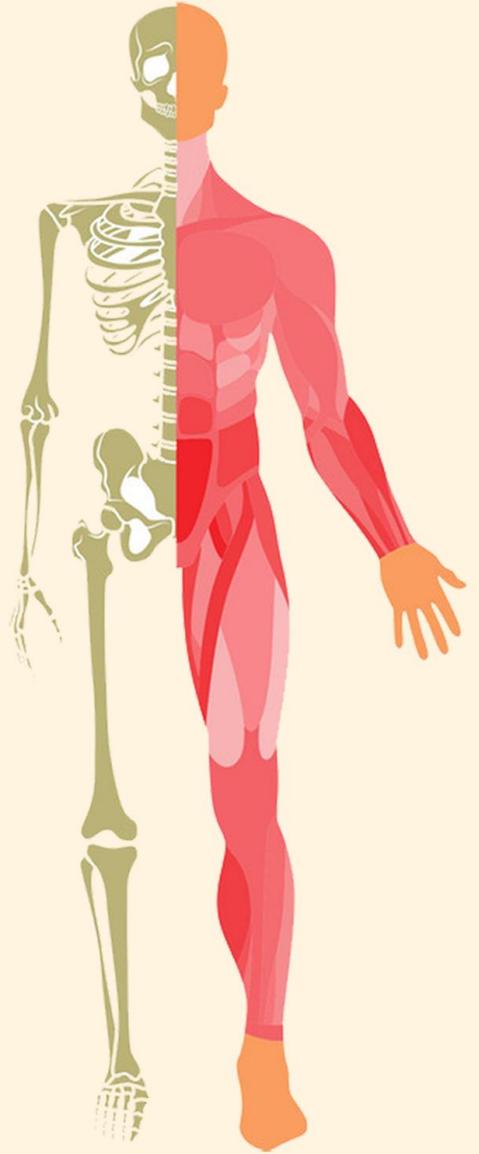




Pathology

Doctor 2017 | Medicine | JU | MSS



Number >>

5

Doctor

Mousa Al-Abbadi

Done By

Tala Saleh

Corrected By

Bayan Abusheikha



1st system - MSS



Osteomyelitis

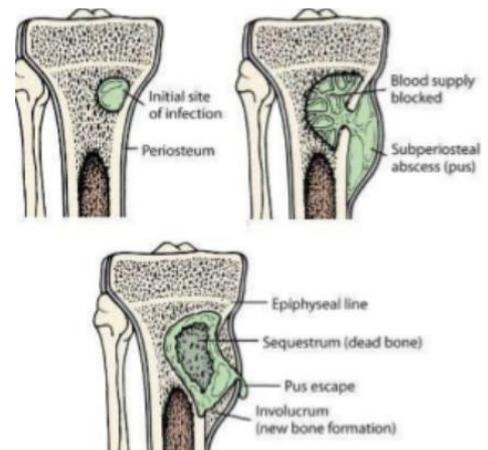
As mentioned in the previous lecture, **Osteomyelitis** denotes inflammation of **bone and marrow**, always secondary to infection. All types of organisms, including viruses, parasites, fungi, and bacteria, can produce osteomyelitis, but infections caused by certain **pyogenic bacteria** and **mycobacteria** are the most common. In this sheet, we will discuss both pyogenic and mycobacterial osteomyelitis.

1- Pyogenic osteomyelitis

- Pyogenic osteomyelitis is almost always caused by **bacteria**, mainly **Staphylococcus aureus**.

The acute phase of Pyogenic Osteomyelitis:

- During the **acute inflammatory phase** due to the infection, bacteria proliferate and induce a **neutrophilic** inflammatory reaction causing **necrosis** of the bone within the first 48 hours.
- The inflammation spreads reaching the periosteum. Further lifting of the periosteum impairs the blood supply to the affected region, contributing to the necrosis.
- The dead bone is known as a **sequestrum**. Rupture of the periosteum leads to a soft tissue **abscess**, which can channel to the skin, creating a **draining sinus**.
- After the first week, **chronic** inflammatory cells release cytokines that stimulate osteoclastic bone resorption, ingrowth of fibrous tissue, and the deposition of **reactive bone** at the periphery. The newly deposited bone can form a **shell of living tissue**, known as an **involucrum**, around the dead bone “sequestrum”.
- A **Cloaca** is an opening in the involucrum through which **pus** and **sequestra** may leak out.



In the picture to the right, draining osteomyelitis of a femur is shown. The dead necrotic bone “sequestrum” induced the formation of reactive bone at the periphery “involucrum”.

- **Signs and Symptoms:** Hematogenous osteomyelitis sometimes manifests as an acute systemic illness with **malaise, fever, chills, leukocytosis**, and marked **throbbing pain** over the affected region. In other instances, the presentation is subtle, with only **unexplained fever** (*most often in infants*) or **localized pain** (*most often in adults*).

- **Diagnosis:** The diagnosis is strongly suggested by the characteristic x-ray findings of a **lytic focus** of bone destruction. In early stages, it may **not** show with radiographic imaging, however, this **does not rule out** osteomyelitis. Also, biopsy and bone cultures are required to **identify** the pathogen in most instances.
- **Treatment:** Admission with the combination of **IV** antibiotics and surgical **drainage**.

The chronic phase of Pyogenic Osteomyelitis:

- In 5% to 25% of cases, acute osteomyelitis **fails to resolve** and persists as a **chronic** infection which is a very bad debilitating disease.
- **Causes:** Chronic infections may develop when there is a **delay in diagnosis**, **extensive bone necrosis**, **inadequate** antibiotic therapy or surgical debridement, or **weakened** host defenses.
- **Complications of chronic osteomyelitis include:** **Pathologic fracture** due to bone weakness, **secondary amyloidosis**, **endocarditis**, **sepsis**, the development of **squamous cell carcinoma** in the draining sinus tracts and **bone sarcoma**.

***Note 1:** Amyloidosis is the build-up of an abnormal protein called **amyloid** in organs and tissues throughout the body. The build-up of amyloid proteins (deposits) can make it difficult for the organs and tissues to work properly.*

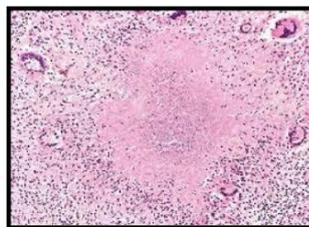
***Note 2:** Pathological fractures may occur due to chronic osteomyelitis, cancer, paget disease, osteoporosis, etc.*

- It is **hard** to treat chronic osteomyelitis.

2- Mycobacterial osteomyelitis

- Mycobacterial osteomyelitis was a problem in **developing** countries, but has **increased** in incidence in the **developed** world too because of **immigration** patterns and **immunocompromised** patients.
- Approximately, **1% to 3%** of individuals with pulmonary or extrapulmonary **Tuberculosis** exhibit **bone infections**.
- It can be spread **hematogenously** or through **direct contact**.
- The bone infection can be **subtle** and may persist for years before being recognized.
- Mycobacterial osteomyelitis tends to be **more destructive** and **resistant** to control than **pyogenic osteomyelitis**.

- Histologically, **caseous necrosis and granulomas**, are typical of Tuberculosis. While with **acid-fast staining** only, the organisms show as **red bacilli** (*named red snipers*).



- Can be treated through **antibacterial drugs** for TB, such as Rifampicin, Streptomycin, Isoniazid, etc.

Tuberculous spondylitis (Pott disease)

- The spine is involved in **40% of cases** of mycobacterial osteomyelitis. The infection breaks through intervertebral discs infecting multiple **vertebrae** causing **Tuberculous spondylitis** extending into the soft tissues. It is **difficult** to treat.
- Destruction of discs and vertebrae frequently results in permanent **compression fractures** that produce **scoliosis** “*spine has a sideways curve*” or **kyphosis** “*outward curve of the spine*” and **neurologic deficits** secondary to the spinal cord and nerve compression.



Bone Tumors and Tumor-like Lesions

- Primary bone tumors are **rare**, and therapy aims to **optimize** survival while **maintaining** the function of affected body parts.
- **Benign** tumors are **more common** than **malignant** tumors and occur with the greatest frequency within the **first three decades** of life. In older adults, a bone tumor is more likely to be **malignant**.
- They are often **asymptomatic**. However, they may produce **pain**, and in some circumstances, the first hint of a tumor’s presence is a **pathologic fracture**.
- The preferences of specific types of tumors for **certain age groups** and **locations** provide important **diagnostic** clues. For example, **osteosarcoma** peaks during **adolescence** and most frequently involves the **knee**, whereas **chondrosarcoma** affects older adults and involves the **pelvis** and **proximal extremities**. (*check the table in the next page*)

The doctor said that we should eventually understand the concept behind this table.

Category	Behavior	Tumor Type	Common Locations	Age (yr)	Morphology
Cartilage forming	Benign	Osteochondroma	Metaphysis of long bones	10–30	Bony excrescence with cartilage cap
—	—	Chondroma	Small bones of hands and feet	30–50	Circumscribed hyaline cartilage nodule in medulla
—	Malignant	Chondrosarcoma (conventional)	Pelvis, shoulder	40–60	Extends from medulla through cortex into soft tissue, chondrocytes with increased cellularity and atypia
Bone forming	Benign	Osteoid osteoma	Metaphysis of long bones	10–20	Cortical, interlacing microtrabeculae of woven bone
—	—	Osteoblastoma	Vertebral column	10–20	Posterior elements of vertebra, histology similar to osteoid osteoma
—	Malignant	Osteosarcoma	Metaphysis of distal femur, proximal tibia	10–20	Extends from medulla to lift periosteum, malignant cells producing woven bone
Unknown origin	Benign	Giant cell tumor	Epiphysis of long bones	20–40	Destroys medulla and cortex, sheets of osteoclasts
—	—	Aneurysmal bone cyst	Proximal tibia, distal femur, vertebra	10–20	Vertebral body, hemorrhagic spaces separated by cellular, fibrous septae
—	Malignant	Ewing sarcoma	Diaphysis of long bones	10–20	Sheets of primitive small round cells

Bone-Forming Tumors:

1- Osteoid Osteoma and Osteoblastoma.

They are **benign** bone-forming tumors that have **similar histologic** features but **differ** clinically and **radiographically**. Malignant transformation is **rare**.

Osteoid osteomas	Osteoblastoma
<p>Less than 2 cm in diameter and are most common in young men.</p> <p>About 50% of cases involve the femur or tibia.</p> <p>Usually, there is a thick rim of reactive bone that may be the only clue radiographically.</p> <p>They present with severe nocturnal pain (by PGE2) that is relieved by aspirin and other NSAIDs.</p> <p>It is frequently treated by radiofrequency ablation or surgery.</p>	<p>Larger than 2 cm in diameter.</p> <p>Involves the posterior components of the vertebrae (laminae and pedicles).</p> <p>The tumor usually does not induce a marked bony reaction.</p> <p>The pain is unresponsive to aspirin.</p> <p>It is usually curetted “scraped” or excised.</p>

Note: *Radiofrequency ablation* is a procedure used to **reduce pain** where an electrical current produced by a radio wave is used to heat up a small area of nerve tissue, thereby decreasing pain signals from that specific area.

2- Osteosarcoma

- Excluding **hematopoietic** tumors (*myeloma and lymphoma*), **osteosarcoma** is the most common **primary malignant** tumor of bone followed by **chondrosarcoma**.
- 75% of osteosarcomas occur in 10-20 year olds “**adolescents**”. The smaller second peak occurs in **older adults**, who frequently suffer from conditions known to **predispose** to **osteosarcoma** (*such as Paget disease and chronic osteomyelitis*). These are referred to as **secondary osteosarcomas**.
- Overall, **men** are **usually more** affected than women (1.6:1). The most common sites in adolescents are the **metaphyseal regions** of the distal femur and proximal tibia (*around the knee joint*).
- Osteosarcomas present as **painful**, progressively enlarging masses. Sometimes a **pathologic fracture** is the first indication.
- Radiographs usually show a **large**, destructive, mixed **lytic** and sclerotic **mass** around the knee joint with **infiltrative margins**. The tumor frequently breaks through the cortex and lifts the periosteum, resulting in reactive subperiosteal bone formation. The triangular shadow, known as **Codman triangle**, is indicative of an **aggressive** tumor, but not only osteosarcoma.
- Approximately, 70% of osteosarcomas have acquired **genetic abnormalities** mainly in tumor-suppressor genes and oncogenes, such as RB gene, TP53 gene, CDKN2A (p16 & p14), MDM2 and CDK2.
- **Osteosarcoma** is treated with a **multimodality approach** that consists of: **Neoadjuvant chemotherapy, surgery, and chemotherapy**.
- These aggressive neoplasms spread **hematogenously** to the **lungs**. The prognosis has **improved** since the arrival of **chemotherapy** with **5-year survival** rates reaching 60% - 70% in patients **without** detectable metastases. However, in patients with **metastases**, recurrent disease, or secondary osteosarcoma, the **prognosis** is still **poor**.



Good Luck ♥