

# An 11-Year-Old Boy with Headache, Fever, and Neck Pain

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**A**n 11-year-old-boy was admitted to the pediatric emergency department with 5 days of headache that was bilateral, throbbing,

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and progressively worsening. It was associated with fever, vomiting, neck pain, and stiffness. He was previously diagnosed as having acute sinusitis, given oral amoxicillin, and discharged from the hospital. Prior to his presentation he was a healthy boy and had no history of headache, chronic illness, recent vaccinations, cutaneous rash, cough, diarrhea, arthralgia, or myalgia. He had two scars of Bacille Calmette-Guerin (BCG) vaccine. Axillary temperature on admission was 38.5°C.

On physical examination, his weight and height were 33.5 kg and 145 cm, respectively. His mental status was alert and attentive. He had meningismus with increased deep tendon reflexes. There were no papilledema or focal neurologic signs. Cerebrospinal fluid (CSF) had a white blood cell count of 170/mcL (neutrophil predominant); protein of 89.1 mg/dL (normal range, 15-

40 mg/dL); and glucose of 33 mg/dL (CSF to serum glucose ratio of 0.33). Computed tomography (CT) scan of the head on the day of admission was normal. Acute bacterial meningitis was suspected, so ceftriaxone (100 mg/kg per day) and vancomycin (60 mg/kg per day) were administered. The patient had four generalized convulsions on the first day of hospitalization, and he developed diplopia with increased headache intensity.

Neurologic examination revealed left abducens nerve palsy. Magnetic resonance imaging with gadolinium contrast was normal. Chest radiograph was clear. CSF gram stain, cultures and acid fast bacilli smear, purified protein derivative (PPD) test, and blood and urine cultures were all negative. On the second day of hospitalization, he began to show signs of increased intracranial pressure with papilledema. His mental status was still alert.

**For diagnosis, see page 427**

*Editor's note: Each month, this department features a discussion of an unusual diagnosis. A description and images are presented, followed by the diagnosis and an explanation of how the diagnosis was determined. As always, your comments are welcome via email at [pedann@Healio.com](mailto:pedann@Healio.com).*

## Diagnosis:

### Tuberculous Meningitis

Rapid progression of symptoms, including increased intracranial pressure and cranial nerve palsy, suggested tuberculous meningitis. Tuberculosis nucleic acid amplification (using the GeneXpert MTB/RIF [*Mycobacterium tuberculosis*/resistance to rifampicin test]; Cepheid, Sunnyvale, CA) from the CSF was positive. Although the chest radiograph was clear and the patient had no respiratory symptoms, chest CT scan showed dense consolidations in the left lung (**Figure 1**). Serum HIV test was negative. Dexamethasone, streptomycin, isoniazid, rifampin, and pyrazinamide were started and the patient recovered without neurologic complication. CSF culture was positive for *M. tuberculosis*.

### DISCUSSION

Tuberculous meningitis is still a major cause of serious illness in many

parts of the world. It occurs in approximately 7% to 12% of patients with pulmonary tuberculosis.<sup>1</sup> The diagnosis of tuberculous meningitis is difficult and is often made after a substantial delay. Delays in the diagnosis and treatment are regarded as major contributing factors to its high mortality rates in developing countries. Atypical presentations and absence of rapid diagnostic tests, such as molecular-based methods in some medical centers, are the most important causes of delay in the diagnosis and treatment.

Central nervous system tuberculosis includes three clinical categories: meningitis, intracranial tuberculoma, and spinal tuberculous arachnoiditis.<sup>2</sup> Early recognition of tuberculous meningitis is of paramount importance because the clinical outcome depends greatly upon the stage at which therapy is initiated. Patients with tuberculous meningitis usually present with a subacute febrile illness that progresses through prodromal, meningitic, and paralytic phases. Atypical presentations include acute, rapidly progres-

sive meningitic syndrome suggesting pyogenic meningitis; slowly progressive dementia occurring over a period of months to years; and an encephalitic course without overt signs of meningitis.<sup>3</sup> The clinical presentation in our patient was compatible with acute bacterial meningitis.

Differentiation of tuberculous meningitis from acute bacterial meningitis is very important. Features independently predictive of tuberculous meningitis include clinical history of longer than 5 days, headache, total CSF white blood cell count of  $<1,000/\text{mm}^3$ , clear appearance of CSF, lymphocyte proportion of  $>30\%$ , and protein content of  $>100 \text{ mg/dL}$ . Occurrence of three or more parameters has a 93% sensitivity rate and a 77% specificity rate.<sup>4</sup> Cranial nerve palsy is also an important factor in differentiating tuberculous meningitis from acute bacterial meningitis.<sup>5</sup> Clinical features favoring tuberculous meningitis in our case were headache, total CSF white blood cell count of  $<1,000/\text{mm}^3$ , clear appearance of CSF, and sixth nerve palsy.

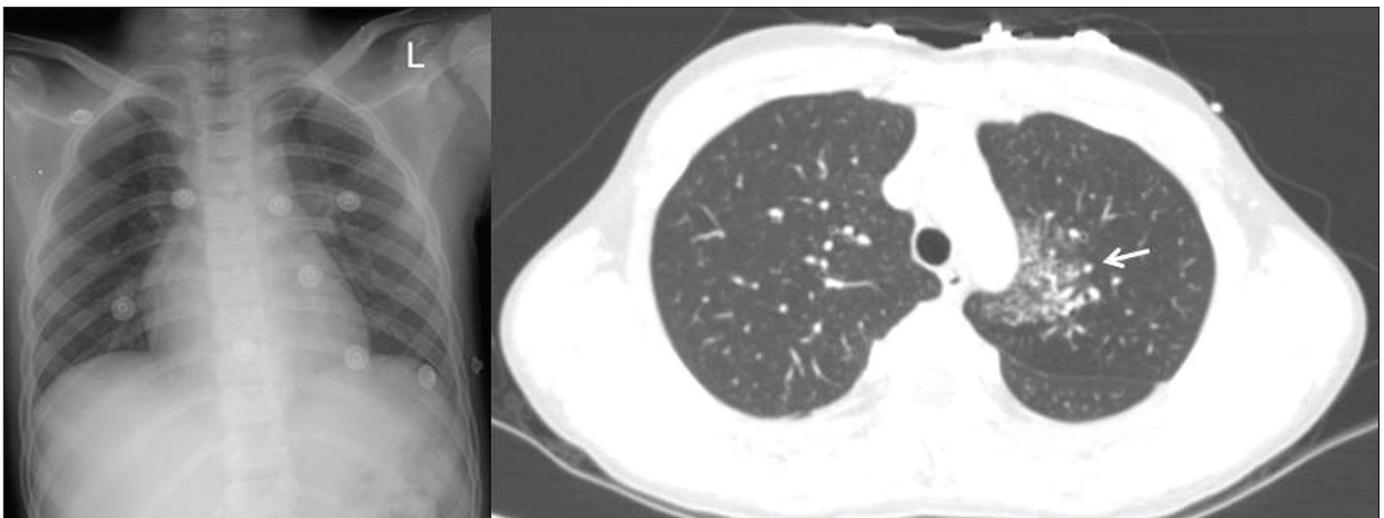


Figure 1. (A) Chest radiograph is clear. Note the eight external monitor leads on the chest. (B) Chest computed tomography scan shows dense consolidations (arrow) in the left lung.

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The BCG vaccine has greatly reduced tuberculosis incidence in developing countries. However, even with BCG vaccination, tuberculous meningitis remains a life-threatening condition, and vaccinated children still have common presentation in terms of severity and poor outcome.<sup>6</sup> Thus, early diagnosis is lifesaving. The definitive and rapid diagnosis of central nervous system tuberculosis depends upon the detection of *M. tuberculosis* bacilli in the CSF. Bacteriologic detection methods, such as direct smear and culture identification, cannot rapidly detect *M. tuberculosis* in CSF specimens. Recently, molecular-based methods, particularly polymerase chain reaction (PCR) assay, have emerged as new methods for the diag-

nosis of central nervous system tuberculosis because of their rapidity, sensitivity, and specificity.<sup>7</sup> Identification of *M. tuberculosis* by PCR assay in our case led us to start antituberculous therapy promptly. On the other hand, absence of respiratory symptoms and a normal chest radiograph does not exclude lung involvement, so a chest CT scan is highly recommended.

In conclusion, central nervous system tuberculosis may mimic acute bacterial meningitis. PCR assay and chest CT may be lifesaving when clinical and laboratory findings are not conclusive.

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