

# Actinomycosis as a Rare Cause of Abscess of Thyroid Gland in 3-Year-Old Child

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## Abstract

Actinomycosis is an atypical cause of infection in the head and neck area, especially in children. A rare incidence of actinomycosis, its non-specific clinical signs that mimic other pathological conditions, as well as a complicated identification of microorganism lead to diagnostic delays in clinical practice. In our article, we offer an overview of the latest theoretical knowledge and present a unique clinical case of actinomycotic infection of the thyroid gland in the patient at our department.

**Keywords:** Actinomycosis • Cervicofacial • Thyroid gland • Children • Abscess

## Introduction

The name Actinomycosis means "ray fungus" for its typical filamentous, fungal-like appearance in infected tissues. In spite of their name Actinomyces are true bacteria and they cannot form spores as fungi. Their filaments, which fragment into bacillary forms, are much narrower than fungal hyphae [1-3]. It is a typical strain of Actinomyces that causes chronic granulomatous inflammation, e.g. an abscess formation, draining sinus tracts, fistulae and tissue fibrosis, which characteristically contain sulfur granules with typical yellow color. The granules are named due to their appearance. The granule is composed of an internal tangle of mycelial fragments and a rosette of peripheral and can be seen without a need of microscopy [4]. They are stabilized by a protein-polysaccharide complex and mineralized by host calcium phosphate. This complex possibly provides a resistance to host phagocytic cells [3]. Actinomycosis is an extremely rare diagnosis in pediatric population-it makes up for about 3% of total cases caused by actinomyces [4]. The most frequently infected tissues in order are head and neck (50-60%), chest (15-20%) and abdomen (about 20%) [5]. It is well recognized that for the infection to develop, the integrity of mucosa must be disturbed. The further spread of actinomycosis is atypical as it invades surrounding structures ignoring anatomical barriers [6,7]. A final diagnosis might prove difficult. Imaging methods as USG, CT scan or MR might be used, but radiology most frequently describes only the mass which expands into the adjacent soft tissues [8]. The standard diagnostic procedure involves the collection of biological material for bacterial cultivation, microscopic examination and specific microbiological tests by needle aspiration of an abscess, fistula or the sinus tract or by biopsy samples [9]. As actinomyces are microaerophilic microorganisms, either a swift transportation of samples to the laboratory or an anaerobic transport medium must be secured. During the isolation, these microbes require an enriched medium and incubation at 37°C with 6 to 10% carbon dioxide. Because of their slow growth, for adequate detection, cultures should be observed for at least 14 to 21 days [6]. Microscopic examination reveals a typical finding of an outer

zone of granulation and a central zone of necrosis. In the central there are typically multiple basophilic granules presented micro-colonies of Actinomyces [10]. Actinomyces are usually sensitive to beta-lactam antibiotics, particularly Penicillin G or amoxicillin. Complete eradication of actinomyces is achieved by long-term antibiotic treatment. Therefore, it is recommended that during the first four to six weeks, large doses of antibiotics should be intravenously applied, followed by oral antibiotics. Optimal treatment should last 6 months, the minimum being 2 months. In severe cases, therapy can be continued for up to 12 months. Ceftriaxone or amoxicillin can be used as alternatives to penicillin G. Surgical interventions are often required for a definitive diagnosis and extensive operations should be considered in complicated cases [11]. Here we present a unique clinical case of actinomycotic abscess of the thyroid gland in a 3-year-old child.

## Case report

A 3 year-old girl, accompanied by her mother, was admitted to our department with a fever of up to 38.7 °C lasting for a week with a good response to antipyretics. She developed a dry, irritating cough accompanied by swallowing difficulties which were initially mild but gradually became moderate. As a result, she refused to eat. She had visited a primary pediatrician who prescribed macrolide antibiotics and antitussive drugs. Since there was no clinical improvement and prolonged fever the child was referred to our hospital.

The patient had not traveled abroad in the previous 3 months and the parents denied any contact with sick persons. Her medical history was unremarkable. The child was a term born baby, delivered vaginally. She was not breastfed and her milestones were average. She was fully vaccinated, with no past history of recurrent illnesses. Upon careful physical examination, the child was alert and oriented. She was febrile with a temperature of 38.5 °C. She showed no evidence of dehydration. She had no rash or joint tenderness. The most prominent sign in her appearance was a mildly swollen neck with noticeable resistance of 2 × 2 cm of elastic consistency without observation of adherence or inflammation in thyroid area (Figure 1). Cervical lymph nodes were not enlarged. She had a respiratory rate of 25 breaths/min., with vesicular breathing sounds and no adventitious sounds. Cardiovascular examination revealed a regular pulse rate at 120 beats/min., normal blood pressure at 106/72 mmHg (95 th. percentile), normally located cardiac apex, and normal S1 and S2 heart sounds. Her abdomen was flat and non-tender. She had no palpable organ enlargement, and her bowel sounds demonstrated normal activity. Upon neurological examination, she was fully awake and aware and had no dysarthria. She had no neck stiffness or any signs of meningeal irritation. Her pupils were round, medium-sized, and reactive to light bilaterally. Baseline laboratory analysis revealed the

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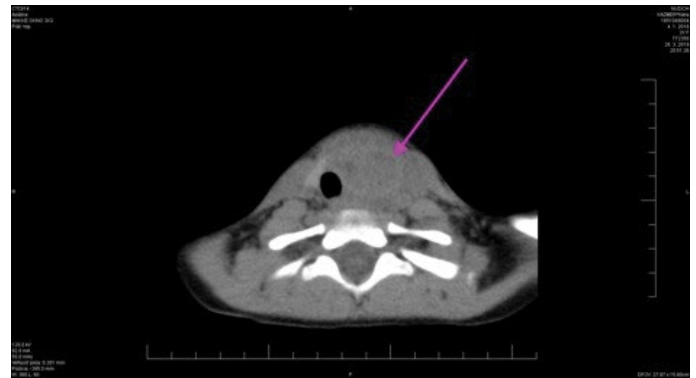
following pathological findings: leukocytosis ( $19.8 \times 10^9/l$ ), increased neutrophils (69.8 %) and mildly elevated CRP (79.3 mg/l). Biochemical indicators were all normal, including a random glucose level, the red blood count, kidney function test results, electrolyte level and liver function test results. In addition to routine laboratory investigations, the hormonal profile, including thyroid hormones, was normal (TSH 4.57 mU/l, fT4 16.43 pmol/l). Serology (IgG and IgM) was negative for Epstein-Barr, cytomegalovirus, herpes type 1 and 2, toxoplasmosis and parvovirus. Chest X-ray was negative. Ultrasonographic examination showed a solid mass sized  $13 \times 14 \times 36$  mm in the left thyroid lobe. Cervical computed tomography was indicated showed a nodule lesion on the left lobe of the thyroid gland (Figure 2). Both incision and drainage of the lesion were performed. A histological examination showed a pyogenic membrane formed by densely active inflammatory and richly vascularized unspecific granular tissue with minimum deposits of cell detritus, located on the periphery, turning into an unspecific fibrous granular tissue with polyclonal plasmatic inflammatory cellulisation, free of any signs of tumor infiltration. It was concluded that it is a case of an undefined abscess of soft tissues in the neck (Figure 3). Surprisingly, microbiologic cultivation of the specimen confirmed the presence of Gram-positive bacteria *Actinomyces odontolyticus*. After obtaining the results, the attendant physician replaced macrolide antibiotics with intravenous penicillin G. A surgical consultation recommended a conservative approach to treatment; only if the treatment was ineffective, should a lobectomy considered. A broad spectrum of predisposing factors were investigated: a focal infection was ruled out by detailed dental examination, a broad spectrum of laboratory investigations excluded both underlying primary or secondary immunodeficiency and finally, laryngoscopy exposed a thyroglossal duct. It was consequently surgically closed- seared by applying fibrin glue. After 9 weeks of continuous intravenous penicillin treatment, a control MRI scan of the neck showed regression of the abscess, however a small cystic formation of 0.2 ml was still detected (Figure 4). Intravenous penicillin was replaced by oral, and the course continued for a further 5 months. The patient was discharged afebrile with normal blood tests. As a follow-up, a regular ultrasound examination of the neck was performed every month. After 3 months of the initial presentation, the girl made a complete recovery with resolution of the cystic formation on ultrasound scan.

## Discussion

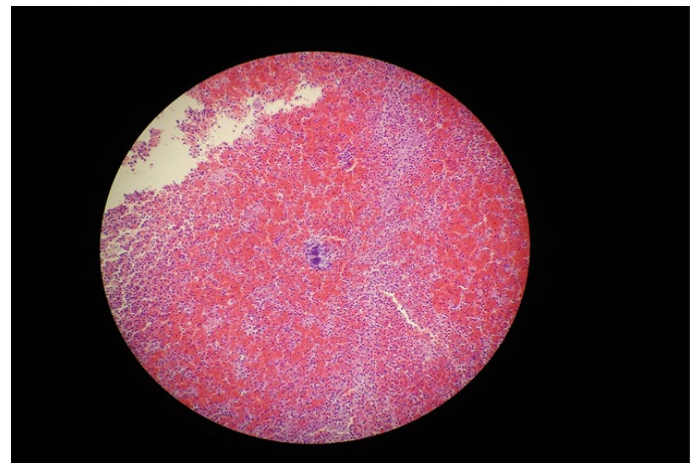
Most cases of cervicofacial actinomycosis are found in the perimandibular region, but localities of primary infection such as the tongue, sinus cavities, middle ear, larynx and the thyroid gland have also been described, too [3-14]. The localization of abscesses in the thyroid gland is unique since it is highly resistant to bacterial infection due to rich venous and lymphatic supply, high iodine content and a protective fibrotic capsule on the surface [15]. There are certain predisposing factors which can lead to actinomycosis, such as poor oral hygiene (tooth decay, gingivitis, tooth infection), trauma of oral mucosis (dental extraction, damaged tissue after radiation) or cervicofacial surgery, maxillofacial trauma, infection caused by the growth of secondary



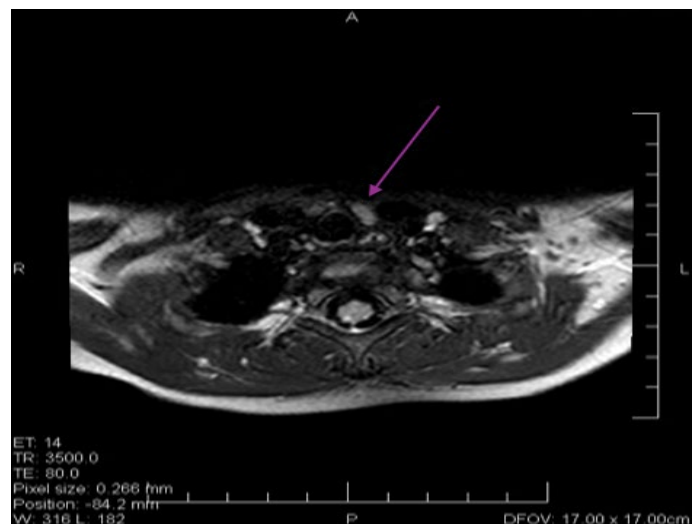
**Figure 1.** The photo of the patient on the second day of hospitalization.



**Figure 2.** Computed tomography scan of the case before treatment.



**Figure 3.** Histopathological examination of the lesion.



**Figure 4.** MRI Scan-The abscess after 9 weeks of antibiotic treatment.

teeth) [16] or immunocompromised patients suffering from diabetes mellitus, immunosuppression, bisphosphonate related osteonecrosis or malnutrition [17]. In childhood age, the pathogenesis of actinomycosis of the thyroid gland could be boosted by a persistent thyroglossal duct or piriform sinus, which facilitates communication between the oral cavity and the thyroid gland parenchyma [18]. Our patient was diagnosed with underlying thyroglossal duct may have allowed for the infection to spread. We managed to disturb its development and close anatomical communication. As a result, we prevented further reinfection.

Cervicofacial actinomycosis can present with a variety of clinical signs

and specific symptoms depending on the localization of infection- typically, these are a slow-growing indurated mass (weeks to months), superficial tension around the mass, less common pain (resulting from the compression of adjacent structures), dyspnea, dysphagia and local signs of inflammation in the infected region. Fistulation with the expression of a thick yellow exudate with characteristic sulfur granules is rare, but is the most easily recognized manifestation. Also, fever (>50% of patients) and fatigue can be observed in patients. Lymphadenopathy is uncommon, because of its atypical spread in the human organism [10]. Symptoms can mimic a number of diseases, particularly malignancy and a thyroid gland infection of other agents.

Thyroid nodules are less common in children than in adults, but have a greater risk of malignancy. It is of utmost importance to distinguish between benign lesions, such as a nodular hyperplasia, intrathyroidal thymus and cysts. Benign lesions are mostly diagnosed accidentally and patients are asymptomatic. As for malignant lesions of the thyroid gland, the most common type in children is papillary thyroid carcinoma [19]. The acute suppurative infection of thyroid gland can cause *S. aureus*, *S. pyogenes*, *S. pneumoniae*, *Klebsiella* species, *H. influenzae*, *Bacteroides* and other pathogens [20,21]. Predisposing factors such as fistula sinus pyriform (up to 70% of children), congenital brachial fistula and thyroglossal duct have been described [22, 23]. Acute thyroiditis typically presents with a sudden onset of symptoms as a fever, a unilateral neck pain, a sore throat, dysphagia and dysphonia. Visually, it is felt as thyroid mass with tenderness, erythema of the adjacent skin and regional lymphadenopathy. Laboratory findings show leukocytosis and a high level of CRP; thyroid hormones are usually normal, however, in some cases may develop hyperthyroidism may develop through the release of the thyroid hormone into circulation due to damaged thyroid follicular cells [24]. Sonography reveals unilobular swelling and/or abscess formation.

## Conclusion

In conclusion, cervicofacial actinomycosis is known as the "great masquerader" of head and neck disease; authors have claimed that fewer than 10% of infections are correctly diagnosed. The differential diagnosis remains difficult because of non-specific manifestations, non-clear radiological findings and hard microbiological identification. When you confirm actinomycotic infection in your patient, it is important to take predisposing factors into consideration in order to prevent reinfections.

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