Journal of Investigative Medicine High Impact Case Reports
Volume 10: 1–3

DOI: 10.1177/23247096211069766
journals.sagepub.com/home/hic
SAGE

From a Machine Saw to a Case of *Mycobacterium Fortuitum* Pyomyositis

Tejave Sharifan, MD[1,2], Nosakhare Idemudia, MS[1], Rupam Sharma, MD[1], Arash Heidari, MD[1,2], Alan Ragland, DO[1,2], Tom Chao, MD[1], and Isabel Fong, PharmD[1]

Abstract

Pyomyositis is a bacterial infection occurring mainly in skeletal muscles. It is most commonly caused by *Staphylococcus aureus* with initial symptoms including muscle pain, swelling, and site tenderness. When available, the most accurate technique to determine the extent and the specific location of disease is the magnetic resonance imaging. Successful management includes early recognition, timely surgical debridement or drainage, and appropriate antibiotic therapy. This case report describes a case of *Mycobacterium fortuitum* pyomyositis in an elderly male associated with challenges of successful diagnosis.

Keywords

pyomyositis, *Mycobacterium fortuitum*, *Achromobacter xylosoxidans*, ultra-high-molecular-weight polyethylene (UHMWPE)

Introduction

Pyomyositis is a rare, pyogenic infection of skeletal muscle tissue. It is thought to originate from an occult source and via hematogenous spread, though the exact cause of primary pyomyositis is unknown.[1] Risk factors include immunodeficiency, trauma, chronic illness, and bacteremia. It commonly manifests as a local abscess but may also present as a diffuse inflammatory or rapidly progressing myonecrotic process.[2] Most common organisms involved in causing pyomyositis are *Staphylococcus aureus* (90%) and *Group A Streptococci* (1%-5%).[3] Less common organisms indicating pyomyositis include other strains of *Streptococcus* (group B, C, G), *Pneumococcus*, *Neisseria spp*, *Haemophilus spp*, *Aeromonas spp*, *Klebsiella spp*, *Yersinia spp*, *Pseudomonas spp*, and *Escherichia spp*.[4,5] The true incidence of *Mycobacterium fortuitum* pyomyositis is unknown, but it has been estimated to be between 4 and 6 cases per million people.[6] Herein presented is a case of *M fortuitum* pyomyositis in a 59-year-old male with associated diagnostic challenges.

Methods

Approval was obtained from the Institutional Review Board of Kern Medical. Retrospective review of the patient's record was performed. A literature search was conducted on PubMed, ResearchGate, and Google Scholar. The following search terms were applied: Pyomyositis, *Mycobacterium fortuitum*, *Achromobacter xylosoxidans*, ultra-high-molecular-weight polyethylene (UHMWPE)

Case Presentation

A 59-year-old male obtained a traumatic right quadriceps tendon tear following an accident using the sawing machine, for which he thereafter underwent incision and drainage (I&D) to the right thigh for an open wound repairment in usual fashion. Nonabsorbable force fiber sutures were placed to quadriceps muscle. At 6 weeks postoperative follow-up, wound dehiscence and pustular exudation were noted from the surgical site. As a result, a second I&D was performed, aerobic, anaerobic, and fungal cultures were collected intraoperatively. Patient was admitted to inpatient wards for intravenous (IV) antibiotics.

Blood counts revealed white blood cell count of 13.0×10^9/L with 91.5% neutrophils. Culture grew *Enterococcus*

[1]Kern Medical, Bakersfield, CA, USA
[2]David Geffen School of Medicine at UCLA, Los Angeles, CA, USA

Received November 1, 2021. Revised December 7, 2021. Accepted December 12, 2021.

Corresponding Author:
Isabel Fong, PharmD, Department of Clinical Pharmacy, Kern Medical, 1700 Mt. Vernon Avenue, Bakersfield, CA, 93305-4144, USA.
Email: Isabel.fong@kernmedical.com

faecalis and *group B streptococci*. Infectious disease was consulted and patient was discharged on oral linezolid 600 mg twice daily for 2 weeks. Two weeks later at orthopedic clinic, patient complained of continuous purulent drainage at the surgical site. The patient was admitted again for a third I&D, removal of nonabsorbable force fiber sutures, and IV antibiotics. Intraoperative culture from the third I&D grew *A xylosoxidans* resistant to ceftriaxone, intermediate to imipenem (Minimum Inhibitory Concentration [MIC] = 8) but sensitive to meropenem and piperacillin-tazobactam. He was discharged on piperacillin-tazobactam 18 grams per day continuous infusion. The patient was followed closely by the internal medicine, outpatient parenteral antimicrobial therapy (OPAT), and orthopedic clinics. At clinic follow-up, the wound remained to be erythematous and warm, with occasional discharge which was purulent in nature. While still on piperacillin-tazobactam, acid fast bacilli (AFB) was isolated from the fungal culture of the second I&D that was collected 5 weeks prior. The isolate was sent to reference lab (National Jewish Health) for speciation and drug sensitivity. Piperacillin-tazobactam was continued to complete treatment for *A xylosoxidans* infection.

While waiting for speciation of the AFB isolate, the patient underwent a fourth I&D with removal of remaining sutures due to persistent sinus tract and pustular drainage. Four days after the fourth I&D, the AFB isolate from the second I&D was identified as *M fortuitum* pending sensitivity. On the same day, AFB was also isolated from the fourth I&D smear. Piperacillin-tazobactam was stopped and IV meropenem 2 grams every 8 hours, oral ciprofloxacin 500 mg twice daily, and oral sulfamethoxazole/trimethoprim 800 mg to 160 mg twice daily were started based on sensitivity pattern described in literature.

Two weeks later, sensitivity results confirmed the *M fortuitum* isolate was sensitive to ciprofloxacin (MIC $\leq$ 0.1), sulfamethoxazole/ trimethoprim (MIC $\leq$ 0.5/9.5), and imipenem (MIC $\leq$ 2). The patient was continued on the same antibiotics. One month later, the AFB isolate from the fourth I&D was also identified as *M fortuitum* with the same sensitivity pattern. Two months later, IV meropenem was discontinued given resolution of drainage. As of the date of this case report, this patient has been on oral ciprofloxacin and trimethoprim/sulfamethoxazole for 10 months with no signs of infection from his wound. The anticipated duration of therapy is planned for at least 1 year.

Discussion

Pathophysiology

Pyomyositis comprises of 3 stages which are as follows: invasive stage, purulent stage, and late stage. The initial invasive stage is usually subacute, lasting anywhere between 1 and 3 weeks during which bacteria seeding occurs in the muscle. This stage can be insidious with variability in fever, pain ratio, and local inflammation. The second purulent stage typically can last anywhere from 10 to 21 days. During the second stage, physical signs begin to become more evident. During the third late stage, complications manifest. Some of the common complications seen are septic shock, rhabdomyolysis along with other manifestations of disease dissemination.[7]

Diagnosis and Management

Magnetic resonance imaging is the preferred technique to determine the extent and the exact location of the disease when available.[8] During the early stages of the disease, intense signals can be detected in the T2 weighted images. Abscesses with rim formation (secondary to contrast) are usually noted in the later stages of the disease.[7] In regions where resources are limited with poor accessibility and availability to computed tomography, MRI and/or emergency settings, ultrasonography can be increasingly helpful. Overall successful management of the disease includes early recognition and appropriate intervention in a timely manner (surgical debridement or drainage and appropriate antibiotic therapy). Failure to perform incision and drainage has been correlated with no response post discharge.[9,10] Nontuberculous mycobacteria are broadly dispersed, opportunistic infections that can cause various disease in multiple organs in humans. *M fortuitum* is a rapidly growing, nontuberculous mycobacterium primarily responsible for extrapulmonary infections.[11] It can often cause soft tissue infections during trauma and/or surgery, as in this patient. It has been reported sensitive to multiple drugs, excluding macrolides.[12] However, antibiotic resistance spectrums vary depending on geographic location and individual hospital administration situations. In vitro, *M fortuitum* has shown low levels of resistance to tigecycline (0%), tetracycline (0%), cefmetazole (12%), imipenem (12%), linezolid (18%), and the aminoglycosides, including amikacin (0%), tobramycin (0%), neomycin (0%), and gentamycin (24%).[11] The need for long-term antibiotic treatment and associated toxicities contribute to frequent suboptimal outcomes in patients. As such, choosing effective empiric treatment for *M fortuitum* could be challenging.

Pyomyositis can often be a prolonged, insidious infection for a number of reasons. Trauma with deep penetration can introduce multiple pathogens. The growth of *Enterococci*, *group B streptococci*, *A xylosoxidans* and *M fortuitum* in this case is perhaps through initial direct inoculation through trauma. As previously mentioned, treatment of pyomyositis is not limited to antibiotic treatment. These patients may require multiple incision and drainages and suture removals. The sutures mentioned are composed of UHMWPE. UHMWPE has been modified in recent years to enhance its antibacterial properties. In particular, silver ions (Ag^+) have been added to UHMWPE to prevent the formation of biofilms.

The key factor in the pathogenesis of hardware infection is the colonization of the device surface and the subsequent

formation of a biofilm.[13] A number of mycobacterium species are known to form biofilms, including *M fortuitum*.[14] Silver nanoparticles (AgNPs) have shown notable antimicrobial activity against 3 multidrug resistant strains, ie, extended spectrum beta-lactamase–positive *Escherichia coli*, methicillin-resistant *S aureus* (MRSA), and teicoplanin-resistant *Streptococcus pneumoniae*.[15] However, AgNPs have yet to be tested for antimicrobial activity against rarer species such as those in this case, that is, *A xylosoxidans and M fortuitum*. As such, any potentially efficacious measures to reduce the probability of biofilm formation should be considered.

Pyomyositis after muscular repairs secondary to trauma can be insidious in onset and underdiagnosed by providers. Some of the key factors in successfully managing this disease include timely incision and drainage, removal of possibly contaminated hardware, utilizing appropriate culture medias, and administering appropriate antibiotic treatment.

Authors' Note

This case has been presented at the American Federation of Medical Research (AFMR)'s Western Medical Research Conference, January 2021.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Ethics Approval

Ethical approval to report the case was obtained from the Kern Medical Institutional Review Board (approval ID: 20073).

Informed Consent

Written informed consent for the patient information and any accompanying images to be published in this article was obtained from the patient.

ORCID iDs

Rupam Sharma https://orcid.org/0000-0003-3457-4371
Arash Heidari https://orcid.org/0000-0003-1091-348X

References

1. Takebayashi K, Sonoda H, Shimizu T, et al. Pyomyositis at the surgical site in a patient with chronic myeloid leukemia: a case report and literature review. *World J Surg Oncol*. 2016;14(1):116. doi:10.1186/s12957-016-0873-x.
2. Bickels J, Ben-Sira L, Kessler A, Wientroub S. Primary pyomyositis. *J Bone Joint Surg Am*. 2002;84(12):2277-2286. doi:10.2106/00004623-200212000-00024.
3. Minami K, Kenzaka T, Kumabe A, Matsumura M. Thigh pyomyositis caused by group A *Streptococcus* in an immunocompetent adult without any cause. *BMC Res Notes*. 2017;10(1):33. doi:10.1186/s13104-016-2346-2.
4. Chauhan S. Tropical pyomyositis (myositis tropicans): current perspective. *Postgrad Med J*. 2004;80(943):267-270. doi:10.1136/pgmj.2003.009274.
5. Christin L, Sarosi GA. Pyomyositis in North America: case reports and review. *Clin Infect Dis*. 1992;15(4):668-677. doi:10.1093/clind/15.4.668.
6. Butler WR, Crawford JT. Nontuberculous mycobacteria reported to the public health laboratory information system by state public health laboratories United States, 1993-1996. Atlanta, GA: National Centre for Infectious Diseases, Centers for Disease Control and Prevention; 1999.
7. Ong CY, Lim JL, Galang LD. Extensive pyomyositis of vastus muscles. *Pan Afr Med J*. 2017;28:30. doi:10.11604/pamj.2017.28.30.13544.
8. Drosos G. Pyomyositis. A literature review. *Acta Orthop Belg*. 2005;71(1):9-16. http://www.ncbi.nlm.nih.gov/pubmed/15792201.
9. Ali I, Rashdan I. Pyomyositis: a case report and literature review. Hospital Physician; 1999:39-42. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.433.8851&rep=rep1&type=pdf.
10. Miller LG, Quan C, Shay A, et al. A prospective investigation of outcomes after hospital discharge for endemic, community-acquired methicillin-resistant and -susceptible *Staphylococcus aureus* skin infection. *Clin Infect Dis*. 2007;44(4):483-492. doi:10.1086/511041.
11. Shen Y, Wang X, Jin J, et al. In vitro susceptibility of *Mycobacterium abscessus* and *Mycobacterium fortuitum* isolates to 30 antibiotics. *Biomed Res Int*. 2018;2018:4902941. doi:10.1155/2018/4902941.
12. Nash KA, Zhang Y, Brown-Elliott BA, Wallace RJ Jr. Molecular basis of intrinsic macrolide resistance in clinical isolates of *Mycobacterium fortuitum*. *J Antimicrob Chemother*. 2005;55(2):170-177. doi:10.1093/jac/dkh523.
13. Harrasser N, Jüssen S, Banke IJ, et al. Antibacterial efficacy of ultrahigh molecular weight polyethylene with silver containing diamond-like surface layers. *AMB Express*. 2015;5(1):64. doi:10.1186/s13568-015-0148-x.
14. Chakraborty P, Kumar A. The extracellular matrix of mycobacterial biofilms: could we shorten the treatment of mycobacterial infections? *Microb Cell*. 2019;6(2):105-122. doi:10.15698/mic2019.02.667.
15. Thapa R, Bhagat C, Shrestha P, Awal S, Dudhagara P. Enzyme-mediated formulation of stable elliptical silver nanoparticles tested against clinical pathogens and MDR bacteria and development of antimicrobial surgical thread. *Ann Clin Microbiol Antimicrob*. 2017;16(1):39. doi:10.1186/s12941-017-0216-y.