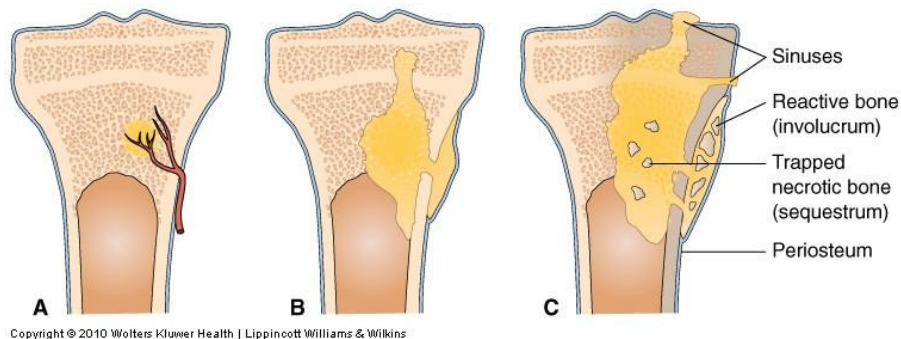


Musculoskeletal System

Osteomyelitis

- Infection of bone and/or bone marrow
- Direct or indirect invasion by an organism
- Direct / Exogenous: open fx, foreign body, trauma
- Indirect / Endogenous: from distant site
- Extension / Contiguous: ulcers
- **Classification**
- Acute = the initial infection or an infection **lasting less than one month**
Inc incidence in children < 12 yrs
- Chronic = infection **lasting longer than one month** or an infection that has failed the initial course of antibiotic therapy for acute osteomyelitis
Mostly adults
Recurrences
- **Etiology**
- Staphylococcus aureus - most common
- May have mixed pathogens
- Gram + & - bacteria, fungus, virus



- **Pathophysiology**
- Bacteria enters a bone
- Inflammatory response
- Purulent material collects within the bone
- Increased pressure → pain
- Ischemia & vascular compromise → ↓ O₂
- Bone dies & sequestra (dead bone separated from living bone) form
- Sequestrum - a haven for bacteria
- Involucrum (new bone sheath) grows around sequestrum
- **Direct Entry (exogenous)**
- Can occur at any age - open wound
- Foreign body
- Microorganisms enter the bone & lodge in an area of bone in which circulation slows, usually the metaphysis.
- Organisms grow → increased pressure

- $\uparrow$ inc pressure = ischemia & vascular compromise (blood vessel thrombosis)
- Infection > bone cortex and marrow = cortical revascularization and necrosis.
- Ischemia $\rightarrow$ bone dies
- Area of devitalized bone separates from the living bone = sequestra.
- Forms new bone = Involucrum
- Sequestrum is difficult to reach by antibiotics and WBC's.
- Enlarges and serves as a site for microorganisms that spread to other sites
- **The sequestrum can move out of the bone and into the soft tissue.**
- Once outside the bone, the sequestrum may re-vascularize and then undergo removal by normal immune processes.
- The sequestrum can be surgically removed by **debridement**.
- If the necrotic sequestrum is not resolved naturally or surgically, it may develop a sinus tract, resulting in chronic, purulent cutaneous drainage.

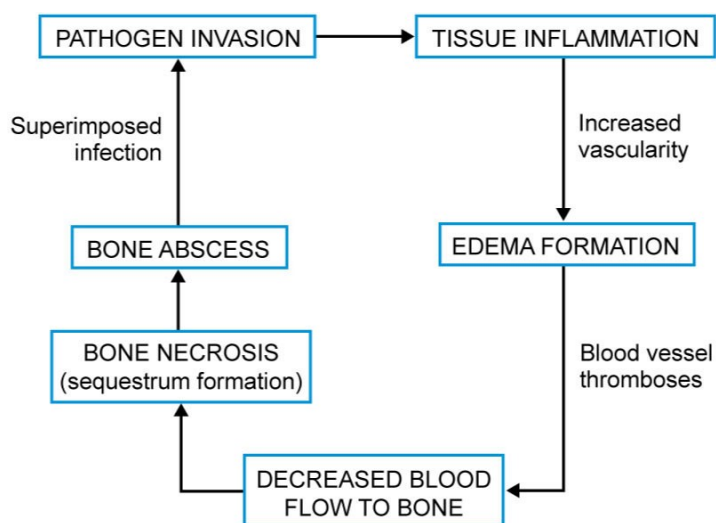


Fig. 53-2. Infection cycle of osteomyelitis.

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- **Indirect Entry (endogenous)**
 - Most frequently affects growing bones in young boys (< 12 years)
 - Higher incidence of blunt trauma
 - Most common sites of indirect injury in children
- Distal femur, proximal tibia, humerus, radius
- Pelvis and vertebrae - **most common sites of infection in adults**
- GU & Respiratory infections – vascular insufficiency
- **Complications**
 - Fractures
 - Chronic infection
 - Sepsis
 - Deformities, Leg length discrepancies
 - Brodie's abscess
 - Amputation
- **Acute Osteomyelitis S/Sx:**
 - Both **systemic and local**
 - Fever, Chills, night sweats, restlessness, nausea, malaise

- Bone pain - unrelieved by rest and worsens with activity
- Swelling, tenderness, and warmth
- Restricted movement
- Drainage from sinus tracts (late sign)
- Fracture
- **Chronic Osteomyelitis S/Sx:**
 - Scar tissue
 - Systemic ↓ , local ↑
 - Constant bone pain and swelling, tenderness, and warmth at the site
 - May have a draining sinus tract (late)
- **Diagnosis:**
 - Early diagnosis & treatment is essential
 - H & P
 - Wound & blood cultures – need to ID the organism
 - ↑ WBC, ↑ ESR (chronic), ↑ CrP (acute)
 - Bone scan – 24- 72 hrs of onset
 - X-rays not indicative until 10-21 days after S/Sx appear
 - MRI - acute
 - CT
- **Prevention:**
 - Aseptic technique
 - Prophylactic antibiotics post-op and post-injury
- **Treatment:**
 - #1 = vigorous and prolonged IV antibiotic therapy
 - IV antibiotic therapy is continued in the home for *4 to 6 weeks or as long as 3 to 6 months.*
 - Cultures or bone biopsy
 - Tetanus
- **Antibiotics**
 - penicillin
 - naftillin (Nafcil)
 - neomycin
 - cephalexin (Keflex)
 - cefoxitin (Mefoxin)
 - gentamycin (Garamycin)
 - tobramycin (Nebcin)
 - cefazolin (Ancef)
- **Treatment:**
 - Ciprofloxacin/Fluoroquinolone for 6 to 8 weeks may be prescribed instead of IV antibiotics.

- Oral abx after IV completed (monitor with ESR & scans)
- Surgical debridement and decompression
- Limit activity to ↓ stress & keep the infection localized
- Immobilize limb
- Cast or splint

- **Surgical Treatment**
 - Irrigation & Debridement
 - Removal of the poorly vascularized tissue and dead bone (sequestectomy)
 - Irrigate with antibiotics
 - Removal of implant
 - Saucerization = a type of decompression surgery
 - Remove a window of bone to ↓ pressure
 - Possible bone or skin graft
 - Intermittent or constant irrigation with antibiotics

- **Wound Packing & Drainage**
 - Closed Wound → irrigate with antibiotics> control hematoma & remove debris
 - One drain going in and one coming out for continuous or intermittent irrigations
 - Open Wound → leave open if 1) open wound or 2) infected with anaerobic organisms
 - Debride with dressing changes

- **Other treatments**
 - Limb protection
 - Hyperbaric oxygen therapy
 - Removal of orthopedic devices
 - Amputation

- **Nursing Assessment**
 - Subjective Data:
 - PMH
 - Medications
 - PSH
 - IV drug abuse
 - symptoms: malaise, anorexia, wt. loss, chills, weakness, paralysis, spasms, local tenderness, pain with movement, stress/coping tolerance
 - Objective Data (signs):
 - Restlessness
 - High, spiking temperature
 - Diaphoresis
 - Erythema, warmth, edema at infected bone
 - Restricted movement
 - Wound drainage
 - Spontaneous fractures
 - Leukocytosis
 - blood and/or wound cultures
 - Elevated ESR & CRP
 - Presence of sequestrum and involucrum

- **Nursing Diagnoses**
 - Acute pain / chronic pain
 - Impaired physical mobility
 - Ineffective therapeutic regimen management
- **Acute Nursing Management**
 - Immobilization
 - Avoid excessive manipulation
 - Pain assessment and intervention
 - Dry, sterile dressings
 - Dressings saturated in saline or antibiotic solution
 - Wet-to-dry
 - Bedrest in the early stages
 - Good body alignment and frequent position changes
 - Avoid - exercise or heat
 - Uninvolved joints and muscles should continue to be exercised
 - Risk for flexion contractures
 - Proper nutrition and hydration
- **Health Promotion**
 - Control existing infections
 - Instruct patients on local and systemic manifestations
 - Symptoms of bone pain, fever, swelling, and restricted limb movement
- **Ambulatory and Home Care**
 - Venous access device
 - Instruct on antibiotic administration. (Schedule, Labs, Side Effects)
 - Adverse & Toxic Reactions: renal impairment, hearing deficits, neurotoxicity
 - Stress the importance of continuing to take antibiotics after the symptoms have subsided.
 - If there is an open wound, dressing changes are often necessary.
 - Family needs to understand the infection is not contagious.
 - Periodic home nursing/ home health visits