



Actinomycotic Abscess of Thyroid Gland in a 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 nonspecific clinical signs that mimic other pathological conditions, as well as a complicated identification of microorganism lead to diagnostic delays in clinical practice. Besides an accurate diagnosis, it is of an utmost importance to pinpoint relevant predisposing factors, which might result in the infection. We present a clinical case of actinomycotic infection of the thyroid gland in the pediatric patient at our department.

Keywords

actinomycosis, cervicofacial, thyroid gland, thyroglossal duct, children

Introduction

Actinomycosis is a bacterial infection caused by *Actinomyces* species, gram-positive, strict, or facultative anaerobe bacteria, which, under normal circumstances, colonize oral flora within gingival cervices and tonsillar crypts, the gastrointestinal tract, and genital microbiota.¹ Actinomycosis is an extremely rare diagnosis in pediatric population—it makes up about 3% of total cases caused by *Actinomyces*. The most frequently infected tissues in order are the head and neck (50%-60%), chest (15%-20%), and abdomen (about 20%).² A final diagnosis might prove difficult. Imaging methods such as sonography, computed tomography (CT) scan, or magnetic resonance might be used, but radiology most frequently describes only the mass which expands into the adjacent soft tissues.³ The standard diagnostic procedure involves the collection of biological material for bacterial cultivation, microscopic examination, and specific microbiological tests. The name actinomycosis means “ray fungus” for its typical filamentous, fungal-like appearance in infected tissues, even though *Actinomyces* are true bacteria. It is a typical strain of *Actinomyces* that causes chronic granulomatous inflammation, which characteristically contains sulfur granules with their typical yellow color.⁴ Microscopic examination reveals a nonspecific finding of an outer zone of granulation and a central zone of necrosis. In the center, there are typically multiple basophilic granules presented as microcolonies of *Actinomyces*.⁵ 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, cultures should be observed for at least 14 to 21 days. The newest technology that can accurately identify *Actinomyces* is matrix-assisted laser desorption ionization time-of-flight mass spectrometry (MALDI-TOF MS).⁶ *Actinomyces* are usually sensitive to beta-lactam antibiotics, particularly penicillin G or amoxicillin. Complete eradication of *Actinomyces* is achieved by long-term antibiotic treatment (optimally 6 months). Surgical interventions are often required for a definitive diagnosis and extensive operations should be considered in complicated cases.⁷ Here, we present a unique clinical case of actinomycotic abscess of the thyroid gland in a 3-year-old child.

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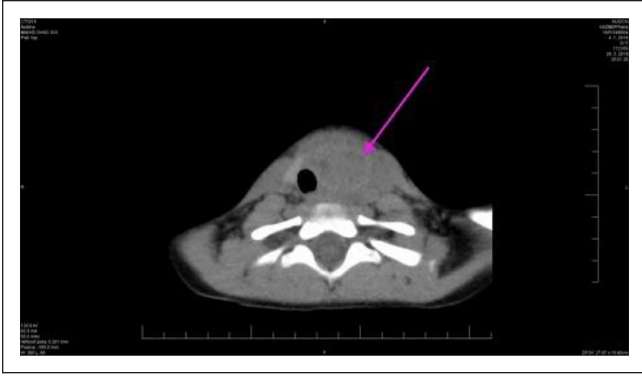


Figure 1. Computed tomography scan of the case before treatment (the deposit in the left lobe of the thyroid gland is circumscribed as a pale margin, the purple arrow points at the margin).

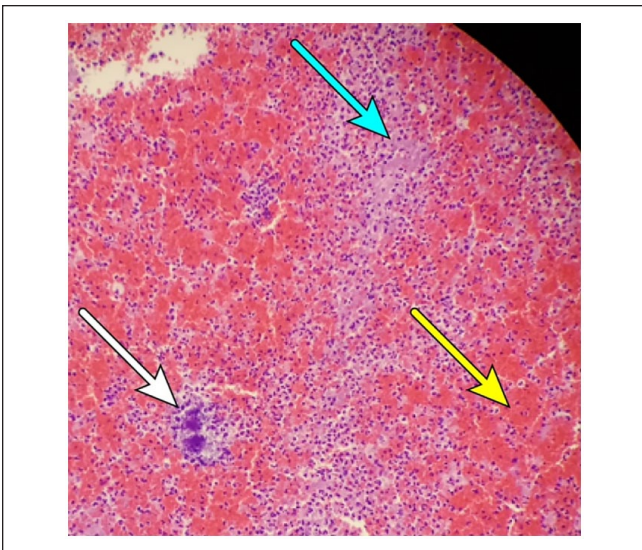


Figure 2. Microscopic examination of the lesion (erythrocytes [the yellow arrow], neutrophils [blue arrow] and basophil granules representing small colonies of *Actinomyces* bacteria [white arrow]).

Case Report

A 3-year-old girl 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. 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. Her medical history was unremarkable. She was fully vaccinated, with no past history of recurrent illnesses. 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 the thyroid area. Cervical lymph nodes were not enlarged. Baseline laboratory analysis revealed the following: leukocytosis ($19.8 \times 10^9/L$), increased neutrophils (69.8%), and mildly elevated C-reactive protein (79.3 mg/L, reference range: 0-10 mg/L). Biochemical indicators were all normal, including thyroid hormones. Ultrasonography and cervical CT showed a solid mass sized 13 × 14 × 36 mm in the left thyroid lobe (Figure 1). Both incision and drainage of the lesion were performed. The microscopic examination showed hemorrhagic and purulent content of the abscess, with rare basophilic granules presented as microcolonies of filamentous bacteria consistent with *Actinomyces* species (Figure 2). A sample of the biological material was cultivated on agar for anaerobic bacteria with 7% sheep blood (EnviroLab) at 35°C to 37°C in the anaerobic atmosphere by prolonged cultivation. The identification of microorganisms was carried out by MALDI-TOF MS after 96 hours. In addition, we carried out verification with gram staining (automated gram stainer PREVI® Color Gram, bioMérieux) and subsequent sample microscopy. Cultivation of the specimen confirmed the presence of gram-positive bacteria *Actinomyces odontolyticus*. After obtaining the microbiological results, macrolide antibiotics were replaced by intravenous penicillin G. A spectrum of predisposing factors was investigated: A focal infection was ruled out by detailed dental examination; a broad spectrum of laboratory investigations excluded both underlying primary and secondary immunodeficiency. After 9 weeks when a CT scan was performed showing massive regression of the abscess and as a result, we switched from intravenous penicillin to oral therapy. The patient was discharged afebrile with normal blood tests. As a follow-up, a regular ultrasound examination of the neck was performed every month. Five months after the patient had been discharged and despite continued antibiotic treatment, the patient was admitted again with a relapse. The recurrence of actinomycotic abscess in the thyroid gland led us to believe that there was very likely a communication between the thyroid gland and the gastrointestinal tract. Finally, laryngoscopy exposed a pathological communication in the left recessus piriformis, probably an anatomical abnormality of the thyroglossal duct. It was consequently surgically closed—seared by applying fibrin glue. After the initial 4 weeks of intravenous treatment, penicillin was taken orally for a further 5 months with a monthly ultrasonography of the thyroid gland. After 13 months of the initial presentation, the girl made a complete recovery with resolution of the cystic formation revealed in the ultrasound scan. It was due to conservative treatment that the infection of the thyroid gland was completely cleared while its function was fully preserved.

Discussion

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.⁸ There are certain predisposing factors which can lead to actinomycosis, such as poor oral hygiene, trauma of oral mucosis (dental extraction, damaged tissue after radiation or cervicofacial surgery, maxillofacial trauma, infection caused by the growth of secondary teeth), or immunocompromised patients suffering from diabetes mellitus, immunosuppression, bisphosphonate-related osteonecrosis, or malnutrition.⁹ In childhood age, this could be boosted by a persistent thyroglossal duct or piriform sinus, which facilitates communication between the oral cavity and the thyroid gland parenchyma.¹⁰ When you confirm actinomycotic infection in your patient, it is important to take predisposing factors into consideration to prevent reinfections because it is the pathological communication that contributes to pathogenesis. Our patient was diagnosed with underlying anatomical abnormality of thyroglossal duct which may have allowed for the infection to spread. We managed to disrupt its development, however, and close the communication.

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.⁵ Symptoms can mimic a number of diseases, particularly malignancy and a thyroid gland infection of other agents.

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.⁶ Clinicians should consider actinomycosis infection in children with verified circumscribed mass lesions in the head and neck region of unclear etiology.

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Declaration of Conflicting Interests

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Ethics Approval

Our institution does not require ethical approval for reporting individual cases or case series.

Informed Consent

Verbal informed consent was obtained from a mother of the patient for anonymized patient information to be published in this article.

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