Multi-drug resistant *Mycobacterium abscessus* septic arthritis following an intra-articular steroid injection; a case report

Frank Mulindwa[1,2,3*], Sana Chaudhary[1], Jewel Estrella[4], Vivek Kandanati[1]

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ABSTRACT

Background: *Mycobacterium abscessus* (*M. abscessus*), a rapidly growing Mycobacterium (RGM) is an emergent cause of soft tissue and musculoskeletal infections. Treatment is often complicated by commonly occurring intrinsic and acquired resistance to not only the classical anti-tuberculous agents but also to most currently available antibiotics.

Case Presentation: We present a case of left thumb carpometacarpal (CMC) joint septic arthritis in a 66-year-old American Caucasian woman following an intra-articular steroid injection for osteoarthritis treatment. She did not improve on conventional empirical cellulitis treatment prompting culture and sensitivity assays. *Mycobacterium abscessus* Deoxyribonucleic acid was detected by real-time polymerase chain reaction (PCR) with additional cultures growing the same organism within a week. Samples were sent to the New York State Department of Health for a full culture and sensitivity profile which demonstrated extensive resistance to antibacterial agents including conventional anti-tuberculous agents.

Conclusion: This case not only highlights the importance of having a high degree of suspicion for *M. abscessus* in joint and soft tissue infections not improving to commonly used empirical therapies even in low prevalent areas. It also underlines the importance of performing cultures and sensitivity given antibiotic combinations for most RGM infections should be sensitivity guided.

Keywords: Septic arthritis, *Mycobacterium abscessus*, rapidly growing Mycobacterium, case report.

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Correspondence to: Frank Mulindwa
*United Health Services, Department of Internal Medicine, Wilson Hospital, New York, NY.
Email: mulindwafrank93@gmail.com
Full list of author information is available at the end of the article.

Background

Mycobacterium abscessus (*M. abscessus*), a rapidly growing mycobacterium (RGM) is an emergent cause of soft tissue and musculoskeletal infections [1]. The index of suspicion of these infections in non-endemic mycobacterial disease regions is low [2]. Treatment is often complicated by commonly occurring intrinsic and acquired resistance to not only the classical anti-tuberculous agents but also to most currently available antibiotics [3].

Case Presentation

The patient was a 66-year-old American Caucasian woman with a past medical history of essential hypertension, hyperlipidemia, hypothyroidism, depression, chronic atrial fibrillation, and osteoarthritis of the carpometacarpal (CMC) joint of the left thumb. Her home medication included: apixaban, trazodone, pravastatin, meloxicam, lisinopril, and levothyroxine. Their family history was significant for coronary artery disease and type 2 diabetes mellitus on her maternal side. She presented a month following a left CMC intra-articular steroid injection for the treatment of her ongoing osteoarthritis of the CMC joint of the left thumb. She complained of left thumb swelling and reddening that had not responded to warm compresses and over-the-counter topical antibiotics. She denied fevers and chills as well as systemic symptoms. On physical examination, she was obese with a body mass index of 31 kg/m^2 but in good general condition. She had a mildly swollen and tender base of the left thumb with mild hyperemia but a normal overlying temperature. There was no fluctuance or draining sinus. Other systemic examinations including respiratory, cardiovascular, and neurological examinations were within normal limits. A diagnosis of left thumb cellulitis was made and she was started on cephalexin for seven days. She presented 10 days later for review and reported the finger had continued to swell and eventually spontaneously opened up draining purulent material. An x-ray was done that showed degenerative changes at the CMC joint but no features of osteomyelitis. A full hemogram done was largely normal with a white blood cell count of 56,000/ µl (normal 4,000–10,500/µl), hemoglobin count of 13.8 g/dl (12.5–15.5 g/dl), and platelet count

of 239 × 10*3/µl (normal 125–425 × 10*3/µl). Additional tests included an erythrocyte sedimentation rate of 106 mm/hour (normal <30 mm/hour). Incision and drainage of a residual 2 cm abscess at the base of the thumb was undertaken in the outpatient and eventually discharged with surgical dressing, topical bacitracin, and doxycycline to be reviewed for serial wound dressing.

Two weeks later due to persistent drainage of the ulcer at the base of the left thumb, she was taken to the operating room for drainage of a left CMC joint abscess. Pus swabs were taken for both anaerobic and aerobic cultures and she was discharged on oral clindamycin. *Mycobacterium abscessus* Deoxyribonucleic acid was detected by real-time PCR with additional cultures growing the same organism within a week. Samples were sent to the New York State Department of Health for a full culture and sensitivity profile. On review 2 weeks after surgical drainage, she reported marked symptomatic improvement. A follow-up magnetic resonance imaging of the hand demonstrated severe osteoarthritic changes in the thumb CMC joint but no features of osteomyelitis with a focal thickening suspicious for a small developing abscess in contiguous tissue. A chest x-ray to screen for ongoing lung infection was also performed and it resulted negative for pulmonary disease. Final cultures resulted positive for *M. abscessus* resistant to ciprofloxacin, clarithromycin, doxycycline, imipenem, linezolid, moxifloxacin, trimethoprim/sulfamethoxazole, tobramycin, and susceptible to amikacin with intermediate susceptibility to cefoxitin.

She was started on clofazimine and omadacycline with subsequent orthopedic follow up and serial surveillance lab tests for medication side effects. After 6 months of therapy, she had total resolution of all symptoms with scar tissue at the base of her thumb.

Discussion

We present a case of septic arthritis of the CMC joint of the left thumb in a 66-year-old American Caucasian woman with multidrug-resistant *M. abscessus*.

Mycobacterium abscessus belongs to non-tuberculous mycobacterium (NTM), particularly RGM which are environmental organisms found worldwide that usually grow in subcultures within a week [1,2]. They are known to cause pulmonary disease, lymphadenitis, disseminated disease, skin, and soft tissue infections, central nervous system infections, musculoskeletal infections, surgical site infections as well as prosthetic device infections [3]. Because of their resistance to disinfectants, they are potential causes of post-surgical and post-procedural infections [4]. There have been trends suggesting an increase in incidence and prevalence of NTM in the United States just like in other parts of the world with reported annual incidences ranging from 3.1 to 4.7, and prevalence increasing from 6.7 to 11.7 between 2008 and 2015 [4,5]. It is suspected this could be largely attributed to increased surveillance and advancement of diagnostics.

Immunodeficiency is a well-documented driver of both tuberculous and non-tuberculous mycobacterial disease [6]. The patient we present had no underlying known immunodeficiency states such as HIV, chronic immunosuppressive therapy, diabetes, splenectomy, or chemotherapy. These are conditions that usually trigger suspicion in clinicians to investigate for both tuberculous and NTM disease potentially leading to under-diagnosis in patients considered low risk like the patient we present. Similar reports of RGM skin infections have been reported following mesotherapy injection inoculation similar to our patient who we believe was inoculated during an intra-articular steroid injection [7]. Similarly, two outbreaks of surgical wound infections traceable to particular hospitals in the Dominican Republic as well as Brazil have been reported [8,9].

Treatment options for *M. abscessus* depend on whether inoculates are macrolide sensitive or resistant. For macrolide-sensitive isolates, a macrolide with at least two more agents including a susceptible intravenous (IV) agent (amikacin/imipenem/cefoxitin) and omadacycline or tigecycline/tedizolid or linezolid/clofazimine is recommended. Evidence for the treatment of macrolide-resistant isolates is largely observational with commonly used regimens including: IV amikacin, IV imipenem, oral omadacycline, and clofazimine with macrolides occasionally added (despite resistance) to regimens in patients with background bronchiectasis. Duration of treatment ranges from 6 to 12 months depending on clinical response and the site of infection [10–12]

Our patient posed a clinical dilemma on the choice of drug therapy. Isolates from the cultures were resistant to quinolones, imipenem, doxycycline, and macrolides. Eventually, she was started on omadacycline and clofazimine for 6 months with complete symptom resolution.

The challenges of *M. abscessus* treatment have been described as an antibiotic nightmare by Nessar et al. [13]. This is due to the intrinsic resistance to not only the classical anti-tuberculous agents but also to most currently available antibiotics as well as acquired resistance to aminoglycosides and macrolides.

Conclusion

This case not only highlights the importance of having a high degree of suspicion for *M. abscessus* in joint and soft tissue infections not improving to commonly used empirical therapies. It also underlines the importance of sample referral to specialized labs for treatment targeted cultures and sensitivity given formulation of antibiotic combinations for treatment of RGM including *M. abscessus* should be sensitivity guided.

What is new?

Mycobacterium abscessus and other rapidly growing mycobacteria are potential causes of soft tissue infections even in non-endemic areas like North America. Having a high index of suspicion is important as these are often resistant not only to commonly used antibiotics but also to most anti-tuberculous agents.

List of Abbreviations

CMC	Carpometacarpal
DNA	Deoxyribonucleic acid
IV	Intravenous
NTM	Non-tuberculous mycobacterium
PCR	Polymerase chain reaction
RGM	Rapidly growing mycobacterium

Conflict of interest

The authors declare that they have no conflict of interest regarding the publication of this case report.

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Consent for publication

Written informed consent for publication of this case report and identifying images was obtained from the participant.

Ethics approval and consent to participate

The case report was approved for publication by the United Health Services Hospitals Institutional Review Board, approval number: 13498.

Author details

Frank Mulindwa[1,2,3], Sana Chaudhary[1], Jewel Estrella[4], Vivek Kandanati[1]

1. United Health Services, Department of Internal Medicine, Wilson Hospital, New York, NY
2. Makerere University Infectious Diseases Institute, Kampala, Uganda
3. Global Health Institute, Antwerp University, Antwerp, Belgium
4. SUNY Upstate Medical School, New York, NY

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Summary of the case

1	**Patient (gender, age)**	Female, 66- year old
2	**Final diagnosis**	*Mycobacterium abscessus* septic arthritis
3	**Symptoms**	Non resolving left thumb cellulitis following an intra-articular steroid injection into the carpometacarpal (CMC) joint for osteoarthritis treatment
4	**Medications**	Omadacycline and clofazimine
5	**Clinical procedure**	Incision and drainage
6	**Specialty**	Infectious diseases