Cutaneous infection caused by *Gordonia amicalis* after a traumatic injury

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Gordonia amicalis infection has never been reported in humans. We report here the first case of G. amicalis-related cutaneous infection after a traumatic injury. The isolate was confirmed by 16S rRNA sequencing analysis and the patient responded well to repeated debridement and antibiotic treatment.
A 30-year-old man was referred to our hospital because of a chronic non-healing wound on the middle finger of his left hand. Three months prior to this presentation, he sustained a high-pressure injection injury to the middle finger of his left hand resulting in progressive painful swelling. He received surgical debridement at a hospital elsewhere, but the condition of the wound did not improve. On arrival at our hospital, physical examination showed a 0.5 cm x 0.5 cm ulcer on the volar side of the distal phalanx and a 1 cm x 1 cm ulcer on the dorsal side of the proximal phalanx of the middle finger of his left hand. A hard mass was also noted on the volar side of the proximal and middle phalanx (Figure 1A). The patient didn’t have fever or other skin lesions. Laboratory studies revealed the following values: white blood cell count, 6.82 x 10^3/l; serum urea nitrogen, 12.4 mg/dl; serum creatinine, 0.9 mg/dl; aspartate aminotransferase 16 U/l; and sodium, 140 mmol/l. Magnetic resonance imaging of the left hand revealed subcutaneous edema and fat stranding on the left middle finger with loculated cyst-like lesions of various size at the dorsoulnar aspect of the proximal portion and at the ventroulnar aspect of the distal portion of the finger. The wound on the middle finger of the left hand was debrided via a Brunner (volar zig-zag) incision. Yellowish discharge and chronic granulomatous inflammation were noted in zones I and II of the left middle finger (Figure 1B). The debrided tissue was sent to microbiology laboratory for bacterial, mycobacterial, and fungal cultures. There was no direct specimen Gram stain preparation made of materials (pus or discharges).

Pathological examination of the excised tissue showed some foci of acute and chronic inflammatory cell infiltration with granulation tissue formation and fibrosis as well as numerous empty spaces surrounded by foreign body giant cells. Several Gram-positive bacilli were visible. Antibiotics (ampicillin-sulbactam 1500 mg q6h)
were administered intravenously and the post-operative course was uneventful. The patient was discharged home two days later on a seven-day course of oral antibiotics (amoxicillin-clavulanate, 1g every 12 hours).

Cultures on the trypticase soy agar supplemented with 5% sheep blood (Becton Dickinson, Sparks, MD) grew few slightly orange and dry colonies and Gram-positive coryneform bacilli with rudimentary branching and weakly acid-fast bacilli after incubation for four days. The growth on chocolate agar (Becton Dickinson) and CDC blood agar plate (Becton Dickinson) was negative. Cultures for mycobacteria and fungi were negative. After subculture and incubation for 72 hours on the blood agar plate, orange, opaque, dry, and nonhemolytic colonies without aerial hyphae were found (Figure 2). The colonies were compatible with those for some *Gordonia*, *Rhodococcus* and *Nocardia* species (10). The isolate exhibited negative biochemical reactions including hydrolysis of casein, xanthine, hypoxanthine, and tyrosine (3).

The isolate was identified as *Gordonia* species by PCR-RFLP of *hsp*65 (440 bp) with the presence of unique fragments of the isolates digested by *Hinf*I (245/150 bp) (10). The isolate was further identified by the partial 16S rRNA gene (980 bp) sequencing analysis as previously described (8). The accession number obtained from the GenBank database was HQ842811.1 with identity of >99.9% as *G. amicalis* and the other closely related strain *G. rubripertincta* with 98.9% identity. Minimum inhibitory concentrations (MICs) of amoxicillin-clavulanate, vancomycin, and ciprofloxacin were determined by the Etest (AB Biodisk, Solna, Sweden) in accordance with the manufacturer’s directions was 1.0/0.5 μg/ml, 0.5 μg/ml, and 0.008 μg/ml, respectively. There were no MIC interpretive criteria of *Gordonia* isolates for defining susceptibility to antimicrobials by the Clinical and Laboratory Standards Institute.

*Gordonia* species, previously classified as *Rhodococcus* species, are ubiquitous in...
the environment and are often found in soil and water (1, 3). Human infections caused by *Gordonia* species are rare. Till now, there are at least nine *Gordonia* species, including *G. terrae*, *G. bronchialis*, *G. polyisoprenivorans*, *G. rubripertincta*, *G. sputi*, *G. arai*, *G. effusa*, *G. otitidis*, and *G. amicalis* (this report) have been reported to cause human infections (1, 2, 5, 7, 8, 10-12). *Gordonia amicalis* was first isolated from garden soil in Russia in 2000 and was proposed as a novel species by Kim et al (9). In this study, the isolate was identified as *C. amicalis* based on the PCR-RFLP of *hsp65* and 16S rRNA sequencing analysis with >99% of identity as defined by the Clinical and Laboratory Standards Institute (document MM18-A) (4). Further comparison of results from biochemical reactions and other sequence-based analysis might be of value for better differentiation between the two genetically close taxa: *G. amicalis* and *G. rubripertincta*.

The clinical significance of *G. amicalis*, however, remains unknown. Herein, we demonstrated the first case of *G. amicalis* cutaneous infection after a traumatic injury. The clinical manifestations of human infections caused by *Gordonia* species include primary bacteremia, catheter-related bloodstream infection, respiratory tract infection, cutaneous infection, ocular infection, and central nervous system infection (2, 5-8, 10-15). Previously reported cases of skin and soft tissue infections (SSTI) due to *Gordonia* species included breast abscess and sternal wound infections (6, 10, 13-15). All of the reported cases of SSTI were caused by either *G. terrae* or *G. bronchialis* and most of the patients required prolonged antibiotic treatment and surgical debridement (6, 10, 13-15).

Optimal antimicrobial treatment for infections due to *Gordonia* species remains unclear. A previous study reported that the MIC values were as low as ≤1/0.5 μg/ml for amoxicillin/clavulanic acid, ≤0.5 μg/ml for ciprofloxacin, and ≤0.5 μg/ml for...
vancomycin against *Gordonia* isolates and that the outcomes in patients treated with these three antimicrobials were favorable (10). In this study, the MIC value of *G. amicalis* was 1.0/0.5 μg/ml for amoxicillin-clavulanate and our patient responded well to antibiotic therapy for nine days and extensive debridement. More clinical isolates of *Gordonia* species are needed to further investigate the in vitro susceptibility and in vivo response.

To the best of our knowledge, this is the first reported case of cutaneous infection caused by *G. amicalis* after a traumatic injury. Combined antibiotic and surgical management is needed to treat the associated infection.
References


FIG 1. (A) A 1 cm x 1 cm ulcer with discharge on the dorsal side of the proximal phalanx of the middle finger of the left hand. (B) Yellowish discharge on the volar side of the middle phalanx beneath the neurovascular bundle.
FIG. 2. Orange, opaque, dry, and nonhemolytic colonies grew on trypticase soy agar supplemented with 5% sheep blood after incubation for 72 hours.