

Primary pulmonary actinomycosis: a retrospective analysis of 145 cases in mainland China

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SUMMARY

OBJECTIVE: To improve our understanding of pulmonary actinomycosis.

METHODS: A retrospective analysis of 145 cases in mainland China was conducted.

RESULTS: The male:female ratio was 2.7:1. Mean age at diagnosis was 48 years (± 12). Main symptoms were cough (87.6%), expectoration (40%), blood-stained sputum (37.2%), fever (26.9%), chest pain (24.8%) and haemoptysis (16.6%). Eighty-eight (60.7%) patients had no underlying disease. Only five patients received a correct initial diagnosis; 60 patients were misdiagnosed with lung cancer, followed by pulmonary tuberculosis (TB) and lung abscess. Most patients were diagnosed using surgical resection, transthoracic needle aspiration or flexible bronchoscopy. Sixty-seven patients received penicillin G, and one patient did not receive any

antibiotics after surgery. The mean duration of treatment with antibiotics was 4.5 months (± 3.7). Overall, 110 (75.9%) patients were fully cured, 4 died, 1 was lost to follow-up, and a record of the prognosis was not available for 30 patients. Mean duration of follow-up was 26 months (± 32).

CONCLUSION: Pulmonary actinomycosis is a rare bacterial infection and is often misdiagnosed as lung cancer or pulmonary TB. The definitive diagnosis depends on pathology; sulfur granules are suggestive, but not specific. Penicillin G is the standard treatment. The optimal duration of antibiotic treatment merits further investigation.

KEY WORDS: actinomycosis; pulmonary; lung; thoracic; retrospective analysis

ACTINOMYCES species are filamentous, Gram-positive, facultative anaerobic or microaerophilic branching, pleomorphic, non-spore-forming, non-acid-fast and slow-growing organisms belonging to the normal flora of the oropharynx, as well as the gastrointestinal and urogenital tracts.^{1,2} If the anatomical barriers to or the integrity of the mucosal barrier are breached, *Actinomyces* species can become pathogenic and invade different organs and tissues of the human body. From this point of view, actinomycosis can be regarded as an endogenous infection.^{3–5} *Actinomyces* belong to the actinobacteria phylum and actinomycetales order.⁵ *Actinomyces* used to be regarded as fungi due to their branching filaments; however, according to their structural characteristics and antibiotic susceptibility patterns, they are typical bacteria.³

Several members of *Actinomyces* species can cause pulmonary actinomycosis. *Actinomyces israelii* is the most common actinomyce, and 72.7% of cases are infected by it.^{3,4} Pulmonary actinomycosis is mainly caused by the aspiration of oropharyngeal or gastrointestinal secretions into the respiratory tract, although it can sometimes occur as a result of

haematogenous seeding, lymphatic spread or spread from the cervicofacial area through the mediastinum.^{5–8} Pulmonary actinomycosis associated with intratracheal or endobronchial foreign bodies have also been reported.^{9–12}

In the present study, we discuss the clinical presentation, imaging findings, diagnosis and management strategy of this uncommon clinical entity on the basis of reported cases in China.

METHODS

The four largest full-text databanks in China (<http://med.wanfangdata.com.cn>, <http://edu.cqvip.com>, <http://www.edu.cnki.net> and <http://www.dayi100.com>) were used to search the literature. Key words used were ‘actinomycosis’, ‘pulmonary’ and ‘thoracic’. Enrolled criteria included 1) symptoms of cough, sputum, haemoptysis, fever, chest pain or dyspnoea; 2) pulmonary parenchymal abnormality on radiology; 3) histopathological examinations confirming filamentous branching organisms with or without sulfur granules from tissues obtained using flexible bronchial biopsy, percutaneous transthoracic needle

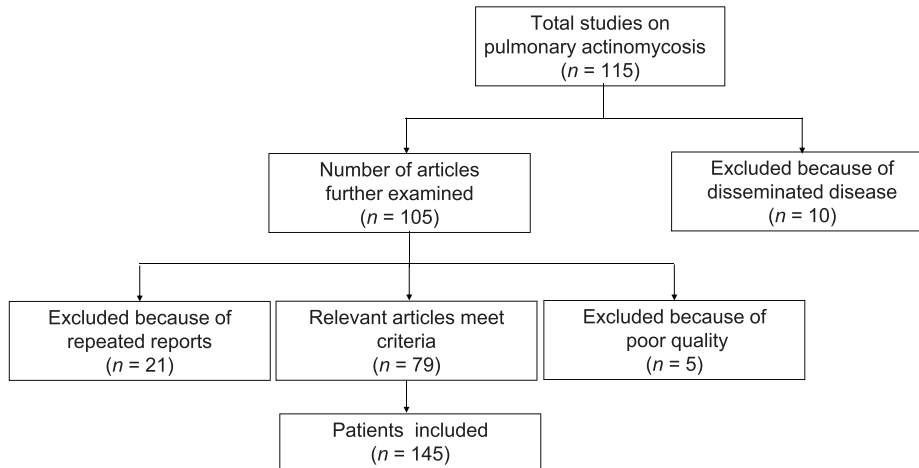


Figure Flowchart for our systematic literature search on patients with primary pulmonary actinomycosis.

aspiration (TTNA) or surgical resection; 4) blood, pleural effusion, sputum or pulmonary tissues culture-positive for *Actinomyces* species; and 5) symptoms and remission/reduction of a pulmonary parenchymal abnormality after treatment for *Actinomyces* infection. If lesions affected the chest wall or extra-pulmonary systems or formed fistulae, the patient was deemed ‘disseminated type’ and excluded from the study. The baseline characteristics, symptoms, underlying diseases, location of lesions, initial diagnosis, diagnostic methods, treatment and prognosis of the patients are given in the Table.

Patient consent

The need for written informed consent was waived as all data were retrospectively reviewed and analysed anonymously.

Ethical approval of the study protocol

Ethical approval of the study protocol was obtained from the ethics committee of the First Affiliated Hospital of Soochow University, Suzhou, China.

RESULTS

Baseline characteristics of patients

A total of 115 articles on pulmonary actinomycosis were published in Chinese from January 1954 to January 2016. Relevant full-text articles were evaluated and discussed by all authors to assess their quality. A flowchart outlining the literature search is shown in the Figure. A final 79 articles, involving 145 patients, were considered to have met the criteria. The male:female ratio was 2.7:1 (106:39). The mean age at diagnosis was 48 (± 12) years.

Clinical manifestations

Symptoms included cough (127/145, 87.6%), expectoration (58/145, 40%), blood-stained sputum (54/

145, 37.2%), fever (39/145, 26.9%), chest pain (36/145, 24.8%), haemoptysis (24/145, 16.6%), dyspnoea (5/145, 3.4%), night sweats (2/145 1.4%). The mean duration of symptoms was 9.2 (± 22.7) months, which ranged from 1 day to 14 years. Ten cases had missing medical records.

Localisation of lesions

The anatomical location of pulmonary actinomycosis was: left upper lobe (LUL, $n = 23$), left lower lobe (LLL, $n = 36$), LLL + LUL ($n = 8$), right upper lobe (RUL, $n = 31$), right middle lobe (RML, $n = 10$), right lower lobe (RLL, $n = 21$), RUL + RML ($n = 1$), RUL + RLL ($n = 2$), RML + RLL ($n = 3$), RUL + RML + RLL ($n = 2$). Eight patients had lesions in both the left and the right side of the lung. The right lung was affected as often as the left (78:75). The mean diameter of the lesions was 5.7 cm (± 3.5 ; range 1.2–20 cm); 101 (69.7%) cases had no information on lesion diameter.

Comorbidity

Overall, 88 (60.7%) patients had no underlying diseases, 41 (28.3%) patients had no medical records, and 16 (11%) patients had the following underlying diseases: diabetes mellitus (DM, $n = 3$), DM + liver cirrhosis ($n = 1$), acute leukaemia ($n = 1$), systemic lupus erythematosus ($n = 1$), pulmonary sequestration ($n = 1$), relapse of pulmonary squamous carcinoma ($n = 1$), congenital pulmonary cyst ($n = 1$), pulmonary abscess ($n = 1$), bronchiectasis ($n = 3$) and foreign body ($n = 3$).

Diagnosis

At the first visit to the clinic, five patients were correctly diagnosed. However, 60 patients were misdiagnosed with lung cancer; other misdiagnoses were pulmonary tuberculosis (TB, $n = 31$), lung abscess ($n = 12$), pneumonia ($n = 12$), bronchiectasis ($n = 2$) and asthma ($n = 1$). There were 33 cases with

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