

Lecture 3



Microbiology of Bone and Joint Infections

- Additional Notes
- Important
- Explanation
- Examples

OBJECTIVES:

- To know about acute osteomyelitis and its etiology, diagnosis and treatment.
- To know about chronic osteomyelitis and its etiology, diagnosis and treatment.
- To know about arthritis and its etiology, diagnosis and treatment.
- To know about joint prosthesis infections.

Introduction

- Bone and joint infections may exist separately or together.
- Both are more common in **infants and children**.
- They're usually caused by **blood transport**, but may result from **local trauma** or **contiguous soft tissue infections** such as: contaminated open fracture.
- It is often associated with foreign body at the primary wound site.
- If it's not treated it may lead to devastating effects.



Fig. 5. Skier's thumb. The proximal phalanx of the thumb. Right thumb with proximal phalanx locking.

Acute Osteomyelitis

- It is an acute infectious process of the bone and bone marrow.
- Site: **metaphysis** of long bones
- **Septic arthritis** is an infection occurs in **diaphysis**
- 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, vasculitis.**
- It may have a short duration or may last several weeks to months.⁽¹⁾
- Primary hematogenous is most common in **infants and children.**
- In adults may occur due to reactivation of a quiescent focus of infection.
- The most common cause of osteomyelitis is **Staphylococcus aureus.**
- **However** there might be other causes such as: **streptococci (group A), H.influenzae⁽²⁾ in children, and streptococci (group B), E.coli⁽³⁾ in infants.**

⁽¹⁾Short duration if it was hematogenously acquired. Long duration if it was secondary infection.

⁽²⁾Haemophilus influenzae ⁽³⁾Escherichia coli.

- There are special cases such as:
 - ✓ In fist injuries, diabetic foot and decubitus ulcers **streptococci** and **anaerobes** will be the cause.
 - ✓ In sickle cell patients **Salmonella** or **streptococcus pneumoniae** will be the cause⁽¹⁾.
 - ✓ In AIDS patients **MTB⁽²⁾** or **mycobacterium avium** will be the cause.
- Diagnosis:
 - ✓ Blood culture because **patients usually have bacteremia**.
- Imaging: X-ray, MRI or CT-Scan
- Treatment:
 - ✓ MSSA methicillin sensitive S.aureus: Cloxacillin or Clindamycin
 - ✓ MRSA methicillin resistant S.aureus: Vancomycin for few day by injection followed by Clindamycin, Linezolid or TMP-SMX⁽³⁾.
 - ✓ Polymicrobial infection “diabetec patients”: Piperacillin-Tazobactam or Quinolone with Metronidazole.

⁽¹⁾Sometimes we diagnose the patients with sickle cell due to osteomyelitis caused by Salmonella.

⁽²⁾Mycobacterium tuberculosis ⁽³⁾Trimethoprim Sulfamethoxazole

Chronic Osteomyelitis

- It is a chronic infection of the bone and bone marrow, it is usually **secondary** to acute osteomyelitis.
 - Hematological spread is **rare**.
 - Management is difficult, may not be completely cured.
 - Most infections are secondary to a contiguous focus or peripheral vascular disease.
- “diabetes and vasculitis patients commonly can have chronic osteomyelitis”**
- Always remember TB and fungal osteomyelitis clinically have indolent “chronic” course.
 - The most common pathogen is **Staphylococcus aureus**.
 - However there are other organisms such as: **Staphylococcus epidermidis, Enterococci, Streptococci, Enterobacteriaceae, Pseudomonas & Anaerobes**.
 - Polymicrobial infection is common with decubitus ulcers & diabetic foot infections

- Mycobacterium and fungi may be seen in immunosuppressed patients.
- MTB osteomyelitis is caused as secondary infection due to primary focus in the lung. “especially in osteomyelitis in the spine”
- TB & Brucella are common in Saudi Arabia.
- Hematogenous osteomyelitis can occur due to fungi e.g. Candida spp., Aspergillus spp.
- Diagnosis:
 - ✓ Blood culture is not very helpful because bacteremia is rare.
 - ✓ WBC normal, ESR elevated but not specific.
 - ✓ Radiologic changes complicated by the presence of bony abnormalities
 - ✓ MRI is the most helpful method for diagnosis and evaluation of extent of disease.

■ Treatment:

- ✓ Surgical debridement with antibiotic therapy.
- “Parenteral antibiotics for 3-6 weeks → long term oral suppressive therapy
- ✓ Some patients may require life long antibiotics.
- ✓ MSSA methicillin sensitive S.aureus: Cloxacillin
- ✓ MRSA methicillin resistance S.aureus & S.epidermidis : Vancomycin followed by oral Clindamycin or TMP-SMX⁽¹⁾
- ✓ MTB: we use 4 drugs: INH⁽²⁾, RIF⁽³⁾, Pyrazinamide & Ethambutol for 2 months → RIF⁽³⁾ & INH⁽²⁾ for other 4 months “so total would be 6 months of treatment”
- ✓ Brucella: Tetracycline and RIF for 2 – 3 months.
- ✓ Other bacteria: Treated as acute osteomyelitis.

⁽¹⁾Trimethoprim Sulfamethoxazole

⁽²⁾Isoniazid

⁽³⁾Rifampicin

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:
 - ✓ 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, tenosynovitis, fever, skin lesions.
 - If it's not treated it will lead to suppurative monoarthritis.
 - ✓ Nongonococcal infection:
 - Occurs in older adults
 - It results from introduction of organisms into joint space as a result of bacteremia or fungemia.

- Causes:
 - ✓ Direct trauma, procedure “arthroscopy” or contiguous soft tissue infection
 - ✓ **Staphylococcus aureus is the most common cause.**
 - ✓ Streptococci and aerobic gram negative bacilli
 - ✓ Lyme disease in endemic areas. “not common in Saudi Arabia”
 - ✓ Salmonella in sickle cell patients. “such as osteomyelitis”
 - ✓ MTB or fungi in chronic arthritis. “such as chronic osteomyelitis”
- Diagnosis:
 - ✓ History & examination
 - ✓ Arthrocentesis⁽¹⁾:
 - Synovial fluid will be cloudy and purulent.
 - Leukocyte count is high
 - Gram stain positive in most cases
 - Exclude crystal deposition arthritis or noninfectious inflammatory arthritis.
 - ✓ Blood culture indicated
 - ✓ If gonococcal infection: take specimen from cervix, urethra, rectum & pharynx for culture of **Neisseria gonorrhoeae**.
 - ✓ Culture of joint fluid and skin lesions also indicated.

⁽¹⁾A procedure whereby a sterile needle and syringes are used to drain fluid from the joint.

■ Treatment:

- ✓ Arthrocentesis with drainage of infected synovial fluid.
- ✓ Occasionally arthroscopic or surgical drainage.
- ✓ Antimicrobial therapy:
 - Gonococcal arthritis: IV Ceftriaxone oral Quinolone or Cefixime for 7-10 days.
 - Nongonococcal arthritis:
 - MSSA: Cloxacillin or Cefazolin
 - MRSA: Vancomycin
 - Streptococci: Penicillin or Ceftriaxone or Cefazolin
 - Enterobacteriaceae: Ceftriaxone or Fluroquinolone.
 - Pseudomonas: Piperacillin & Aminoglycoside
 - Animal Bite: Ampicillin-Sulbactam
 - Lyme disease arthritis: Doxycycline for 1 month

■ Prognosis & Complications:

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

■ Risk factors: Age, Rheumatoid arthritis, polyarticular joint involvement, virulent pathogens

Infections of Joint Prosthesis⁽¹⁾

- Occurs in 1-5% of total joint replacement, within 5 years of joint replacement.
- Often caused by **skin flora**.
- Result in significant morbidity and health care costs.
- Diagnosis:
 - ✓ Aspiration & surgical exploration
 - ✓ Skin flora regarded as pathogens if isolated.
 - ✓ Arthrography “**helpful to define sinus tracts**”
 - ✓ ESR & C-reactive protein “CRP” may be high.
 - ✓ X-ray may not be helpful
- Treatment:
 - ✓ Surgery: removal of prosthesis
 - ✓ Antimicrobial for 6 weeks:
 - Begin empiric IV antibiotic to cover MRSA & gram negative rods.
 - ✓ Chronic therapy with oral drug if removal of prosthesis was not possible.

⁽¹⁾An artificial joint.

Quiz

1. The most common cause of osteomyelitis & arthritis is:
a) S.aureus b) Streptococci c) S.epidermidis

2. In sickle cell patients osteomyelitis will be caused by:
a) Brucella b) MTB c) Salmonella

3. have indolent “chronic” course
a) Salmonella & S.aureus b) MTB & Fungi c) MTB