

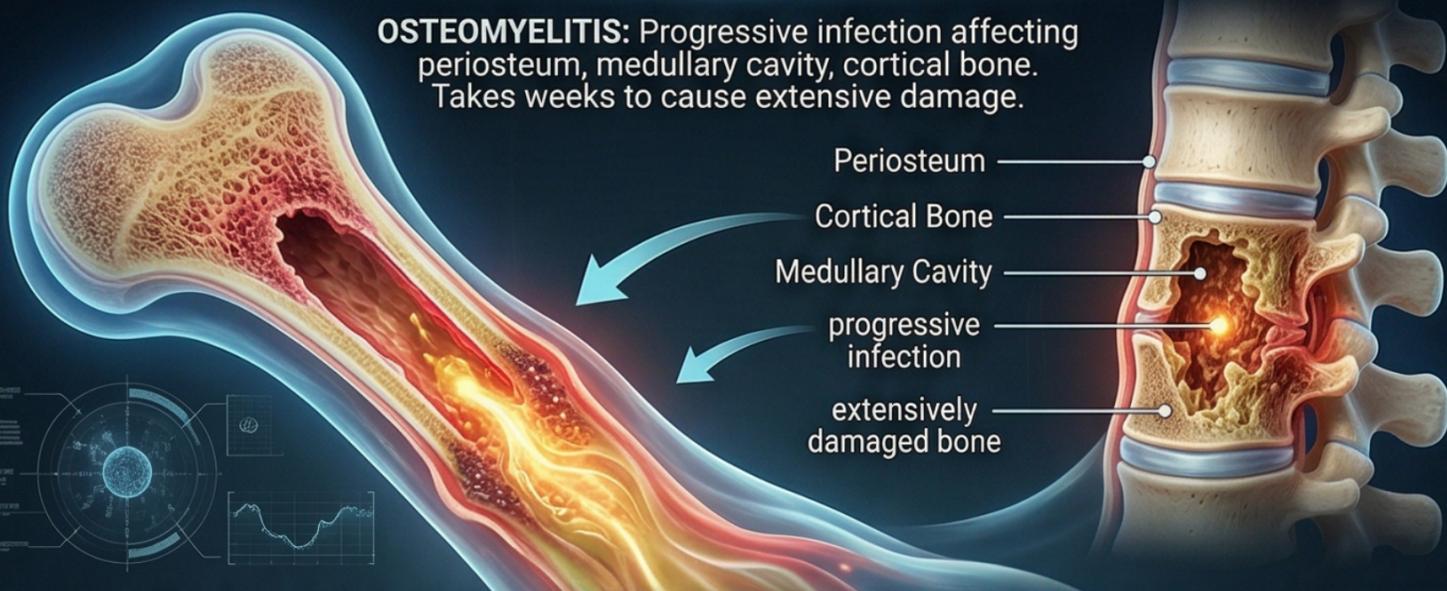
INFECTIONS OF THE BONES AND JOINTS



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OSTEOMYELITIS (BONE INFECTION)

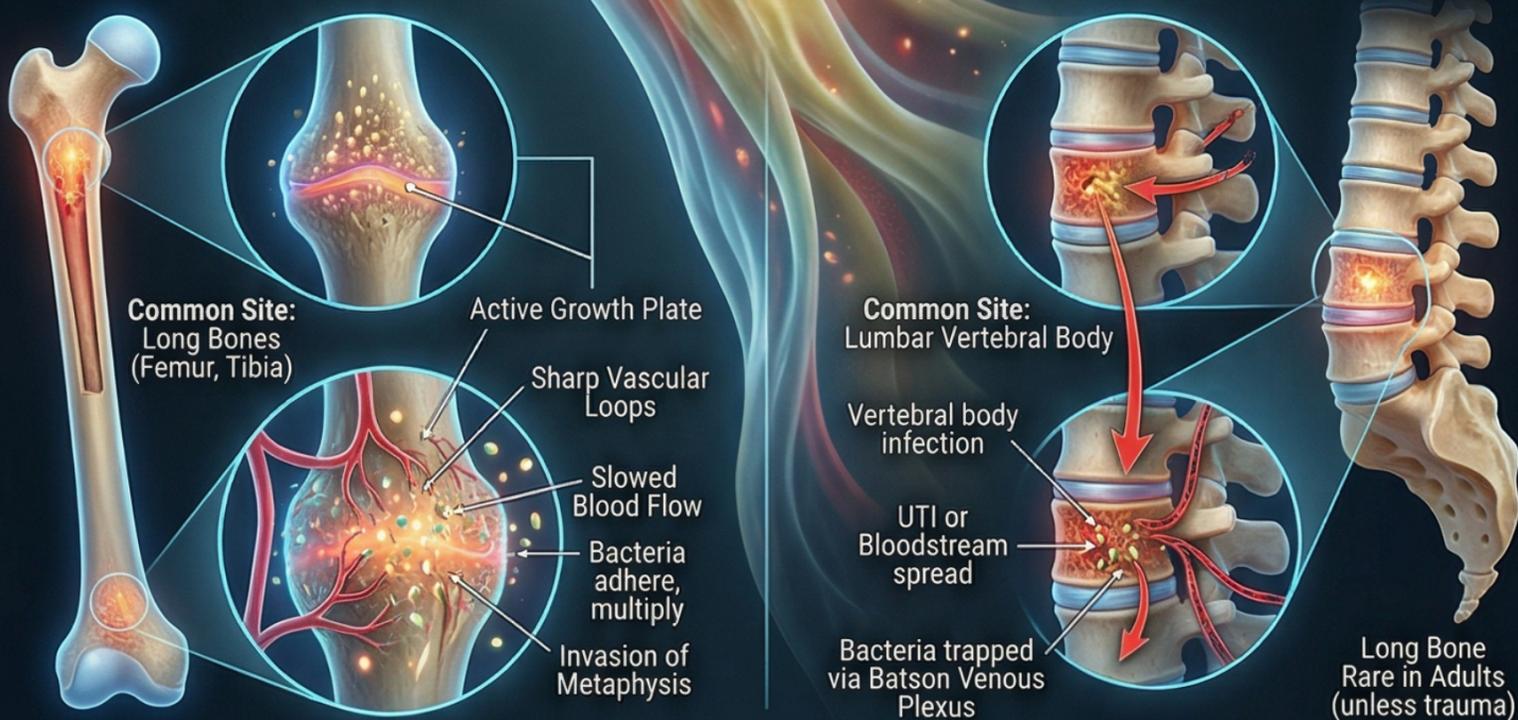
OSTEOMYELITIS: Progressive infection affecting periosteum, medullary cavity, cortical bone. Takes weeks to cause extensive damage.



CHILDREN/ADOLESCENTS

AGE-SPECIFIC DIFFERENCES

ELDERLY/ADULTS



CAUSES BASED ON PATIENT PROFILE

Infants <i>S. aureus</i> , <i>S. agalactiae</i> , <i>E. coli</i>	Children (1-16 years) <i>S. aureus</i> , <i>S. pyogenes</i> , <i>H. influenzae</i>	Adults (>16 years) <i>S. aureus</i> , CoNS (e.g., <i>S. epidermidis</i>), gram-negative rods	Patients (16 years) Polymicrobial (<i>S. aureus</i> , <i>Streptococcus</i> , gram-neg rods, anaerobes)
Diabetic Foot Polymicrobial (<i>S. aureus</i> , gram-neg rods, anaerobes)	Diabetic cotone Polymicrobial (<i>S. aureus</i> , <i>Streptococcus</i> , gram-neg rods)	IV Drug Users (IDUs) <i>P. aeruginosa</i> in cervical vertebrae	Puncture Wound (athletic shoes) <i>P. aeruginosa</i> or <i>S. aureus</i>
Sickle Cell Disease <i>S. aureus</i> , <i>Salmonella</i>	Prosthetic Joints CoNS (e.g., <i>S. epidermidis</i>), <i>S. aureus</i>		

SYMPTOMS

Acute Fever, chills, localized pain, swelling, redness (1-2 days) 	Chronic Intermittent localized pain, often without fever (weeks/months)
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DIAGNOSIS & TREATMENT

Diagnosis MRI (most sensitive), elevated ESR/CRP, diagnostic standard is positive bacterial culture from bone biopsy 	Treatment Acute (4-6 weeks antibiotics). Chronic or extensive damage (Surgery + antibiotics) 	SPECIFIC ANTIBIOTICS MSSA (Nafcillin/Oxacillin) MRSA (Vancomycin) Streptococcus (Penicillin G) Gram-negative rods (Ciprofloxacin) Pseudomonas (Piperacillin-tazobactam + Gentamicin) Anaerobes (Clindamycin or Metronidazole)
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Overview of Bone and Joint Infections

- The document primarily covers two main infections: **Osteomyelitis** (bone infection) and **Septic Arthritis** (joint infection).
- ***Staphylococcus aureus* (*S. aureus*)** is the most common cause of infection in both of these diseases.
- Children and elderly adults are the most vulnerable groups to contract these infections.

1. Osteomyelitis (Bone Infection)

Osteomyelitis is a progressive infection that affects the bone, including the periosteum, medullary cavity, and cortical bone. It can take several weeks to cause extensive bone damage.

Age-Specific Differences

- **Children/Adolescents:** Typically develop osteomyelitis in the long bones (like the femur or tibia). This is because active growth plates have sharp vascular loops that slow down blood flow, allowing bacteria to adhere, multiply, and invade the metaphysis.
- **Elderly/Adults:** Typically develop osteomyelitis in the vertebral body of the lumbar spine. Infections often spread to the vertebrae from urinary tract infections (UTIs) or the bloodstream, using the Batson venous plexus to trap bacteria. Long bone osteomyelitis is rare in adults unless caused by trauma.

Causes Based on Patient Profile

- **Infants:** *S. aureus*, *S. agalactiae*, *E. coli*.
- **Children (1-16 years):** *S. aureus*, *S. pyogenes*, *H. influenzae*.
- **Adults (>16 years):** *S. aureus*, CoNS (e.g., *S. epidermidis*), gram-negative rods.
- **Diabetic Foot:** Often a polymicrobial contiguous spread involving *S. aureus*, *Streptococcus*, gram-negative rods, and anaerobes.
- **IV Drug Users (IDUs):** More likely to get *Pseudomonas aeruginosa* in the cervical vertebrae.

- **Puncture Wounds through Athletic Shoes:** Likely to result in *P. aeruginosa* or *S. aureus* infections.
- **Sickle Cell Disease:** *S. aureus* and *Salmonella* are the most common causes.
- **Prosthetic Joints:** CoNS (e.g., *S. epidermidis*) is the most common, followed by *S. aureus*.

Symptoms

- **Acute:** Appears within 1-2 days (common in children) with fever, chills, localized pain, swelling, and redness.
- **Chronic:** Develops over weeks/months (common in adults/elderly) with intermittent localized pain, often without a fever.

Diagnosis and Treatment

- **Diagnosis:** MRI is the most sensitive imaging modality. ESR and CRP levels are usually elevated. The preferred diagnostic standard is a positive bacterial culture from a bone biopsy.
- **Treatment:** Acute osteomyelitis requires 4–6 weeks of antibiotics. Chronic osteomyelitis or cases with extensive damage usually require surgery alongside antibiotics.
- **Specific Antibiotics:** MSSA (Nafcillin/Oxacillin), MRSA (Vancomycin), *Streptococcus* (Penicillin G), Gram-negative rods (Ciprofloxacin), *Pseudomonas* (Piperacillin-tazobactam + Gentamicin), Anaerobes (Clindamycin or Metronidazole).

ARTHRITIS ASSOCIATED WITH INFECTIONS

Reactive & Septic Arthritis

A. REACTIVE ARTHRITIS

STERILE INFLAMMATION: Joint inflammation happens **WEEKS AFTER** a distant bacterial infection.



SYMPTOMS (REITER SYNDROME)

ASYMMETRICAL POLYARTHRITIS

CONJUNCTIVITIS

RASH

URETHRITIS

ASYMMETRICAL POLYARTHRITIS

Sterile
or
Weeks later

CAUSES

- **Chlamydia trachomatis* (MOST COMMON)
- Campylobacter jejuni*
- Yersinia*
- Shigella*
- Salmonella*
- Streptococcus*

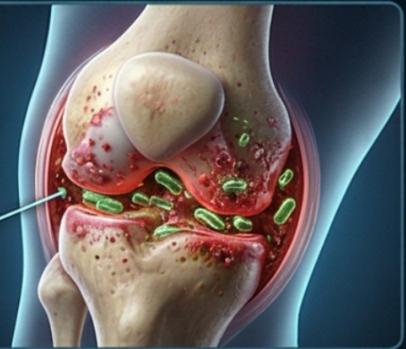
RISK FACTOR



HLA-B27
genetic marker

B. SEPTIC (INFECTIOUS) ARTHRITIS

SERIOUS DIRECT INFECTION: Rapidly permanent damage & disability if untreated.



ETIOLOGY

- YOUNGER ADULTS:**
- Neisseria gonorrhoeae* (Gonococcal Arthritis)
- ELDERLY:**
- Gram-negative bacilli
- ALL:**
- Most common *S. aureus*

PATHOGENESIS

PATHOGENS ENTER VIA BLOODSTREAM (Bacteremia) from:

- UTIs
- IV drug use
- endocarditis

IMMUNE RESPONSE (PMNs, CYTOKINES) & **BACTERIAL ENZYMES** damaging cartilage

CLASSIC TRIAD SYMPTOMS



FEVER

JOINT PAIN

IMPAIRED RANGE OF MOTION

NO Rash, Urethritis, or Conjunctivitis

NONGONOCOCCAL VS. GONOCOCCAL

NONGONOCOCCAL (e.g., *S. aureus*)

- Single joint monoarticular
- Joint Drainage, 3-4 Weeks IV Antibiotics

GONOCOCCAL (*N. gonorrhoeae*)

- Multiple joints polyarticular, disseminated
- Fever, Tenosynovitis, Skin Pustules
- Joint Drainage, IV Ceftriaxone 24-48h, then 7-10 days Oral Antibiotics

DIAGNOSIS OF SEPTIC ARTHRITIS

SYNOVIAL FLUID ANALYSIS (CRITICAL)



- OPAQUE/YELLOW-GREEN
- HIGH WBC (>100,000/mm³)
- >75% PMNs
- ELEVATED PROTEIN (3-5 g/dL)

CULTURES (FLUID):



Positive
(Nongonococcal)

Negative
(Gonococcal)

SUSPECTED GONOCOCCAL:

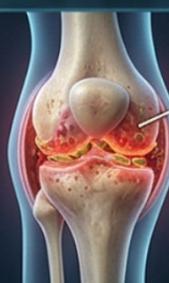
Swabs (Pharynx, Rectum, Cervix, Urethra) on Thayer-Martin Media



ADDITIONAL RISK FACTORS



SPECIFIC PATHOGENESIS



SYNOVIAL FLUID enzyme **PHOSPHOLIPASE A2** targets Gram-positive bacteria (e.g., *S. aureus*)

PREVENTION

FOR NONGONOCOCCAL



Treat UTIs, SSTIs, Pneumonia. Avoid Joint Trauma

FOR GONOCOCCAL



Safe sex practices. Identify & treat infected partners

2. Arthritis Associated with Infections

The document highlights two types of arthritis linked to microbes: Reactive Arthritis and Septic Arthritis.

A. Reactive Arthritis

- It is a **sterile** inflammation of a joint that happens weeks after a bacterial infection in a distant part of the body.
- **Symptoms:** Asymmetrical polyarthritits, urethritis, conjunctivitis, and a rash (often called Reiter syndrome).
- **Causes:** The most common cause is *Chlamydia trachomatis*. Other causes include *Campylobacter jejuni*, *Yersinia*, *Shigella*, *Salmonella*, and *Streptococcus*.
- **Risk Factor:** Occurs more commonly in patients with the HLA-B27 genetic marker.

B. Septic (Infectious) Arthritis

- Unlike reactive arthritis, this is a serious infection directly inside the joint that can rapidly cause permanent damage and disability if not aggressively treated.
- **Etiology:** Bacteria are the most common cause, specifically *S. aureus*. However, in young sexually active adults, *Neisseria gonorrhoeae* (Gonococcal arthritis) is a primary cause. Gram-negative bacilli often affect the elderly.
- **Pathogenesis:** Pathogens usually enter via the bloodstream (bacteremia) from sources like UTIs, IV drug use, or endocarditis. Joint destruction is caused by an immune response (PMNs, cytokines) and bacterial enzymes.
- **Classic Triad of Symptoms:** Fever, joint pain, and impaired range of motion. Septic arthritis patients do **NOT** have the rash, urethritis, or conjunctivitis seen in reactive arthritis.

Septic Arthritis: Nongonococcal vs. Gonococcal

- **Nongonococcal (e.g., *S. aureus*):** Usually affects one joint (monoarticular). Requires joint drainage/lavage and 3-4 weeks of IV antibiotics.
- **Gonococcal (*N. gonorrhoeae*):** Can be disseminated, causing fever, tenosynovitis,

polyarthritis, and skin pustules. Treated by draining the joint, IV ceftriaxone for 24-48 hours, followed by oral antibiotics for 7-10 days.

Diagnosis of Septic Arthritis

- **Synovial Fluid Analysis is critical:** In septic arthritis, the fluid is opaque/yellow-green, has high white blood cells (>100,000/mm³), >75% PMNs, and elevated protein (3-5 g/dL).
- Cultures from the synovial fluid are usually positive for nongonococcal arthritis but negative for gonococcal arthritis.
- For suspected gonococcal arthritis, swabs from the pharynx, rectum, cervix, or urethra should be cultured on Thayer-Martin media.

Additional Details on Septic Arthritis:

- **Additional Risk Factors:** Increased susceptibility occurs in patients with Rheumatoid Arthritis (RA), Osteoarthritis (OA), Systemic Lupus Erythematosus (SLE), joint trauma, or those receiving intra-articular steroids.
- **Specific Pathogenesis:** The synovial fluid contains an enzyme called Phospholipase A2, which targets gram-positive bacteria like *S. aureus*.
- **Prevention:**
 - For Nongonococcal infections: Prompt treatment of UTIs, skin and soft tissue infections (SSTIs), and pneumonia, as well as avoiding joint trauma.
 - For Gonococcal infections: Safe sex practices and identifying/treating infected partners.

