

# Evaluation of a tuberculous abscess on the right side of the diaphragm with contrast-enhanced computed tomography: A case report

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**Abstract.** We herein investigate the case of a patient with a tuberculous diaphragmatic abscess confirmed by pathology. The patient underwent plain computed tomography (CT) examination of the chest and contrast-enhanced abdominal CT examination. The abscess appeared as hypodense mass with thick and irregular wall, which was enhanced on the contrast-enhanced CT images. The shape of the mass resembled an irregular double convex lens. No enlarged lymph nodes were detected on the CT images. The presence of a tuberculous diaphragmatic abscess should be suspected in patients with a diaphragmatic hypodense mass with enhanced thick walls, even when there is absence of enlarged lymph nodes on the CT images.

## Introduction

*Mycobacterium tuberculosis* (TB) infection remains a challenge to human health (1,2). Although abdominal TB is uncommon, the peritoneum is commonly involved in patients with abdominal TB infection (3,4). Charoensak *et al* (4) reported that certain cases with tuberculous peritonitis may mimic other diseases, which represents a diagnostic challenge for clinicians.

A few cases with intraperitoneal tuberculous abscesses have been previously reported, whereas diaphragmatic tuberculous abscess (DTA) is particularly rare (4-6). The aim of this case report was to gain some experience regarding the computed tomography (CT) findings in this DTA case, which

was pathologically confirmed, with the hope that it will be contributory to the comprehensive CT diagnosis of DTAs.

## Case report

The present study was reviewed and approved by the Institutional Review Board of The Affiliated Hospital of Weifang Medical University. The patient provided written informed consent was provided to the publication of this case.

A 22-year-old male patient presented with night sweats, easy fatigability and obscure right upper abdominal pain for 60 days. The clinical examination of the patient did not identify an abdominal palpable mass, and there was no history of lung TB.

Plain CT scanning of the chest was performed using the GE Bright Speed 16-detector spiral CT scanner (GE Medical Systems, Chicago, IL, USA) with the following parameters: 120 KV, 130 mAs and 5 mm slice width. Contrast-enhanced abdominal CT scanning was performed using the Siemens Somatom Sensation Cardiac 64-slice spiral CT scanner (Siemens, Munich, Germany) with the following parameters: 120 KV, 200-390 mAs and 5 mm slice width. The patient received intravenous Ultravist (300 mgI/ml; Bayer Schering Pharma AG, Berlin, Germany) administered as a bolus, at an injection rate of 3.0 ml/sec. Oral contrast material (water) was administered.

The CT images revealed a hypodense diaphragmatic mass, sized 6.0x4.5x3.5 cm, pushing on the parenchyma of the liver. The shape of the mass resembled an irregular double convex lens based on the right side of the diaphragm. The wall of the mass exhibited irregular thickening with enhancement. Gas collection or calcification were not detected within the mass (Figs. 1-3). The right side of the diaphragm was discontinuous. The right retroperitoneal space and the adjacent pleura were invaded, with marginally increased thickness of the subpleural fatty tissue (Fig. 4). No enlarged lymph nodes were detected in the mediastinum, root of the mesentery or upper para-aortic region. No tuberculous lesion was detected on the bilateral lung fields (Fig. 5).

Surgery was performed. The mass involved the right side of the diaphragm and adhered to the liver. The small and large

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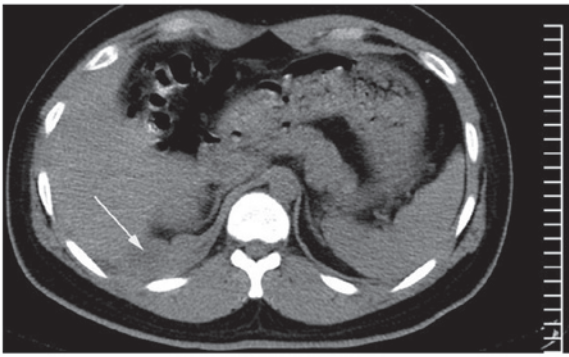


Figure 1. Axial plain computed tomography image showing a hypodense diaphragmatic mass (white arrow) pushing on the hepatic parenchyma. The shape of the mass resembled an irregular double convex lens.

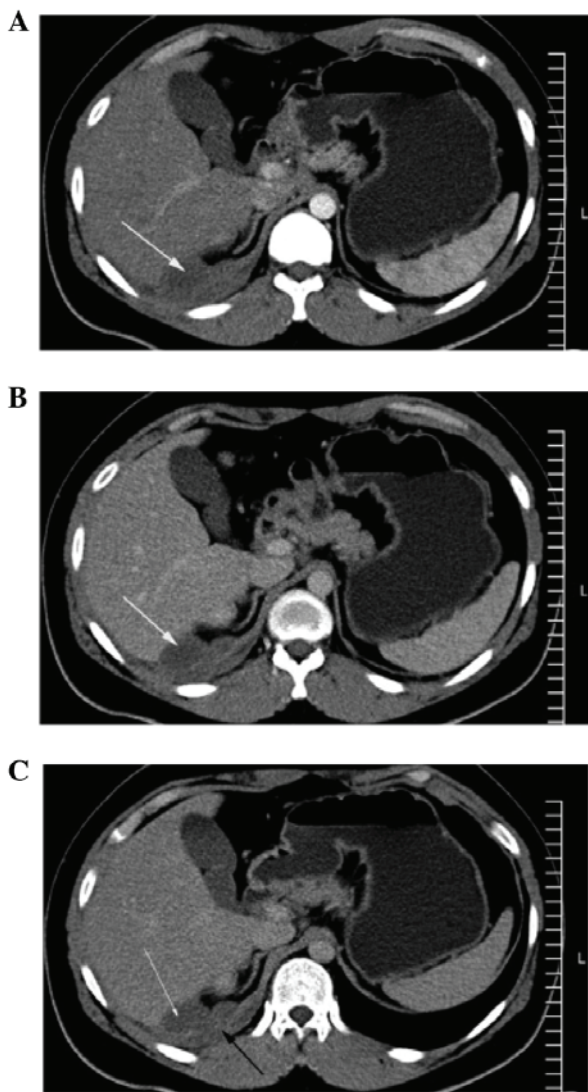


Figure 2. Axial computed tomography images during the (A) arterial, (B) venous and (C) delayed phases, showing the wall of the mass as being irregularly thick with enhancement (white arrows). The diaphragm was discontinuous (black arrow).

bowel were normal. The pathological diagnosis was that of caseous TB. After being treated with anti-tuberculosis drugs, the patient fully recovered and was discharged from hospital.

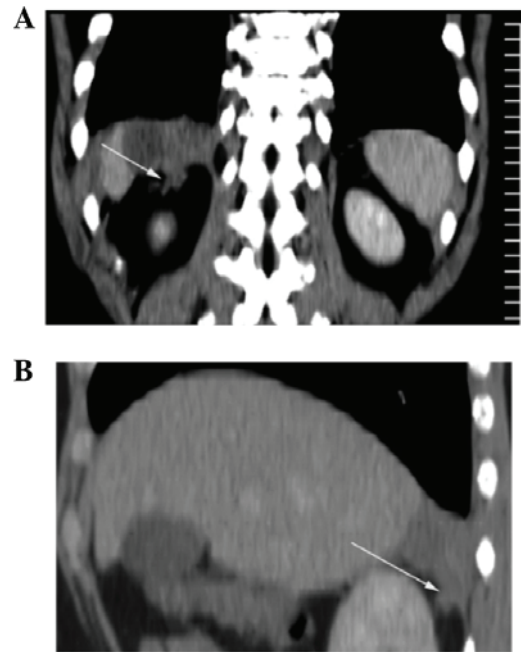


Figure 3. (A) Coronal and (B) sagittal contrast-enhanced computed tomography images showing invasion of the right retroperitoneal space (white arrows).

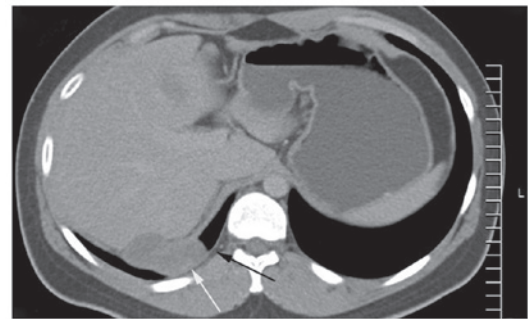


Figure 4. Axial computed tomography image showing invasion of the adjacent pleura (white arrow). The subpleural fatty tissue was thicker compared with that of the contralateral side (black arrow). No enlarged lymph nodes were identified.

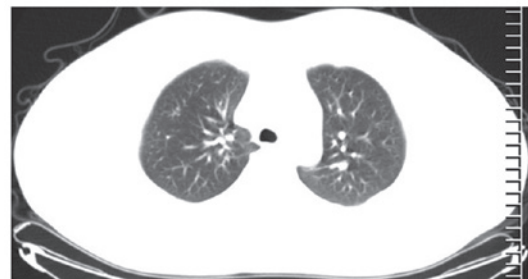


Figure 5. Axial computed tomography image did not reveal tuberculous lesions of the bilateral lung field.

## Discussion

Tuberculous lesions are associated with a variable spectrum of medical imaging manifestations, and they may mimic

other diseases (6-9). It is important to familiarize with the CT manifestations of tuberculous lesions to ensure accurate CT diagnosis.

Abdominal TB commonly spreads or disseminates by the following routes: i) Intestinal TB spreading to the lymph nodes; ii) hematogenous dissemination; and iii) direct extension of adjacent tuberculous lesions (8). Only a small proportion of patients with abdominal TB also suffer from pulmonary TB (7). It has been reported that multifocal TB may occur secondary to lympho-hematogenous dissemination after the initial infection (10). In our patient, the adjacent pleura and retroperitoneal space were invaded, whereas no enlarged lymph nodes or other tuberculous lesions were detected. This indicates that the spreading route of this case of DTA may be hematogenous dissemination.

The reasons for the rarity of skeletal muscle TB may be as follows: i) High levels of lactic acid; ii) not enough reticuloendothelial tissue; iii) not enough lymphatic tissue; and iv) rich blood supply (11,12). Thus, the abovementioned reasons may help to explain the rarity of the DTA.

In the present study, the wall of the DTA was irregularly thickened with permanent enhancement, which was similar to the cases reported in the literature (6). The right retroperitoneal space displayed fibrous strands neighboring the mass, which also conformed to inflammatory changes. In this case, the shape of the abscess (irregular double convex lens), the simultaneous involvement of the pleural cavity and retroperitoneal space with a discontinuous diaphragm on CT images may help with the localization and diagnosis.

**Differential diagnosis.** Most inflammations of the diaphragm result from direct extension from adjacent lesions (13), whereas lung cancer may directly invade the diaphragm (14). In this case, no lesions were detected within the lung field.

Malignant pleural mesothelioma may involve the diaphragm, and trans-diaphragmatic extension may be detected on CT examination (15). A rind-like pleura, with a thickness of >10 mm is crucial for the diagnosis of malignant pleural mesothelioma (16). Increased thickness of the subpleural fatty tissue was the sign for the diagnosis of benign pleural lesion on CT images (16). In the present case, the subpleural fatty tissue adjacent to the diaphragmatic mass was thicker compared with that of the contralateral side, which conformed to the diagnosis of a benign pleural lesion.

It may be difficult to distinguish diaphragmatic from abdominal tumors, particularly in the case of tumors arising from the right side of the diaphragm (17). In the present case, no abnormal signs were detected within the liver parenchyma and peritoneum.

Primary tumors of the diaphragm are rare, and the most common benign lesions are diaphragmatic cysts (18). The CT density of the diaphragmatic mesothelial cyst is similar to that of water, and the margin is well-defined without enhancement (19), which was different from the findings in this case.

In summary, DTA, despite its rarity, should be suspected in patients with a diaphragmatic hypodense mass exhibiting enhanced thick wall, even in the absence of enlarged lymph nodes on CT images.

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