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***Mycobacterium abscessus* subspecies *massiliense* infection after skin graft and cholecystectomy in a burn patient**

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Abstract

Diagnosing skin and soft tissue infections due to rapidly growing mycobacteria (RGM) can often prove difficult, leading to delays in treatment. Postoperative infections caused by RGM are increasingly recognized both within and outside the USA, but are rarely encountered in burn units. We report a case of postoperative skin and soft tissue infection along a cholecystectomy incision in a burn patient caused by *Mycobacterium abscessus* subsp. *massiliense*. Postoperative infections caused by RGM require a high index of suspicion, often necessitating biopsy for definitive diagnosis. Physicians should consider this diagnosis when postoperative infections arise later than typically seen for routine bacterial infections and fail to respond to first-line therapy.

Keywords

Rapidly growing mycobacteria; Burn; Postoperative infection; *Mycobacterium massiliense*

Introduction

Mycobacterium abscessus subsp. *Massiliense* is a rapidly growing Mycobacterium (RGM) that was first described when *M. abscessus* was divided into three different species in 2006: *M. abscessus* sensu stricto, *Mycobacterium massiliense*, and *Mycobacterium bolletii*. Multilocus sequence typing in 2011 then reclassified these three organisms as subspecies within the *M. abscessus* species, which was later supported by whole-genome sequencing in 2013 and matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) in 2014 (Mougari et al., 2016).

The most commonly encountered RGM isolated within the USA include *M. abscessus*, *Mycobacterium fortuitum*, and *Mycobacterium chelonae*, which account for up to 90% of the infections caused by RGM (Mougari et al., 2017). By definition, these mycobacteria

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Conflict of interest
None declared.

Ethical approval
None required.

grow on solid media within 7 days, confirmed by repeating the culture on subculture to avoid falsely rapid growth because of a large inoculum size. These organisms are ubiquitous and are readily isolated in the environment and from non-sterile water sources, and healthcare-associated infections due to RGM are increasingly recognized (Brown-Elliott and Wallace, 2015; Petrini, 2006).

Case report

The case patient was a 55-year-old previously healthy woman who had sustained partial and full-thickness burns involving 45% of her body surface area 6 months prior, when her grill had exploded. After a prolonged hospitalization requiring several excisional skin and soft tissue debridement procedures with cadaveric and epithelial autologous skin grafts, she underwent an open cholecystectomy 1 month before transfer to our hospital.

Shortly after, the patient developed a rash with pink-to-red papules and nodules coalescing into plaques in a linear distribution along her incision and involving her autologous skin grafts (Figure 1). A biopsy revealed granulomatous inflammation with giant cells; staining failed to identify any pathogens (Figures 2 and 3). Cultures grew on Middlebrook 7H11 agar in 3 days, suggesting RGM.

The patient was started on cefoxitin, clarithromycin, and moxifloxacin empirically. Species identification was performed with molecular assays (including *rpoB* gene and 16S rRNA sequencing) and antimicrobial susceptibility testing was performed by microdilution assays. The isolate was susceptible to azithromycin, clarithromycin, clofazimine, kanamycin, and tigecycline, intermediate to cefoxitin, and resistant to all other drugs tested. The patient improved and was discharged on clarithromycin and moxifloxacin for a 6-month course.

Discussion

Skin and soft tissue infections due to the *M. abscessus* group typically occur after accidental trauma or surgery and can occur in both immunocompromised and immunocompetent patients. In postoperative infections, the average onset of symptoms ranges from 24 to 60 days after surgery, appearing much later than typical bacterial surgical site infections (Appelgren et al., 2008; Ghosh et al., 2017; Schnabel et al., 2016). Nodules usually first develop into draining abscesses, but can at times coalesce into larger plaques to cause chronically draining wounds, as in the patient case presented here. These infections are frequently misdiagnosed as bacterial infections but fail to respond to first-line therapy (Griffith et al., 2007).

Clusters of postoperative infections have arisen after a myriad of surgical procedures. A total of 21 cases of postoperative wound infections caused by RGM were described following cosmetic surgeries performed in the Dominican Republic in 2013–2014, with the majority growing *M. abscessus*. These infections were considered to have occurred due to the use of a contaminated water supply (Schnabel et al., 2016). Outbreaks have also been seen in the USA with post-injection joint infections secondary to failure of the disinfectant benzalkonium chloride (Tiwari et al., 2003), as well as following laser-assisted in situ keratomileusis due to the use of non-sterile water in a misting humidifier (Edens et al.,

2015). Recently a series of cases of RGM port-site infections were described following laparoscopic surgery in India. Of the 32 patients identified with chronic port-site infections, 20 had acid fast bacilli (AFB) identified on staining and 15 of these grew RGM (13 were *M. abscessus*, two were *M. fortuitum*); the most commonly performed procedure was a cholecystectomy (Ghosh et al., 2017).

RGM are infrequently encountered among patients in burn units. One case report describes a case of *M. abscessus* bacteremia in a patient in a burn unit (Vaghaiwalla et al., 2014). A recent case series reviewed over 2428 patients with thermal burns admitted to the United States Army Institute burn center and found only two patients who had RGM isolated: *M. abscessus* in a patient's tracheal aspirate and blood cultures and *M. fortuitum* in a patient's sputum (Boyer et al., 2010). In a case series describing RGM infections after a tsunami struck Thailand in 2004, RGM were isolated from 15 patients, nine of whom had skin grafts (Appelgren et al., 2008). These cases were not of clonal descent so were felt to be environmental contamination acquired during initial injury from the tsunami itself, rather than from contaminated healthcare exposure. The case presented here in appears to be the first published report of a burn patient developing a RGM skin and soft tissue infection at the site of a skin graft and cholecystectomy incision.

M. abscessus species possess inherent and acquired resistance to many commonly used antimicrobials (Nessar et al., 2012). Although macrolides are the mainstay of therapy, acquired resistance to this drug class can rapidly occur due to the presence of the inducible *erm(41)* gene, encoding a 23S methylase (Mougari et al., 2017; Nessar et al., 2012). *M. massiliense* is unique among the *M. abscessus* group in that it lacks an effective *erm(41)* due to deletions within the gene. However, resistance to macrolides can still develop through other mutations, most commonly due to mutations in the *rrl* gene, which results in a mutant 23S rRNA (Maurer et al., 2012; Mougari et al., 2017). Therefore, current American Thoracic Society (ATS)/Infectious Diseases Society of America (IDSA) guidelines recommend combination therapy consisting of a macrolide with two additional agents, generally amikacin, ceftazidime, or imipenem. Other agents with potential efficacy include linezolid, tigecycline, and telithromycin, but these have not been studied extensively. It is recommended that combination antimicrobial therapy is continued for a minimum of 4 months to avoid the development of drug resistance, with surgical debridement recommended if abscesses or foreign bodies are present, or if there is extensive disease (Griffith et al., 2007).

In summary, RGM are increasingly recognized as causes of postoperative infections, and outbreaks are being seen both within and outside the USA (Edens et al., 2015; Ghosh et al., 2017; Schnabel et al., 2016; Tiwari et al., 2003). The presence of a chronic draining abscess or plaque, onset of symptoms later than what is typically seen for routine bacterial postoperative infections, and failure to respond to first-line antibiotics for bacterial infections should raise concern that a RGM may be present. Clinicians should keep a high index of suspicion in these cases and pursue skin biopsy early when skin and soft tissue infections fail to improve on empirical therapy. It is also important to have close communication with the microbiology laboratory to ensure a proper workup is done, including identification to the species level to guide appropriate antimicrobial therapy.

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References

- Appelgren P, Farnebo F, Dotevall L, Studahl M, Jonsson B, Petrini B. Late-onset posttraumatic skin and soft-tissue infections caused by rapid-growing mycobacteria in tsunami survivors. *Clin Infect Dis* 2008;47(2):e11–6. [PubMed: 18549312]
- Boyer JM, Blatz PJ, Akers KS, Okulicz JF, Chung KK, Renz EM, et al. Nontuberculous mycobacterium infection in a burn ICU patient. *Burns* 2010; 36(7):e136–9. [PubMed: 20594758]
- Brown-Elliott BA, Wallace RJ, Jr. In: Bennett JE, Dolin R, Blaser MJ, editors. *Infectious caused by Mycobacterium bovis and nontuberculous Mycobacteria other than Mycobacterium avium complex*. Eighth ed. Philadelphia, PA: Elsevier/Saunders; 2015.
- Edens C, Liebich L, Halpin AL, Moulton-Meissner H, Eitniear S, Zgodzinski E, et al. Mycobacterium chelonae eye infections associated with humidifier use in an outpatient LASIK Clinic–Ohio, 2015. *MMWR Morb Mortal Wkly Rep* 2015; 64 (41): 1177. [PubMed: 26492452]
- Ghosh R, Das S, De A, Kela H, Saha ML, Maiti PK. Port-site infections by nontuberculous mycobacterium: a retrospective clinico-microbiological study. *Int J Mycobacteriol* 2017;6(1):34–7. [PubMed: 28317802]
- Griffith DE, Aksamit T, Brown-Elliott BA, Catanzaro A, Daley C, Gordin F, et al. An official ATS/ IDSA statement: diagnosis, treatment, and prevention of nontuberculous mycobacterial diseases. *Am J Respir Crit Care Med* 2007; 175 (4):367–416. [PubMed: 17277290]
- Maurer FP, Ruegger V, Ritter C, Bloemberg GV, Bottger EC. Acquisition of clarithromycin resistance mutations in the 23S rRNA gene of Mycobacterium abscessus in the presence of inducible erm(41). *J Antimicrob Chemother* 2012;67(11):2606–11. [PubMed: 22833642]
- Mougari F, Bouziane F, Crockett F, Nessar R, Chau F, Veziris N, et al. Selection of resistance to clarithromycin in Mycobacterium abscessus subspecies. *Antimicrob Agents Chemother* 2017;61(1).
- Mougari F, Guglielmetti L, Raskine L, Sermet-Gaudelus I, Veziris N, Cambau E. Infections caused by Mycobacterium abscessus: epidemiology, diagnostic tools and treatment. *Expert Rev Anti Infect Ther* 2016;14(12):1139–54. [PubMed: 27690688]
- Nessar R, Cambau E, Reyrat JM, Murray A, Gicquel B. Mycobacterium abscessus: a new antibiotic nightmare. *J Antimicrob Chemother* 2012;67(4):810–8. [PubMed: 22290346]
- Mycobacterium Petrini B. abscessus: an emerging rapid-growing potential pathogen. *APMIS* 2006;114(5):319–28. [PubMed: 16725007]
- Schnabel D, Esposito DH, Gaines J, Ridpath A, Barry MA, Feldman KA, et al. Multistate US outbreak of rapidly growing mycobacterial infections associated with medical tourism to the Dominican Republic, 2013–2014(1). *Emerg Infect Dis* 2016;22(8):1340–7. [PubMed: 27434822]
- Tiwari TS, Ray B, Jost KC, Jr., Rathod MK, Zhang Y, Brown-Elliott BA, et al. Forty years of disinfectant failure: outbreak of postinjection Mycobacterium abscessus infection caused by contamination of benzalkonium chloride. *Clin Infect Dis* 2003;36(8):954–62. [PubMed: 12684906]
- Vaghaiwalla T, Satahoo SS, Zarifa R, Dauer M, Davis JS, Dearmas D, et al. Mycobacterium abscessus infection in a burn intensive care unit patient. *Surg Infect (Larchmt)* 2014;15(6):847–9. [PubMed: 25493353]



Figure 1. Pink-to-red papules and nodules coalescing into plaques in a linear distribution along the patient's cholecystectomy scar.

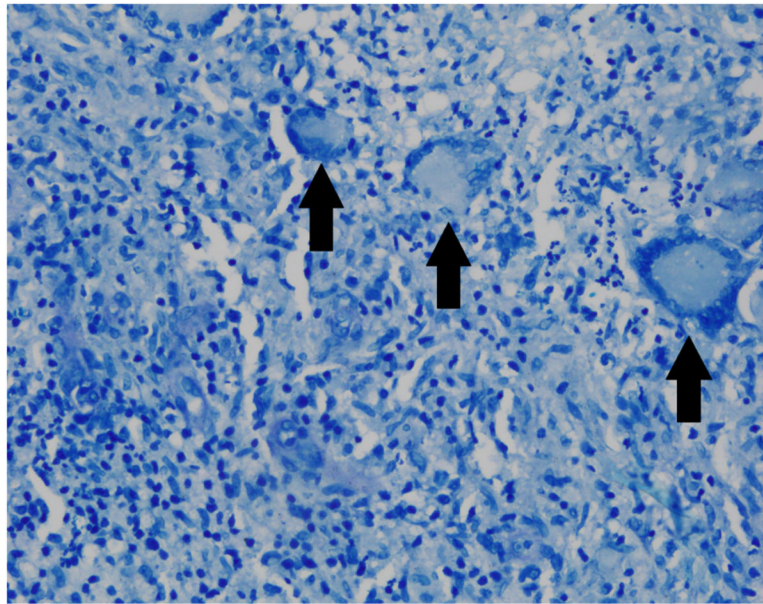


Figure 2. Punch biopsy with AFB staining at 40× magnification. Black arrows indicate giant cells.

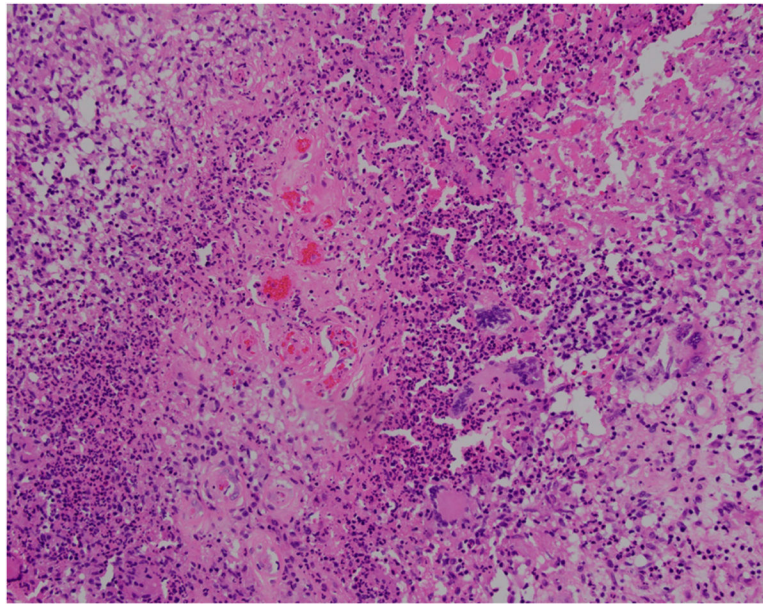


Figure 3.
Punch biopsy with hematoxylin and eosin staining at 20× magnification.