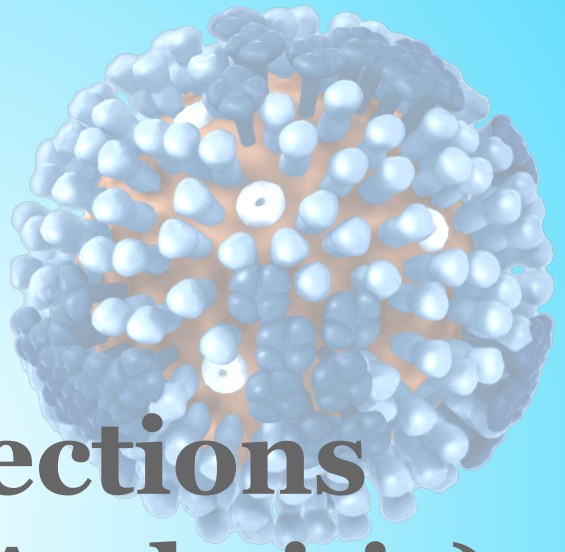
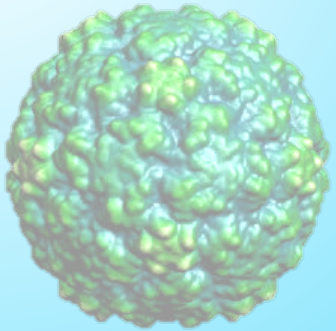


# Joints and Bone infections (Osteomyelitis and Arthritis)

concentrate on the summary



# Objectives:

- Define Osteomyelitis and Arthritis.
- Know that the two conditions can happen together or separately
- Differentiate between acute and chronic Osteomyelitis and Arthritis
- know the pathogenesis and risk factors to both Osteomyelitis and Arthritis
- Realize that bone and joint infection can be acquired through blood or directly from adjacent affected organs and tissues
- —Know the commonest causative agents of arthritis and osteomyelitis.
- —Know the laboratory diagnosis and investigation of both conditions.
- —know the management and treatment of both osteomyelitis and arthritis.

# Introduction

- Bone & joint infections may exist separately or together, Both are more **common in infants and children**.

- Usually caused by **blood** borne spread ,but can result from **local trauma** or spread from **contiguous soft tissue infection**.

- Often associated with **foreign body** at the primary wound site. If not treated lead to devastating effect

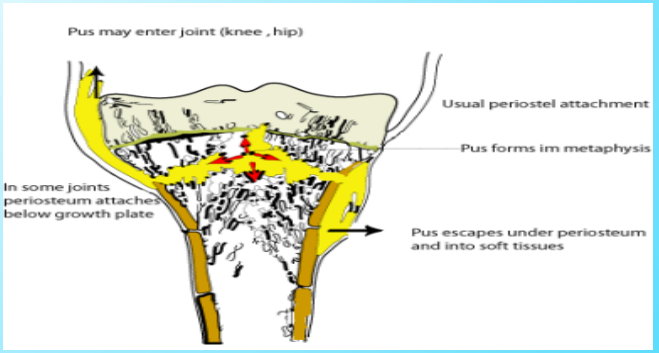
# Acute Osteomyelitis

- Acute osteomyelitis is acute infectious process of the bone and bone marrow .
- How the pathogen can reach the bone ?

1- **Hematogenous route**

2- **Contiguous soft tissue focus** ( postoperative infection, contaminated open fracture, soft tissue infection)

3- **In association with peripheral vascular disease** (diabetes mellitus )
Can have a short duration ( few days for hematogenously acquired infection) or may last several weeks to months( if secondary to contiguous focus of infection)



# Etiology, Epidemiology & Risk Factors

- **Primary hematogenous** is most common in infants & children.
  - Infants: *S.aureus*, group B streptococci, *E.coli*.
  - Children: *S.aureus*, group A streptococci, *H.influenzae*.
  - Adults: Hematogenous cases less common, Most cases due to *S.aureus*

**Site :**

- Metaphysis of long bones ( femur, tibia, humerus)
- Septic arthritis common as the infection begins in diaphysis.
- Vertebral osteomyelitis can occur in adults secondary to a UTI or prostatitis.
- Candidemia from infected central venous catheters can lead to fungal osteomyelitis.

- **Contiguous infection**:
- bacteria related to primary focus , it includes: Gram positive cocci, Gram negative bacilli, anaerobes, and polymicrobial infection.

- **Special clinical situations**:
  - coagulas -negative staphylococci, *Propionebacterium*, and *S.aureus* in foreign body infections
  - *Enterobacteriacea* and *Pseudomonas* in nosocomial infections and IV drug use.
  - Streptococci and anaerobes in fist injuries, and diabetic foot and dicubitus ulcers,
  - *Salmonella* or *S. pneumoniae* in sickle cell patients; *Eikenella, Pasturella multocida* in human/ animal bites;
  - *M.tuberculosis* or *M. avium* in AIDS.

## Patient Presentation

- Systemic manifestations occurs in less than 50% of patients.
- **Acute onset of bone pain, fever with rigors and diaphoresis.**
- Symptoms usually of less than 3 week's duration.
- **Local signs** : soft tissue swelling, erythema, warmth, point tenderness, percussion tenderness over the vertebral body & limited mobility of the involved extremity.

## Differential diagnosis

- Primary and metastatic bone malignancies
- Trauma
- Acute rheumatic arthritis
- Hemarthrosis
- Ewing sarcoma
- Vertebral compression fracture.

## Diagnosis

- Blood culture
- Blood culture or aspiration of overlying abscess if blood cultures are negative
- Leucocytosis may or may not occur
- Erythrocyte sedimentation rate ( ESR) elevated, but could be normal as well.
- **Imaging:**

**1-X-ray** : normal early in disease, Bone destruction changes seen by 2-4 weeks.

2- **MRI** highly sensitive & specific. Preferred for vertebral osteomyelitis and cases

3- **CT Scan** used as alternative of MRI.

4- **Technetium bone scan, Gallium** –and **Indium -111-labelled WBC scan** ( detection within 3 days of onset). Maximum effect to rule out osteomyelitis.

# Treatment & Management

**1-Appropriate antimicrobial therapy** : 2-4 weeks parenteral ( to achieve optimal bone concen. and ensure compliance) followed by oral therapy for a total of at least 6 weeks.

- **MSSA**: Nafcillin followed by oral Flocloxacillin , Dicloxacillin or Clindamycin .
- **MRSA**: Vancomycin followed by Clindamycin, Linezolid, or TMP-SMX.
- **Polymicrobial infection**: Ampicillin-Sulbactam, Piperacillin-Tazobactam or Quinolone with Metronidazole.

- ➔ *S.epidermidis*: Vancomycin and Rifampicin
- ➔ *Enterobacteriacae*: Ceftriaxone
- ➔ Other Gram negative bacilli: Quinolones
- ➔ *P. aeruginosa*: Cefepime, Meropenem, or Piperacillin +/- Aminoglycoside.
- ➔ Anaerobes: Metronidazole or Clindamycin

**2- Surgery** :for neurological complications, paravertebral abscess & hip joint involvement.

# Prognosis & Complications

- Early diagnosis and antibiotic treatment produce optimal results.
- Inadequate therapy result in relapse and chronic disease.
- **Complications**: septicemia, metastatic abscesses, septic arthritis, chronic osteomyelitis, loss of limb ,or paravertebral abscess.
- Monthly ESR for 3 months and at 6 months useful to document treatment.
- Cases due to contiguous source more difficult to eradicate .Relapse common (50%) , surgery indicated.

# Chronic Osteomyelitis

•A chronic infection of the bone and bone marrow usually secondary to inadequately treated or relapse of acute osteomyelitis.

•Management difficult , prognosis poor. It can't be completely cured.

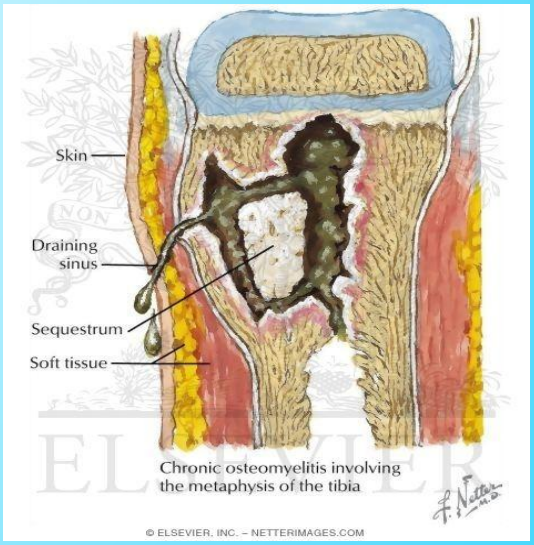
•**S. Aureus** is the most common pathogen and other organisms such as S.epidermidis.

•Tb,brucella,and fungal osteomyelitis have a chronic course. It especially seen in the immunocompromised patients.

•The tb bone infection usually comes from the lung

•Brucella bone infection usually comes from animal contact or (drinking of raw milk)

•Brucella and tb infections have similar manifestations.



## •Diagnosis:

•Blood culture not very helpful, because is bacteremia (presence of bacteria in the blood) rare.

•WBC  normal, ESR elevated but not specific.

•MRI helpful for diagnosis and evaluation of extent of disease.

•Surgery can be used for diagnosis

## •Patient presentation:

•Sinus tract, persistent wound drainage or a chronic non-healing ulcer are common presentations.

•And scars over the skin

# •Treatment

•Extensive surgical debridement with antibiotic therapy. Parenteral antibiotics for 3-6 weeks followed by long term oral suppressive therapy.

•MSSA: parenteral Nafcillin followed by Dicloxacillin

•MRSA S.epidermis: vancomycin

•Other bacteria treat as acute osteomyelitis

•Four drugs are used for the treatment of TB infections the most important is rifampicin.

# •Complications:

Recurrence, Loss of limb, and Pathological fractures

# Arthritis


infectious arthritis

- It is an inflammation of the joint space, secondary to infection.-
- Generally affects a single joint and result in suppurative inflammation.
- Hematogenous seeding of joint is most common.
- Common symptoms: Pain, swelling & limitation of movement.

It may be:

1. **Gonococcal infection:**

- Most common cause in young patients & Sexually active adults by transmitting Neisseria gonorrhoeae "in sexually active adults".
- It is secondary infection due to cervicitis "in women" & urethritis "in men".
- It is present with polyarthralgia(chronic pain in more than one joint in the body), tenosynovitis (the inflammation of the synovium), fever, skin lesions.
- If it's not treated it will lead to suppurative monoarthritis.

2. **Nongonococcal infection:**

- Occurs in older adults
- It results from introduction of organisms into joint space as a result of bacteremia or fungemia.

# Etiology, Epidemiology & Risk factors

**causes:**

- direct trauma, procedures (arthroscopy) or from contiguous (surrounding) soft tissue infection.
- S.*aureus* is most common cause.
- Other organisms : streptococci group b and aerobic Gram negative bacilli.
- —Lyme disease in endemic areas.(not in saudi arabia)
- —Chronic arthritis may be due to MTB or fungi or

— **Risk factors:** age, diabetes, immunosuppresion, IV drug use(drug addicts), Central venous catheters, prior joint damage (rheumatoid arthritis) or procedure (arthroscopy), or sexually transmitted diseases.

**patient presentation**

- Gonococcal arthritis

1. Early disease: fever, rash,tenosynovitis (inflammation and swelling of a tendon especially of hands, wrists), polyarthralgia resulting from non-suppurative arthritis.
2. Late disease: monoarticular, suppurative arthritis.

- —Non-gonococcal arthritis:

1. Monoarticular suppurative arthritis ( knee, wrist most common),fever, pain, limitation of joint movement, swollen and tender joint, joint effusion, limited range of movement.

- —Sternoclavecular or Sacroilliac joint pain in IV drug users( commonly P.aeruginosa).
- —Immunocommpromized hosts: disseminated fungal or mycobacterial disease may present as septic arthritis.

## Treatment:

Arthrocentesis with drainage of infected synovial fluid.

Occasionally arthroscopic or surgical drainage.

**Antimicrobial therapy:**

- **Gonococcal arthritis**: IV Ceftriaxone ( or Ciprofloxacin or Ofloxacin) then switch to oral Quinolone or Cefixime for 7-10 days.
- **Non Gonococcal arthritis**:

1. **MSSA**:Nafcillin or Cefazolin
2. **MRSA**: Vancomycin
3. **Streptococci**: Penicillin or Ceftriaxone or Cefazolin
4. **Enterobacteriaceae**: Ceftriaxone or Fluoroquinolone
5. **Pseudomonas**: Piperacillin and Aminoglycoside
6. **Animal** bite : Ampicillin-Sulbactam

- **—Lyme disease arthritis**: Doxycycline for 1 month.

# Prognosis & Complications:

- Gonococcal arthritis has an excellent outcome
- Non Gonococcal arthritis may result in scarring with limitation of movement,
  ambulation is affected in half of the cases.

**Risk factors:** Age, prior rheumatoid arthritis, poly-articular joint involvement, hip or shoulder involvement, virulent pathogens and delayed initiation or response to therapy.

# Infections of Joint Prosthesis

-1-5% of total joint replacement.

-Most infections occurs within 5 years of joint replacement.

-Often caused by skin flora

-Diagnostic aspiration of joint fluid necessary

-Result in significant morbidity and health care costs.

-Successful outcomes results from multidisciplinary approach.

# Etiology, Epidemiology & Risk factors

-Results from contamination during surgery or postoperative. wound infection adjacent to the prosthesis.

-Factors delay healing ( hematoma, ischemia)

-**Occasionally result from bacteremia**

-Prosthesis & bone cement predispose to infection

-Occurs at the prosthesis-bone interface

-Bacteria adhere to biomaterials and develop a biofilm that protect them from host defenses and antimicrobial agents.

-Mostly caused by coagulase negative staph., or *S.aureus*.

-Occasional pathogens: streptococci, enterococci ,and anaerobes

-Usually single pathogen ,occasionally polymicrobial

## —Risk factors:

H/O superficial wound infection, post surgical complications, underlying illness, any source of bacteremia.

## Differential diagnosis:

Aseptic loosening or dislocation of prosthetic joint

Prosthetic debris induced cynovitis & hemarthrosis

## Patient Presentation:

-Subacute onset

-*S.aureus*, streptococci,Gram negative rods can cause acute ,rapidly progressive infection

-Joint pain ,swelling most common

-Fever with acute ,early postsurgical infections

-Cellulitis, cutaneous wound, or discharging sinus overlying the joint.

## Diagnosis of Prosthetic Arthritis

-Aspiration & surgical exploration to obtain specimen for culture & sensitivity testing & histopathology.

-Skin flora regarded as pathogens if isolated from multiple deep tissue cultures.

-Plain X-ray may not be helpful

-**Arthrography** may help define sinus tracts

-Bone scan-not specific  for infection

-ESR and C-reactive protein( CRP ) may be high.

# Treatment & Management

-Surgical debridement and prolonged antimicrobial therapy

-Surgery: removal of prosthesis

-Antibiotic –impregnated cement during re-implantation

-Antimicrobial for 6 weeks:

-Begin empiric IV antibiotic to cover MRSA and Gram negative rods ( Vancomycin+ Cefepime, Ciprofloxacin, or Aminoglycoside)

-Chronic therapy with oral drug if removal of prosthesis not possible.

# Summary

★ The most common cause of osteomyelitis is **Staphylococcus aureus**.

★ We have to differentiate between TB and Brucella Bacteria, **Brucella** ( from contacting with animals ), cause **TB** have a lot of complications such as respiratory problems.

★ streptococci (**group A**), H.influenzae in [ **children** ], and streptococci (**group B**), E.coli in [ **infants** ].

★ Infections of Joint Prosthesis is often caused by **skin flora.**

★ The pathogen may be transported by:

-Hematogenous route (**blood stream**)
-Contiguous soft tissue focus e.g. **open fracture**
-Association with peripheral vascular disease e.g.**diabetes**.

★ Common cause of sickle cell disease is **salmonella and streptococcus pneumoniae**.(the most important note)

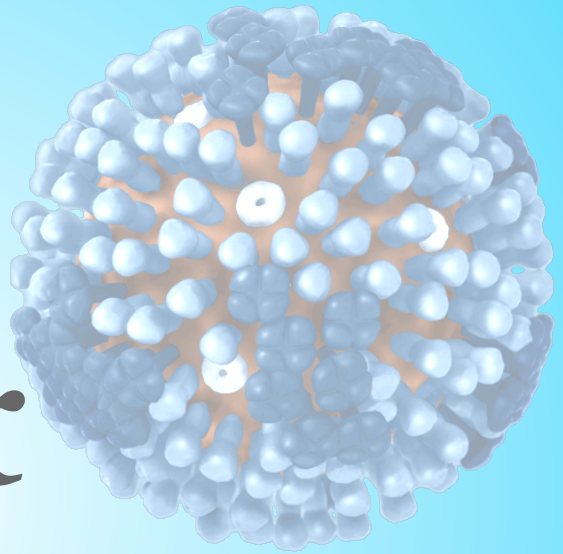
# Useful Videos

## Acute and chronic osteomyelitis

http://www.youtube.com/watch?v=kaqwrlYacxc

## Arthritis

http://www.youtube.com/watch?v=fdgCRYV2aZM

# *Good Luck*

Done by:

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