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Pulmonary actinomycosis — a case report

Promienica płuc — opis przypadku

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Abstract

Pulmonary actinomycosis is a rare disease caused by *Actinomyces* sp. Its symptoms and radiological findings are not characteristic, so the diagnosis might be difficult to establish. We report a case of a 59 year old male, who developed bronchopulmonary Actinomycosis due to poor dental hygiene. The infectious process affected lung parenchyma and infiltrated chest wall causing multifocal sternal osteolysis and multiple cutaneous fistulas. The radiological findings suggested neoplasmatous process. The diagnosis was based on histopathological findings of fistular scrapes. The material contained *Actinomyces* colonies. After 6 months of antibiotic therapy the patient's state improved and the cutaneous fistulas healed. Radiological finding revealed partial resolution of the lung infiltration.

Key words: pulmonary actinomycosis, computed tomography, lung tumor

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Introduction

Lung cancer is the most common neoplasm in men older than 50 years of age. Long-term tobacco smokers are in the group at highest risk of the disease. For this reason a neoplastic disease should always be considered at first place in patients with a long history of smoking and persistent chronic infiltrations in lung parenchyma [1]. Imaging studies are often not efficient in differentiating between pulmonary actinomycosis and a proliferative process. The presence of general symptoms such as weakness, body weight loss, low-grade temperature do not help either. They are typical for chronic inflammation, such as in actinomycosis, as well as for a neoplastic disease. This causes prolonga-

tion of the diagnostic process and a delay in commencement of adequate treatment [3].

Below we report on a case of pulmonary actinomycosis, in which the radiological picture suggested a neoplastic disease.

Case report

A 59-year-old male, an ex-cigarette smoker, was admitted to the Department of Pneumology of Gdansk Medical University in Sep 2010 due to infiltrating lesion of the right lung. On admission he reported cough with purulent sputum, exertional breathlessness, general weakness, and appetite and

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body weight loss. These symptoms had been present for over a year and were the cause of previous stays in a hospital in Słupsk. Blood tests at that time revealed anaemia, increased parameters of inflammation, and elevated levels of liver transaminases (table 1). Chest X-ray showed a peripheral oval opacity. The patient's condition improved on antibiotic therapy (ciprofloxacin, ceftriaxone). Increased levels of the transaminases were put down to hepatitis C, diagnosed at that time. The patient was discharged to further follow-up in an outpatient setting, but he decided not to continue with the diagnostic process. After half a year his condition began to deteriorate gradually again. In addition, oozing skin fistula on his back appeared. It healed after short course of an antibiotic administered at home. In Feb and Mar 2010 the patient was admitted to the pulmonology department in the hospital in Słupsk again, due to shortness of breath on exertion, productive cough, appetite loss, and decreasing body weight. At that point new oozing skin fistulas appeared in the region of the sternum. Blood tests showed elevated inflammation indices and anaemia (table 1). Computed tomography (CT) of the chest revealed extensive infiltration in the upper and middle lobes of the right lung. The infiltration extended into the soft tissues of the chest wall and costal cartilages. Osteolytic foci in the sternum were also seen (figure 1). Fibrobron-

choscopy was performed. It showed oedematous mucosa of the upper lobe's bronchi, widening of smaller carina on the right side, and traces of blood in the bronchus of the 3rd right segment. Seven-day antibiotic therapy (cefuroxime) was applied, resulting in significant improvement of the patient's condition. In order to establish the diagnosis a trans-thoracic fine-needle biopsy was done. There were no neoplastic cells in the obtained material. Subsequently, a core-needle biopsy of the infiltration was performed. The histopathological examination showed only the presence of blood clots and fragments of fibrous and fat tissues from the chest wall; the neoplastic cells were not found. In successive CT scans a small degree regression of the infiltrating lesion was observed. The antibiotic was continued and clinical improvement was achieved. Within a few weeks of cessation of treatment, the breathlessness and cough worsened, further loss of body weight appeared, and the skin fistulas in the sternum area were still present. At that point the suspicion of actinomycosis was raised and the patient was referred to the Department of Pneumology at Gdansk Medical University for further investigations. At that time blood tests showed anaemia and increased levels of inflammatory parameters (table 1). The examination revealed skin fistulas in the sternum region and advanced dental caries. Chest X-ray confirmed the presence of an infiltrative lesion in the

Table 1. Laboratory findings

| Data | CRP(mg/l) | WBC(G/l) | Neutrocyty(%) | Hgb (g/dl) | Ht (%) | AST(IU/l) | ALT(IU/l) |
|---------|-----------|----------|---------------|------------|--------|-----------|-----------|
| 07.2009 | 46 | 12 | – | 11 | 34 | 161 | 122 |
| 02.2010 | 57 | 15 | 78 | 11 | 37 | 96 | 52 |
| 09.2010 | 70 | 12 | 71 | 10 | 32 | 29 | 14 |
| 12.2010 | 0,8 | 4 | 42 | 11 | 34 | 38 | 19 |



Figure 1. CT scanning (february 2010). Infiltration in the right lung, localized in the lung tissue and soft tissues of the chest wall

right middle lobe. Another attempt at transthoracic fine-needle biopsy of the lesion was made. No diagnostic specimen was obtained due to the lesion's high density. Repeated bronchofiberscopy did not show any abnormalities. Examination of the bronchial washings revealed the presence of neutrophils, macrophages, and stratified ciliated epithelium cells. Neoplastic cells were not found. *Klebsiella pneumoniae* was cultured. The microscopic examination and cultures for acid-fast bacilli were negative. Single colonies of *Staphylococcus aureus* and multiple colonies of *Porphyromonas sp.*, *Peptostreptococcus sp.*, *Prevotella sp.* were cultured from the skin fistula swab. The microbiological investigations toward actinomycosis were negative for both sampled materials. The histopathological examination of the fistular scrapes showed purulent granulation with few colonies of *Actinomyces sp.* (figure 2,3). Despite this, the culture of fistular scrapes for *Actinomyces sp.* was negative.

Taking into consideration the clinical and histological presentation, a diagnosis of pulmonary actinomycosis was made. Treatment with intravenous amoxicillin with clavulanic acid (3 x 1.2 g per day for 14 days) was applied, followed by amoxicillin administered orally in a dose of 500 mg three times a day. Dental treatment was started as well. A total of 13 teeth were extracted and 6 were treated conservatively. After 4 weeks of treatment the skin fistulas stopped oozing. Chest CT done after 3 months showed marked decrease of the infiltration (figure 4). The patient's general condition improved, exertional breathlessness diminished, and body weight normalised. The cutaneous fistulas regressed to a significant degree. The indices of inflammatory process decreased. Anaemia was still present (table 1). A microbiologist's advice was sought, and the dose of amoxicillin was increased up to 1.0 g three times a day and continued for 6 months. At the end of the treatment complete remission of clinical symptoms, cutaneous fistulas, and radiological changes was achieved. As soon as his condition returned to normal the patient stopped attending the outpatient clinic for further check-ups.

Discussion

Pulmonary actinomycosis is a rare disease with an occult beginning and progressive chronic course. Usually, it affects males in the fourth and fifth decades of life [3–5]. The disease may be localised in various body parts, but most frequently involves the cervicofacial (55%) and abdominopelvic (20%) regions. Only in around 15%

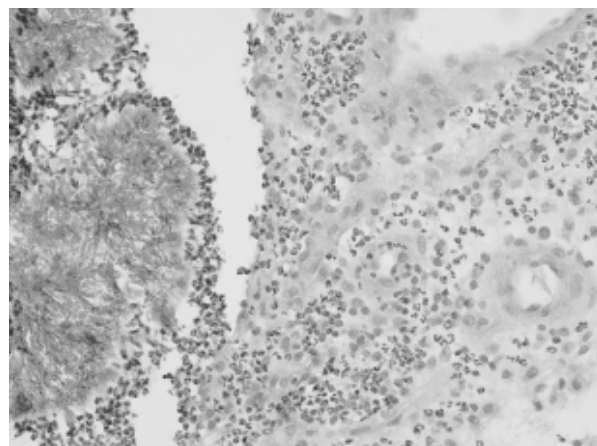


Figure 2. The structure of *Actinomyces* colony (histochemical PAS stain, original magnification × 400)

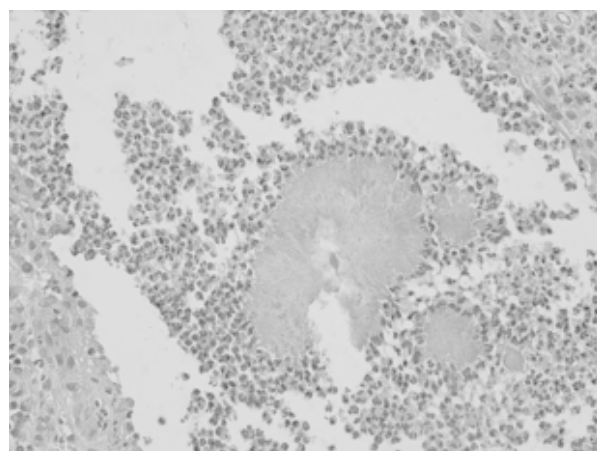


Figure 3. *Actinomyces* colony among purulent granulation (hematoxylin and eosin stain, original magnification × 400)

of cases it occurs within the thorax [6, 7]. It may further extend into the soft tissues and bones of the chest wall causing cutaneous fistulas and osteolysis [2, 4, 7].

Actinomycosis is an infection caused by anaerobic Gram and Grocott-Gomori positive bacteria from *Actinomyces sp.* The most commonly isolated pathogen is *Actinomyces israelii*. In cases of pulmonary involvement *Actinomyces meyeri* is also a frequent finding [5, 6]. These bacteria are normally found in the human oral cavity [8]. The disease usually develops as a result of aspiration of pathogens from oropharyngeal or gastrointestinal secretions. Individuals with advanced dental caries, such as our patient, are particularly predisposed. Development of the disease is also promoted by injury within the oral cavity and aspiration, including foreign body aspiration [2]. The frequency of actinomycosis is higher among people with

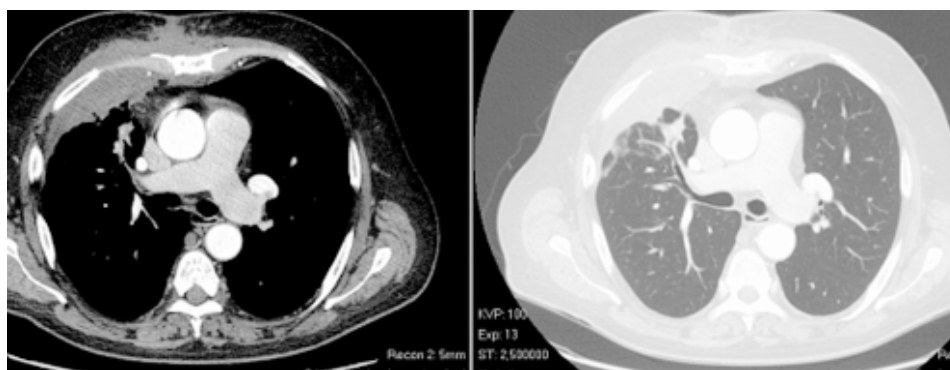


Figure 4. CT scanning (december 2010), after 3 months treatment. Partial regression of pulmonary infiltration was seen

immunodeficiency, malnutrition, after radiotherapy, with diabetes mellitus, liver cirrhosis or, as in our patient, chronic hepatitis [3].

Clinical presentation and results of imaging studies in pulmonary actinomycosis are nonspecific, often raising suspicion of a neoplastic disease [6, 8]. Therefore, establishing an ultimate diagnosis may be difficult and significantly prolonged [3]. The main symptoms include: progressive weakness, low-grade temperature, body weight loss, cough with purulent sputum, and exertional breathlessness. Haemoptysis and pleural chest pain may also occur [4, 7]. Lesions may appear in lung tissue, pleura, and lower airways [3]. Radiological examinations typically reveal infiltrations with air bronchograms, often with cavitation, or a picture of fibrotic changes. The infiltration may extend into the pleura and chest wall; mediastinal lymphadenopathy may be present as well [2, 4, 9]. Cutaneous fistulas and abscesses are frequent phenomena [2, 4, 7], as in the presented case. Haematogenous dissemination of the disease is rare [6, 10].

The disease may be confirmed by isolation of the pathogens from involved organs. The material for microbiological investigation should be collected in strictly anaerobic conditions, before commencement of antibiotic therapy [6, 7]. It should be remembered that *Actinomyces* is part of the saprophytic flora of the oral cavity, so cultures or cytological examination of sputum samples are of no diagnostic use [6, 11]. Furthermore, obtaining positive cultures is also difficult due to frequent mixed infections [9]. In one publication, positive cultures were obtained in about 50% of cases, whereas in the other one it was only in 7% of cases [2, 11]. Since the result of the culture may be negative, the ultimate diagnosis is often based on histopathological examination of involved tissues [7, 11]. There are foci of purulent necrosis with domination of neutrophils, plasmocytes, and histiocytes in biopsy specimens. ‘Sulphur granules’,

the pathological hallmark of the disease, are also seen. These yellow granules consist of branching, often partly calcified, masses of the microorganisms [4, 9]. The amount of typical granulation in the purulent exudation from the fistula or biopsy specimen may be not enough to establish ultimate diagnosis, especially if antibiotics were used earlier [10]. The additional problem is that colonies of the microorganisms easily undergo fragmentation, and due to the inhomogeneous pattern in Gram staining they resemble colonies of streptococci [9]. These are the reasons why making a proper diagnosis of pulmonary actinomycosis involves thoracotomy in many cases [2, 3, 6]. In the case we present, fine-needle and core-needle biopsies of the mass in the right lung were performed, but the results were inconclusive. Attention to the high density of the mass, typical for actinomycosis [6], was paid during the second attempt at fine-needle biopsy. The ultimate diagnosis was made on the basis of a histopathological study of skin fistula scrapings, which showed the presence of colonies of *Actinomyces*.

The history of improvement with antibiotic treatment may be a helpful diagnostic clue. In the presented patient, antibiotics were applied several times, always resulting in subsidence of clinical symptoms and a decrease in the tumour size on chest CT scan.

The conservative treatment of actinomycosis is based on antibiotic therapy. Elimination of the source of infection is essential in order to prevent recurrence of the disease [9]. The antibiotic of choice is penicillin or, in the case of contraindications, clindamycin, erythromycin, or doxycycline [4, 5]. Initially, antibiotics are given intravenously, drug of first choice penicillin G in dose 10–20 mln units/day [6]. Some authors used amoxicillin with clavulanic acid, ceftriaxone or imipenem with good results [2, 6]. Subsequently, the treatment is continued orally: penicillin V, amoxicillin, clindamycin, erythromycin, or doxycycline. Due to poor

penetration of antibiotics into the densely packed colonies of *Actinomyces*, the treatment should be prolonged [11]. A 12-month treatment was recommended in the past. Nowadays, a shorter therapy lasting for 3-6 months is used more often [5, 11]. Some authors achieve good clinical effects using only oral treatment, without the initial period of intravenous antibiotic administration [2, 11]. If the pharmacological treatment is preceded by surgical treatment, a shorter course of antibiotic therapy is often sufficient [11]. It is also important to start the treatment as soon as possible. Such an approach limits the fibrosis and prevents haematogenous dissemination of the disease. If the penicillin appears to be ineffective, resistance to the used antibiotics should be considered [11]. Strains of *Actinomyces* producing a beta-lactamase have been reported [2, 9]. As in described patient, a mixed infection may be present. In such a case, coexisting bacteria may influence the course of the disease and be responsible for treatment failure [2, 11]. In such cases, broad-spectrum antibiotics are recommended [2, 10, 11]. The optimal time, after which the efficacy of treatment should be evaluated, is not known. In one of the reports, radiological regression was seen in 83% of patients after 4 weeks of antibiotic therapy. In case of no improvement after 4 weeks of treatment, resistance to the therapy was also seen after 12 weeks [11]. In such patients the option of surgical treatment should be considered [11].

Conclusions

Actinomycosis, especially involving lung parenchyma, is a rare disease nowadays. However, it

should remain an important differential during investigation of chronic infiltrative changes in lungs. The early establishment of the proper diagnosis allows for the commencement of proper pharmacological treatment and saves patients from unnecessary surgery in many cases.

Conflict of interest

The authors have no conflict of interest to report.

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