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MEDICINE
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Lecture :
Microbiology of Bone and Joint Infections

important
Extra notes
Doctors notes

"لا حول ولا قوة إلا بالله العلي العظيم" وتقال هذه الجملة إذا دهم الإنسان أمر عظيم لا يستطيعه ، أو يصعب عليه القيام به .

Objectives:

1. Define osteomyelitis and arthritis
2. Know that the two conditions can happen together or separately.
3. Differentiate between acute and chronic osteomyelitis and arthritis
4. Know the pathogenesis and risk factors of both osteomyelitis and arthritis
5. Realize that bone and joint infections can be acquired through blood or directly from adjacent affected organs and tissues.
6. Know the commonest causative agents of arthritis and osteomyelitis.
7. Know the laboratory diagnosis and investigation of both conditions.
8. 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
  - 1- **blood borne spread** المنتقله عن طريق الدم , but can result from
  - 2- **local trauma** or spread from
  - 3- **contiguous** التيشيو الملاصق او القريب **soft tissue infection.**
- Often associated with **foreign body** at the primary wound site.
- If not treated lead to devastating effect

- Note: Bacteremia is presence of bacteria in the blood.

What is Acute Osteomyelitis:

Definition:

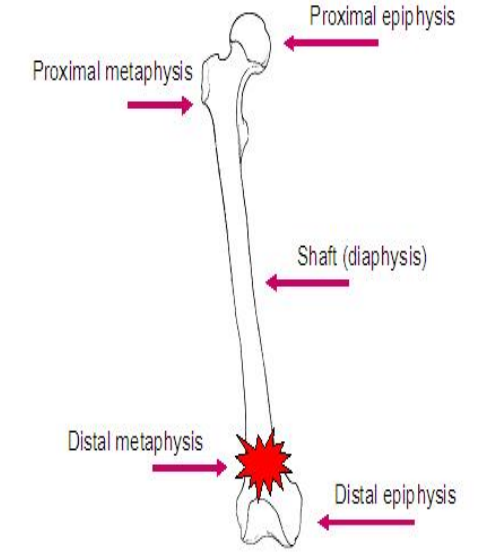
- Acute osteomyelitis is acute **infectious** process of the **bone and bone marrow** .

Duration:

- **1) a short duration**
  - few days for hematogenously* (also called primary) acquired infection
- **2) last several weeks to months**
  - if secondary to contiguous focus* of infection

- In association with peripheral vascular disease (**chronic disease**)
  - diabetes mellitus ,severe atherosclerosis, vasculitis

Most commonly in metaphysis



* عن طريق الدم

* Relapseرجوع المرض can occur if only osteomyelitis is treated without treating the surrounding tissue infection (focus)

How they reach	Risk Group	
Primary Hematogenous route **site:(Metaphysis of long bones)**	Children and infants common Adult less common (may occur due to reactivation of a quiescent (خامد)focus of infection from infancy or childhood)** -most cases are due to S.AUREUS -S. Aureus septic arthritis (begins in the diaphysis) -Vertebral- GU infection -Candida –Venous Catheter	**Infant :** S.aureus, group B streptococci , gram –ve rods like E.coli.
		Children: S.aureus, group A streptococci, H.influenzae.
Contiguous soft tissue focus	**Post operative** infection, **contaminated** open fracture, soft tissue infection , puncture wounds	Gram positive cocci, Gram negative bacilli, anaerobes, and poly-microbial infection.
Special clinical situations	**Prosthesis (أعضاء صناعية)**	**Coagulas -negative staphylococci, and corynebacterium** (normal flora of skin) Propionebacterium, and S.aureus in foreign body infections
	Nosocomial infections **(hospital acquired infection)** and IV drug use	Enterobacteriacea and Pseudomonas
	Fist injuries, and diabetic foot and dicubitus ulcers,	Streptococci ,, anaerobes
	in sickle cell patients	a.Aureus , Salmonella or S. **pneumoniae**
	Human/ animal bites;	Eikenella, Pasturella multocida
	AIDS. **Mostly chronic**	M.tuberculosis or M. avium (Mycobacterium tuberculosis (MTB) or Mycobacterium avium)
	Infection after trauma ,injury or surgery	S.aureus, group A Streptococcus,Gram negative rods, anaerobes.

-RED: very important,Make sure you know it all.- The rest: give it a quick read and focus on the underlined.

**معناه شخص أصيب بانفكشن و هو صغير ورجعت له لمن كبر

What is Acute Osteomyelitis:

- **Patient presentation**:
  - ✓ Systemic manifestations occurs in less than 50% of patients.
  - ✓ Acute osteomyelitis usually of abrupt مفاجئonset
  - ✓ Acute onset of bone pain, fever with rigors and diaphoresis تعرق غزير .
  - ✓ 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.

- **Clinical presentation & blood tests:**
  - ✓ Acute osteomyelitis usually of abrupt onset
  - ✓ fever
  - ✓ localized pain , heat , swelling
  - ✓ Tenderness of affected site
  - ✓ (one or more bones or joints affected in hematogenous spread).
  - ✓ May be local tissue infection (abscess or wound) .
  - ✓ Blood test: leukocytosis, high ESR and C-reactive protein.

- **Differential diagnosis:**
  - ✓ Primary and metastatic bone malignancies
  - ✓ Trauma
  - ✓ Acute rheumatic arthritis
  - ✓ Hemarthrosis
  - ✓ Ewing sarcoma
  - ✓ Vertebral compression fracture.

What is Acute Osteomyelitis:

Diagnosis	
Laboratory	Radiological
• CBC (Count Blood Cell): Leukocytosis may or may not occur • Erythrocyte sedimentation rate (ESR) elevated, but could be normal as well (not specific).	• X-ray : normal early in disease, soft tissue swelling , subperiosteal elevation seen early and Bone destruction changes seen by 2-4 weeks
• Blood culture. • Aspiration of overlying abscess "Biopsy" if blood cultures are negative, and it's most specific.	• MRI highly sensitive & specific, preferred for vertebral osteomyelitis and cases associated with contiguous foci of infection or peripheral vascular disease.
	• CT Scan used as alternative of MRI.
	• Technetium bone scan, Gallium and Indium-111 labelled WBC scan* (detection within 3 days of onset). Maximum effect to rule out osteomyelitis.

*Indium-111 labelled WBC scan:
Also called "indium scan", it's a nuclear medicine procedure in which while blood cells (mostly neutrophils) are removed from the patient, tagged معلم بعلامةwith the radioisotope (نظائر مشعة) Indium-111, and then injected intravenously back into the patient. The tagged leukocytes subsequently localize to areas of relatively new infection.

What is Acute Osteomyelitis:

Organisms	Antibiotics	Duration/Surgery/complication and follow up
Methicillin sensitive (MSSA) Ex: *Staph.aureus*	Cloxacillin, cefazolin or Clindamycin .	• Early treatment is critical • **Treat for 2-4 weeks parenteral (I.V) followed by oral therapy for a total of at least 6 weeks**. • **Surgery for neurological complications, para-vertebral abscess & hip joint involvement**. • 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.
Methicillin resistant(MRSA) Ex: *Staph.aureus*	**Vancomycin followed by Clindamycin**, Linezolid, or TMP-SMX (cannot use Beta-Lactam antibiotics)	
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	

*more than one organsm

Chronic Osteomyelitis:

- A chronic infection of the bone and bone marrow usually secondary to inadequately treated or relapse of acute osteomyelitis.
- Has to be managed carefully, **sometimes it is very difficult to handle**
- Very long chronic disease (May recur many years, decades, after initial episode.)
- ★ Majority of them are coming from other site, majority of patients have vascular disease
- ★ TB and Fungal are common causes

- Risk Factors:

1. Penetrating trauma
2. Prosthetic devices
3. Animal bites
4. IV drug use

- Host Risk Factors:

1. Peripheral vascular disease
2. Peripheral neuropathy
3. Sickle cell disease
4. Diabetes mellitus
5. Immunocompromised states.

If the infection tacking long time to heal , Always remember TB epically in elderly and immune compromised patient

Chronic Osteomyelitis:

- Causative Agents:

The most common pathogen	**Other microorganisms**	**Decubitus ulcers and diabetic foot infections.**
S.aureus	S.epidermidis,enterococci,streptococci,Enterobactericae,Pseudomonas, Acinetobacter spp., anaerobes (Bacteroides, anaerobic streptococci, Clostridium)	Polymicrobial infection common

Chronic Osteomyelitis: Clinical presentation and DD:

- **Patient Presentation:**
  - Acute symptoms and systemic manifestations are **uncommon**.
  - **Sinus tract**
  - **Persistent wound drainage**
  - Chronic **non-healing ulcer**
  - Local signs may be absent except during acute exacerbation.
  - Overlying skin may be scarred and adherent to the involved bone.
- **Differential Diagnosis**
  - Osteoid osteoma
  - Osteosarcoma
  - Secondary bony metastases
  - Paget's disease of the bone
  - Gout

Chronic Osteomyelitis:

- In **immunosuppressed** patients:

1. **Mycobacteria Tuberculosis (MTB)**
   - **MTB osteomyelitis** (may be seen in immunosuppressed patient)
   - **Primarily** results from **hemtogenous spread** from **lung** foci
   - Or, as an extension from a **caseating lymph bone** (50% in spine). It resembles **Brucella oesteomyelitis .**
   - **TB & Brucella are common in KSA.**

2. **Fungi**
   - **Hematogenous osteomyelitis due to fungi** eg.
     - *Candida* spp.,
     - *Histoplasma*
     - *capsulatum,*
     - *Aspergillus* spp
     - Other fungi may occur.

Chronic Osteomyelitis: **Diagnosis**

1-Laboratory

- WBC normal, ESR elevated but not specific.
- **Blood culture not very helpful**- because as **bacteremia rare.**
- **Definite microbiological diagnosis** by culture of **bone biopsy** or FNA & Histological examination
- **Surgery for diagnosis and therapeutic purposes**
- Wound /sinus culture not reliable. Isolation of MRSA or vancomycin resistant enterococci should initiate infection control measures.

2-Radiological

- Radiologic changes complicated by the presence of bony abnormalities
- **MRI helpful for diagnosis and evaluation of extent of disease.**
- **Combined** bone scan and Indium WBC scan.

Chronic Osteomyelitis: Treatment and Management

1-Surgical

- Extensive surgical **debridement** with **antibiotic therapy**. **Parenteral** antibiotics for **3-6 weeks** followed by **long term oral** suppressive therapy.
- Some patients may require life long antibiotic ,others for acute exacerbations.
- Other bacteria treat as acute osteomyelitis.

2-Medical

Organisms	Antibiotics
MSSA:	parenteral cloxacillin followed by oral treatment
MRSA & S.epidermidis:	Vancomycin (with added Rifampicin) then oral Clindamycin or TMP-SMX.
TB	4 drugs : INH,RIF ,Pyrazinamide & Ethambutol for 2 ms followed by RIF + INH for additional 4 ms.
Brucella	with Tetracycline and Rifampicin for 2 to 3 months.

Chronic Osteomyelitis: Complications & Prognosis

- **Complications:**
  - Recurrence
  - Loss of limb
  - Pathological fractures
  - Primary epidermoid carcinoma of sinus tract
  - Malignant histocytoma
  - Secondary amyloidosis
  - Lymphoma & multiple myeloma(rare)

- **Prognosis:**
  - Relapses are frequent

Doctor's nots:

You should memorize: the method, drug, major clinical presentation and Two complication

Septic Arthritis:

Defenition :

- **Septic (Infectious) Arthritis** is 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.

Symptoms:

- Pain, swelling, limitation of movement common symptoms

Pathophysiology:

- Results from introduction of organisms into joint space as a results of bacteremia or fungemia from infection at other body sites.
- Occasionally results from direct trauma, procedures (arthroscopy) or from contiguous soft tissue infection.

Risk factors:

Age – Diabetes – Immunosuppresion - IV drug use - CV catheters - Prior joint damage (rheumatoid arthritis) or procedure (arthroscopy) - H/O sexually transmitted diseases.

Septic Arthritis: Etiology

-Other Organisms :

- Streptococci and aerobic Gram negative bacilli.
- **Lyme disease** due to tick bite in endemic areas uncommon in ksa.
- Chronic arthritis may be due to MTB or fungi in Immunocopramized
- IV drug user Sternoclavecular or Sacroilliac due to P.aeruginosa

-Common Organisms:

- S.aureus is most common cause.

-Common causes of septic arthritis:

Age/special conditions	Common organism
Neonates	S.aureus, group B streptococcus, Gram negative rods.
Infants /children	S.aureus, group A streptococcus, S.pneumoniae, H. influenzae type b
Adults	S.aureus, Neisseria gonorrheae
Sickle cell disease	Salmonella species, S.aureus
Trauma /surgical procedure	S.aureus
Chronic arthritis	MTB, Fungi
Prosthetic arthritis	Skin flora

Septic Arthritis: Types:

1. Gonococcal arthritis:

- **Gonococcal infection most common cause in young, sexually active adults**
- Caused by ***Neisseria gonorrheae*** leads to disseminated infection secondary to urethritis in men /cervicitis in women.

- **Early diseas**: Initially present with polyarthralgia, tenosynovitis(especially of **hands** and **wrist**) , fever, skin lesions resulting from NON-suppurative arthritis.
- **Late disease**: If untreated leads to suppurative monoarthritis.

2. Non-gonococcal arthritis

- **Nongonococcal arthritis occurs in older adults. Results from introduction of organisms into joint space as a results of bacteremia or fungaemia from infection at other body sites.**
- Monoarthicular suppurative Arthritis
- **Knee** and **wrist** are the most common, **fever and pain**
- Swollen and tender join with Joint effusion and limitation of joint movement.

Septic Arthritis:

Diagnosis:

- by arthocentesis to obtain synovial fluid for analysis Gram stain, culture & sensitivity
- History/examination to exclude systemic illness. Note H/O tick exposure in endemic areas and sexual contact.

Differential Diagnosis:

- Crystal –induced arthritis
  Gout, pseudogout
- Noninfectious inflammatory arthritis
  Acute rheumatoid arthritis
- Reactive arthritis
  Reiter syndrome, acute rheumatic fever
- Trauma
- Viral arthritis
  Parvovirus B19, Hepatitis B virus.

Samples	Tests
Arthrocentesis should be done as soon as possible;	1. Synovial fluid is cloudy and purulent 2. Leukocyte count generally > 50,000/mm3,with > 75 % PMN 3. Gram stain and culture are positive in >90% of cases 4. Exclude crystal deposition arthritis or noninfectious inflammatory arthritis.
Blood cultures - Culture of skin lesions can be performed and joint fluid	indicated
Cervix, urethra, rectum & pharynx Swab or urine	If gonococcal infection : suspected for N.gonorrheae for culture and DNA testing for N.gonorrheae.
Skin Rash	Can be culture

Septic Arthritis: Treatment & Management

- **Treatment:** Drainage & antimicrobial therapy important management.

✓ Arthrocentesis with drainage of infected synovial fluid.
✓ Repeated therapeutic Arthrocentesis often needed Occasionally, arthroscopic or surgical drainage/debridement
✓ Antimicrobial therapy should be directed at the suspected organism and susceptibility **results:**

Nongonococcal infectiuos arthritis:	Gonococcal arthritis:
1. MSSA: Cloxacillin or Cefazolin 2. MRSA: Vancomycin 3. Streptococci: Penicillin or Ceftriaxone or Cefazolin 4. Enterobacetriacae: Ceftriaxone or Fluroquinolone 5. Pesudomonas: Piperacillin and Aminoglycoside 6. Animal bite : Ampicillin-Sulbactam 7. Lyme disease arthritis: Doxycycline for 1 month.	• IV Ceftriaxone (or Ciprofloxacin or Ofloxacin) then switch to oral Quinolone or Cefixime for 7-10 days.

✓ Change the antibiotics according to sensitivity, Arthrocentesis can repeated and Surgery rarely required

Septic Arthritis: Prognosis & Complications

- **Prognosis:**
  - **Gonococcal** arthritis has an **excellent** outcome
  - Risk factors for long –term adverse sequellae include:
    - ✓ Age
    - ✓ Prior rheumatoid arthritis
    - ✓ Poly-articular joint involvement
    - ✓ Hip or shoulder involvement
    - ✓ Virulent pathogens
    - ✓ Delayed initiation or response to therapy
- **Complications:**
  - **Non-gonococcal** arthritis: can result in scarring with limitation of movement, ambulation is affected in 50% of cases.

Infections of Joint Prosthesis:

- Occur in 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.

- **Risk factors**:
  - ✓ history of 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

Infections of Joint Prosthesis:

- **Etiology:**
  - ✓ Results from **contamination during surgery** or post op. 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**

- **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.

Infections of Joint Prosthesis:

- **Diagnosis of Prosthetic Arthritis:**
  - ESR and C-reactive protein(CRP) may be high.
  - 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

- **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.

	Definition	Pathogenesis (Risk factors and etiology)	Diagnosis	Treatment	Epidemiology
Acute osteomyelitis	It is an acute infectious process of the bone and bone marrow. Found in the Metaphysis of long bones	They could be affected by: - Hematogenous route - Contiguous soft tissue focus: • Postoperative (after surgery) • Infection. • Contaminated open fracture. • Soft tissue infection. • Puncture wounds. - Peripheral vascular disease: • Diabetes mellitus. • Severe atherosclerosis. • Vasculitis.	Could be done by: 1. Blood culture. 2. Aspiration.	➢ MSSA: - Cloxacillin - Clindamycin. ➢ MRSA: - Vancomycin - Clindamycin, - Linezolid - TMP-SMX. ➢ Polymicrobial infection: - Piperacillin-Tazobactam - Quinolone with Metronidazole.	Primary hematogenous is most common in infants & children. But in adults, hematogenous cases less common, but may occur due to reactivation of a inactive infection from infancy or childhood. Most cases are due to *S.aureus*.
Chronic osteomyelitis	**It is a chronic infection of the bone and bone marrow usually:** - Secondary to inadequately treated - Relapse of acute osteomyelitis.	**They could be affected by:** - S.aureus is the most common pathogen, other microorganisms: • S.epidermidis • Enterococci • Streptococci - Polymicrobial infection - Mycobacteria and fungi - TB & Brucella - Hematogenous osteomyelitis - Hematological spread "rare"	**Could be done by:** 1.**Blood culture "not helpful"** 2.**Or:** • WBC "normal" • ESR "not specific" • Radiologic "good" • MRI "the best"	➢ **Surgical:** - With antibiotic therapy ➢ **Long life antibiotic** ➢ **MSSA: Cloxacillin** ➢ **MRSA & S.epidermidis:** - Vancomycin then oral Clindamycin - TMP-SMX ➢ **Other bacteria: treat as acute oesteomyelitis** ➢ **MTB: 4 drugs:** - INH + RIF & Pyrazinamide + Ethambutol - RIF + INH ➢ **Brucella is treated with:** Tetracycline + Rifampicin	**It's may not completely cured, and may recur many years or decades. Also some cases common with other diseases like:** - Decubitus ulcers - Diabetic foot infections - Immunosuppressed **Most cases are due to *S.aureus*.**

Arthritis	Inflammation of the joint space secondary to infection.	**Etiology:** • Staphylococcus aureus (most common cause.) • Direct traumas. • Procedures. (Arthroscopy.) • Contiguous soft tissue infection. • Streptococci and aerobic gram -ve bacilli. • Lyme disease in endemic areas. • Salmonella (in sickle cell patients.) • MTB or fungi. (Mostly causes chronic arthritis. • Neisseria gonorrheae. (Common cause of gonococcal arthritis in young people and sexually active adults.) • Bacteremia or fungemia. (Causes nongonococcal arthritis in older adults.) Risk factors: • Age. • Rheumatoid arthritis. • Particular joint involvement. • Virulent pathogens. • Delayed response to therapy.	• History examination (to exclude systemic illness.) • Arthrocentesis. • Blood cultures indications. • Specimen from cervix, urethra, rectum and pharynx for culture DNA testing for N.gonorrheae. (only if gonococcal infection is suspected.)	• Arthrocentesis, (with drainage of infected synovial fluid.) • Repeated therapeutic arthrocentesis. • Arthroscopic or surgical drainage. • Antimicrobial therapy for gonococcal and nongonococcal arthritis.	Gonococcal arthritis: Excellent outcome. Nongonococcal arthritis: -Scarring. -Limitation of movement. -Ambulation is affected (in 50% of the cases.)
Infections of Prosthetic arthritis	Infections that occur after join replacement	**Etiology** • 5 years of joint replacement • Skin flora **Risk factors (Not mentioned in the slides)** • Diabetes mellitus • Obesity • The incidence of infection following arthroplasty revision surgery is higher than that in primary implanattion	• 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.	• **Surgical debridement** and prolonged antimicrobial therapy • **Surgery**: removal of prosthesis • **Antibiotic** • **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 <u>if removal</u>** of prosthesis **<u>not possible.</u>**	• Occurs in 1 - 5 % of total joint replacement. • Result in significant morbidity and health care costs. • Successful outcomes result from multidisciplinary approach.

SAQ:

26 years old male with urethritis came with polyarthralgia, fever and skin rash. After taking his history, we found that he traveled to southern east Asia two weeks ago and he had sexual contact. And the blood culture indicates Gram Negative diplococci Bacteria.

Q1: What is the most likely Diagnose in this case?

It could be Gonococcal arthritis (septic Arthritis)

Q2: What is the most likely organism can cause that?

Neisseria gonorrhea bacteria.

Q3: Blood culture is one of the samples that we can take it for diagnosis, list three samples we can take it also in this case?

Arthrocentesis (Synovial fluid) / Culture of skin lesions / Cervix, urethra, rectum Swab / urine

Q4: List three tests will help us in this case?

Synovial fluid / DNA testing for N.gonorrheae / Gram stain / Leukocyte count.

Q5: What is the prognosis in this case?

Gonococcal arthritis has an excellent outcome especially with early stage of this disease.

Q6: What is the treatment & management we recommend in this case?

- IV Ceftriaxone (or Ciprofloxacin or Ofloxacin)
- Then switch to oral Quinolone or Cefixime for 7-10 days.

*zoom to see the answers ;)

Did you study well ? https://www.onlineexambuilder.com/micro-3/exam-122235

SAQ:

Q1: : List some Complications of Chronic Osteomyelitis?

Recurrence / Loss of limb / Pathological fractures Secondary amyloidosis
May develop cancer such as (Malignant histiocytoma / Lymphoma & multiple myelomas)

Q2: List two type osteomyelitis may have indolent “chronic” course?

TB osteomyelitis / fungal osteomyelitis

Q3: How can Mycobacteria Tuberculosis develop into chronic osteomyelitis?

Either Primarily results from hematogenous spread from lung foci
Or As an extension from a caseating lymph bone.

Q4: List some Antibiotics we can use it to treat TB?

Pyrazinamide & Ethambutol for 2 months
followed by Rifampicin(RIF) + Isoniazid (INH) for additional 4 months.

Q5: Infections of Joint Prosthesis Mostly caused by?

coagulase positive staph (S.aureus) / coagulase negative staph (S.epidermidis).

Q6: List Some organism can cause Acute osteomyelitis in infant?

S.Aureus / group B streptococci / E.coli.

Q7: List some Complications of Non-Gonococcal arthritis?

scarring with limitation of movement.
In 50% of cases, ambulation can occur.

GOOD LUCK!

MICROBIOLOGY TEAM:

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