

Osteomyelitis

Cindy Glickman, MD, and Maura Porto, DO

Contiguous vs Hematogenous Spread

Contiguous- direct contamination: fracture, wounds, diabetic ulcers, infection of surrounding structures

- Hematogenous- from blood stream. Tends to have more acute presentation

Presentation

- Subacute to chronic pain. Wound that is slow to heal despite local therapy +/- sinus tracts
- May not have fever, systemic symptoms unless acute hematogenous OM

Diagnosis

- Clinical: Use Wagner's Classification of Diabetic Foot Ulcers to document physical exam findings
- Probe to bone: Likelihood ratio if finding is present = 6.0

Grade 0	No open lesion
Grade 1	Superficial ulcer
Grade 2	Deep ulcer
Grade 3	Abscess
Grade 4	Gangrene of the forefoot
Grade 5	Gangrene of the entire foot

- Labs (Non-diagnostic): Can have elevated inflammatory markers (ESR, CRP). May not have leukocytosis

Radiology

- X-Ray: often first-line image; cannot rule out, helpful if shows abnormality (periosteal elevation)
- MRI W/WO contrast
 - Limitations of MRI include: patient-specific contraindications to MRI due to presence of non-compatible devices, availability of MRI imaging, presence of mechanical prosthesis (due to potential artifact)
 - If unable to get MRI, alternative would be CT scan W/ contrast, nuclear medicine scan
 - Limitations of CT scan W/ contrast: soft tissues resolution is not as strong as MRI, cannot identify bone marrow edema (present in early osteomyelitis)
 - Limitations of nuclear medicine scan: poor anatomic localization, and can be difficult to obtain as inpatient due to insurance coverage

Microbiology

- Bone biopsy, surgical debridement
 - Pre-treatment with antibiotics can decrease yield of surgical cultures
 - If cultures negative, can consider PCR/nucleic acid amplification to identify a pathogen, but won't have sensitivity information

Selected Populations

- Diabetics
 - Most frequent diabetic-associated complication necessitating hospitalization
 - Consider OM if ulcers persist despite 6 weeks standard care, large size (>2cm), exposed bone
 - May not have elevated inflammatory markers or leukocytosis
- IVDU
 - Hematogenous seeding
 - Most common bacteria: Staph aureus
- Sickle Cell Disease
 - Bony infarction due to vaso-occlusion, infected via hematogenous seeding
 - Common bacteria: Salmonella, Staph aureus

Treatment

- Generally, 4-6 weeks targeted parenteral therapy to culture results
 - Factors that may impact duration include the duration of infection (acute vs chronic) presence or removal of hardware, and antibiotic characteristics
 - Shorter courses may be considered in patients who have rapid improvement of inflammatory markers, and in some of the smaller bones of the hand
 - Would treat for 6+ weeks in patients that don't undergo surgical debridement, vertebral and long bone osteomyelitis, or who have persistently elevated inflammatory markers
- Studies showed increased bone sterilization with longer antibiotic treatment¹
- OVIVA trial- non inferiority of oral antibiotics²
 - While this trial did show non-inferiority of oral antibiotics to parenteral antibiotics, limited microbiologic data was presented, with higher doses of antibiotics required which may be difficult to tolerate
 - Specifically identified organisms were: Staphylococcus aureus, Coagulase-negative staphylococcus, Streptococcus species, Pseudomonas species
 - Limited bacterial sensitivity data presented
 - Decisions on utilization of oral antibiotics in this setting must consider patient specific factors
 - Factors include: cost considerations of oral vs IV antibiotics, potential risks of PICC line insertion (skin integrity and introduction of skin bacteria), patient adherence
- Hold antibiotic treatment to obtain bone biopsies and cultures unless patient systemically ill
- Deep-seeded infections, particularly if abscess or sinus tract present, would likely benefit from surgical debridement

References

1. Bennett, J. E., Dolin, R., & Blaser, M. J. (2020). *Mandell, Douglas, and Bennett's principles and practice of infectious diseases*. Elsevier.
2. Li, H. K., Rombach, I., Zambellas, R., Walker, A. S., McNally, M. A., Atkins, B. L., ... & Scarborough, M. (2019). Oral versus intravenous antibiotics for bone and joint infection. *New England Journal of Medicine*, 380(5), 425-436.
3. Wagner FW. The Dysvascular Foot: A System for Diagnosis and Treatment. *Foot & Ankle*. 1981;2(2):64-122. doi:[10.1177/107110078100200202](https://doi.org/10.1177/107110078100200202)
4. McGee, S. (2022). The Diabetic Foot. Evidence-Based Physical Diagnosis (5th ed, pp. 457-460).
5. Lee YJ, Sadigh S, Mankad K, Kapse N, Rajeswaran G. The imaging of osteomyelitis. *Quant Imaging Med Surg*. 2016;6(2):184-198. doi:10.21037/qims.2016.04.01