

Tubercular brain abscess in HIV patient: A case report on rare complication of tuberculosis in the Indian subcontinent

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Title

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Abstract

Tuberculosis (TB) is one of leading causes of death, especially in developing countries. Common manifestations of TB include pulmonary symptoms with fever like, cough and pleuritic chest pain. Tubercular meningitis or tubercular brain abscess (TBA) is one of the rare manifestations of tuberculosis which leads to marked morbidity and mortality in TB patients. Prevalence of TBA is approximately 4-8% in immunocompetent individual however, in individual with pre-existing immunocompromised state like, HIV seropositive individual occurrence of TBA is shoots up to 20%. Here, we reported a case of 45-year-old male patient on anti-retroviral therapy (ART) with known status of HIV positive, presented with headache, fever and vomiting since several days. On admission, lab investigations revealed, mild leukocytosis with raised ESR and CRP. Non-contrast computed tomography (NCCT) of brain shows single ring enhancing lesion mimicking brain abscess. Further investigations confirmed tuberculosis infection. CSF analysis also suggestive of tubercular meningitis. Stereotactic aspiration of abscess was done with in situ catheter for drain residual fluid. Along with surgical management, anti-tubercular therapy (ATT) was also initiated in patient to control tubercular infection and prevent recurrence. Due to extensive treatment with ATT, ZN stain become negative and CXR return partially to normal state without any residual clinical symptoms and focal neurological deficit.

Keywords

Tuberculosis, Neuro-tuberculosis, Tubercular brain abscess, HIV infection, Anti-tubercular therapy

Introduction

Prevalence of tuberculosis in developing countries is significantly higher than developed nations. However, after global AIDS pandemic, cases of tuberculosis are also raised in developed countries due to marked increased in number of immunocompromised individual. In general, patients having tuberculosis is present with low grade fever, prolonged cough, occasional chest pain, fatigue and significant weight loss. Extra-pulmonary spread of tuberculosis like tuberculosis of central nervous system (CNS), especially tuberculous meningitis, is one of the leading causes of mortality in developing countries like India. The problem is further aggravated by the increasing prevalence of HIV infection. [1,2] Tubercular brain abscess (TBA) is a very uncommon manifestation of CNS tuberculosis. Prevalence of TBA is approximately 4-8% in immunocompetent individual however, in individuals with HIV-TB co-infection occurrence of TBA is raised

up to 20%. [3] TBA may be unilocular or multilocular and resembles a pyogenic abscess clinically and radiological, differentiation between this two is challenging. [4] Patients may present with features of raised intracranial pressure and focal neurological deficit, depending on the site of the abscess. [5] CT-scan or MRI of the brain as well as confirming primary tuberculosis infection is helpful for diagnosing TBA. On the basis of involvement of brain parenchyma, usually combined medical and surgery is considered for management of TBA.

Case History

A 45 years old male, farmer by occupation residing at Gujarat, India presented with complaints of headache since two-week that had gotten progressively worse, intermittent fever that may get up to 102°F, non-bilious, non-projectile vomiting, and cognitive issues since 5 days. During the examination, the patient had a normal body temperature and a Glasgow Coma Scale (GCS) score of 15. He exhibited neck stiffness and tested positive for Kernig's and Brudzinski's signs. No focal neurological deficits were observed. However, patient has a significant past history. Patient was diagnosed with HIV positive 3 years ago and is on ART since diagnosis. Further workup has been done which includes pathological and radiological investigations.

Differential diagnosis:

Tubercular brain abscess, pyogenic brain abscess, fungal brain abscess, neoplastic lesion

Investigations:

Laboratory investigations -

Blood tests (Table - 1): Leukocytosis with neutrophilia, elevated erythrocyte sedimentation rate (ESR), and elevated C-reactive protein (CRP).

Interferon-Gamma Release Assay (IGRA): Positive

Cartridge-based Nucleic Acid Amplification Test (CBNAAT): Positive

Cerebrospinal fluid (CSF) analysis: CSF pleocytosis with lymphocytic predominance, elevated protein, and decreased glucose and also positive for Acid-fast bacilli. (AFB)

Sputum analysis: AFB smear from sample detected mycobacterium tuberculosis bacilli.

Radiology investigations -

Brain NCCT (Figure - 1): Revealed a single, ring-enhancing lesion in the right frontal lobe with surrounding edema (Is encircled in red color in image) suggestive of brain abscess

Chest X-ray (Figure - 2): Pleural thickening and diffuse calcification in right lung indicating previous primary tuberculosis infection in this patient

Pathological and radiological findings suggestive of tubercular brain abscess. Diagnosis was confirmed with CSF analysis and well established primary foci of tuberculosis infection in right lung. Management of TBA is initiated surgically and anti-tuberculosis therapy (ATT) was also started to resolve infection and prevent recurrence.

Treatment:

Surgical management -

Stereotactic Aspiration: This minimally invasive procedure involved using image guidance to precisely locate and aspirate (remove) the abscess with a needle. Abscess Cavity Drainage: After the abscess is drained or aspirated, a drainage catheter was left in place to continue removing any residual fluid. Close Monitoring: Patients should be closely monitored post-surgery for any complications and to ensure that the infection is responding to treatment. Aspirated material was sent for microbiological evaluation; the report detected tuberculosis bacterium on Ziehl-Neelsen (ZN) stain with no evidence of malignancy.

Medical management -

The standard treatment regimen for drug-susceptible TB; isoniazid (INH) 5 mg/kg/d, rifampicin (RMP) 10 mg/kg/d, pyrazinamide (PZA) 25 mg/kg/d, and ethambutol (ETB) 15 mg/kg/d, were given to the patient during the intensive phase (IP) for 2 months. Continuation phase (CP); isoniazid, rifampin and ethambutol were prescribed for the next 4 months with regular monitoring and follow-up. On follow up, continuation phase has been extended further 6 month and hence total duration of ATT was total 12 months. Patient was on antibiotics for 2 weeks of post-op and 3 days of pre-op.

Outcome and follow-up:

The presenting complaints of patient headache, intermittent fever, non-bilious, non-projectile vomiting were treated with symptomatic treatment and relieved on a day of admission. A drain was kept for a week after neurosurgical operation of a patient. Then it was removed and also the patient was on antibiotics for 2 weeks of post-op and 3 days of pre-op too; Also ATT (anti tuberculosis treatment) was started for 2-month intensive and 4-month continuation therapy and it was further extended to 10 months. Patient was followed up till 18 months until complete resolution of symptoms and ZN stain found to be negative from nasal-oral swab. Patient was discharged after 2 weeks of admission. Then he was on weekly follow-up till 4 weeks; then after bi-weekly follow up till 3 months; and then patient was on monthly follow up till 9 months; Lastly was 2 monthly follow up till 18 months until complete resolution of his clinical signs, symptoms, AFB stain negative, CXR return partially to normal state and no focal neurological deficit present with cognitive status is at achievable normal state.

Discussion

Tuberculosis continues to be a significant public health concern in India, with millions of cases each year. However, tubercular brain abscesses are very uncommon in tuberculosis. This instance highlights the need to consider TBA in patients with neurological symptoms, particularly in areas with a high incidence of tuberculosis. [6]

While only few cases have been documented in global medical literature to meet the specific criteria established by Whitener. [7] The reason why abscesses develop instead of the more common tuberculoma, which make up about 20% of intracranial space-occupying lesions in patients, is unclear. Various factors, including the body's immune status, the amount of the infectious agent, the characteristics of the affected tissue, and the anti-tuberculosis treatment, may influence the type of tissue reaction. [5,7] It typically arises from the spread of *Mycobacterium tuberculosis* through the bloodstream from another location, though it can also spread through the lymphatic system from the cervical lymph nodes. The walls of the abscess generally lack epithelioid and giant cells, which are common in tuberculomas, and if such cells are present, they do not form organized follicles. [8] The abscess wall is composed of a necrotic inner surface and a fibrous outer surface associated with an inflammatory reaction. [8,9] TBA is usually caused by the hematogenous spread of *mycobacterium tuberculosis* from a primary focus in the lungs.

In literature review, we found that the clinical presentations of tubercular brain abscess are variable, depending on the size and location of the abscess. Common symptoms include headache, fever, seizures, and focal neurological deficit. [3] Previously published case reports include cerebral TBA at various location within brain parenchyma in HIV patients. [1,10-13] Hydrocephalus can also be present in cases of TBA [14], however in our case it is not present. This case also emphasizes an uncommon and serious form of central nervous system tuberculosis in HIV patient: tubercular brain abscess (TBA) with signs of meningitis. This patient, a 45-year-old male farmer from Gujarat, India, experienced headache, fever and vomiting since several days. Examination indicates meningeal irritation, but no focal neurological deficits were found which is usually present in significant number of patients CNS tuberculosis. [15] The Glasgow Coma Scale (GCS) score of 15 indicated the patient was fully conscious at the time of presentation.

The diagnostic modalities for TBA is commonly includes, blood investigations, brain imaging by CT-scan or MRI and AFB on stain, culture or PCR. [16] In our case we have confirmed TBA through various investigative

methods. On blood tests neutrophils were significantly high with raised inflammatory markers (CRP & ESR). Cerebrospinal fluid (CSF) analysis revealed an increased number of cells with a predominance of lymphocytes, elevated protein levels, reduced glucose levels and AFB smear detected mycobacterium tuberculosis bacilli, which are indicative of tuberculous meningitis. A chest X-ray revealed primary tuberculosis infection in the right lung. Importantly, brain NCCT findings are suggestive of brain abscess.

The mainstay of treatment of TBA is surgical management as well as ATT. In this patient both surgical and medical approaches have been used. The abscess was aspirated by stereotactic aspiration. After the aspiration, the patient began anti-tuberculous therapy (ATT), which is essential for treating tuberculous abscesses (TBA). Following the surgery and initiation of ATT, the patient's symptoms improved markedly, leading to their discharge after two weeks with instructions to continue ATT for six months. The patient fully recovered, demonstrating the effectiveness of prompt and vigorous treatment in these situations.

While the prognosis of TBA is generally favorable with prompt diagnosis and treatment, it can be complicated by factors such as HIV infection, malnutrition, and other immunosuppressive conditions. The patient in this case has HIV, which likely contributed to worsening of tuberculosis. However, the presence of pleural thickening and calcification suggests a chronic or reactivated tuberculosis infection, which could have posed additional challenges if not managed appropriately.

This case report of a tubercular brain abscess in a middle-aged farmer from Gujarat, India, highlights the diagnostic and therapeutic challenges associated with this rare manifestation of tuberculosis. It emphasizes the need for a high index of suspicion, thorough diagnostic workup, and aggressive treatment to ensure favorable outcomes. Public health measures to control tuberculosis and improve nutritional and immune status among the population are critical in preventing such severe complications.

Key clinical message

This case highlights the necessity of considering TBA in patients with neurological symptoms and a history of TB or immunosuppression due to HIV. Early diagnosis through neuroimaging and CSF analysis, coupled with surgical treatment and extended anti-tuberculous therapy, is essential for positive outcomes. Thorough follow-up is critical to track treatment progress, address potential complications, and ensure complete recovery while preventing relapse.

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Consent of patient:

We have taken written consent from patient regarding publishing clinical information as well as radiological image findings of patient, which would be open access and patient is agreed with this condition.

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Author Contribution:

Jay Kakadiya – Conceptualization, investigation, methodology, writing – original draft, writing – review & editing

Hem Prajapati – Conceptualization, methodology, resources, writing – original draft

Manan Patel – Conceptualization, investigation, writing – original draft

Chintan Kakadiya – Formal analysis, resources, validation, writing – original draft

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