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E-mail: jzus@zju.edu.cn

***Case Report:***

# Pulmonary actinomycosis: a case undergoing resection through video-assisted thoracic surgery (VATS)

LIN Ming-shian[1], LIN Wea-lung[2], LUH Shi-ping[†‡3], TSAO Thomas Chang-yao[4], WU Tzu-ching[4]

([1]*Department of Medicine, Chia-Yi Christian Hospital, 600 Taichung, Taiwan, China*)

([2]*Department of Pathology, Chung-Shan Medical University and Hospital, 402 Taichung, Taiwan, China*)

([3]*Department of Surgery, Chung-Shan Medical University and Hospital, 402 Taichung, Taiwan, China*)

([4]*Department of Medicine, Chung-Shan Medical University and Hospital, 402 Taichung, Taiwan, China*)

[†]E-mail: luh572001@yahoo.com.tw

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**Abstract:** Actinomycosis is an uncommon disease, which is usually manifested as cervicofacial infection and related to poor oral hygiene or compromised immune function. Pulmonary actinomycosis is rare, but its diagnosis is changing due to its variable presentation and the similarity in appearance to other intrapulmonary diseases. Here we report an 80-year-old man with a solitary pulmonary nodule over the left upper lobe. Pulmonary neoplasm was highly suspected in this patient and thus resection of the mass was undertaken through video-assisted thoracic surgery (VATS). Histopathological examination demonstrated this patient had an *Actinomyeces* infection. While the application of VATS in patients with pulmonary actinomycosis has rarely been reported in literature, we conclude that VATS is valuable for the diagnosis and treatment of patients with undetermined pulmonary nodule(s).

**Key words:** Pulmonary actinomycosis, Video-assisted thoracic surgery (VATS), Resection
**doi:**10.1631/jzus.2007.B0721 **Document code:** A **CLC number:** R445; R655

## INTRODUCTION

*Actinomyces* spp., first described in the 19th century, exist in the soil and oral cavity, and the species name was derived from its ray-like arrangement with sulfur granules (Rippon, 1988). They can infect human beings as well as other animals (Bennhoff, 1984; Reichel and Wragg, 2007). Actinomycosis is uncommon, and usually occurs in patients with compromised immune function or poor oral hygiene (Kinnear and MacFarlane, 1990). It usually results in cervicofacial infection, and pulmonary infection is relatively rare (Schaal and Lee, 1992). In this study, a patient with pulmonary actinomycosis mimicking lung tumor who underwent a pulmonary resection through video-assisted thoracic surgery (VATS) was reported.

[‡] Corresponding author

## CASE REPORT

An 80-year-old man was admitted with the complaints of intermittent cough with blood-tinged sputum for 3 months. His cough usually aggravated at night, and no prominent chest pain, anorexia or body weight loss was noted. The medicine he took from other clinic did not markedly improve the symptoms. He smoked cigarettes 1 pack a day for over 50 years and quitted 3 years ago. He had a gingival inflammation several months ago and underwent local treatment irregularly. A physical examination showed that this patient was moderately developed and nourished and had clear consciousness. Respiratory examinations found no cervical lymphadenopathy, musculoskeletal disorder or other abnormalities. His blood pressure was 150/80 mmHg. Chest X-ray revealed a solitary nodular shadow over the left upper lung field (Fig.1). The computed tomogram (CT) showed a

speculated mass, 2 cm in diameter, over the left B1-2 segment of the left lung, which was highly suspected as a malignancy (Fig.2). Therefore he was referred to the thoracic surgical ward for a further examination and treatment.

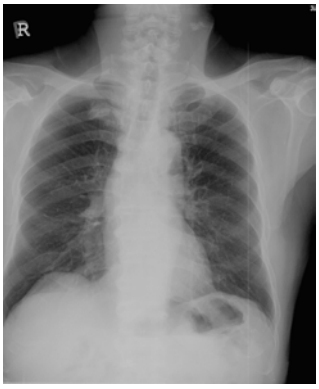



**Fig.1 Chest X-ray revealed a solitary nodular shadow over the left upper lung field**

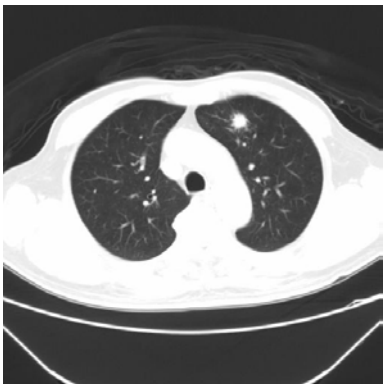


**Fig.2 A speculated mass, 2 cm in diameter, over the left B1-2 segment of the left lung was shown on chest computed tomogram scan**

In our ward, the positron emitted tomogram (PET) revealed a hypermetabolic lesion over the left upper lobe of the lung of the patient, which favors a malignancy. However, cytology of sputum and transbronchial brushing were negative for malignant cells, along with the normal bronchoscope examination and negative for bacterial, tuberculous or fungal infection from the repeated sputum cultural results. A CT guided biopsy was recommended but the patient refused to undergo this procedure.

The patient underwent a surgical resection through the VATS. The B1 segmentectomy was performed smoothly through a 4 cm utility incision and a 1 cm port for scope. The gross picture of the mass is yellowish, elastic on palpation, and without prominent pleural retraction (Fig.3). The frozen section did not show malignant cells and the subsequent pathological examination demonstrated the aggregates of filamentous Gram-positive microorganism in the characteristic of "sulfur granules", indicating actinomycosis (Fig.4). This patient was discharged uneventfully and underwent penicillin p.o. treatment at our clinic for 2 months. He is alive and well now and has had a regular follow-up for 6 months.

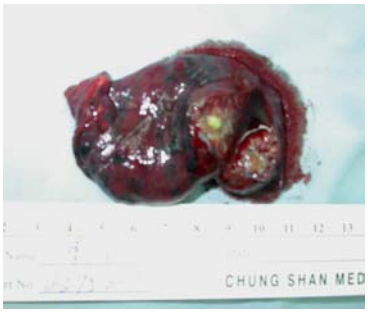
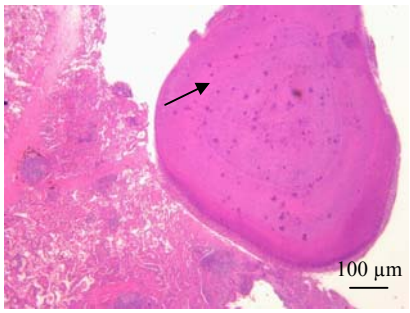
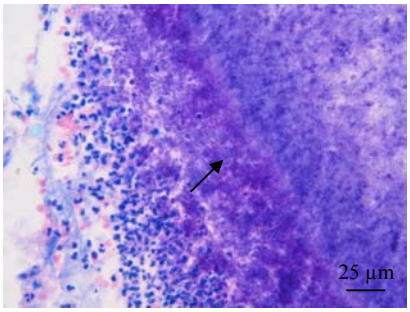



**Fig.3 Grossly, the mass is yellowish, elastic on palpation, without prominent pleural retraction**




(a)




(b)

**Fig.4 Microscopically, aggregates of filamentous Gram-positive microorganism in characteristic of "sulfur granules" (arrow), indicating actinomycosis. (a) HE stain; (b) Giemsa stain**

## DISCUSSION

*Actinomyes* spp., belonging to a family of Gram-positive and anaerobic bacteria and existing on the soil, are normally found in human organs such as the oropharynx, gastrointestinal tract and female genitalia (Smego and Foglia, 1998). *A. israelli* is the most commonly subtype that causes human diseases (Weese and Smith, 1975). Actinomycosis has been reported around the world for more than one hundred years, but the incidence of all forms of actinomycosis has remarkably declined in recent years, especially in the developed country (Russo, 1995). Pulmonary involvement is rare, accounting for approximately 15% of all patients with actinomycosis (Mabeza and MacFarlane, 2003).

The pathogenesis of actinomycosis is still unclear. Most cases with actinomycosis are associated with a variety of other microorganisms (Holm, 1950). Clinical infection is usually related to the disruption of the mucosal barrier that allows the organism to invade, such as dental sepsis, appendicitis, diverticulitis, surgery, or intrauterine devices (Miller and Haddad, 1998; Lippes, 1999). Pulmonary actinomycosis might be related to poor oral hygiene or aspiration of gastrointestinal fluid, and as well the immuno-compromised status (Heffner, 1988; Klapholz *et al*., 1989).

Radiographic pictures of pulmonary actinomycosis varied and could mimic a wide spectrum of benign and malignant diseases (Conant and Wechsler, 1992). The chest X-rays range from small nodular lesion to cavitating lesions with pleural, chest wall, transdiaphragmatic, or spine involvement (Flynn and Felson, 1970). Actinomycosis has the characteristic to penetrate the tissue plane, resulting in fistula or abscess formation. The CT findings of patients with pulmonary actinomycosis include patchy, nodular, or cavitating pulmonary lesions, as well as pleural or mediastinal lesions (Allen *et al*., 1987). The value of PET in the diagnosis of pulmonary actinomycosis is not clear (Hoekstra *et al*., 1999). Up to 25% of cases with thoracic actinomycosis were initially misdiagnosed as malignancy (Mabeza and MacFarlane, 2003; Moore and Scannell, 1968).

The diagnosis of thoracic actinomycosis remains a clinical challenge, not only because it is uncommon but also because the culture of this bacterium from the sputum or bronchoalveolar secretions is technically difficult (Wong *et al*., 2004), and as well sometimes represents merely colonization (not pathological microorganism) (Ariel *et al*., 1991). A reliable diagnosis of this pathogen still requires histological or microbiological examinations. Biopsy through fiberoptic bronchoscopy can be used in patients with endobronchial actinomycosis (Ariel *et al*., 1991), and the ultrasound or CT guided biopsy used for the diagnosis of patients with peripheral lung lesions (Das, 1994). Since the clinical and gross pictures of pulmonary actinomycosis intra-operatively obtained are indiscernible from that of carcinoma, a minimally invasive approach, such as VATS, as well as a limited pulmonary resection and a frozen section to decide the subsequent procedures, is recommended (Moore and Scannell, 1968; Luh and Liu, 2006). The application of VATS in the diagnosis and treatment of pulmonary actinomycosis, has only been reported twice in literature (Kobashi *et al*., 2004; Kakuda *et al*., 1997). Our case shows that VATS is more reliable than the CT or sono-guided biopsy for the diagnosis of pulmonary actinomycosis, and less invasive than an open thoracotomy for the treatment of patients with undetermined pulmonary nodule(s).

Pathological features of pulmonary actinomycosis include a granulomatoid lesion with or without giant or epitheloid cells (Brown, 1973). The appearance of radiating arranged sulfur granules is the pathological hallmark of this disease. However, these granules could be appeared in other diseases such as nocardiosis or chromomycosis as well (Brown, 1973).

The choice of antimicrobial agents against actinomycosis is penicillin, and the duration of a therapy depends on the severity of the disease and the efficacy of the treatment, usually lasting at least one to two months (Slade *et al*., 1973). A recent study containing eight patients who underwent a 4-week course of imipenem-cilastain therapy reported a satisfactory result (Yew *et al*., 1999).

We conclude that the application of VATS is more reliable in the diagnosis, and less invasive in the treatment of patients with pulmonary actinomycosis manifested as undetermined pulmonary nodule(s).

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