

Microbiology Team

430

2nd Lecture

Microbiology of Bone and Joint Infections

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Introduction

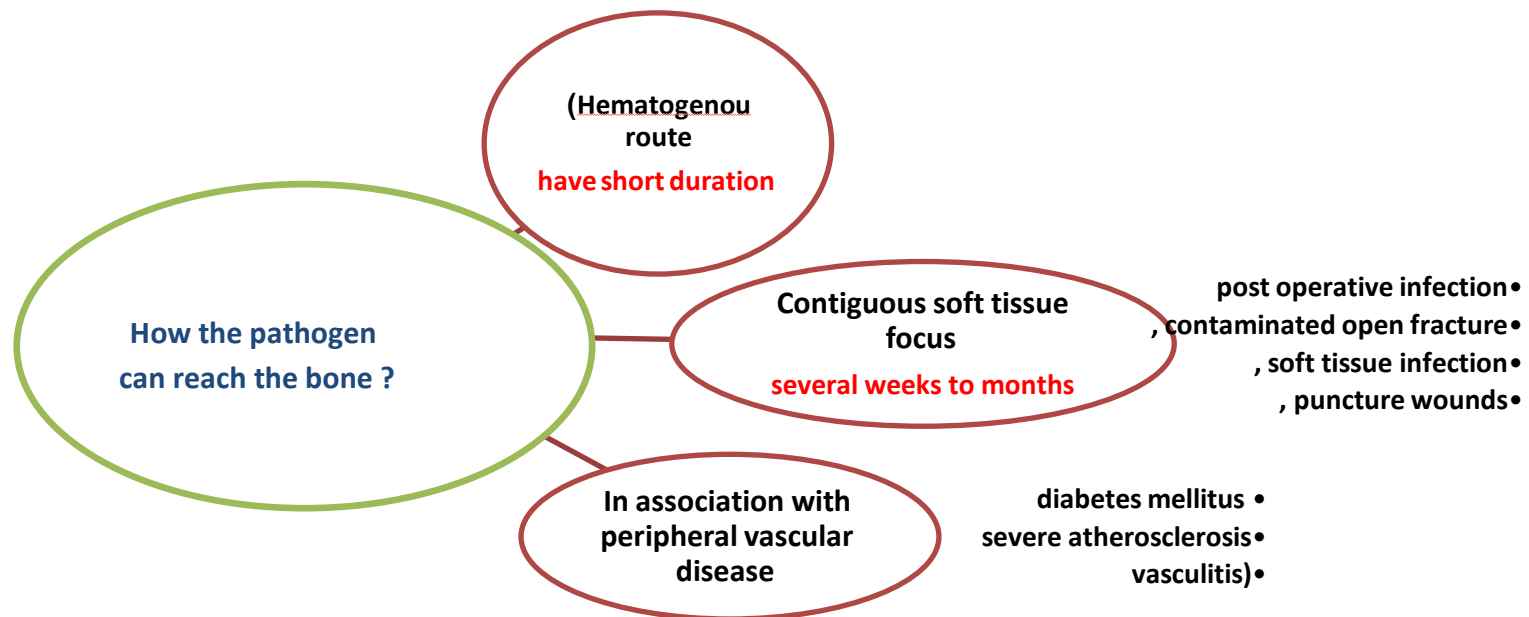
- a. Bone & joint infections may exist separately or together.
- b. Both are more common in infants and children
- c. Usually caused by:
 - local trauma
 - by blood borne spread(: blood which transfer from person that infected to another one)
 - Contiguous soft tissue infection(: this infection transfer from tissue that get infected to normal tissue
- d. Often associated with foreign body at the primary wound site.
- e. If not treated lead to devastating effect (be worse)

Note : which written in red , green color are very important

Terminology:

- **blood borne** : blood which transfer from person that infected to another one
- **contiguous soft tissue infection** : this infection transfer from tissue that get infected to normal tissue
- **devastating effect** : be worse
- **UTI** التهاب المسالك البولية
- **Candidemia** is the presence of fungi or yeasts in the blood. It is most commonly caused by Candida
- **in nosocomial infections** people in hospital
- **dicubitus ulcers** تقرحات السرير
- **MRSA** Methicillin-resistant *Staphylococcus aureus*
- **MSSA** Methicillin-sensitive *Staphylococcus aureus*.
- **Debridement** is the medical removal of a patient's dead, damaged, or infected tissue to improve the healing potential of the remaining healthy tissue
- **Infections of Joint Prosthesis** التهابات الأطراف الصناعية
- **Cellulitis** is a diffuse inflammation of connective tissue with severe inflammation of dermal and subcutaneous layers of the skin.
- **Gonorrhea** is a common sexually transmitted infection caused by the bacterium *Neisseria gonorrhoeae*

Acute Osteomyelitis



	Infection	Non infection
Differential diagnosis	<ul style="list-style-type: none"> • Primary and metastatic bone malignancies • Trauma • Acute rheumatic arthritis • Hemarthrosis • Ewing sarcoma (<u>cancer cells are found in the bone or in soft tissue</u>). • Vertebral compression fracture 	<ul style="list-style-type: none"> • Osteoid osteoma (tumor arise from osteoblast) • Osteosarcoma • Secondary bony metastases • Paget's disease of the bone(very common) • Gout(very common)
Diagnosis	<ul style="list-style-type: none"> • Blood culture (<u>very important step</u>) • Leukocytosis (increase wbc) may or may not occur • Erythrocyte sedimentation rate (ESR) elevated, but could be normal as well. • X-ray : normal early in disease(in early stage), • MRI highly sensitive & specific (<u>associated with contiguous foci of infection or peripheral vascular disease</u>) • CT Scan used as alternative of MRI. • Technetium bone scan, Gallium –and Indium -111-labelled WBC scan 	<ul style="list-style-type: none"> • Blood culture not very helpful- because is bacteremia rare. • WBC normal, ESR elevated but not specific. • Radiologic changes complicated by the presence of bony abnormalities • <u>MRI helpful for diagnosis and evaluation of extent of disease.</u> • Combined bone scan and Indium WBC scan. • Wound /sinus culture not reliable. Isolation of MRSA or Vancomycin resistant enterococci should initiate infection control measures

<p>Treatment and management</p>	<ul style="list-style-type: none"> • Appropriate antimicrobial therapy , 2-4 weeks parenteral 6 weeks orally <ul style="list-style-type: none"> ♣ MSSA : Clindamycin, cloxacilin (important) ♣ MSRA : Vancomycin followed by Clindamycin, Linezolid, or TMP-SMX ♣ Polymicrobial infection: Ampicillin-Sulbactam, Piperacillin-Tazobactam or Quinolone with Metronidazole. ♣ <i>S.epidermidis</i>: Vancomycin and Rifampicin ♣ <i>Enterobacteriaceae</i>: Ceftriaxone ♣ Other Gram negative bacilli: Quinolone ♣ <i>P. aeruginosa</i>: Cefepime, Meropenem or Piperacillin +/- Aminoglycoside. ♣ Anaerobes: Metronidazole or Clindamycin • Surgery for: <ul style="list-style-type: none"> • neurological complications, • Paravertebral abscess • hip joint involvement 	<ul style="list-style-type: none"> • 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. • MSSA: parenteral Nafcillin followed by Dicloxacillin • MRSA & <i>S.epidermidis</i>: Vancomycin (with added Rifampicin) then oral Clindamycin or TMP-SMX. • Other bacteria treat as acute osteomyelitis. • TB: 4 drugs : INH,RIF ,Pyrazinamide & Ethambutol for 2 ms followed by RIF + INH for additional 4 ms . (very important) • Surgery for diagnosis and therapeutic purposes.

Complication	<p>— Septicemia, metastatic abscesses, septic arthritis, chronic osteomyelitis, loss of limb, or Paravertebral abscess.</p>	<ul style="list-style-type: none"> • Recurrence • Loss of limb • Pathological fractures • Primary epidermoid carcinoma of sinus tract • Malignant histocytoma • Secondary amyloidosis • Lymphoma & multiple myeloma(rare)
General Risk factor	<p>—</p> <ul style="list-style-type: none"> • Penetrating trauma • Prosthetic devices الأظراف الصناعيه مثلا • Animal bites • IV drug use <p>—</p>	
— Host risk factors:	<ul style="list-style-type: none"> • Peripheral vascular disease • Peripheral neuropathy • Sick cell disease, diabetes mellitus & immunocompromised states. <p>—</p>	
— Symptoms	<ul style="list-style-type: none"> • Fever with rigors and diaphoresis • Pain • & limited mobility of the involved extremity. • Sinus tract, persistent wound drainage or a chronic non-healing ulcer are common presentations 	

<p>— Etiology</p>	<ul style="list-style-type: none"> • Primary Hematogenous is most common in infants & children ♣ Infants: <i>S.aureus</i>, group B streptococci, <i>E.coli</i>. ♣ Children: <i>S.aureus</i>, group A streptococci, <i>H.influenzae</i>. <p>Site : Metaphysis of long bones (femur, tibia, humerus)</p> <ul style="list-style-type: none"> ♣ Adult : Hematogenous cases less common, but may occur due to reactivation of a quiescent focus of infection from infancy or childhood ♣ 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 <ul style="list-style-type: none"> • Contiguous infection: bacteria related to primary focus , it includes: Gram positive cocci, Gram negative bacilli, anaerobes, and poly-microbial infection 	
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	<ul style="list-style-type: none"> • Special clinical situations: <ul style="list-style-type: none"> ♣ in foreign body infections : coagulas -negative staphylococci, <i>Propionebacterium</i>, and <i>S.aureus</i> ♣ in nosocomial infections and IV drug use: <i>Enterobacteriaceae</i> and <i>Pseudomonas</i> ♣ in fist injuries, and diabetic foot and dicubitus ulcers: Streptococci and anaerobes ♣ sickle cell patients (very important) : <i>Salmonella</i> or <i>S. pneumoniae</i> ♣ AIDS: <i>M.tuberculosis</i> or <i>M. avium</i> 	
Some important points	<ul style="list-style-type: none"> • <i>S.aureus</i> is the most common pathogen(very very important) • Polymicrobial infection common with decubitus ulcers and diabetic foot infections • Mycobacteria and fungi may be seen in immunosuppressed patients • Tb brucella are common in ksa specially vertebrea(very important) • Hematogenous osteomyelitis due to fungi eg. <i>Candida</i> spp and <i>Aspergillus</i> • <i>MTB</i> osteomyelitis primarily results from <ul style="list-style-type: none"> ♣ hemtogenous spread from lung foci ♣ or as an extension from a caseating lymph bone (50% in spine) 	<ul style="list-style-type: none"> • Definite microbiological diagnosis by culture of bone biopsy or FNA & Histological examination (very important point)

Arthritis

Definition	Infectious Arthritis is inflammation of the joint space secondary to infection. Hematogenous seeding of joint is most common.
Symptom	Pain Swelling limitation of movement common symptoms
Diagnosis	<ul style="list-style-type: none"> arthrocentesis to obtain synovial fluid for analysis and blood culture (take sample from synovial fluid) Gram stain culture & sensitivity
Treatment	Drainage & antimicrobial therapy important management.
Etiology	<ul style="list-style-type: none"> Gonococcal infection: <ul style="list-style-type: none"> Common cause in young. sexually active adults caused by <i>Neisseria gonorrhoeae</i> leads to disseminated infection (نشر العدوى) secondary to urethritis/cervicitis (very important point) . Initially present with polyarthralgia, tenosynovitis, fever, skin lesion If untreated leads to suppurative monoarthritis Nongonococcal arthritis: <ul style="list-style-type: none"> occurs in older adults Results from introduction of organisms into joint space as a results of bacteremia or Fungemia from infection at other body sites.

<p>Causes</p>	<ul style="list-style-type: none"> • direct trauma • procedures (arthroscopy) • from contiguous soft tissue infection. • <i>S.aureus</i> is most common cause (very important) • Other organisms : streptococci and aerobic Gram negative bacilli (very important) • Lyme disease in endemic areas. • Chronic arthritis may be due to MTB or fungi(TB في حالة شفتو) • (على طول كرونك) • In sickle cell disease and like osteomyelitis is caused by salmonella species • In children less than 3 -4 years invasive Haemophilus influenza causes arthritis and osteomyelitis
<p>Risk factor</p>	<ul style="list-style-type: none"> • age • diabetes • Immunosuppressant • IV drug use • CV catheters • prior joint damage (rheumatoid arthritis) • procedure (arthroscopy) • H/O sexually transmitted disease

Patient Presentation	<ul style="list-style-type: none"> • Gonococcal arthritis <ul style="list-style-type: none"> ♣ Early disease: fever , tenosynovitis (especially of hands, wrists), polyarthralgia resulting from non-suppurative arthritis ♣ Late disease: monoarticular, suppurative arthritis. • Non-Gonococcal arthritis <ul style="list-style-type: none"> ♣ Fever, limitation of joint movement , range of movement., limited
Differential Diagnosis	<ul style="list-style-type: none"> • 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).
Diagnosis of Infectious Arthritis	<ul style="list-style-type: none"> • History/examination to exclude systemic illness. Note H/O tick exposure in endemic areas • Arthrocentesis (aspirate synovial fluid) should be done as soon as possible : <ul style="list-style-type: none"> ♣ Synovial fluid is cloudy and purulent ♣ Leukocyte count generally > 50,000/mm³,with > 75 % PMN ♣ Gram stain and culture are positive in >90% of cases ♣ Exclude crystal deposition arthritis or noninfectious inflammatory arthritis. • Blood cultures indicated • If Gonococcal infection suspected take specimen from cervix, urethra, For culture or DNA testing for <i>N.gonorrhoeae</i>. • Urine may be used for DNA testing also. • Culture of joint fluid, skin lesions and blood culture also indicated

<p>Treatment & Management</p>	<ul style="list-style-type: none"> • Arthrocentesis with drainage of infected synovial fluid. (very important point) • Occasionally, arthroscopic or surgical drainage/debridement • Antimicrobial therapy should be directed at suspected and susceptibility results: <ul style="list-style-type: none"> ♣ Gonococcal arthritis: IV Ceftriaxone then switches to oral Quinolone or Cefixime for 7-10 days. ♣ Nongonococcal infectious arthritis: <ul style="list-style-type: none"> • MSSA: Nafcillin or Cefazolin • MRSA: Vancomycin • Streptococci: Penicillin or Ceftriaxone or Cefazolin • Enterobacteriaceae: Ceftriaxone or Fluroquinolone • Pseudomonas: Piperacillin and Aminoglycoside • Animal bite : Ampicillin-Sulbactam • Lyme disease arthritis: Doxycycline for 1 month.
<p>Prognosis & Complications</p>	<ul style="list-style-type: none"> • Nongonococcal arthritis: can result in scarring with limitation of movement, ambulation is affected in 50% of cases.

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

- Results from contamination during surgery or post op
- wound infection adjacent to the prosthesis
- Factors delay healing (hematoma, ischemia)
- Occasionally result from bacteremia
- Mostly caused by coagulas negative staph., or *S.aureus*
- Occasional pathogens: streptococci, enterococci ,and anaerobes

Risk factors	<ul style="list-style-type: none"> • H/O superficial wound infection • post surgical complications • underlying illness • any source of bacteremia.
— Differential diagnosis:	<p>Aseptic loosening or dislocation of prosthetic joint Prosthetic debris induced synovitis & Hemarthrosis</p>
— Patient Presentation	<ul style="list-style-type: none"> • Subacute onset • <i>S.aureus</i>, 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	<ul style="list-style-type: none"> • 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 (تصوير المفاصل) • Bone scan-not specific for infection • ESR and C-reactive protein (CRP) may be high.
— Treatment & Management	<ul style="list-style-type: none"> • Antimicrobial for 6 weeks: • Chronic therapy with oral drug if removal of prosthesis not possible. • Surgery: removal of prosthesis

Good Luck