



Epidemiology, Clinical Characteristics, and Outcomes of Extra-Pulmonary Non-Tuberculous Mycobacterial Infections from a Single Center over a 10-year Period

Mary B. Ford MD¹, Jason F. Okulicz MD¹, Jesse R. Salinas², John L. Kiley MD¹

¹Infectious Disease Service, Brooke Army Medical Center, JBSA Fort Sam Houston, TX, USA ² Department of Microbiology, Brooke Army Medical Center, JBSA Fort Sam Houston, TX, USA

Correspondence

E-mail: Mary.B.Ford6.mil@health.mil
 Mailing Address: 3551 Roger Brooke Dr.
 San Antonio, TX 78234
 Phone Number: (210) 916-5554

Background

- Non-tuberculous mycobacteria (NTM) are ubiquitous in the environment and infections are increasingly prevalent
- The organisms cause a wide variety of clinical syndromes, including extra-pulmonary infections
- Skin and soft tissue infections (SSTI) and bone infections caused by NTM are often associated with surgery, traumatic inoculation, and cosmetic procedures
- Determining contamination versus true infection can be difficult
- Data to guide diagnosis and treatment of these infections is sparse and often based upon expert recommendations with limited evidence
- Patients often require a combination of medical and surgical treatment to achieve cure
- We sought to better understand SSTI and bone infections caused by NTM at our institution

Methods

- All NTM clinical isolates recovered at Brooke Army Medical Center (BAMC) from 2012-2022 were initially screened
- SSTI and bone isolates were included, all others were excluded
- Corresponding electronic health records were reviewed for epidemiologic, microbiologic, and clinical data
- Infections were defined as recovery of ≥ 1 NTM isolate from skin, soft tissue, or bone cultures with a corresponding clinical syndrome
- Due to evidence that there is often a traumatic inoculation link between SSTI and bone infections, we analyzed these together

Results

- Of 1442 isolates reviewed, 40 isolates from 27 corresponding patients were analyzed, with a median of 1 isolate per patient
- A total of 21 patients had infecting isolates
- Two-thirds (18 of 27) of patients were female, with a median age of 51 (IQR 33-66)
- No difference was identified between patients with infecting isolates vs non-infecting isolates when comparing BMI and comorbidities
- Routes of exposure were predominately surgery (arthroplasty, cosmetic procedures), and traumatic injury with inoculation of significant environmental bioburden
- Time from isolate recovery to directed medical therapy was a median of 33 days (IQR 6-60)

Results

Majority (78%) of isolates were true infections secondary to surgery (29%) or trauma (33%).
Time from symptom onset to isolate recovery was prolonged – a median of 64 days (IQR 48-108).

Characteristic	All Patients with SSTI/Bone NTM Isolates	Patients Meeting Infection Criteria	Patients not Meeting Infection Criteria	P-value
Number, N	27	21 (77.8)	6 (22.2)	
Age, median (IQR)	51 (33-66)	51 (33-66)	47 (35-60)	
Gender, female	18 (67)	15 (71)	3 (50)	0.367
Race/ethnicity				
White	15 (55.6)	13 (61.9)	2 (33.3)	
Black	3 (11.1)	1 (4.8)	2 (33.3)	
Asian	2 (7.4)	2 (9.5)	0 (0)	
Other/Unknown	7 (25.9)	5 (23.8)	2 (33.3)	
Body Mass Index (BMI), median (IQR)	26.2 (23.7-31.3)	26.6 (22.7-32.5)	26.8 (26.1-28.5)	
Comorbidities				
Hypertension	10 (37.0)	8 (38.1)	2 (33.3)	1.000
Cardiovascular disease	6 (22.2)	5 (23.8)	1 (16.7)	1.000
Diabetes mellitus	3 (11.1)	2 (9.5)	1 (16.7)	0.545
Solid organ malignancy	2 (7.4)	2 (9.5)	0 (0)	1.000
Autoimmune condition	5 (18.5)	4 (19.1)	1 (16.7)	1.000
Route of Exposure				
Trauma	8 (29.6)	6 (28.6)	2 (33.3)	1.000
Surgery	10 (37.0)	7 (33.3)	3 (50.0)	0.638
Suspected Environmental Exposure	3 (11.1)	3 (14.3)	0 (0)	1.000
Tattoo	1 (3.7)	1 (4.8)	0 (0)	1.000
Unknown	5 (18.5)	4 (19.0)	1 (16.7)	1.000
Site of Isolate Recovery				
Skin/Soft Tissue	21 (77.8)	15 (71.4)	6 (100)	0.284
Bone	6 (22.2)	6 (28.6)	0 (0)	0.284

Data expressed as N (%) or Median (IQR)

Results

Mycobacterium isolates (total number)	All Patients with SSTI/Bone NTM Isolates	Patients Meeting Infection Criteria	Patients not Meeting Infection Criteria
<i>M. abscessus</i>	12 (44.4)	11 (52.3)	1 (16.7)
<i>M. avium complex</i>	4 (14.8)	3 (14.3)	1 (16.7)
<i>M. fortuitum</i>	4 (14.8)	3 (14.3)	1 (16.7)
<i>M. chelonae</i>	2 (7.4)	2 (9.5)	0 (0)
<i>M. gordonae</i>	2 (7.4)	0 (0)	2 (33.3)
<i>M. senegalense</i>	1 (3.7)	1 (4.8)	0 (0)
<i>M. haemophilum</i>	1 (3.7)	1 (4.8)	0 (0)
<i>M. kubicae</i>	1 (3.7)	0 (0)	1 (16.7)

Data expressed as N (%) or Median (IQR)

Of patients with true infections, **4 received medical therapy alone, 8 received surgery alone, 8 received combined medical and surgical therapy, and 1 patient received no treatment.**

Seven of eight patients who received surgical therapy alone and the single patient who received no treatment did not have an infectious disease consult.

Conclusions

- Data supporting diagnosis and treatment decisions in NTM SSTI and bone infections is limited
- In this study, the majority of NTM isolated were determined to be associated with true infections, most commonly caused by rapid growing NTM
- We confirm that surgery and trauma are the most common mechanisms of exposure
- The delay between symptom onset and directed therapy demonstrates a need for additional studies delineating specific criteria for diagnosis and treatment