

Research article

The imaging manifestations of caseous pulmonary tuberculosis with type-II diabetes mellitus

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Abstract

Objective: The aim of this study was to discuss the radiographic manifestations of type-II diabetes mellitus (DM) in patients with caseous tuberculosis (TB).

Methods: We performed a retrospective analysis of the chest radiographs and CT scans of 18 type-II diabetic patients with caseous tuberculosis, treated at Zhongnan Hospital, from January 1997 to December 2012.

Results: Eighteen cases of type-II diabetic patients with caseous tuberculosis (DMTB) showed different degrees of cough, cough phlegm and hemoptysis. Imaging performance: All eighteen cases showed big flake and multiple small pieces of integration high-density shadows. All showed caseous pneumonia, and two cases also showed atelectasis. CT examination revealed a number of small hollows in the lesions. Fourteen cases of the lesions were in the right lung, one in the left lung, and three cases in the bilateral lungs. Six cases were confirmed after Sputum examination or bronchoscopy, eight cases were confirmed one month later with a variety of ineffective treatments, and the rest were confirmed through operation.

Conclusion: Type-II diabetic patients with caseous tuberculosis mainly showed consolidation and atypical lung field lesions on chest radiographs. Becoming familiar with these features will be helpful to imaging diagnosis of DMTB.

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Keywords: Type-II diabetes mellitus; Caseous tuberculosis; X-ray computed

1. Introduction

There are about 170 million patients globally with diabetes. This number may double by 2030. And, tuberculosis (TB) is also a major global public health catastrophe [1,2]. The convergence of the two epidemics may lead to an increased incidence of TB [3]. In recent decades, TB has increasingly become a problem in low-income countries, particularly those with HIV epidemic [4]. While the TB risk conferred by

diabetes is lower than HIV/AIDS, its high prevalence makes it comparable to HIV/AIDS in terms of global population-attributable TB risk [5]. Thus, TB in diabetic patients will become an increasingly important problem.

A high index of suspicion and prompt investigation of diabetic patients with signs and symptoms characteristic of pulmonary TB may allow earlier diagnosis and treatment. However, non-specific clinical manifestations of pulmonary damage may affect correct diagnosis and timely treatment [6]. As a result, imaging diagnosis of TB with DM is getting more and more attention. The author collected 18 cases of DMTB data in Zhongnan Hospital to explore the imaging manifestations in patients with DMTB.

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2. Material and methods

2.1. General information

This study was conducted at Zhongnan Hospital which is a 2000-bed, university-affiliated teaching hospital in Wuhan, Hubei Province, and was approved by the institutional review boards of the hospital. The medical records of patients admitted between January 1997 and December 2012 were searched to identify all confirmed cases of DMTB. Among them, the main criteria for hospital admission of TB patients include sepsis, hemoptysis, respiratory failure, advanced malnutrition, and pleural effusion. All patients who had undergone X-Ray, CT examination, Fiberbronchoscopy or pathological examination and who met the criteria for diagnosis of TB were eligible for this study. The diagnosis of DM was defined as clinical manifestation and laboratory examination, the diagnosis of TB was defined as radiographical evidence of active pulmonary infection, confirmed by Fiberbronchoscopy or pathological demonstration of the organisms from lung biopsy specimen.

2.2. Inspection methods

X-ray was operated on front and lateral chest radiographs; CT scan was operated on 14 patients, including the routine scan and the contrast scan. Routine scanning of the entire lung was performed with 16×1.5 -mm or 32×1.2 -mm collimation, Contrast CT examination was performed in patients with the non-ionic-iodine contrast agent Iopamiro, by means of automatic injection (2.5–3.0 mL/s) after 40–45 s of injection. Window settings were modified on all images to optimally assess lung parenchyma (window level, –500 to –700 Hounsfield units [HU]; window width, 1000–1500 HU) and mediastinum (window level, 30–50 HU; window width, 350–500 HU).

2.3. Statistic analysis

Measurement datas were manifested using mean \pm standard, correlations between different CT abnormalities were analyzed using the Spearman test. Statistical analysis was conducted using SPSS 16.0. Significance was defined as $P < 0.05$ with two-sided analysis.

3. Results

3.1. General characteristics

The medical records of 18 consecutive adult patients with DMTB detected in the period from January 1997 to December 2012 were selected, including 13 males (72.22%) and 5 female (27.78%) patients, aged 17–75 years old. The patients' basic information and characteristics are summarized in Table 1. Chest plain film examinations were conducted on all 18 patients (100%), CT examinations were conducted on 14 patients (77.78%), including 7 patients (38.89%) did the contrast

Table 1
Basic information for the 18 patients.

n	18
Age (years)	Median (Range) 52 (17–75)
Gender	
Male	13 (72.22%)
Female	5 (27.78%)
X-Ray examination	18 (100%)
CT routine examination	14 (77.78%)
CT contrast examination	7 (38.89%)
Pathological examination	6 (33.33%)
Fiberbronchoscopy examination	4 (22.22%)

examination. Fiberbronchoscopy examination was operated on 4 patients (22.22%), and pathological examination was conducted on 6 patients (33.33%). Anti-inflammatory treatments for the 8 cases one month which were suspected as pulmonary inflammation or cancer were invalid, then we tried to carry out anti-tuberculosis treatments, and it is effective.

3.2. Imaging examination

The group of eighteen patients all showed caseous pneumonia, X-ray showed big flake and multiple small pieces of integration high-density shadows with edge blur and lightness (Fig. 1a), CT showed irregular regiment massive increase with no enhancement (Fig. 1b). Two cases of atelectasis, one of them presented large consolidation shadows with air bronchogram (Fig. 2). CT scanner revealed a number of small hollows and obvious air bronchogram in the lesions (Fig. 3). Position of the lesions (Table 2): fourteen cases of lesions were in the right (Fig. 4), one case in the left lung, and three cases in the bilateral lungs.

3.3. Fiber-optic bronchoscopy examination

Fiber-optic bronchoscopy showed inflammatory change and epithelial hyperplasia in all cases (Fig. 5).

3.4. Pathological evaluation

Although we had done pathological examination in 6 cases, only 3 cases were positive, showing granulomatous inflammation with caseous necrosis (Fig. 6).

4. Discussion

Some of the observed manifestations of DMTB may be related to a decrease in the immune system functions. It is well known that diabetic patients have an impaired T-lymphocyte function, including a delayed adaptive immune response to Mycobacterium [7]. In some studies there was a higher prevalence of positive acid-fast bacilli sputum smears in the diabetic patients [6,8,11]. This may be because TB and DM comorbidity favors a reduced capacity to control infections. Zhang and colleagues believe that diabetic patients have a higher bacillary burden [9]. Another reason could be attributed

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