



Unit VII – Problem 1 – Pathology: Osteomyelitis

- Pyogenic osteomyelitis:

- **Definition:** a low-grade inflammation of the bone caused by pyogenic bacterial infection (producing pus).
- **How does it start:** there will be bacterial metaphyseal localization within 24 hrs of intravenous inoculation (presence of bacteria in veins of bones). There will be sequestration of bacteria (حبس للبكتيريا) with 8 days of inoculation.
- **Organisms include:** Staphylococcus spp (ex: S.aureus) – E.coli – N.gonorrhoea – H.influenzae – Salmonella in sickle-cell disease – Proteus spp
- **Associated factors of Salmonella and osteomyelitis:**

Infective-agent related factors	Host-related factors (example: patients with SCD)
<ul style="list-style-type: none"> * Non-typhoidal Salmonella * Septicemia associated with Salmonella infection 	<ul style="list-style-type: none"> * Decreased phagocytic activity of RES * Decreased opsonizing capacity of RES * Infarcts in GIT, bones and RES

- **Bones affected in osteomyelitis:**

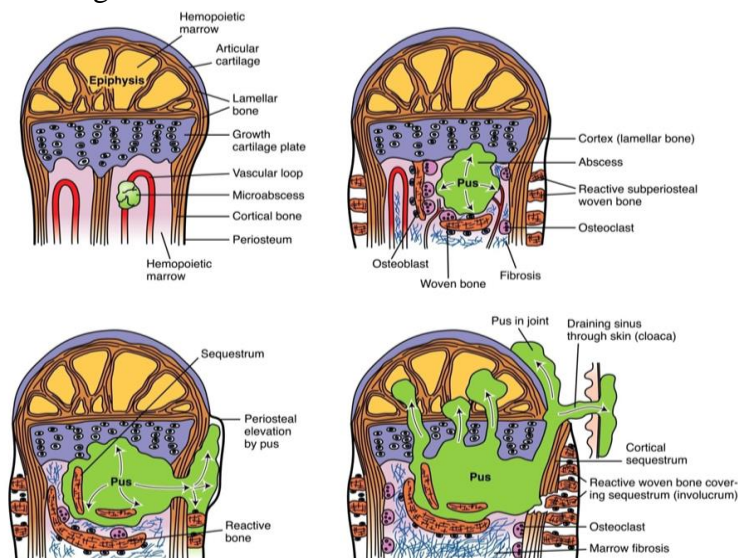
- ✓ Any bone (hematogenous vs. direct route):

Hematogenous route	Direct route
Suppurative infections (العدوى القيحية) <ul style="list-style-type: none"> – endocarditis – urinary tract infections – genitourinary surgery – drug addicts 	Dental abscess (jaw will be affected) – frontal sinusitis – deep pressure sores (sacral osteomyelitis) – penetrating wounds – foreign bodies (ex: implants & surgical devices)

- ✓ End of long bones: metaphysis of long bones adjacent to actively growing epiphyseal cartilage plate (in this area there is slow circulation of blood allowing the bacteria to multiply).
- ✓ Vertebral column.

- **Pyogenic osteomyelitis of long bones (hematogenous route):**

- ✓ It is an acute inflammatory response occurring at metaphysis of long bones where there is a unique vascular loop which will slow blood flow allowing bacteria to enter bone marrow and multiply there.
- ✓ The purulent exudate (الإفرازات القيحية) produced by the bacteria will spread in marrow spaces leading to medullary cavity full with pus.
- ✓ The pus will enter the Haversian system of the metaphysis to elevate the periosteum (subperiosteal abscess).
- ✓ All of these events will lead to an increase in intraosseous pressure of exudate resulting in bone necrosis.





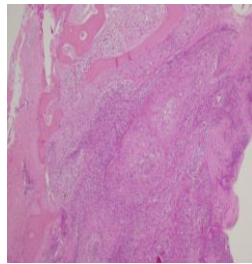
✓ *Summary of pathogenesis:*

Sequestrum	Necrotic/ dead bone tissue embedded in pus
Involucrum	Periosteal reactive new bone formation around necrotic sequestrum
Cloaca	A hole formed in the bone during the formation of draining sinus
Brodie's abscess	Granulation tissue and reactive bone at the metaphysis of long bone (especially upper end of tibia) formed from periosteum and endosteum which surrounds the infection

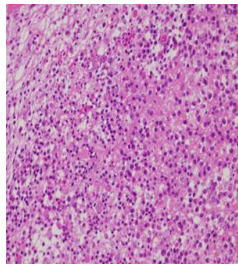
- **Pyogenic vertebral osteomyelitis (hematogenous route):**
 - ✓ Initial focus in vertebral end plate (sequence of events are similar to those occurring in long bones and mentioned above).
 - ✓ The infection spreads to intervertebral discs and there will be direct spread from one vertebra to the next + disc destruction resulting eventually in vertebral collapse.
 - ✓ Reactive bone formation (involucrum) from adjacent vertebra may cause spontaneous fusion.
 - ✓ As the lesion heals, sclerosis will develop (تصلب الأنسجة).
- **Complications of osteomyelitis:**
 - ✓ Septicemia: disseminated abscesses, infective carditis.
 - ✓ Septic bacterial arthritis.
 - ✓ Pathological fractures.
 - ✓ Alteration in growth rate.
 - ✓ Squamous cell carcinoma.
 - ✓ Amyloidosis.
 - ✓ Chronic osteomyelitis.
 - ✓ *Vertebral-related complications:* vertebral collapse, compression fracture, paravertebral abscess, spinal epidural abscess, cord compression and neurological manifestations.



Chronic osteomyelitis



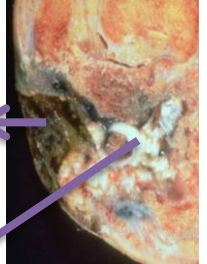
inflammatory exudate



abscess formation



squamous cell carcinoma



Draining sinus

- **Tuberculosis of bones and joints:**

- It is secondary to an infection in lungs or lymph nodes.
- Spreading by hematogenous route.
- Characterized by granuloma formation and destructive caseation (figure below)
- **TB osteomyelitis of long bones:**
 - ✓ Uncommon.
 - ✓ Found in endemic areas among elderly.
 - ✓ Destroys the articular cartilage and extends to involve the synovium and joint space.
- **TB spondylitis (Pott's disease):**
 - ✓ Affecting lower thoracic and lumbar vertebra.
 - ✓ Affecting bodies of vertebrae and sparing the lamina, spines and adjacent vertebrae. Note that intervertebral discs are destroyed by compression rather by invasion (figure)
 - ✓ Because of little bone formation → vertebral collapse → kyphosis and scoliosis.
 - ✓ *Complications of Pott's disease:* cold paraspinal abscess, cold psoas abscess, spinal cord compression (paraplegia), angulations of spine.

