

Osteomyelitis

Osteomyelitis: The Basics

Osteomyelitis: *An infection of the bone.* This can range from a localized infection to a severe, systemic illness. Understanding the different types is crucial.

Acute Osteomyelitis: *Infection lasting days to weeks.* Characterized by rapid onset of symptoms.

Chronic Osteomyelitis: *Infection lasting months to years.* Often involves recurrent episodes and the formation of *sequestra* (dead bone fragments).

Sequestra: *Pieces of necrotic bone that separate from viable bone.* These are a hallmark of chronic osteomyelitis and impede healing. Their presence often necessitates surgical removal.

Sinus Tract: *A pathognomonic (characteristic) feature of osteomyelitis.* It's an abnormal passage leading from a deep infection to the skin surface, often draining pus.

Involucrum: *New bone formation surrounding the area of infection.* The body's attempt to wall off the infection.

Periosteal Seeding: *Spread of infection from the bone to the periosteum (outer covering of the bone).* This can lead to further inflammation and bone destruction.

Cloacae: *Multiple draining passages that can form in chronic osteomyelitis.* These are often interconnected and can make treatment more challenging.

Bone Ischemia: *Reduced blood flow to the bone.* This is a major factor in the development of osteomyelitis, as it compromises the bone's ability to fight infection.

Hematogenous vs. Non-Hematogenous Osteomyelitis

This classification is based on the route of infection:

Hematogenous Osteomyelitis: *Bacteria reach the bone via the bloodstream.* This is more common in children and can affect multiple sites.

- **Common pathogens:** *Staphylococcus aureus* (including MRSA), *Pseudomonas aeruginosa*, *Serratia marcescens* (in IV drug users), *Aspergillus* (immunocompromised), *Beta-hemolytic streptococci*, *Mycobacterium tuberculosis*, *Candida* species.
- **Risk factors:** Age <50 (children), IV drug use, endocarditis, indwelling vascular devices, orthopedic hardware, hemodialysis, sickle cell disease.

Non-Hematogenous Osteomyelitis: *Infection spreads directly to the bone from adjacent tissues.* This is more common in adults and often associated with trauma or surgery.

- **Common pathogens:** *Staphylococcus aureus* (including MRSA), coagulase-negative staphylococci, aerobic gram-negative bacilli, *Corynebacteria*, fungi, and mycobacteria.
- **Risk factors:** Poorly healing wounds (diabetic foot ulcers, decubitus ulcers), orthopedic hardware, diabetes, peripheral vascular disease, peripheral neuropathy.



Microbiology and Diagnostics

Culture and Sensitivity: *Essential for guiding antibiotic therapy.* Ideally, this should be performed on a bone biopsy sample, as cultures from other sources (swabs, sinus tracts) are prone to contamination and false-negative results.

Blood Cultures: *May be positive in hematogenous osteomyelitis,* but can be negative if bacteremia has resolved by the time of diagnosis.

Imaging:

- **Acute (<2 weeks):** CT or MRI are preferred for early detection.
- **Chronic (>2 weeks):** X-rays may suffice initially, but MRI is often needed for complete assessment.
- **Diabetic foot infections:** MRI is often the imaging modality of choice.
- **Metal hardware:** Nuclear imaging (e.g., bone scan) may be necessary.

Laboratory Findings: Elevated white blood cell count (WBC), erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP) are common, but not always present, especially in chronic cases.



Treatment Strategies

Antibiotic Therapy: The cornerstone of osteomyelitis treatment. Duration varies greatly depending on the type of osteomyelitis, presence of sequestra, and response to treatment.

- **Non-hematogenous:** Often requires prolonged IV or highly bioavailable oral antibiotics (6+ weeks). Surgical debridement (removal of infected tissue) is frequently necessary.
- **Hematogenous:** Duration is less certain, but generally 4 weeks without surgical debridement, and longer with surgical intervention.

Surgical Debridement: *Removal of infected bone and tissue.* Essential for chronic osteomyelitis and cases with significant bone destruction or sequestra.

Hardware Removal: May be necessary in cases of infection involving orthopedic implants. This often requires a shorter course of antibiotics post-surgery.

Specific Forms of Osteomyelitis

Vertebral Osteomyelitis (Spondylodiscitis): *Infection of the vertebrae and intervertebral discs.* Often presents with back pain, potentially leading to spinal deformities and neurological complications. *Staphylococcus aureus* is the most common pathogen.

Sternoclavicular and Pelvic Osteomyelitis: More common in IV drug users due to the risk of bacteremia.

Long Bone Osteomyelitis: More common in children.

Diabetic Foot Infections and Osteomyelitis

Diabetic Foot Infections: A significant complication of diabetes, often leading to osteomyelitis. Neuropathy, peripheral vascular disease, and impaired immune function increase the risk.

Risk Factors: Previous foot ulceration, neuropathy, foot deformity, vascular disease, certain medications (e.g., SGLT2 inhibitors), age, ethnicity, socioeconomic status.

Management: Includes thorough assessment, sharp debridement, wound care, pressure reduction (offloading), and prevention of relapses. Antibiotic therapy is crucial, guided by culture and sensitivity results. The duration of antibiotic

therapy is tailored to the severity of the infection and the presence of osteomyelitis.

Important Facts to Memorize

- 1. Osteomyelitis definition and classification (acute vs. chronic, hematogenous vs. non-hematogenous).**
- 2. Key pathogens for each type of osteomyelitis.**
- 3. Risk factors for hematogenous and non-hematogenous osteomyelitis.**
- 4. Clinical presentation of osteomyelitis (acute vs. chronic).**
- 5. Diagnostic modalities (blood cultures, imaging, bone biopsy).**
- 6. Importance of bone biopsy for culture and sensitivity.**
- 7. Principles of antibiotic therapy (duration, route of administration).**
- 8. Role of surgical debridement and hardware removal.**
- 9. Specific forms of osteomyelitis (vertebral, sternoclavicular, pelvic, long bone).**
- 10. Diabetic foot infections: risk factors and management.**
- 11. The significance of neuropathy and vascular disease in diabetic foot infections.**
- 12. Pathogenesis of osteomyelitis (ischemia, sequestra formation, sinus tract formation).**
- 13. Involucrum and cloacae: their significance in chronic osteomyelitis.**
- 14. Common complications of osteomyelitis (abscess formation, neurological deficits).**
- 15. The importance of early diagnosis and treatment in preventing complications.**
- 16. Interpreting laboratory findings (WBC, ESR, CRP).**
- 17. Understanding the limitations of non-bone tissue cultures in diagnosing osteomyelitis.**
- 18. The role of imaging in guiding treatment decisions.**
- 19. The challenges in treating chronic osteomyelitis.**

20. The increased mortality risk associated with diabetic foot infections.

Comparison Table: Hematogenous vs. Non-Hematogenous Osteomyelitis

Feature	Hematogenous Osteomyelitis	Non-Hematogenous Osteomyelitis
Route of Infection	Bloodstream	Direct spread from adjacent tissues
Age Group	More common in children, vertebral in adults	More common in adults
Onset	Often acute	Can be acute or chronic
Pathogens	<i>S. aureus</i> , <i>P. aeruginosa</i> , <i>S. marcescens</i> , etc.	<i>S. aureus</i> , coagulase-negative staphylococci, etc.
Risk Factors	IV drug use, endocarditis, indwelling devices, etc.	Poorly healing wounds, diabetes, vascular disease, etc.
Treatment	Antibiotics, sometimes surgery	Antibiotics, often surgery (debridement, hardware removal)

This study guide provides a framework for your oral exam preparation. Remember to expand on these points and practice explaining the concepts in your own words. Good luck!