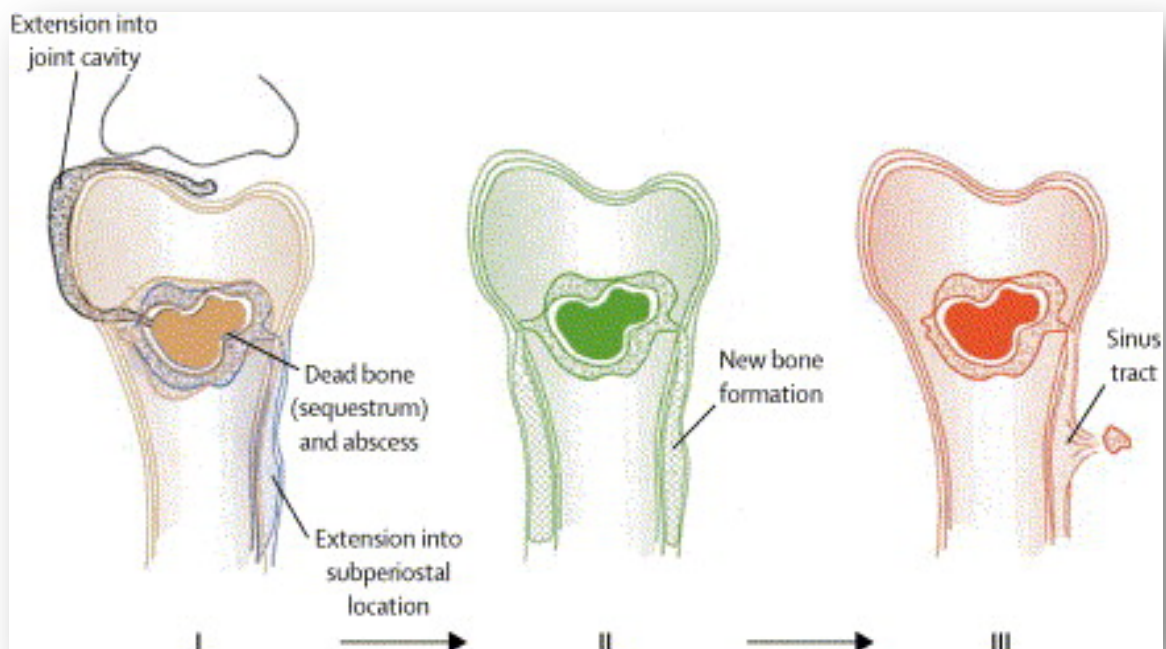


Osteomyelitis

Lecture: 5th female / 4th male

Email: pathology433@gmail.com

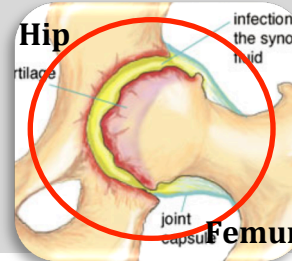
Date: 6-1-2014



Infectious (septic) arthritis

General information

- It is serious because it can cause rapid joint destruction and **permanent deformities**.
- A medical emergencies caused by bacterial invasion of a joint, resulting in **inflammation** of the synovial lining.
- If the organisms enter the joint cavity, **effusion and pus** are formed, with destruction of bone and cartilage.
- **Both genders are affected equally**
- The infection involves **only a single joint**
- usually **the knee**-followed in order by hip, shoulder, elbow, wrist, and sternoclavicular joints.
- Joint aspiration is typically purulent
- **Culture** allows identification of the causal agent.



Pathogenesis (risk factors)

- Any concurrent **متزامن** bacterial infection.
- Serious chronic illness (cancer, rheumatoid arthritis, SLE,..etc.)
- Alcoholics and elderly people run a **higher risk** of developing septic arthritis.
- Diseases that **depress the autoimmune** system or with prior immunosuppressant therapy.
- I.V. drug abuse, by heroin addicts, for example.
- **Other factors**: recent articular trauma, joint surgery and intra-articular injections.

Bacteria commonly involved

- Any bacteria can be causal:
 - **Haemophilus influenzae** predominates in **children under age 2 years**
 - **S. aureus** is the main causative agent in **older children and adults**
 - **Gonococcus** is prevalent **سائد** during late adolescence and young adulthood.
 - Individuals with **sickle cell disease** are prone **عرضة** to infection with **Salmonella** at any age.

Clinical features:

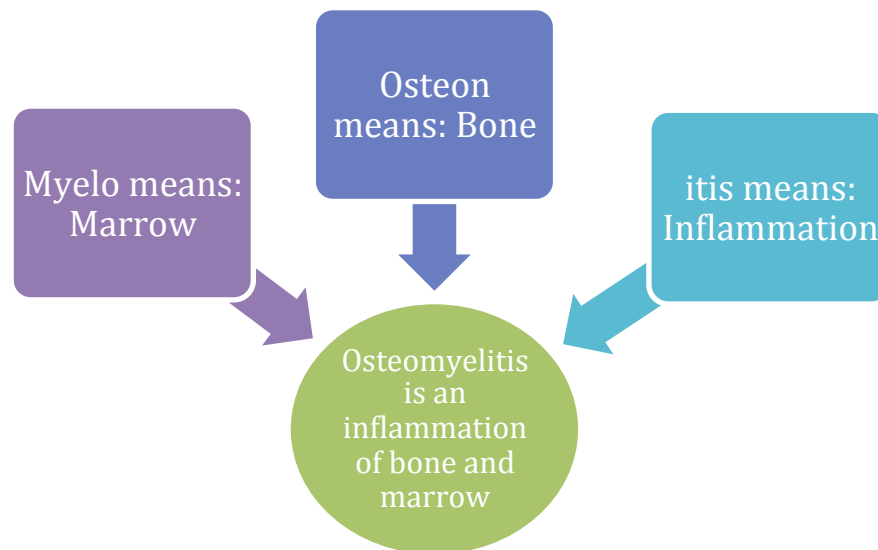
- sudden onset of pain
- redness, and swelling of the joint with restricted range of motion.
- Fever, leukocytosis, and elevated erythrocyte sedimentation rate
- Infectious arthritis must be rapidly diagnosed and treated promptly to prevent irreversible and permanent joint damage.



Complication

- **Septic arthritis** can lead to **ankylosis** and even fatal septicemia.
- However, prompt antibiotic therapy and joint aspiration or drainage cures most patients.

Pyogenic Osteomyelitis



In common use it is virtually synonymous with **infection** caused by certain mycobacteria and **pyogenic bacteria** “bacteria capable of causing acute inflammation and abscess formation “

It can be secondary to systemic infection but more frequently occurs as a primary isolated disease.

Osteomyelitis **almost always caused by bacteria** (osteomyelitis that caused by viruses, parasites, fungi is rare)

It can be:

- Acute.
- Chronic
- Special type : **Tuberculosis Osteomyelitis**

It's acute osteomyelitis always caused by bacteria.

CAUSES

Staphylococcus aureus is responsible for 80% to 90% the cases of pyogenic osteomyelitis (in normal people) **why?**

Staph. aureus expresses receptors to bone matrix components, may be related to the fact that facilitating its adherence to bone tissue.

Bacteria which are common in certain conditions:

- **Neonates:** Escherichia coli and group B streptococci.
- **Persons with sickle cell disease:** Salmonella
- **Patients with genitourinary tract infections or with intravenous drug abusers:** E.coli, Klebsiella and Pseudomonas
- **Direct spread during surgery or open fractures (secondary to bone trauma):** Mixed bacterial infections, including anaerobes

Routes of infection and site

The offending organisms reach the bone by one of three routes:

- Hematogenous spread, (**most common**).
- Extension from a contiguous site.
- Direct implantation after compound fractures or orthopedic procedures

The most common sites are: the distal femur and proximal tibia

Risk factors include:

- childhood and adolescence
- diabetes mellitus (especially involving the foot)
- compromised immunity (including AIDS)
- sickle-cell disease

Sites of involvement

Influenced by the vascular circulation, which varies with age.

The metaphysis is quite vascular and hence is often the site where infection localizes.

Neonates: metaphysis, epiphysis or both

Children: metaphysis

Adults: epiphysis and subchondral regions

Clinical Course and Diagnosis

Malaise, fever, leukocytosis, chills, and throbbing pain over the affected region.

Symptoms also can be subtle, with only unexplained fever, particularly in infants, or only localized pain in the adult. In many untreated cases, blood cultures are positive, but biopsy and bone cultures are usually required to identify the pathogen. Present may extremely stable in children and infants, who may present only with pyrexia (pyrexia of unknown origin,PUO)

Diagnosis:

- Sign/symptoms.
- X-ray ...changes consist lytic focus of bone surrounded by a zone of sclerosis
- Blood cultures (In as many as 50% of cases, no organisms can be isolated)
- biopsy

Chronicity and Complications

Chronicity may develop with:

- delay in diagnosis
- extensive bone necrosis
- abbreviated antibiotic therapy
- inadequate surgical debridement,
- weakened host defenses.

Complications:

- Pathologic fracture.
- Secondary amyloidosis
- Endocarditis
- Sepsis
- Squamous cell carcinoma if the infection creates a sinus tract.
- Rarely sarcoma in the affected bone
- Formation of sinus
- Formation of fistula

Stages:

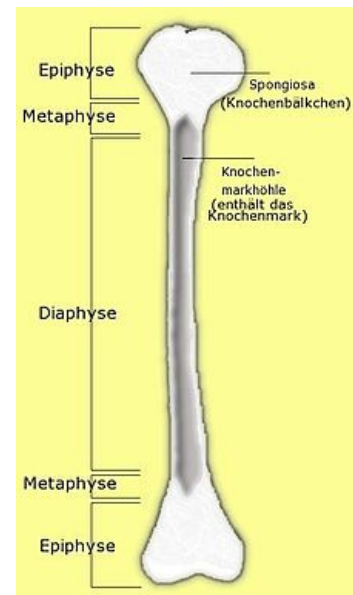


Avascular necrosis

This necrosis of bone is due to ischemia. Ischemia may result if the blood supply to bone is interrupted which may occur if there is a fracture particularly in areas blood supply is suboptimal e.g. the scaphoid and femoral neck . Most other cases of vascular necrosis are either idiopathic or follow corticosteroid administration.

Acute osteomyelitis

The primary site of infection is usually in the metaphysial region, from which the infection may spread to involve the cortex and form a subperiosteal abscess; may spread into the medullary cavity; or, rarely, may spread into the adjacent joint space.



Medical prescription:

- Pain relief
- Parenteral antibiotics for at least 2 weeks, followed by oral antibiotics for at least 4 weeks
- Surgical decompression and removal of any dead bone
- Rehabilitation.

♣ Tuberculosis osteomyelitis

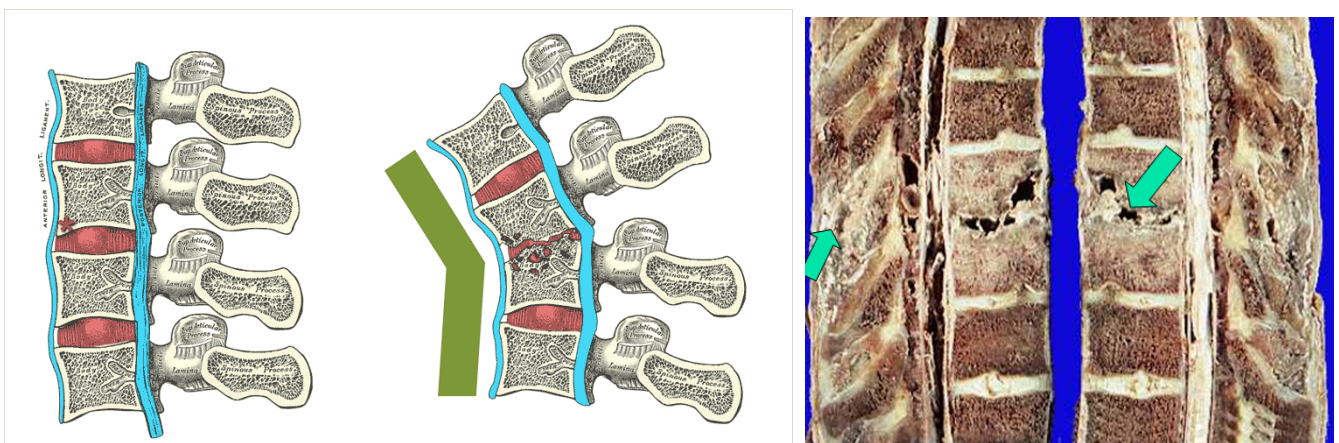
- TB Osteomyelitis is rare and always chronic. It affects the spine (vertebrae) and long bones (metaphysis and epiphysis).
- It may be secondary of lung TB by (By blood stream)

<p>Routes of entry (The organisms usually reach the bone through the)</p>	<ul style="list-style-type: none"> • Usually blood borne <ul style="list-style-type: none"> - originate from a focus of active visceral disease • Direct extension <ul style="list-style-type: none"> • from a pulmonary focus into a rib • or from tracheobronchial nodes into adjacent vertebrae <p>OR</p> <ul style="list-style-type: none"> • spread via draining lymphatics.
<p>most common sites</p>	<p>1- of skeletal involvement : thoracic and lumbar vertebrae followed by the knees and hips</p> <p>2- Pott's disease is the involvement of spine</p> <p>In patients with AIDS frequently multifocal</p>
<p>Histopathology</p>	<p>collections of epithelioid histiocytes and lymphocytes with caseation necrosis</p>
<p>Clinical features</p>	<ul style="list-style-type: none"> • Pain • Fever • Weight loss • May form an inguinal mass " psoas abscess".
<p>Complications</p>	<ul style="list-style-type: none"> • Bone destruction • Tuberculous arthritis • Sinus tract formation • Amyloidosis

♣ Tuberculosis of the vertebral bodies:

- clinically serious form of osteomyelitis
- Infection at this site causes :
 - ✓ vertebral deformity.
 - ✓ collapse.
 - ✓ posterior displacement (Pott disease).
 - ✓ leading to neurologic deficits.

♣ Pott's disease

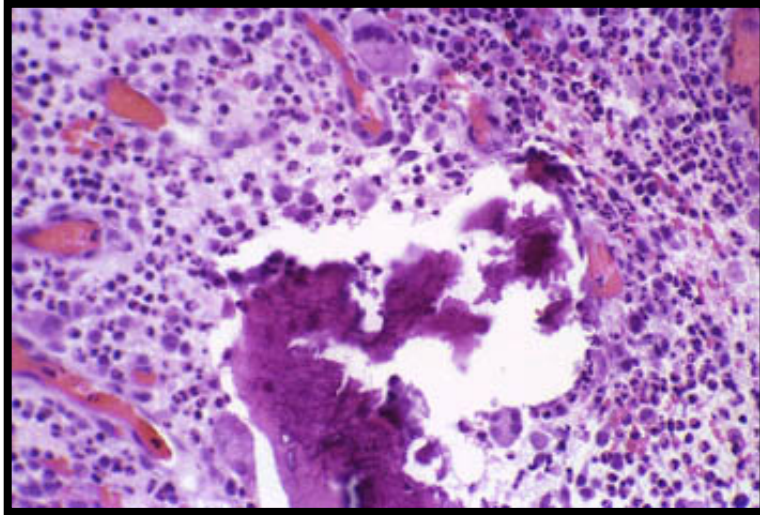


✂ The infection breaks through the intervertebral discs and extends into the soft tissues (muscles) forming Psoas abscesses.

- Because the tubercle bacillus is microaerophilic, the synovium, with its higher oxygen pressures, is a common site of initial infection. The infection then spreads to the adjacent epiphysis, where it elicits typical granulomatous inflammation with caseous necrosis and extensive bone destruction.
- Rickets refers to the disorder in children, in which it interferes with the deposition of bone in the growth plates.
- Bone infection complicates an estimated 1% to 3% of cases of pulmonary tuberculosis.
- The patient presents with pain, swelling, anemia and تعرق بارد

Morphology

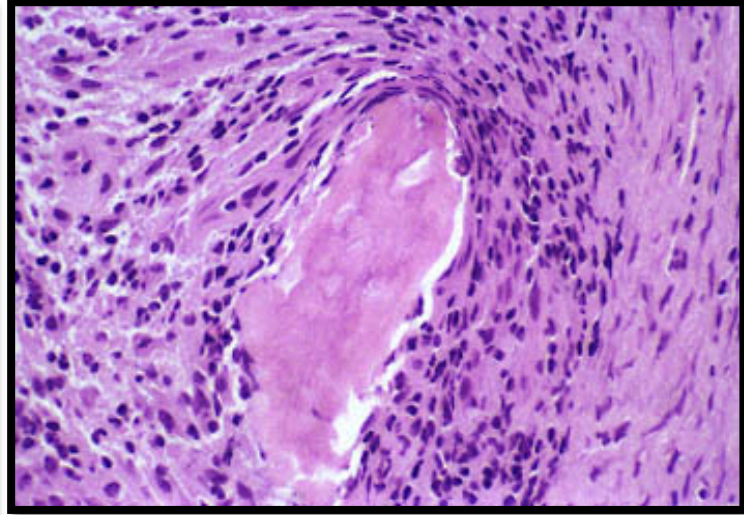
Bone, acute osteomyelitis



A fragment of dead bone surrounded by numerous acute inflammatory cells

Dead pieces of bone is known as the **sequestrum**
New bone may be deposited called **Involucrum**

Bone, chronic osteomyelitis



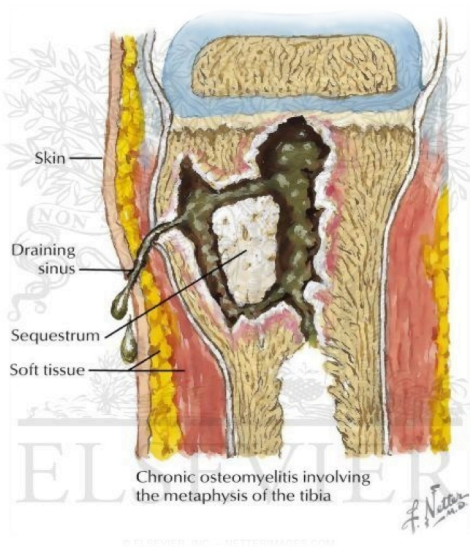
A bone necrotic fragment that is surrounded by a mononuclear cell infiltrate
 What is the significance of the empty lacunae in the bone fragment?
 Empty lacunae are a histologic **hallmark of necrosis of bone**.

The morphologic changes in osteomyelitis depend on the chronicity and location of the infection.

- After the first week of infection, chronic inflammatory cells become more numerous.
- Leukocyte cytokine release stimulates osteoclastic bone resorption, fibrous tissue ingrowth, and bone formation in the periphery.
- Reactive woven or lamellar bone can be deposited; when it forms a shell of living tissue around a **sequestrum**, it is called an **involucrum**.
- Viable organisms can persist in the sequestrum for years after the original infection.
- In infants (and uncommonly in adults), **epiphyseal infection can spread into the adjoining joint to produce suppurative arthritis, sometimes with extensive destruction of the articular cartilage and permanent disability**.
- An analogous process can involve vertebrae, with an infection destroying intervertebral discs and spreading into adjacent vertebrae.

Brodie abscess

Brodie abscess:
Is a small intraosseus abscess that frequently involves the cortex and is walled off reactive bone.



Rupture of the periosteum → soft tissue abscess formation → draining sinuses.

MCQs:

1. **OSTEOMYLITIS in neonates can caused mostly by :**
 - A. S.aureus.
 - B. E.coli.
 - C. Staphylococcus.
 - D. Streptococcus group A.
2. **Which patient is more susceptible to OSTEOMYLITIS:**
 - A. Diabetes mellitus.
 - B. Children.
 - C. Heart disease.
 - D. Kidney failure.
3. **When TB affected bone that called:**
 - A. Osteomyelitis.
 - B. Sickle cell anaemia.
 - C. Diabetes mellitus.
 - D. Pott's disease.
4. **OSTEOMYLITIS is an inflammation disease which occur in:**
 - A. Bone.
 - B. Bone marrow space.
 - C. Muscles.
 - D. Both A &B.
5. **Dead pieces of bone known as :**
 - A. Involucrum.
 - B. Sequesterum.
 - C. Fistula.
 - D. All answers are correct.
6. **The main cause of OSTEOMYLITIS in adult is :**
 - A. S.aureus.
 - B. Anthrax.
 - C. Clostridium.
 - D. Slamonella.



1. B
2. A
3. D
4. D
5. B
6. A

A SPECIAL THANKS TO ALL THE PEOPLE WHO MADE THIS POSSIBLE. AND FOR WORKING HARD ON THE 2 BLOCKS.

Rawan Al-Badaie

**ZHOUR ALHEDYAN
NOURA AHMED
YARA ALENEZI
SHUA'A ALSAYARY
ALANOUD ALMUHAIDEB
NAWT ALFUWERES
NADA BINDAWOOD
RAWAN ALABDULLAH
YASMEEN ALSHEHRI
JEWASHER ALABDULLKAREEM
AREEJ ALAMAN
REEM ALMASSOUD
AREEJ ALRAJEH
HANEN ALJAFRI
LULWAH ALTURKI
AISHA ALSAFI
MAHA ALZEHEARY
KHAWLA ALSHAHRANI
NOURA ALBULUSHI
HAIFA ALOTAIBI
AREEJ ALENEZI
SHATHA ALZHRANI
RASHA ALENEZI**

Waleed Al-Rajban

**OTHMAN ABID
AHMED ALZOMAN
ABDULLAH ALJURAIIS
KHALED ALSUHAIBANY
RAYAN ALOWAISHEQ
MOJAHED OTAYF
OMAR ALDAHHAS
ABDULLAH ALATAR**

**HOPEFULLY YOU GAINED KNOWLEDGE FROM THIS TEAM.
SEE YOU NEXT TERM!!**

