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***Mycobacterium mageritense* tattoo infection: a known complication with a novel species**

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Abstract

Non-pigmented rapidly growing mycobacteria are nontuberculous mycobacteria (NTM) capable of producing disease. We report a case of tattoo-associated NTM infection with a novel species: *Mycobacterium mageritense*. A 48-year-old man presented with a two-week history of a papulopustular eruption on the shaded areas of a tattoo that had been placed five weeks prior while in the Philippines. Histopathology from punch biopsies revealed suppurative granulomatous dermatitis with acid fast bacilli present. Subsequent matrix assisted laser desorption/ionization time of flight (MALDI-TOF) mass spectrometer identified the bacteria as *Mycobacterium mageritense*. After consultation with infectious disease specialists and culture susceptibilities, the patient was treated with three months of dual antibiotic therapy with minocycline and moxifloxacin. The patient experienced a slow but complete resolution of clinical skin findings after the course of treatment. Since discovery in 1997, *M. mageritense* infection has been demonstrated in a wide spectrum of disease, predominantly skin and soft tissue infections. The species has not been previously implicated in tattoo-associated NTM infections. *M. mageritense* should be considered as a specific type of mycobacteria in the differential diagnosis for tattoo-associated NTM infections owing to differences in antibiotic susceptibilities compared to other NTM species.

Keywords: tattoo, nontuberculous mycobacterium, rapidly growing mycobacterium, Mycobacterium mageritense, infection

Introduction

Non-pigmented rapidly growing mycobacteria (RGM) are non-tuberculous mycobacteria (NTM) capable of producing disease in humans. Rapidly

growing mycobacterium species are ubiquitous in nature and are found in soil samples and municipal tap water in a worldwide geographic distribution, including the United States [1].

Nontuberculous mycobacteria may cause delayed skin and soft tissue infections after common skin procedures or trauma [1-3]. The first case of cutaneous NTM inoculation as a complication from tattooing was described in 2003 [4]. Since this observation, NTM including *M. abscessus*, *M. fortuitum*, *M. haemophilum*, *M. immunogen*, *M. massiliense*, and most commonly *M. chelonae* have been implicated in tattoo-associated skin infection [2, 5-8]. We describe a case of tattoo-associated NTM skin infection by a novel species of RGM, *M. mageritense*.

Case Synopsis

A 48-year-old man with no significant past medical history presented to our clinic with a two-week history of a papulopustular eruption on the shaded areas of a tattoo that was placed five-weeks prior in the Philippines. He reported that the rash was initially pruritic, but at presentation the lesions were painful and irritated by clothing. Hydrocortisone 1% cream prior to dermatologic evaluation had been of no benefit.

The patient was well appearing and afebrile at the time of presentation. Physical examination revealed a Fitzpatrick type IV man with monomorphous erythematous papules and pustules coalescing into plaques along the entire left arm (**Figure 1A, B**). The main outline of the tattoo was spared, with the plaques almost exclusively involving the shaded portions of ink. No lymphadenopathy was appreciated.

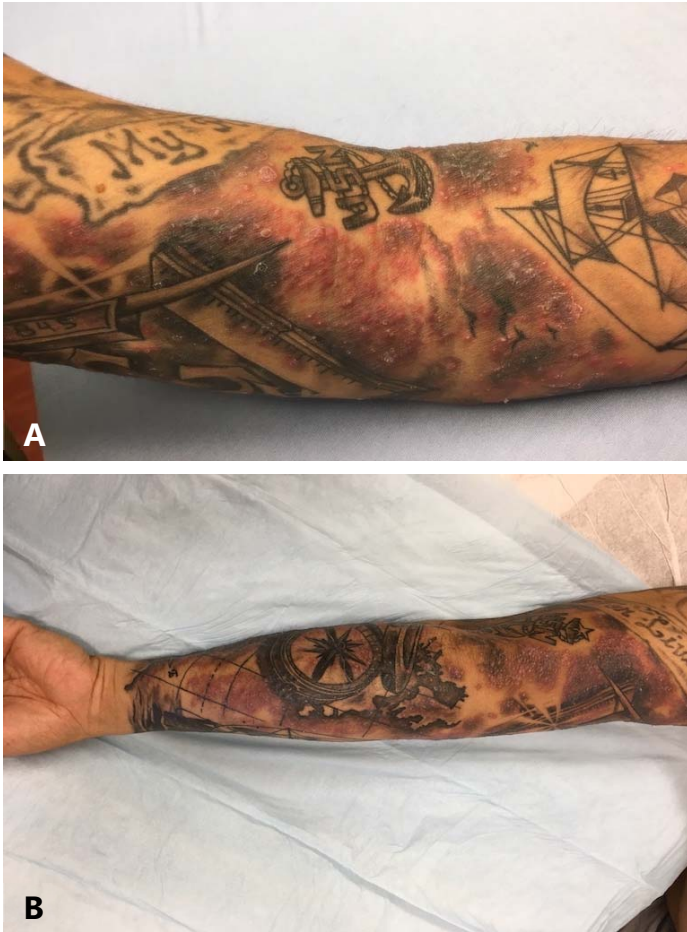


Figure 1. Erythematous plaques studded with pustules located predominantly in the shaded portions of ink **A)** on the medial left arm, and **B)** posterior left forearm sparing the main outline of the tattoo.

Two punch biopsies were obtained from the left arm for histopathology (**Figure 2**) and culture. Owing to high clinical suspicion for mycobacterial infection the patient was empirically placed on minocycline 100mg twice daily. Acid-fast bacteria smear was negative and cultures were positive within 3-4 days and initially reported as gram negative rods. After discussion with a microbiology consultant and assistance of a matrix assisted laser desorption/ionization time of flight (MALDI-TOF) mass spectrometer, the bacteria was quickly and accurately identified as *Mycobacterium mageritense*. Subsequently the histopathology revealed suppurative granulomatous dermatitis with acid fast bacilli present and the Fite-Foraco stain highlighted a cluster of bacilli confirming the diagnosis (**Figure 3**). Organisms were not identified on the Ziehl-Neelsen stain and Grocott methenamine silver and periodic

acid-Schiff stains were negative for fungal elements. The mycobacterium was sent for susceptibility testing and found to be sensitive to minocycline and moxifloxacin.

Our patient was diagnosed with a tattoo-associated *M. mageritense* cutaneous infection. After consultation with an infectious disease consultant the addition of moxifloxacin 400mg orally once daily was added to the minocycline regimen. Dual antibiotic therapy was continued for three months and the patient had slow but complete resolution of clinical skin findings after the completion of treatment.

Case Discussion

Tattoos have become increasingly more common in western countries. It is estimated that 24% of adults aged 18 to 50 in the United States have tattoos [9]. Yet, despite their rise in popularity, a recent survey of university students demonstrated a paucity of knowledge concerning the complications of tattoos [10].

Although many skin disorders have been linked to tattoos, the most common complication is infection. Superficial and deep skin infections with *Streptococcus pyogenes* and *Staphylococcus aureus* as well as inoculation with HIV, hepatitis B, hepatitis C, *Treponema pallidum*, and *Clostridium tetani* have all been described and linked to unsterile instruments [11, 12].

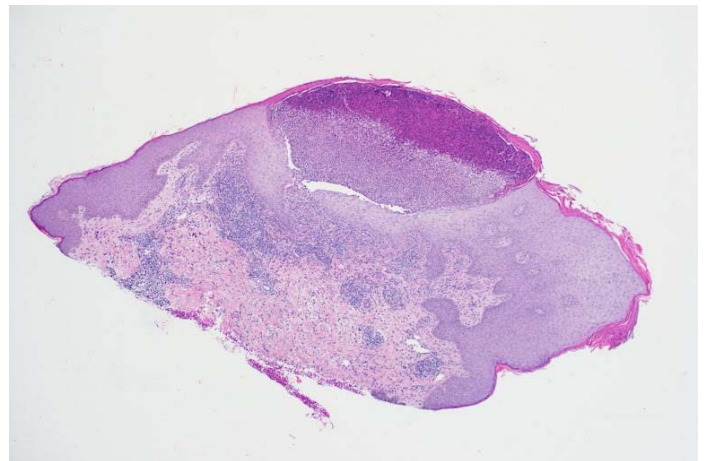


Figure 2. Subcorneal pustule with pseudoepitheliomatous hyperplasia and surrounding chronic inflammatory infiltrate. H&E 4x.

Within the past fifteen years, NTM have been identified as a source of local cutaneous infections leading to tattoo complications [2, 5-8]. NTM infections commonly present as painful or pruritic erythematous papules, pustules, ulcers, or plaques. The average time of onset is usually within four to six weeks after tattooing, but has been observed as late as six months after inoculation [5, 6]. Contamination of equipment or dilution of ink with unsterile tap water have been identified as the etiology for most tattoo-associated NTM infections [2, 5-8]. However, contamination of ink at the manufacturing level has also been implicated in outbreaks in the United States and Europe [5, 7]. *Mycobacterium chelonae* is the most common species of NTM isolated from tattoos, but *M. abscessus*, *M. fortuitum*, *M. haemophilum*, *M. immunogen*, and *M. massiliense* have also been reported. *Mycobacterium mageritense* has never been implicated.

Mycobacterium mageritense is a rapidly growing NTM first discovered in 1997 [13]. The species was named in homage to Magerite, the old Arabic word for Madrid, where a majority of the initial isolates were obtained. Phenotypically, *M. mageritense* is most closely related to *M. fortuitum* in antibiotic susceptibility and biochemical testing [1, 13]. The species was originally isolated from sputum samples but was initially not considered clinically significant. *Mycobacterium mageritense* has now been shown to cause disease in both immunocompetent and immunocompromised hosts [14]. This NTM exhibits a wide spectrum of disease, predominantly skin and post-operative or traumatic soft tissue infections as well as osteomyelitis, non-tuberculous lung infections, prosthetic endocarditis, sinusitis, and central line associated blood stream infections [3, 15-19].

Previously described cutaneous and surgical site wound infections have been suppurative in nature and include abscesses and furunculosis [3, 15, 19]. Clinical manifestations after suspected inoculation may appear within one week [20], but onset of symptoms have been reported as late as 100 days [3]. Our patient's presentation of coalescing erythematous papules is similar to previous

descriptions of tattoo-associated NTM infections in morphology and onset of symptoms. However, despite the similarities, the treatment for *M. mageritense* can differ from other tattoo-associated NTM infections.

No standard guidelines exist for the treatment of cutaneous NTM infections. Macrolides, tetracyclines, fluoroquinolones, aminoglycosides, cephalosporins, rifampin, and linezolid of varying duration have all been utilized for treatment [2, 6, 21]. Clarithromycin is commonly included in combination therapy for treatment of tattoo-associated NTM infections from *M. abscessus*, *M. fortuitum*, and *M. chelonae* [2, 6, 21]. Isolates of *M. mageritense* have been shown to be largely resistant to macrolides owing to *erm* gene inducible macrolide resistance [14, 21]. Isolates from the United States have shown poor susceptibility to amikacin and doxycycline and thus *M. mageritense* is often more difficult to treat [14]. *Mycobacterium mageritense* is generally susceptible to trimethoprim-sulfamethoxazole, fluoroquinolones, and imipenem. Combination therapy for a treatment duration of three to twelve months has been shown to provide clinical resolution of symptoms [14-20]. Despite historical sensitivities, antibiotic therapy should be guided by in vitro sensitivities of culture isolates. Our patient showed positive response to minocycline and moxifloxacin combination therapy and cleared his lesions after three months of treatment.

Conclusion

Nontuberculous mycobacterium infections are a known, but rare complication of tattooing. Inoculation occurs through use of contaminated ink and equipment at the tattoo parlors but has also been reported during the manufacturing process [2, 5-8]. To our knowledge, tattoo-associated infection by *M. mageritense* has never been described. *Mycobacterium mageritense* should be specifically included in the differential diagnosis for suspected tattoo-associated NTM infections owing to the differences in antibiotic susceptibilities when compared to other NTM species.

Potential conflicts of interest

The authors declare no conflicts of interests.

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