Scholars Journal of Medical Case Reports
Abbreviated Key Title: Sch J Med Case Rep
ISSN 2347-9507 (Print) | ISSN 2347-6559 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Microbiology

Osteitis of the Diabetic Foot Caused by Actinomyces Odontolyticus

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DOI: https://doi.org/10.36347/sjmcr.2026.v14i06.004 | **Received:** 16.04.2026 | **Accepted:** 27.05.2026 | **Published:** 03.06.2026

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Abstract | **Case Report**

Introduction: Actinomycosis is a suppurative infection caused by bacteria of the genus Actinomyces. Bone localization in diabetics is rare. Bacteriological study by conventional method is difficult. ***Observation:*** This is the case of a 63-year-old diabetic patient, who presented a purulent swelling of the right foot, progressing for 2 months without fever, with signs of necrosis. The x-ray of the foot showed images of osteolysis of the bones of the big toe. The cytobacteriological study allowed the isolation of *Actinomyces odontolyticus* after 48 h culture. ***Conclusion:*** *Actinomyces spp* osteitis is rare in diabetics, isolation of the bacteria by culture is exceptional.

Keywords: Osteitis, Diabetic foot, Suppurative infection, Actinomyces.

INTRODUCTION

Actinomycosis are granulomatous, chronic and invasive infections due to an anaerobic or micro-aerophilic Gram-positive bacillus, filamentous with swollen ends, non-sporulated. There are six species that are pathogenic to humans, the main one being Actinomyces israelii [1]. Actinomycosis can be orocervicofacial, thoracic, abdominopelvic, cutaneous, musculoskeletal, pericardial, central nervous system infection or disseminated actinomycosis [2].

This observation reports the case of a diabetic foot infection with *Actinomyces odontolyticus* osteitis.

MEDICAL OBSERVATION

This is a 63-year-old patient with 25-year history of diabetes on insulin, who presented a painful swelling of the metatarsal part and the big toe of the right foot 2 months before the consultation, the course was marked by the extension of the swelling, with the appearance of a purulent collection, these symptoms progressed without fever. On examination, the patient was conscious, afebrile at 37.5 ° C. Local examination of the right foot found edematous foot, warm metatarsal and phalangeal swelling, a purulent collection on the sole of the foot, and patches of necrosis [image1]. The standard x-ray of the foot showed images of focal osteolysis of the big toe and subcutaneous emphysema. CRP was 110 mg / L, CBC showed a predominantly polynuclear neutrophilic hyperleukocytosis. A sample of the pus collected on the plantar surface of the foot was taken. The cytobacteriological study found a purulent sample, small Gram-positive bacilli on direct examination, and the culture on blood agar grew at 48 hours, objectifying small and white colonies [image 2]. The culture was monobacterial. Catalase was negative. Gram staining from the colonies showed small Gram-positive bacilli [image 3]. Identification of colonies by MALDI TOF was in favor of Actinomyces odontolyticus [image 4 shows the colonies after 8 days incubation, and image 5 shows the filamentous appearance of Gram bacteria from colonies after 8 days in culture]. An antibiogram on agar medium was carried out, it showed good sensitivity to beta-lactams, macrolides and glycopeptides. Due to the extent of soft tissue involvement and necrosis, Chopart amputation was performed. And the patient was put on clavulanic acid amoxicillin.

Image 1: Appearance of the foot on admission

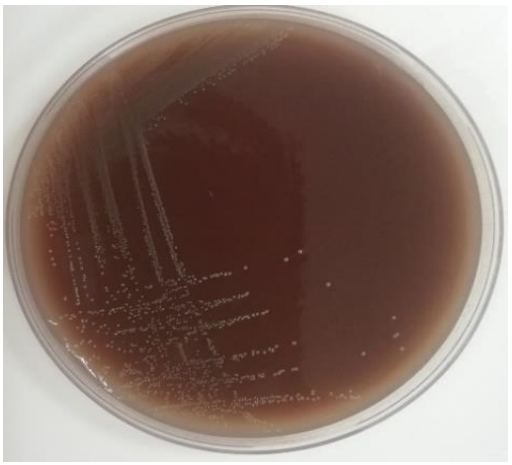

Image 2: Appearance of the colonies at 48 hours of incubation

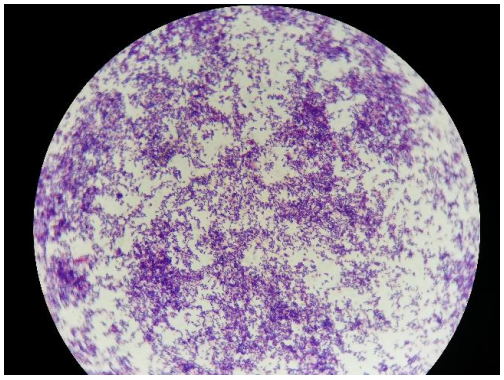

Image 3: Direct Gram examination from colonies isolated in culture of 48 hours of incubation

Image 4: Colonies after 8 days incubation on blood agar

Image 5: Direct Gram examination from colonies of 8 days of culture

DISCUSSION

Human actinomycosis, a chronic, granulomatous infectious disease, has been recognized for a long time, and its causative agent, originally named currently *Actinomyces israelii*, was described in 1896 by Kruse. It was not until 1951 that another *Actinomyces* species, *Actinomyces naeslundii*, was implicated in actinomycotic lesions in humans, while *Actinomyces odontolyticus* and *Actinomyces viscosus* were described in 1958 and 1969, respectively [2].

In a recent review, 26 individual *Actinomyces* species were listed, which were known to be implicated in human infections *Actinyomces* species with validly published names that have been implicated in human infections [3].

A. bovis	A. israelii	A. radicidentis
A. cardiffiensis	A. massiliensis	A. radingae
A. dentalis	A. meyeri	A. timonensis
A. europaeus	A. naeslundii	A. turicensis
A. funkei	A. nasicola	A. urogenitalis
A. georgiae	A. neuii	A. viscous
A. gerencseriae	A. odontolyticus	
A. graevenitzii	A. oris	
A. hominis	A. oricola	
A. hongkongiensis	A. pyogenes	

The most common species causing actinomycotic abscesses in humans are A. israelii, A. naeslundii, A. odontolyticus, A. viscosus, A. meyeri, A. gerencseriae [4].

Actinomyces odontolyticus is part of the oral and esophageal commensal flora, it dominates on the surface of the tongue and the gum [2, 5]. It has been implicated in dental caries, periodontitis [5], head and neck infections [6], pericarditis [7], abscess of the arm after cocaine injection, submandibular cellulitis, perianal abscess, peridiverticular abscess [4], liver abscess [8], bacteremia [9], pulmonary actinomycosis [10] and other infections.

invasive disease caused by Actinomyces odontolyticus is thought to be related to immunosuppression. It's normally seeded from oropharyngeal sources [7].

Other factors that can cause actinomycosis have been implicated: diabetes, neoplasia, alcoholism, HIV seropositivity, local trauma, a foreign body, and the intrauterine device for abdomino-pelvic involvement [4].

Regarding physiopathology, direct inoculation is the usual cause of limb involvement. At the osseous level, the bone is affected by an adjacency lesion. In the event of a primary lesion, the bone is affected by the hematogenous route. This is rare [3 to 5%] and accounts for the disseminated forms with generally pulmonary, hepatic and cerebral locations [1,11].

In our patient, the bone involvement appears to be by contiguity as evidenced by the presence of soft tissue abscesses.

Only a few cases of actinomycosis osteomyelitis have been reported in the literature. Although the pathomechanism of actinomycosis

osteomyelitis is unclear, it is suggested that inflammation begins when the normal composition of the microbial flora is disturbed, and chronic inflammation leads to localized pathological changes in the bone [12].

The microbiological diagnosis of actinomycosis is the isolation of the causative agent from a sterile infectious site. The best clinical specimens are deep aspirations, pus. Conversely, swabs, urine, sputum or bronchial lavage samples are not suitable. Any contamination by the local microbiota and any exposure to oxygen should be avoided or minimized.

Actinomyces spp classified among the strict anaerobes, aerotolerant which grow in an atmosphere enriched with 10% CO2. Actinomyces spp is rarely isolated in culture, due to inhibition of its growth by other microorganisms, inadequate culture conditions or inadequate incubation. It grows slowly, culture on agar medium requires at least 5 days, this duration can be up to 15 to 20 days [3]. The culture on blood agar medium in this observation was positive after 48 hours of incubation in an atmosphere enriched with 5% CO2.

The identification and differentiation of species belonging to the genus Actinomyces can cause major problems for microbiology laboratories if using conventional methods: the biochemical kits marketed, the Rapid ID32A and Rapid ANA II galleries [3].

These conventional tests can lead to misidentification of clinical isolates of Actinomyces. More precise alternative methods are then used more and more: 16s rRNA sequencing, 16s rDNA sequencing, PCR and mass spectrophotometry: MALDI TOF whose evaluation of the use with Actinomyces species has gave positive results. In a comparative study, mass spectrometry correctly identified 97% of the 32 strains of the species Actinomyces, while the biochemical kits identified 33% of the strains. Add to its precision the speed of results [2, 3].

Actinomyces spp is rarely responsible for diabetic foot infection. The bacteria often isolated by conventional techniques are the Gram-positive cocci dominated by Staphylococcus aureus and the aerobic Gram-negative bacilli, anaerobic germs are generally rare [13, 14]. On the other hand, when efficient microbiological techniques are used, anaerobic germs are isolated in 75 to 95% of cases [13].

With regard to diabetic foot lesions with osteitis, studies using bone biopsy are almost unanimous that Staphylococcus aureus is the most frequently isolated germ [13]. The sample received for this patient with osteitis was not a bone biopsy, but a collected pus whose culture was monobacterial to Actinomyces odontolyticus.

In two studies using 16S rRNA sequencing and culture, looking for the germs responsible for osteomyelitis in diabetic patients [14], and those that infect diabetic foot ulcers [15], the genus Actinomyces was isolated by sequencing in 26% of cases for the first and in 20% for the second, no case of Actinomyces spp was isolated by culture.

Another study, which aimed to assess the microbial diversity of diabetic wounds by molecular biology and culture, did not isolate any cases of Actinomyces spp [16].

In the prospective study done by K Sasikumar and al [17] on 104 ulcer biopsies of diabetic feet, and that of A Abdulrazak and al [18] on 86 samples of pus and curettage of diabetic feet after debridement, the search for the germs responsible for the infection was carried out by culture in aerobic and anaerobic medium. No culture has isolated the genus Actinomyces.

CONCLUSION

Actinomycosis is a rare infectious bacterial disease. It evolves in a chronic fashion, associating necrosis and micro-abscess. Isolation of the genus Actinomyces in samples from diabetic feet is rare. Its isolation by culture is even rarer. Its isolation after 48 hours of incubation is exceptional. In fact, in the literature studied, all the cases of isolation of Actinomyces spp in diabetic feet were carried out by sequencing 16S rRNA or 16S rDNA. This can be explained by the presence of other bacteria inhibiting its growth on bacterial culture.

This observation underscores the value of the use of mass spectrometry in the rapid identification of actinomycetes.

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