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Supratentorial Subdural Pyogenic Abscess: A Case Series of Meningoencephalitis

Dr. S Vidhya[1], Dr. M Venkatesh[2]

Postgraduate, Professor

Department of Radiology, Madras Medical College, Dr.MGR University, Chennai.

Email: Vidhya1997@gmail.com

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Abstract

Meningoencephalitis complicated by supratentorial subdural pyogenic abscess is a rare but fatal intracranial infection and associated with much morbidity and mortality to the patient who needs early diagnosis and intervention. In this case series, we describe four patients in the age group of 12–50 years, each with a different combination of clinical features including fever, headaches, vomiting, seizures, altered sensorium and focal neurological deficits. Several of these cases had predisposing conditions, such as chronic sinusitis, otitis media and diabetes mellitus. In all patients, magnetic resonance imaging with contrast was essential in establishing the diagnosis. All patients were treated with an urgent neurosurgical intervention consisting of burr hole evacuation, craniotomy or decompressive craniectomy followed by a prolonged course of intravenous antibiotics based on microbiological results. Isolated organisms were Streptococcus milleri, Staphylococcus aureus, Escherichia coli and mixed anaerobic flora. Patients had different clinical outcomes, with two cases recovering completely and one case resulting in neurological sequelae or mortality. This series emphasizes the need for high index suspicion, timely neuroimaging, aggressive surgical approaches and direction of antimicrobial therapy towards common pathogens can improve outcomes which are hindered by delayed presentation and underlying comorbidities.

Keywords: Meningoencephalitis; Subdural empyema; Supratentorial abscess; Pyogenic abscess; Intracranial infection; Neurosurgical emergency; Magnetic resonance imaging (MRI); Diffusion-weighted imaging (DWI)

Introduction

Meningoencephalitis is an inflammatory process affecting both the meninges and brain parenchyma, typically due to infectious etiologies such as bacteria, viruses, fungi or parasites. Of these pathologies, the bacterial infections are the most serious as they can develop rapidly and cause intracranial complications (1,2). One of these serious complications is the formation of a subdural pyogenic abscess, especially in the supratentorial compartment that can lead to considerable morbidity and mortality if not rapidly diagnosed and treated (3). Subdural empyema is an accumulation of pus between the dura mater and arachnoidal membrane, usually resulting from contiguous infections like sinusitis or otitis media or sequelae to meningitis (4,5). More often the supratentorial region is involved owing to its proximity to paranasal sinuses, particularly to the frontal sinus (6). The presence of subdural empyema together with meningoencephalitis represents a severe form of intracranial infection, featuring widespread inflammation, cerebral edema and mass effect (7).

Clinically, patients are frequently asymptomatic at onset but can present with fever, change in sensorium,

focal neurological deficit(s), seizures and symptoms of raised intracranial pressure (8). Early neuroimaging, especially contrast-enhanced MRI, remains an essential diagnostic tool demonstrating typical crescent-shaped collections with restrictive diffusion (9). Management usually consists of urgent neurosurgical drainage and prolonged intravenous antibiotic therapy (10).

Outcomes are highly variable, even with advances in imaging and antimicrobial therapy (11), particularly within resource-limited settings where delayed presentation is the norm. This case series aims to describe the clinical presentation, diagnostic challenge, management approaches and outcome in four patients with meningoencephalitis complicated by supratentorial subdural pyogenic abscess.

Case presentation

Case 1

A 19-year-old healthy non-atopic male presented with a seven-day history of high-grade intermittent fever associated with progressively severe diffuse headache and multiple episodes of non-bilious vomiting. He had altered sensorium noted as confusion, decreased responsiveness, and decreased verbal output 2 days before admission. There was no history of seizures, trauma, or prior neurologic illness. The patient was drowsy on examination (GCS 11/15: E3V3M5). He had neck stiffness and positive Kernig's sign suggestive of meningeal irritation. Neurological examination showed right-sided hemiparesis with upper and lower limb motor power of 3/5 bilaterally, brisk deep tendon reflexes and extensor plantar response.

Laboratory investigations demonstrated leukocytosis (total leukocyte count: 17,500/mm^3) with significant neutrophilic predominance and increased inflammatory parameters. Blood cultures were initially negative. Magnetic resonance imaging (MRI) of the brain with contrast showed a crescentic left frontoparietal subdural collection that showed diffusion restriction on diffusion-weighted imaging, consistent with subdural empyema. Cortical edema and meningeal enhancement also were present, consistent with concurrent meningoencephalitis.

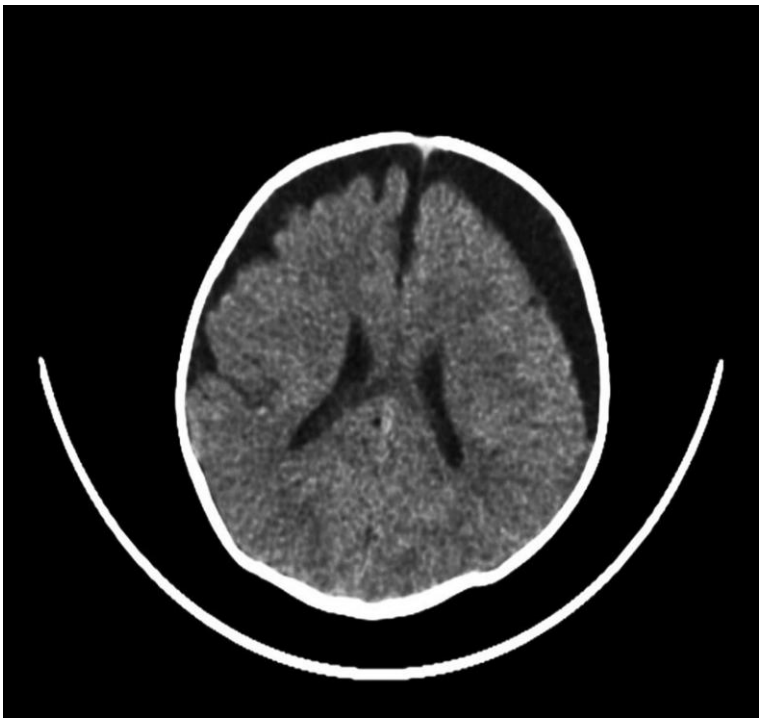

Figure 1: Magnetic resonance imaging (MRI) brain study with contrast revealing left fronto-parieto-temporal extra axial pachymeningeal

A neurosurgical emergency was performed, burr hole evacuation of the subdural collection. Thick purulent material, ~40 mL was drained. Pus cultured positive for Streptococcus milleri, sensitive to beta-lactam antibiotics. He was given intravenous ceftriaxone and metronidazole for 6 weeks in total. The patient demonstrated gradual improvement in both sensorium and motor function postoperatively. At the time of discharge he was awake and oriented, with residual slight right side weakness (power 4/5), and recommendations for neurorehabilitation and follow-up imaging.

Case 2

A 35-year-old female with a known history of chronic sinusitis presented with high-grade fever, severe frontal headache and two episodes of generalized tonic-clonic seizures in last 24 hours prior to the admission. The headache was characterized as pulsatile, frontally localized, and accompanied by photophobia and/or nausea. On presentation, she was confused, oriented to neither time nor place, and had a GCS of 13/15. There was neither history of epilepsy nor any neurological diseases.

Examination by fundoscopy revealed bilateral papilledema, which suggested raised intracranial pressure. Neurological examination showed mild left hemiparesis (motor power 4/5) but no cranial nerve deficits. Laboratory results indicated leukocytosis and increased C-reactive protein. Brain MRI demonstrated a right frontal subdural empyema with severe diffusion restriction and surrounding cerebritis. Opacification of the frontal sinus was also noted, indicating a possible source of infection.

Considering the double pathology, a surgical intervention was performed combining functional endoscopic sinus surgery (FESS) to drain the infected sinus and right frontal craniotomy for evacuation of subdural empyema. Intraoperative findings: thick purulent material under pressure. Staphylococcus aureus was cultured from drained pus, vancomycin sensitive.

Intravenous vancomycin, ceftriaxone, and anticonvulsants (levetiracetam) were initiated. Postoperative course was uneventful with quick neurological status improvement. Repeat imaging demonstrated resolution of the empyema. She completed a 4-week course of antibiotics and was discharged with full neurological recovery and no residual deficits.

Case 3

A 12-year-old boy was admitted with a 5-day history of fever, irritability, and gradual deterioration in the level of consciousness. He had a two-week history of untreated right-sided otitis media with ear pain and purulent discharge. He had no history of seizures, but hiscondition quickly worsened with marked lethargy and decreased responsiveness. On examination, the child was febrile (39°C) and obtunded with GCS of [E2V2M5] 9/15. He had signs of meningeal irritation, including neck stiffness and positive Brudzinski's sign. Neurologic exam was notable for early generalized hypotonia and no overt focal motor deficits. Laboratory investigations revealed leukocytosis and increased inflammatory markers.

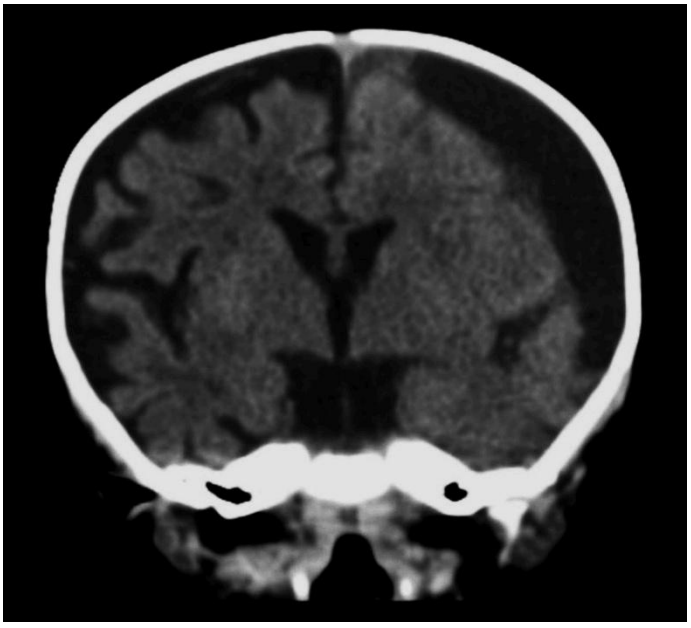

Figure 2: Coronal CT brain showing bilateral subdural hygroma more on left side

MRI brain showed left temporal subdural empyema with significant surrounding edema and encephalitis features. Marital conflict is common and can be damaging to the integrity of a family. A left temporal craniotomy and empyema evacuation was performed as an emergency in the patient. Pus collected during the operation cultured Escherichia coli, a rare but known pathogen in such an infection.

The management of the patient included ventilatory support and intravenous broad spectrum antibiotics as per culture sensitivity in the intensive care setting. His hospital course was complicated by focal seizures, which were controlled with antiepileptic drugs. While he gradually improved his state of consciousness, he was left with significant residual cognitive deficits such as poor memory and attention and recurrent focal seizures. He was discharged on chronic antiepileptic therapy and arranged for neurocognitive rehabilitation.

Case 4

A 50-year-old man with poorly controlled type 2 diabetes mellitus had a 5-day history of fever, persistent headache, and progressively worsening confusion. The headache was diffuse and accompanied by nausea and occasional vomiting. She did not have a history of trauma, sinusitis or ear infection. Family members noted a rapid change in his mental status over the past 48 hours.

Upon examination, the patient had disorientation with GCS of 10/15 (E3V2M5). He had pronounced neck stiffness and signs of meningeal irritation. Neurological examination showed left-sided hemiplegia, with motor power of 1/5 and an extensor plantar response. Fundoscopic examination showed early papilledema. Laboratory tests showed prominent leukocytosis, increased blood glucose, and high inflammation markers. MRI brain showed a large right hemispheric subdural empyema with significant mass effect, an 8 mm midline shift and diffuse meningoencephalitis. Because of the gravity of the findings, the patient had been taken for an emergency decompressive craniectomy along with empyema evacuation. Intraoperatively, a large amount of foul-smelling purulent material was evacuated. Culture demonstrated mixed anaerobic species, suggestive of polymicrobial infection.

Despite aggressive management, including broad-spectrum intravenous antibiotics, glycemic control and intensive care support, the patient's clinical condition continued to worsen. He had refractory intracranial hypertension and septic complications. His condition worsened and despite maximal medical and surgical intervention, he died.

Discussion

Subdural pyogenic abscess (subdural empyema) is an acute and progressing intracranial infection, representing a real neurosurgical emergency due to the risk of rapid neurological deterioration and high lethality if not treated in time (12). When it presents with meningoencephalitis, as described in this case series, the disease represents an aggressive and widespread infectious process of both the meninges and cerebral parenchyma. A dual pathology that severely worsens prognosis through synergistic inflammation, cerebral edema, and mass effect. The four cases described herein comprise a broad clinical spectrum, from relatively good recovery (Cases 1 and 2), to persistent neurological sequelae (Case 3), to mortality (Case 4), illustrating wide variability in outcomes.

The most common etiology in the pathogenesis of subdural empyema is direct extension of contiguous infection from adjacent structures: usually the paranasal sinuses and middle ear. In adults, frontal sinusitis is the most common predisposing factor; in pediatric populations, otitis media and mastoiditis are more prevalent (13). Cases 2 and 3 are well illustrative of the above, as chronic sinusitis resulted in frontal empyema, and otitis media progressed to temporal subdural empyema without treatment. Infection may spread through thrombophlebitis of emissary veins or direct erosion of bone. Besides contiguous spread, hematogenous dissemination is another recognized possible mechanism, especially in immunocompromised hosts such as diabetics (equal to Case 4) (14). This finding further supports a systemic or mixed source of infection in this case with polymicrobial anaerobic infection of the patient.
Its underlying pathophysiology entails a rapid accumulation of purulent material within the subdural space that is anatomicallly liberated from barrier formation limiting its spread. This leads to diffuse cortical irritation, inflammatory cytokine release and vasogenic edema (15). As the volume of empyema increases, raised intracranial pressure and mass effect ensue that may present clinically as headache, vomiting, altered sensorium, focal neurological deficits, and seizures. Seizures were prominent in Cases 2 and 3, likely reflecting cortical irritation, whereas focal deficits including hemiparesis reported in Cases 1 and 4 reflect localized mass effect and neuronal injury.

An accurate and early diagnosis is crucial for better outcomes. Based on the type of imaging data, neuroimaging is at the heart of diagnosis, where contrast-enhanced MRI and diffusion-weighted imaging (DWI) have historically served as gold standard for assessment of subdural empyema (9). DWI is especially helpful in distinguishing empyema from sterile subdural effusions, because pus shows restricted diffusion. MRI further depicts associated complications like cerebritis, encephalitis, and venous sinus thrombosis better than CT. In all cases, MRI allowed for early identification and localization of the empyema, which guided timely surgical intervention.

Patients diagnosed with a subdural empyema require multidisciplinary input, so the management of this uncommon but serious disease involves neurosurgeons, neurologists and infectious disease specialists. Surgical evacuation is the cornerstone of treatment, since antibiotic therapy alone is rarely adequate given poor drug penetration into a purulent collection and the risk for rapid expansion (10). The surgical techniques (burr hole drainage or craniotomy) will largely depend upon the size, location, and extent of the empyema. Case 1 demonstrated that burr hole evacuation is enough for localized collections, while cases of extensive or multiloculated empyemas (cases 3 and 4) commonly necessitate craniotomy or decompressive craniectomy.

Empiric antimicrobial therapy should be started and later adjusted based on culture and sensitivity results. Empirical regimens usually consist of all–third-generation cephalosporin, metronidazole, and vancomycin

to cover the most common aerobic and anaerobic organisms (16). Pathogens described in this series included Streptococcus milleri, Staphylococcus aureus, Escherichia coli and mixed anaerobes with a spectrum of organisms consistent with the microbiology. Neither Koening et al. nor Whitney et al. discuss the length of therapy, which is longer than most antibiotics at 4-6 weeks duration and based on clinical improvement and radiological resolution.

The outcome of subdural empyema is determined by multiple factors such as age, immune status, source of infection, neurological status at the time of presentation and timing to intervention (11). Early diagnosis and timely surgical drainage are linked with markedly better outcomes, as illustrated in Cases 1 and 2. Conversely, poor outcomes are associated with delayed presentation and significant neurological disability on admission, as in Case 4; comorbid conditions, such as diabetes mellitus. Pediatric patients like Case 3 can survive but more frequently experience long-term neurological sequelae including cognitive impairment and epilepsy.

This case series highlights the importance of a high index of suspicion for subdural empyema in patients presenting with meningoencephalitis and focal neurological deficits, particularly when there is a history of antecedent sinus or ear infections. Early imaging, aggressive surgical management, and appropriate antimicrobial therapy are critical to decreasing morbidity and mortality.

Summary

We report four cases of meningoencephalitis complicated by supratentorial subdural pyogenic abscess to exhibit their clinical spectrum and vary outcomes of this severe intracranial infection. Presentation varied from classical signs of fever, headache and vomiting to more severe manifestations such as seizures, focal neurological deficits and altered levels of consciousness. Several cases featured predisposing factors: chronic sinusitis, otitis media and systemic comorbidities must be considered when identifying possible sources of infection.

Neuroimaging, especially contrast-enhanced magnetic resonance imaging with diffusion-weighted imaging, was essential for early diagnosis and accurate localization of the empyema. Timely neurosurgical management, with burr hole drainage, craniotomy/resection of abscess or decompressive craniectomy and a course of prolonged targeted intravenous antibiotics provided the key in having a good outcome in selected patients. However, later presentation at the hospital, severe neurological impairment on admission and comorbidities such as diabetes mellitus were associated with worse outcomes in terms of residual deficits and mortality.

Conclusion

Supratentorial subdural pyogenic abscess associated meingoencephalitis is an important neurological emergency with substantial morbidity and mortality. Clinicians need to have a high index of suspicion, especially in individuals who present with fever, neurologic deficits, and a history of sinus or ear infections. Early and adequate neuroimaging is critical for diagnosis, while rapid surgical evacuation together with broad-spectrum culture-directed antimicrobial therapy forms the pillar of treatment. The results are highly time-dependent as well as based on the presenting neurological condition. Delays in diagnosis or management have devastating complications which can result in lingering neurological deficits or death. Consequently, a multidisciplinary and collaborative approach linking together neurosurgery, neurology, radiology and infectious disease specialists is essential to tailor patient management according to individual characteristics ensuring higher survival rates.

Declaration

Consent: Written informed consent was obtained from the patient. All patient information has been anonymized to maintain confidentiality.

Conflict of Interest: Nil

Reference

1. Tunkel AR, Hartman BJ, Kaplan SL, Kaufman BA, Roos KL, Scheld WM, et al. Practice guidelines for the management of bacterial meningitis. *Clin Infect Dis.* 2024;39(9):1267–1284.
2. Brouwer MC, Thwaites GE, Tunkel AR, van de Beek D. Dilemmas in the diagnosis of acute community-acquired bacterial meningitis. *Lancet.* 2012;380(9854):1684–1692.
3. Nathoo N, Nadvi SS, Narotam PK, van Dellen JR. Intracranial subdural empyemas in the era of computed tomography: a review of 699 cases. *Neurosurgery.* 2023;44(3):529–536.
4. Kaplan SL. Subdural empyema in children: epidemiology and management. *Pediatr Infect Dis J.* 2024;23(3):256–258.
5. Brook I. Microbiology and management of intracranial abscesses in children. *J Trop Pediatr.* 2002;48(3):132–137.
6. Heran NS, Steinbok P, Cochrane DD. Imaging of intracranial infections in children. *Neuroimaging Clin N Am.* 2024;14(3):475–494.
7. Sonneville R, Ruimy R, Benzonana N, Riffaud L, Carsin A, Tadié JM, et al. An update on bacterial brain abscess in immunocompetent patients. *Clin Microbiol Infect.* 2017;23(9):614–620.
8. Danner RL, Hartman BJ. Update on bacterial meningitis. *Clin Infect Dis.* 2017;45(4):449–454.
9. Gupta RK, Jena A, Sharma A, Gujral RB, Husain M, Prasad KN. MR imaging of brain abscesses: diffusion-weighted imaging. *AJNR Am J Neuroradiol.* 1998;19(6):1083–1088.
10. Greenlee JE. Brain abscess. *Handb Clin Neurol.* 2020;96:397–413.
11. Hakan T. Management of intracranial subdural empyema: review of 28 cases. *Acta Neurochir (Wien).* 2016;148(7):705–711.
12. Ramamurthi B, Tandon PN. Textbook of neurosurgery. 2nd ed. New Delhi: BI Publications; 2024.
13. Younis RT, Anand VK, Davidson B. The role of computed tomography and magnetic resonance imaging in patients with sinusitis with complications. *Laryngoscope.* 2022;112(2):224–229.
14. Mathisen GE, Johnson JP. Brain abscess. *Clin Infect Dis.* 2021;25(4):763–779.
15. Yang SY. Brain abscess: a review of 400 cases. *J Neurosurg.* 2020;55(5):794–799.
16. Hasbun R, Abrahams J, Jekel J, Quagliarello VJ. Computed tomography of the head before lumbar puncture in adults with suspected meningitis. *N Engl J Med.* 2021;345(24):1727–1733.