

# Pathology

## teamwork 437

### Lecture Four **[4]** : Osteomyelitis and septic arthritis.

#### Color Index :-

- **VERY IMPORTANT**
- Extra explanation
- Examples
- **Diseases names: Underlined**
- **Definitions**



# OBJECTIVES:

- Understand the etiology, pathogenesis and clinical features of osteomyelitis.
- Be familiar with some of the terminology used in bone infections like: sequestrum, involucrum, Brodie abscess and Pott's disease.
- Understand the clinicopathological features of tuberculous osteomyelitis
- Identify the bacteria commonly involved in septic arthritis, the clinicopathological features and the characteristics of the joint fluid

# OSTEOMYELITIS

**Osteomyelitis:-** refers to **inflammation** of the **bone** and **marrow** and is usually the **result of infection**

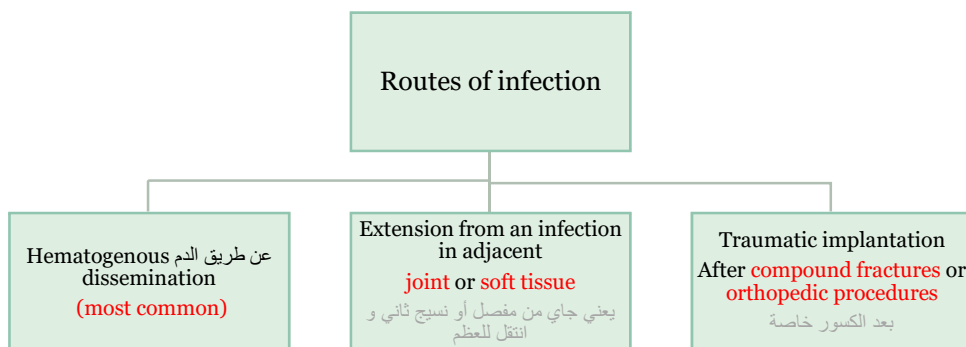
## Osteomyelitis Etiology :

All types of organisms including : **Viruses** , **Parasites** , **Fungi** , and **Bacteria**  $\xrightarrow{\text{Can produce}}$  Osteomyelitis

The most common are infections caused by certain **pyogenic bacteria** and **mycobacteria**

## Pyogenic Osteomyelitis :

In case of <b>في حالة</b>	Organism
Most frequent	<i>Staphylococcus aureus</i>
Neonates	<i>Escherichia coli</i> and group B streptococci.
Patients with sickle cell disease	<i>Salmonella</i>
1- Patients with genitourinary tract infections 2- Patients with intravenous drug abusers	<i>E.coli, Klebsiella and Pseudomonas</i>
Direct spread during surgery or open fractures (secondary to bone trauma)	Mixed bacterial infections, including <i>anaerobes</i>



# PYOGENIC OSTEOMYELITIS

- Bacteria proliferate, inducing an **acute inflammatory reaction**, with consequent cell death.
- Entrapped bone rapidly becomes necrotic; this non-viable bone is called a **sequestrum**. عبارة عن نسيج من عظم ميت .. داخل العظم نفسه
- Bacteria and inflammation can percolate throughout the Haversian systems to reach the periosteum.

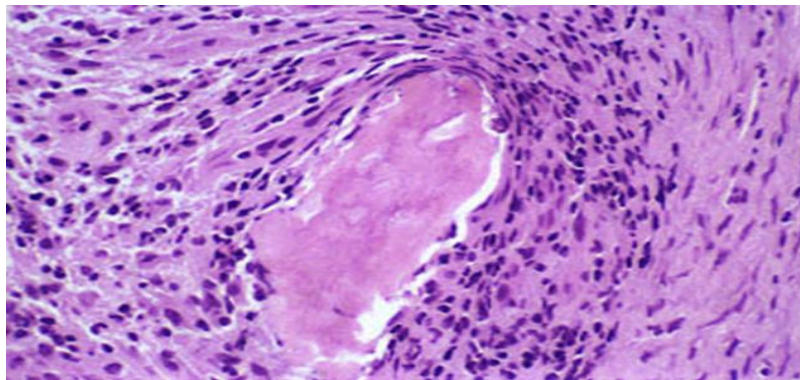
## In children

- the periosteum is loosely attached to the **cortex**; therefore, sizable “major” **sub periosteal abscesses** can form and **extend** for long distances along the bone surface

- **Brodie abscess** is a small intraosseous abscess that frequently involves the cortex.

## In infants & 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** (مماثل) **process** can involve vertebrae, with an infection **destroying intervertebral discs** and **spreading** into adjacent vertebrae.

## CONT..

Rupture

- **Rupture** of the periosteum

lead to

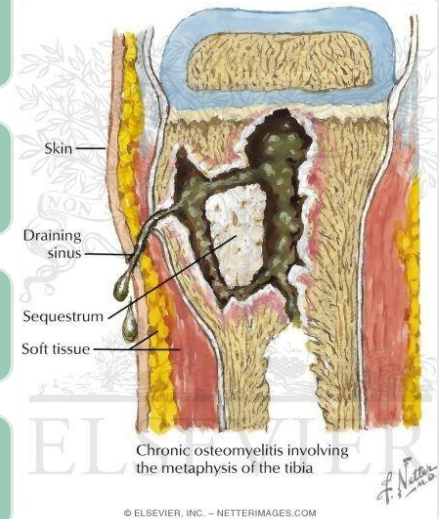
- to abscess formation in the surrounding soft tissue

may lead

- **draining sinus** Sometimes the sequestrum crumbles, releasing fragments

pass

- through the sinus tract.



- 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.

### • **Clinical Features :-**

- Osteomyelitis classically **manifests** as an **acute systemic illness**, with **malaise, fever, leukocytosis**, and **throbbing** “ارتجاج - خفقان” **pain** over the affected region.
- **Symptoms** also can be subtle, with **only unexplained fever**, **particularly** → infants, only **localized pain** in the → child.

# PYOGENIC OSTEOMYELITIS CLINICAL FEATURES

Osteomyelitis classically manifests as an acute systemic illness, with malaise (tired) fever, leukocytosis, 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.

## PYOGENIC OSTEOMYELITIS DIAGNOSIS

- Sign/symptoms. الأعراض يلي تشوفها
- **X-ray**: a lytic focus of bone surrounded by a zone of sclerosis we (can see the formation of sequestrum)
- **Blood cultures** (we can see the bacteria that affect patient)
- **Biopsy** (we can see the necrotic bone & inflammatory cells )
- In many untreated cases, blood cultures are positive, but biopsy and bone cultures are usually required to identify the pathogen.

Here sometimes the blood culture appear negative-absence of bacteria- that's why we take biopsy

# TREATMENT

- Treatment requires aggressive antibiotic therapy.
- Inadequate treatment of acute **osteomyelitis** may lead to **chronic osteomyelitis** which is notoriously (بشكل ملحوظ) difficult to manage.
- Surgical removal of bony tissue may be required.

## CHRONICITY MAY DEVELOP WITH

الحالات التي يمكن أن يصير فيها المرض مزمن

- 1) delay in diagnosis
- 2) extensive bone necrosis
- 3) abbreviated antibiotic therapy
- 4) inadequate surgical debridement,
- 5) weakened host defenses. Immunity low

## COMPLICATIONS

<https://www.youtube.com/watch?v=MNkI6Of2PRs>

[https://www.youtube.com/watch?v=кта5vCz\\_8Lw](https://www.youtube.com/watch?v=кта5vCz_8Lw)

Secondary amyloidosis

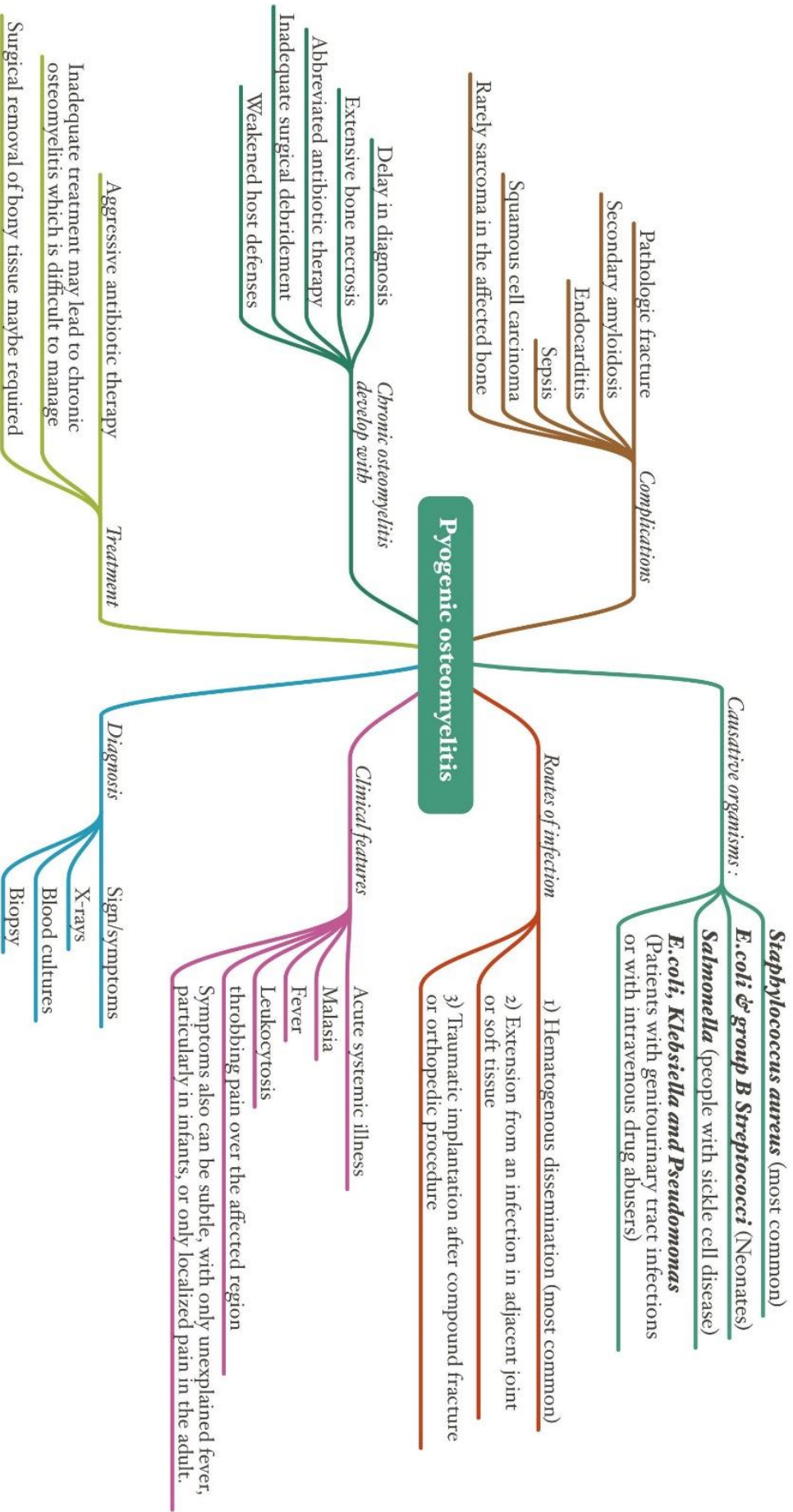
Pathologic fracture.

Endocarditis

Sepsis

Squamous cell carcinoma if the infection creates a sinus tract.

Rarely sarcoma in the affected bone





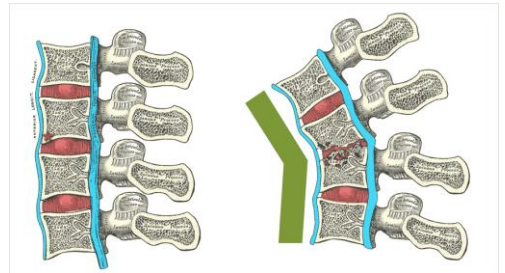
# TUBERCULOUS OSTEOMYELITIS

Pott's disease is a form of tuberculosis that happens OUTSIDE the lungs.

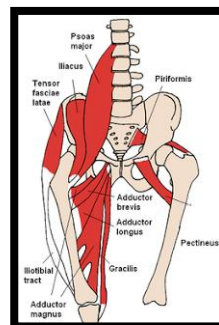
- second most common after pyogenic.
- **What is the routes of entry ?**
  1. Usually blood borne and originate from a focus of active visceral disease.
  2. Direct extension e.g. from a pulmonary focus into a rib or from tracheobronchial nodes into adjacent vertebrae , or spread via draining lymphatics.
- **What are the most common sites of skeletal involvement?**
  - ❖ Thoracic and lumbar vertebrae followed by the knees and hips
  - ❖ **Pott's disease** is the involvement of **spine**

In patients with AIDS frequently multifocal  
Due to low immunity , more than one vertebrae is involved

- **What are the pathogenesis ?**
  - ❖ The infection breaks through the intervertebral discs and extends into the soft tissues forming abscesses.



- ❖ In **Pott's disease**, the infection may break through the intervertebral discs and extends into the muscle forming **Psoas abscesses** ( psoas is the name of the muscle).



- **What is the Histopathology of Tuberculous osteomyelitis ?**

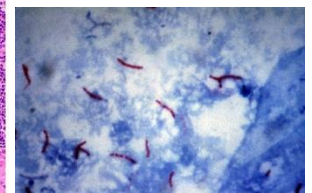
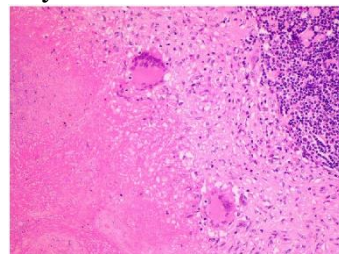
collections of epithelioid histiocytes and lymphocytes with caseation necrosis with **multinucleated giant cells**.

## Ziehl Neelsen stain

Special stain for mycobacterial organisms.

- **What are the Clinical features?**

1. Pain
2. Fever
3. Weight loss
4. May form an inguinal mass “ **psoas abscess**”.



## Tuberculous osteomyelitis

### Routes of entry

Blood borne usually and originate from a focus of active visceral disease  
Direct extension or spread via draining lymphatics

### Complications

Bone destruction  
Tuberculous Arthritis  
Sinus tract formation  
Amyloidosis

### Clinical features

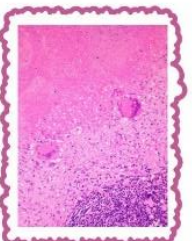
Pain  
Fever  
Weight loss  
May form an inguinal mass  
"psoas abscess"

### Common sites involved

**Thoracic and lumbar vertebrae**  
followed by the **knees and hips**  
Pott's disease is the involvement of **spine**  
In patients with AIDS frequently **multifocal**

### Histopathology

Collections of epithelioid histiocytes  
Lymphocytes with caseation necrosis



**Pott's disease**  
The infection breaks through the intervertebral discs and extends into the soft tissues forming abscesses or into the muscle forming **Psoas abscesses**



# Infectious Arthritis



Very good  
video

- Microorganisms of all types can seed joints during **hematogenous dissemination**.
- Articular structures can also become infected by **direct inoculation** or from **contiguous spread from a soft-tissue abscess** or **focus of osteomyelitis**.
- **Infectious arthritis is potentially serious why?** (Possible Question in SAQ)  
*because it can cause rapid destruction of the joint and produce permanent deformities*
- The infection involves **only a single joint** (monoarthritis) usually:

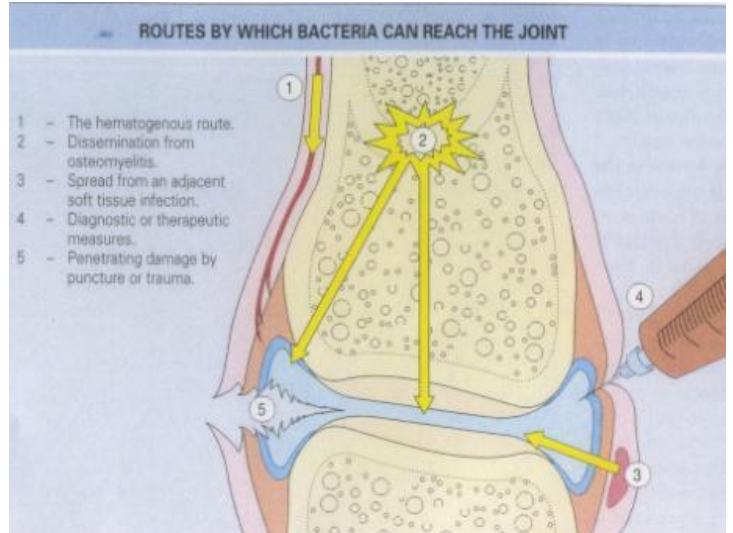


The order is important

- Joint aspiration is *typically purulent*
- **How can you identify the causal agent ?**  
By Performing *Culture*

## Routes of infection:

- 1) Hematogenous عبر الدم
- 2) Contiguous spread from osteomyelitis
- 3) Contiguous spread from a soft tissue abscess
- 4) Iatrogenic غلط من الدكتور أو الجراح
- 5) Traumatic



## Infectious Arthritis-bacterial

Haemophilus influenzae	predominates in children <b>under age 2 years</b>
S. aureus (staphylococcus aureus)	main causative agent in <b>children and adults</b>
Gonococcus * (Neisseria gonorrhoeae)	prevalent during <b>late adolescence and young adulthood</b>
Salmonella	Individuals with <b>sickle cell disease</b> at any age.
Bacterial infections almost always cause an <b>acute suppurative arthritis</b>	

\* Sexually transmitted

### Risk factors

- Immune deficiencies (congenital and acquired)
- Debilitating illness
- Joint trauma
- Intravenous drug abuse

### Clinical features

- sudden onset of pain
- redness, and swelling of the joint with restricted range of motion.
- Fever, leukocytosis, and **elevated** erythrocyte sedimentation rate (ERS)

### Complication

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

- **Infectious arthritis must be rapidly diagnosed and treated promptly, why?**

*to prevent irreversible and permanent joint damage.*



Figure 1  
Knee monoarthritis with inflammatory signs.

\* تصلب المفاصل

\*\* نسمم الدم

# Infectious Arthritis

## Routes of infection

- 1) Hematogenous
- 2) Contiguous spread from osteomyelitis
- 3) Contiguous spread from a soft tissue abscess
- 4) Iatrogenic
- 5) Traumatic

## Common sites

The infection involves only a single joint.

The knee followed by hip, shoulder, elbow, wrist and sternoclavicular joints.

Bacterial infections almost always cause an **acute suppurative arthritis**

## Causative organisms

- Haemophilus influenzae* (children under 2 years)
- S. aureus* (older children & adults)
- Gonococcus* (late adolescence & young adulthood)
- Salmonella* (people with sickle cell disease)

## Risk factors

- Immune deficiencies (congenital & acquired)
- Debilitating illness
- Joint trauma
- Intravenous drug abuse



## Clinical features

- Fever
- Sudden onset of pain
- redness, and swelling of the joint with restricted range of motion
- Leukocytosis and elevated erythrocyte sedimentation rate

## Treatment

- prompt antibiotic therapy
- joint aspiration or drainage

## Complications

Septic arthritis can lead to ankylosis and even fatal septicemia.

# MCQS

**1) In PYOGENIC OSTEOMYELITIS, there's chronic inflammatory cells become more numerous after .....of infection.**

- 1- 1 hour
- 2- 1 day
- 3- 1 week
- 4- 1 month

**2) We can diagnosis pyogenic osteomyelitis by:**

- 1- x-ray
- 2- biopsy
- 3- 1&2
- 4- non

**3) Tuberculous osteomyelitis is collections of epithelioid histiocytes and lymphocytes with:**

- 1- caseation necrosis
- 2- Gangrene necrosis
- 3- fat necrosis
- 4- coagulative necrosis

**4) Clinical features of Tuberculous osteomyelitis:**

- 1- weight gain
- 2- pain
- 3- redness
- 4- 1&3

**5) Risk factors of Infectious Arthritis:**

- 1-Joint trauma
- 2- Immune deficiencies
- 3- no risk factor
- 4- 1&2

**6) osteomyelitis Etiology is:**

- 1- trauma
- 2- genetic disorder
- 3- All types of organisms, including bacteria
- 4- unknown etiology

1)	3
2)	3
3)	1
4)	2
5)	4
6)	3

# MEMBERS :

## Females:

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-وفاء العتيبي

-الجوهرة الشننغيني

-رزان الزهراني

-رهف الشمري

-روان مشعل

-منيرة المسعود

-نوف العتيبي

-رزان الزهراني

-هديل عورتاني

-فاطمة بالشرف

-ابتسام المطيري

-رنا القرم

-غرام جليدوان

-بلقيس الراحمي

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داود إسماعيل

فهد الفايز

محمد بن معيوف

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**Kindly contact us if you have any questions/comments and suggestions:**

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**GOOD LUCK! 😊**

## **Resources:-**

- 1- Females slides
- 2- Robbin's Basic Pathology

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