in pediatric neurology and infectious disease management.

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. Ministry of Health and Prevention Research Ethics Committee/RAK Subcommittee issued approval MOHAP/REC/2024/67-2024 F-N. In regards to the above-mentioned Study protocol, this is to confirm that on the meeting dated (04/06/2024) the Ministry of Health and Prevention Research Ethics Committee has reviewed the Study protocol as well as all the documents submitted in the Submission file from the ethical point of view and has approved the conduct of the above-mentioned study.

Conflicts of interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following: Payment/services info: All authors have declared that no financial support was received from any organization for the submitted work.

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