



CASE REPORT

The use of thoracic computed tomography scanning and EBUS-TBNA to diagnose tuberculosis of the central nervous system: two case reports

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ABSTRACT: Herein, we report two cases of tuberculosis (TB) of the central nervous system where accessing the cerebrospinal fluid for diagnostic purposes was relatively or absolutely contraindicated at presentation.

The finding of mediastinal lymphadenopathy on thoracic computed tomography scans, which was not visible on plain chest radiography, allowed endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) of these lymph nodes to support the diagnosis of TB in each patient and rule out other disease processes.

EBUS-TBNA is a new bronchoscopic technique and in this case report appears to be a safe and useful option in the diagnosis of TB. Moreover, it proved to be so in cases where the main focus of disease was outside the thorax.

KEYWORDS: Diagnosis, lymphatic diseases, tuberculosis, ultrasonography

Herein, we present two cases of suspected tuberculosis (TB) of the central nervous system (CNS), both meningeal and spinal, the diagnosis of which was aided by the use of thoracic computerised tomography (CT) scans to identify enlarged mediastinal lymph nodes not visible on normal chest radiographs. Subsequent endobronchial ultrasound (EBUS) and transbronchial needle aspiration (TBNA) allowed rapid and safe diagnosis of granulomatous inflammation at a site distant from the CNS and acquisition of tissue for drug sensitivity testing. These cases demonstrate the use of thoracic CT scanning and a novel technique, EBUS-TBNA, to help determine the management of critically ill patients with TB of the CNS.

CASE REPORTS

Patient A, a 31-yr-old British-Asian female, presented with cough and confusion. A CT head scan demonstrated mild hydrocephalus. In view of this a lumbar puncture was not performed. Blood results of note included: haemoglobin concentration of $12.3 \text{ g}\cdot\text{dL}^{-1}$; white blood cell count of $8.3 \times 10^9 \cdot \text{L}^{-1}$; erythrocyte sedimentation rate of $8 \text{ mm}\cdot\text{h}^{-1}$; and C-reactive protein of

$47 \text{ mg}\cdot\text{L}^{-1}$. A positive T-SPOT.TB blood test provided evidence of infection with *Mycobacterium tuberculosis* and, although a chest radiograph showed no evidence of active pulmonary TB, a thoracic CT scan was carried out to establish the presence of disease outside the CNS (fig. 1). Mediastinal lymphadenopathy with necrosis was demonstrated on the CT scan, subcarinal lymph node aspiration was demonstrated with EBUS, and real-time cytological analysis confirmed the presence of granulomatous lymphadenitis (table 1). A Ziehl-Neelsen stain of the needle aspirate showed the presence of alcohol and acid fast bacilli (AAFB), although a direct auramine stain for AAFB was negative. TB culture of the EBUS-TBNA sample subsequently grew fully sensitive *M. tuberculosis*. The patient has had an excellent radiological and clinical response after 6 months (out of a planned total of 12 months) of anti-tuberculous therapy accompanied by a weaning steroid regimen.

Patient B, a 37-yr-old Somalian female, was admitted with a 3-month history of a progressively weak left arm with distal paraesthesia. Blood results of note included: haemoglobin concentration of $11 \text{ g}\cdot\text{dL}^{-1}$; white blood cell count

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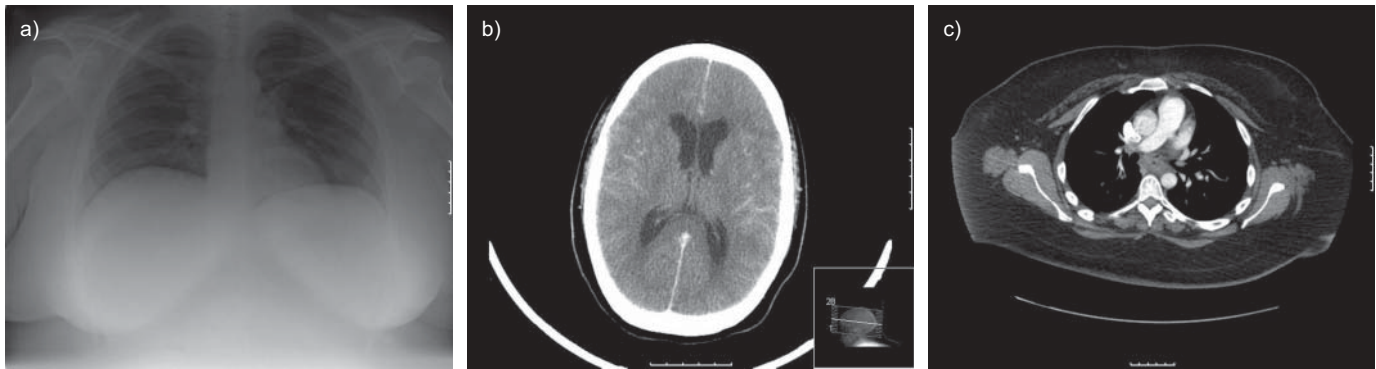


FIGURE 1. a) Chest radiograph of patient A. b) Contrast enhanced computed tomography scan of the head from patient A demonstrating generalised diffuse cerebral swelling with features in keeping with hydrocephalus but no definite leptomeningeal enhancement. The insert shows the scanogram which demonstrates the level of the computed tomography slice. c) Computed tomography scan of the thorax from patient A demonstrating a significantly enlarged subcarinal lymph node with features suggestive of necrosis.

of $9.2 \times 10^9 \cdot L^{-1}$; erythrocyte sedimentation rate of $116 \text{ mm} \cdot \text{h}^{-1}$; and C-reactive protein of $47 \text{ mg} \cdot \text{L}^{-1}$. Magnetic resonance imaging (MRI) of the spine identified changes consistent with a TB abscess and spinal cord compression at C6-C7; supportive evidence of TB infection was provided by a positive T.SPOT.TB blood test. A concurrent thoracic CT scan verified the presence of mediastinal lymphadenopathy and EBUS-TBNA of the patient's subcarinal node shortly afterwards confirmed granulomatous inflammation consistent with tuberculosis (table 1). Ziehl-Neelsen and auramine staining of the needle aspirate was negative for acid fast bacilli. She commenced intravenous dexamethasone and empiric quadruple anti-tuberculous therapy (rifampicin, isoniazid, ethambutol and pyrazinamide). A repeat MRI scan 1 month after the start of therapy demonstrated marked improvement in the spinal lesions along with complete resolution of the patient's symptoms. A scan 4 months later showed additional improvement. The EBUS-TBNA was culture negative for Mycobacteria at 6 weeks; culture negativity for Mycobacteria is not an infrequent finding in patients with highly probable tuberculosis, and given the marked symptomatic and radiological improvement, with cytological changes consistent with TB, we continued to treat the patient with standard anti-tuberculous therapy.

Both patients have been stepped down to rifampicin and isoniazid dual therapy for the continuation phase of treatment at 2 months, and both will complete a planned total of 12 months treatment.

DISCUSSION

In our case series, where safe sampling of the CNS was not immediately possible in two cases of suspected CNS TB,

confirming the diagnosis was initially dependent on finding CT evidence of radiological thoracic involvement not apparent on plain radiographs, and targeting this area for the acquisition of sample for microbiological and cytological analysis using EBUS-TBNA. In both cases, this approach proved to be the exclusively diagnostic method, and was instrumental in managing critically ill patients.

Definitive diagnosis of tuberculous meningitis depends upon the detection of the tubercle bacilli in the cerebrospinal fluid by smear examination and mycobacterial culture, but sensitivities for both vary significantly [1, 2]. In addition, a lumbar puncture may be contraindicated where there are signs of raised intracranial pressure, precluding the acquisition of any fluid for smear and culture.

In TB, plain chest radiographs may be normal or show only mild or nonspecific findings in patients with active pulmonary disease [3]. CT has been found to be superior to chest radiography in the assessment of subtle parenchymal disease, and mediastinal lymphadenopathy [4].

Thus, as demonstrated with these cases, where disseminated or neurological granulomatous disease is suspected, the use of CT scanning in place of normal chest radiography may be helpful in finding evidence of previous or concurrent active disease. Moreover, CT scans may identify hilar and mediastinal lymph nodes suitable for sampling by EBUS and TBNA. TBNA has been used safely and effectively to obtain cytological specimens from mediastinal lymph nodes for the diagnosis and staging of bronchogenic carcinoma >20 yrs [5]. However, the published data on mediastinal tuberculous lymphadenitis diagnosed by TBNA is more limited [6–8].

TABLE 1 Cytological appearance of endobronchial ultrasound-transbronchial needle aspiration samples in patients A and B

Patient	Pathology
A	Necrotic debris and sheets of acute inflammatory cells. Scattered multinucleate giant cells and plump epithelioid histiocytes. Ziehl-Neelsen stain shows alcohol and acid fast bacilli.
B	Paucicellular lymph node aspirate with granulomatous inflammation.

With cytological analysis, TBNA can confirm the presence of granulomatous inflammation at sites that are readily accessible outside the CNS. The advent of EBUS-TBNA for the diagnosis of TB is novel and has only been briefly described in the literature [9]. Our report emphasises its safety and usefulness in two cases where it was instrumental in reaching a diagnosis. In our report, one of the two patients was culture positive following mediastinal lymph node aspiration. EBUS may now allow even higher rates of smear and culture positivity than TBNA alone; we await published data on this exciting new technique in the diagnosis of TB.

STATEMENT OF INTEREST

None declared.

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