



Tubercular Subdural Empyema with Tubercular Abscess: Lessons Learnt

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Abstract

Tuberculosis (TB) is still one of the major health care problems in many developing countries. Among various forms of TB, central nervous system (CNS) TB causes significant morbidity and mortality. CNS TB can present in various forms: cerebritis, abscess, meningitis, tuberculoma, calcified granuloma, meningitis, or hydrocephalus. But subdural empyema is a very rare form of presentation. Very few cases have been reported till now in the literature. So, high level of suspicion, thorough microbiological and histological investigations to diagnosis, and early and timely inception of anti-TB medication are keys in its management. Here, we are presenting a case of tubercular subdural empyema that was successfully treated with surgical evacuation and anti-TB medication.

Keywords

- CNS
- tuberculosis
- subdural empyema
- tubercular abscess

Introduction

Tuberculosis (TB) is still a major health problem in many parts of the world. Among various types of TB, central nervous system (CNS) TB has very poor prognosis. CNS TB accounts for approximately 1% all cases of TB and it can present in various forms like tubercular meningitis, hydrocephalus, tuberculoma, abscess, and infarct.¹ However, CNS TB presenting as subdural empyema is very rare. We are presenting a case of tubercular subdural empyema with simultaneous abscess and have reviewed relevant literature.

A 41-year-old gentleman presented with right hemicranial headache for 4 months, fever 15 days, altered sensorium 10 days, and multiple episodes of vomiting from 3 days. However, there was no history of seizures. He had history of contact with his brother who had pulmonary TB 2 years ago. There was no evidence suggestive of immunocompromised status of the patient. On examination, he was disoriented (Glasgow Coma Scale [GCS] score was 14/15), had no meningismus features, no

focal neurological deficit, but had features of sepsis. Papilledema was noted on fundoscopy. Noncontrast computed tomography (CT) head done on arrival revealed hypodense subdural collection in right parieto-occipital region with diffuse ill-defined hypodensity in right fronto-temporo-parietal region, along with significant mass effect and midline shift (► **Fig. 1A**). Patient's neurological status deteriorated (GCS 12/15) quickly after CT. So, without waiting for further radiological/contrast studies, he was operated on emergency basis. Right fronto-temporo-parietal decompressive craniectomy was done. Dura was tense; on opening it, thick odorless pus came out from subdural space. Brain was tense and bulging out. There was pus collection in right temporal lobe tip. The abscess wall was dark yellowish and brittle. Surrounding normal parenchyma was edematous, soft, and easily suckable. The brain abscess with its wall, along with temporal polar area, was excised. Brain was pulsatile at the end of procedure. Lax duraplasty was performed. During surgery, we were not aware of causative organism and first assumption was pyogenic empyema. So, the bone was discarded in view of

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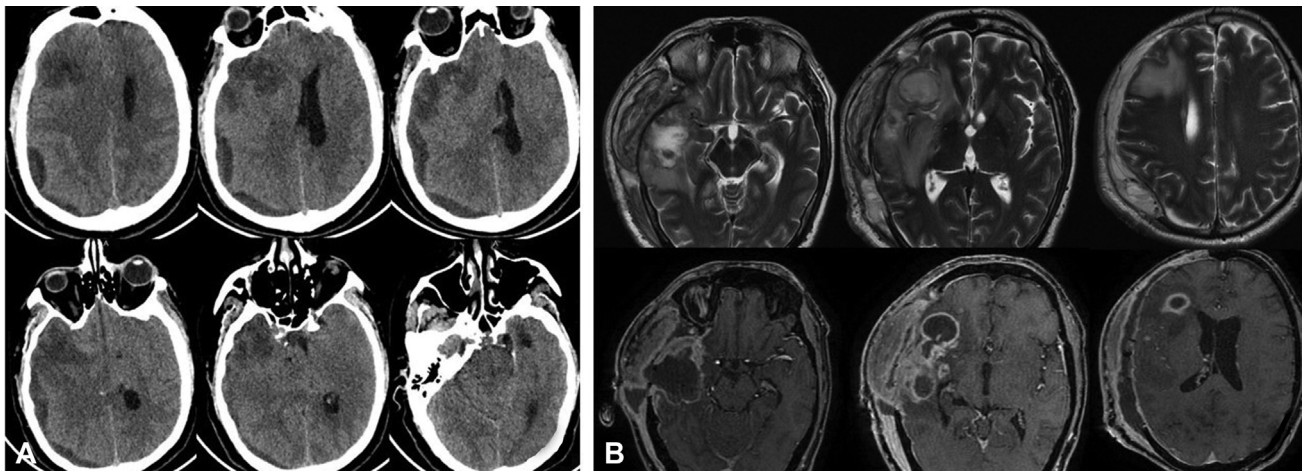


Fig. 1 (A) Preoperative axial noncontrast computed tomography images showing right fronto-temporo-parietal extra-axial hypodensity, with right temporal lobe ill-defined hypodensity with significant mass effect. (B) Magnetic resonance imaging of brain. Top row: Axial T2 sections showing absence of bone in right fronto-temporo-parietal region along with iso- to hyper-intense lesions in right frontal area, with heterogeneous changes in right temporal lobe with surrounding edema. Bottom row: Axial postcontrast T1 images suggestive of multiple ring-enhancing lesions involving right frontal and temporal areas with central nonenhancing areas and enhancement in temporalis muscle and subgaleal region.

suspected involvement with infection. The Gram stain, acid fast bacillus (AFB) stain, and bacterial cultures of pus were negative. On cerebrospinal fluid (CSF) study, sugar was 68 mg/dL (corresponding random blood sugar: 138 mg/dL); protein was 45 mg/dL; total leukocyte count was 100 cells/mm³: 80% monomorphs and 20% polymorphs; Gram stain, fungal stain, and AFB stain were negative; cartridge-based nucleic acid amplification test (CBNAAT) of CSF was negative for tuberculous bacilli; and culture was sterile. Patient's clinical condition improved initially after the surgery but on 10th postoperative day, patient's neurological condition deteriorated. Urgent contrast-enhanced magnetic resonance imaging (CEMRI) brain was done, which suggested multiple abscesses in various stages from cerebritis to abscess stage in frontal and temporal regions without significant mass effect (► **Fig. 1B**). CBNAAT of pus came positive for tuberculous bacilli with Rifampicin resistance. Histopathological examination showed acute and chronic inflammatory infiltrates along with necrosis without any granulomatous reaction (► **Fig. 2**). Patient was managed conservatively with antitubercular medication and he was started on multidrug-resistant (MDR) TB regimen. Patient's neurological condition gradually improved. The cause of deterioration in postoperative period after the initial brief improvement in neurological status might be because of diffuse meningoencephalitis due to TB, as the patient has improved with anti-TB medication. On follow-up after 12 months, he is conscious, oriented, and without any neurological deficits.

The cases with tubercular subdural empyema (► **Table 1**) have been reported from infancy to sixth decade and all, except one, were males.² Majority had features of headache and raised intracranial pressure, while other features were fever and seizures ($n=3$ each).³⁻⁷ One case had features suggestive of active pulmonary TB.⁴ Other associations observed were purulent ear discharge and recent history

of calvarial trauma (skull fractures). One patient had features of meningitis.⁶ Either history of TB infection or contact with TB patients was present only in three cases.³⁻⁵ Our patient presented with headache, fever, and altered behavior, with contact with pulmonary TB patient. On examination, none of them have focal neurological deficits except one.⁷

Area of subdural empyema is variable, mostly located in frontal, temporal, and parietal regions. In one patient along with left fronto-parietal region, interhemispheric empyema was observed.⁵ Bone involvement was observed in only one of all three mentioned cases;³ rest of the publications did not comment about bone involvement.

Pyogenic brain abscesses on magnetic resonance spectroscopy usually show the presence of amino acids (0.9 ppm) along with lipid and lactate, with or without the presence of acetate and succinate. The amino acids are always observed in pyogenic abscess even when patient is

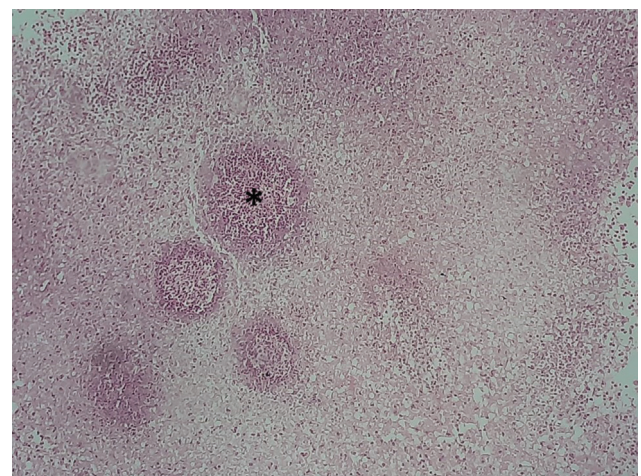


Fig. 2 10x Hematoxylin and eosin histopathological examination suggestive of acute and chronic inflammatory infiltrates surrounding necrotic area (*).

Table 1 Details of all the cases of tubercular subdural empyema in the English literature

	Age of patient/Sex	Presenting complaints	Examination	History of pulmonary TB/TB exposure	Site of subdural empyema	Bone involvement	Treatment given
van Dellen et al (1998) ³	59 years/Male	Headache	GCS 15/15; no focal deficits; no meningismus	Pulmonary TB	Left fronto-parietal	Yes	Fronto-parietal craniotomy, drainage of empyema, and bone was discarded
Cayli et al (2001) ⁴	1 year/Male	Fever, cough, breathlessness, headache, vomiting, lethargy	GCS 15/15; no focal deficits; no meningismus	Pulmonary TB	Right fronto-parietal	No	Right fronto-parietal craniotomy and drainage of empyema
Banerjee et al (2010) ⁵	12 years/Male	Headache, vomiting, fever	GCS 13/15; no focal deficits; no meningismus	TB exposure	Left fronto-parietal and interhemispheric	No	Left fronto-parietal craniotomy and drainage of pus
Turel et al (2012) ²	3 months/ Female	Focal motor seizure, irritability	Normal sensorium; no focal deficits; no meningismus	No	Left fronto-temporo-parietal	NA	Parietal twist drill evacuation, left fronto-temporo-parietal craniotomy, and evacuation of empyema
Kim et al (2016) ¹⁰	46 years/Male	GTCS with h/o trauma and skull fracture 18 days back	NA	No	Left fronto-temporal and occipital	NA	Craniotomy and evacuation of empyema
Vijayakumar et al (2012) ⁶	11 years/Male	Fever, headache, right ear purulent discharge	Drowsy; verbalizing normally; no focal deficit; neck stiffness present; Kernig's sign negative	NA	Right parafalcine; associated right temporal abscess and mastoiditis	NA	Craniotomy, drainage of pus, and excision of lateral wall of abscess
Gautam et al (2020) ⁷	13 years/Male	Seizure, headache, vomiting, altered sensorium, weakness of right upper and lower limbs	Drowsy; irritable; right hemiparesis	NA	Left frontal convexity and anterior interhemispheric region	NA	Left frontal burr hole, dura opened, and pus drained

Abbreviations: GCS, Glasgow coma scale; GTCS, generalized tonic-clonic seizure; h/o, history of; NA, not available; TB, tuberculosis.

Table 2 Differences between pyogenic and tuberculosis abscess

	Pyogenic abscess	Tubercular abscess
History	Symptoms due to primary infective foci, like mastoiditis, sinusitis, and pneumonia; abscess anywhere in the body; high-grade fever	<ul style="list-style-type: none"> • History of pulmonary or other variant TB • Close contact with TB patient • Evening rise of temperature • Constitutional symptoms of TB¹
Examination	Severe pyrexia and other features of sepsis present; severe neck stiffness	<ul style="list-style-type: none"> • Sepsis features are very rare • Cranial nerve deficits • Focal deficits (hemiparesis, aphasia)¹
Radiology including MR spectroscopy	Amino acids (0.9 ppm), lipid, lactate with or without succinate and acetate; ⁸ high MT ratio; usually thin walled	<ul style="list-style-type: none"> • Lipid, lactate peaks were observed • No evidence of amino acids • Associated basal exudates and hydrocephalus⁸ • Low MT ratio • Thicker wall
Histopathology findings	Intense polymorphonuclear infiltrate	Similar to pyogenic abscess, characteristic granulomatous reaction may be absent while epithelioid histiocytes forming ill-defined granulomas and palisading arrangement at edge of necrosis may be present ¹¹
Bacteriology	Conventional Gram stain may reveal Gram positive or negative bacteria	AFB positive bacteria; CBNAAT can detect mycobacterial DNA

Abbreviations: AFB, acid-fast bacillus; CBNAAT, cartridge-based nucleic acid amplification test; DNA, deoxyribonucleic acid; MR, magnetic resonance; MT, magnetization transfer; TB, tuberculosis.

on antibiotic treatment. In tubercular abscess, lipid and lactate peaks were observed and no evidence of amino acids were seen.⁸

Even though it is very difficult to differentiate between pyogenic and tubercular abscesses with clinical and radiological findings, we tried to compile few features to differentiate these two in **Table 2**.

Our patient was prophylactically loaded with phenytoin followed by maintenance dose, although he did not have any seizure. The seizure prevalence in brain abscess varies widely with various studies because of sample size of the study, site involved, follow-up duration, and other factors. In a follow-up study done by Koszewski, incidence of epilepsy in brain abscess was 37%.⁹

Salient Features in Current Case

Initial working diagnosis in this case was pyogenic abscess, and broad-spectrum antibiotics were used first. We unfortunately did not suspect tuberculous abscess preoperatively even though there is a positive contact history, because the patient did not have any clinical symptomatology in the previous 2 years after coming in contact of person with TB. He also did not have any primary TB focus in lungs or anywhere else in the body on physical examination and chest X-ray. It was a misjudgment on our part that we neglected the contact history, because TB contact history is very common in India.

The patient's status gradually declined after a brief improvement offered by decompression. After initiation of second-line antitubercular treatment (ATT) against MDR TB detected on CBNAAT, patient's status again improved. Hence it is important that the presence of TB contact history

should be considered and evaluated reasonably in all brain abscess patients, especially in India

Proposed Protocol

Protocol for work-up of patient presenting with fever and altered mental status:

- Thorough physical examination to rule out any foci outside CNS causing sepsis and altered sensorium or acting as source of CNS infection.
- Contrast-enhanced CT/CEMRI brain to rule out meningitis, abscess, or other lesions causing infection and mass effect.
- Lumbar puncture (LP; guarded LP if mass effect present on radiology); send CSF for gram stain, acid fast stain, CBNAAT, bacterial culture sensitivity, and tubercular culture sensitivity along with routine sugar, protein, and cellular work-up.
- High-resolution CT chest to rule out any definitive cause of sepsis or primary sepsis causing spread of infection to brain.
- Blood, urine, and endotracheal secretion culture sensitivity work-up; send routine blood work to rule out any metabolic abnormalities causing altered sensorium.
- Start empirical antibiotics immediately after obtaining CSF and other fluids for culture sensitivity work-up.

CNS TB presenting as subdural empyema is very rare, but high degree of suspicion is recommended and evaluation regarding TB history or contact must be obtained in all patients, especially in developing countries. In all cases, collected pus should be sent for TB assessment including CBNAAT.

MDR TB incidence is on rise in India, which necessitates modification of ATT for avoiding dismal outcomes. Successful clinico-radiological outcomes can be obtained with appropriate treatment.

Conflict of Interest

None declared.

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