

## Musculoskeletal System (Bones and Joints)

### Important Clinical Principles

#### 1. Epidemiology

- **Age:** Neoplasms of the bone – children and adults get different bone tumours. Older age group patients tend to get conditions such as osteoarthritis and osteoporosis
- **Gender:** Certain inflammatory conditions, particular Rheumatoid arthritis or Systemic Lupus Erythematosus, tend to occur with greater frequency in females. Osteoporosis tends to occur more frequently in postmenopausal women

#### 2. Distribution of Disease (applies to both bone and joint diseases)

- **Single or multiple site involvement:** Bones – Multiple bony lesions may raise the consideration for metastatic disease. Joints – Some arthropathies are mono-articular whilst others are pauci- or polyarticular
- **General size / structure of bone/joints:** Long bones (limb bones) vs Axial skeleton (spine, pelvis). Small bones or joints (eg. hands and feet)
- For bony neoplasms, **specific location within long bones is important:** Diaphysis (Ewing sarcoma); Metaphysis (osteosarcoma); Epiphysis (giant cell tumour)

#### 3. History of other conditions

- Autoimmune conditions such as Systemic Lupus Erythematosus can result in joint disease
- History of known malignancy eg. prostate or breast carcinoma should always raise the suspicion of metastases in patients with discrete bony lesions

#### 4. Diagnostic Imaging

- This applies to both bone and joint diseases
- Modalities include plain X rays and CT scans
- Imaging essentially shows the Gross pathology, but in black and white

#### 5. Joint Fluid Aspiration

- This is a useful test in joint diseases
- Fluid can be sent to several labs for examination
- **Microbiology** – Gram stain, ZN stain, culture
- **Pathology** – for cytology examination and examination for crystals under the microscope
- **Gout** – negatively birefringent needle shaped crystals
- **Pseudogout** – weakly positively birefringent rhomboid shaped crystals

### Clinical Manifestations.

You may refer to clinical texts for a more detailed list.

#### 1. Bones

- Pain (night pain is worrying, eg. for neoplasm, or tuberculosis)
- Swelling
- Pathologic fracture – occurs in underlying abnormal bone, which can be due to infectious (eg. chronic osteomyelitis), metabolic (e.g. osteoporosis) or neoplastic disease
- Sinuses (associated with osteomyelitis)
- Deformity (can be associated with metabolic conditions)

#### 2. Joints

- Pain, loss of function
- Swelling
- Clinically, septic arthritis and crystal arthropathies can sometimes be difficult to distinguish from each other, and require examination of joint fluid aspirate – see point 5 above
- Loss of function
- Stiffness
- Abnormal range of motion / locking (this may occur in traumatic conditions e.g. ligamentous or meniscal injury in the knee, which will be covered during the clinical posting)

#### 3. Symptoms related to soft tissue structures close to bone/joints:

- Nerve compression – eg. osteophytes in cervical spine arthritis can lead to nerve compression
- Tendons, insertions – eg. pain from tendinitis
- Joint capsule / tendon / tendon sheath eg. Nodule – ganglion

#### 4. Systemic symptoms: Fever, weight loss

- Other clinical manifestations of underlying systemic disease – eg. in patients with hyperuricaemia, disseminated infection, hyperparathyroidism

### Bone and Joint Diseases: Overview

Where to start?

#### I. Think about the Functions of the musculoskeletal System

- Mineral homeostasis (Calcium, phosphorus)
- Housing for haematopoietic bone marrow elements
- Mechanical functions
- Protect viscera
- Movement and locomotion
- Body structure and size

II. Next, it may be helpful to begin by **classifying the conditions** into:

- **BONE vs JOINT diseases**

and

- **FOUR major aetiologic categories: Inflammatory, Infectious; Metabolic and Neoplastic**
- There are of course conditions that fall into other aetiologic categories (eg. traumatic, vascular,

congenital, etc), however, we will focus on these four, in accordance with your lecture material.

Here's a simple framework to start with:

#### I. Bones

- Infectious diseases (osteomyelitis)
- Metabolic diseases (osteoporosis; osteomalacia/rickets; hyperparathyroidism; Paget's disease)
- Neoplasms (Benign vs Malignant primary neoplasms; Metastatic malignancy)

#### II. Joints

- Inflammatory diseases (eg. osteoarthritis – degenerative and inflammatory; rheumatoid arthritis; crystal arthropathies)
- Infectious diseases Affect both bones (osteomyelitis) and joints (septic arthritis)

**Mindmap: Approach to bone and joint diseases:**

<https://medicine.nus.edu.sg/pathweb/pathology-demystified/musculoskeletal-system-demys/ii-bone-and-joint-diseases-overview/>

#### Main Diseases of Bones and Joints

Mindmaps on the main diseases of bones and joints:

<https://medicine.nus.edu.sg/pathweb/pathology-demystified/musculoskeletal-system-demys/iii-main-diseases-of-bones-and-joints/>

#### Talking POTS and exercises in clinicopathologic correlation

<https://medicine.nus.edu.sg/pathweb/pathology-demystified/musculoskeletal-system-demys/talking-pots-clinicopathologic-correlation/>

#### A Real-life Case and Quiz

<https://medicine.nus.edu.sg/pathweb/pathology-demystified/musculoskeletal-system-demys/a-real-life-case-and-quiz/>

#### A Real-Life Case Demo

<https://medicine.nus.edu.sg/pathweb/pathology-demystified/musculoskeletal-system-demys/a-real-life-case-part-2/>