

Orthopaedics X-Rays

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Introduction

When analysing orthopaedics X-Rays, you should remember the rule of two:

- ✓ **2 views**- AP and lateral
- ✓ **2 sides**- Normal and affected
- ✓ **2 joints**- Proximal and distal
- ✓ **2 occasions**- Repeat X-Ray
- ✓ **More than 1 site**- In case of polytrauma.

X-Ray 1

Chronic osteomyelitis

Description:

This is a plain X-Ray of left humerus with shoulder joint, scapula and clavicle showing:

1. Areas of bony destruction
 2. An osteolytic cavity containing a dead piece of bone (sequestrum, a radiodense area pointed by the yellow arrow)
 3. Irregularity and thickening of the whole shaft.
- So, it seems to be a case of chronic osteomyelitis.

What is sequestrum?

Sequestrum is a dead piece of bone surrounded by infected granulation tissue. It is seen in chronic osteomyelitis.



Why sequestrum appears radio-dense in X-Rays?

1. Absence of resorption activity in that area due to loss of vascularity
2. Collapse of the affected segment
3. Sequestrum appears radiodense in the background of radiolucency.

Do you know the types of osteomyelitis?

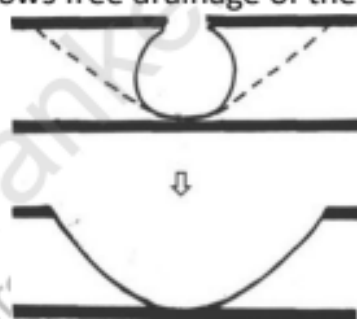
Osteomyelitis is of 3 types: acute, subacute and chronic.

Give an example of subacute osteomyelitis?

Salmonella osteomyelitis.

What are the treatment options?

1. Sequestrectomy: Removal of sequestrum through a window cutting through the involucrum.
2. Saucerization: The infected bone cavity is converted into a 'saucer' by removing its wall. This allows free drainage of the infected material.



3. Curettage
4. Excision of an infected bone.

What are the pre-requisites for sequestrectomy?

1. Well separated sequestrum
2. Adequately formed involucrum.

What are the complications of chronic osteomyelitis?

Common complications:

1. Deformity
2. Pathological fracture
3. Shortening of limbs (especially in children).

Uncommon complications:

1. Sinus tract malignancy
2. Amyloidosis.

Why metaphysis is commonly affected in osteomyelitis?

1. Metaphysis is the growing end of bone, so it is ill matured
2. Hair pin arrangement of the blood vessels in metaphysis.

In which type of osteomyelitis, diaphysis is commonly affected?

In salmonella osteomyelitis, which is common in children with sickle cell anemia.

X-Ray 2

Exostosis/ Osteochondroma

Description:

This is a plain X-Ray of left knee joint showing a *pedunculated mass* coming out of the upper end of tibia arising from the epiphysio-metaphyseal junction.

- So, it seems to be exostosis/ osteochondroma.

What is the commonest site?

Around the knee joint.

Why you are saying that the lesion is benign?

Because of the well-defined outline.

What are the characteristic features of exostosis?

1. Painless bony swelling around a joint
2. Progress very slowly



3. A long history
4. Stops growing after the age of skeletal maturity.

When does an exostosis become painful?

1. Bursitis of the overlying bursa
2. Stretching of nerve
3. Pathological fracture
4. In case of malignancy.

What is the chance of an exostosis becoming malignant?

Very less (around 1%).

In which type of exostosis, the chance of malignancy is higher?

Hereditary multiple exostosis (around 10% chance).

What are the changes in case of malignant transformation of an exostosis?

1. Rapid growth of the swelling
2. Pain
3. Skin changes:
 - Stretching
 - Loss of glistening
 - Vascular prominence.

What is the treatment of choice?

Excision of the lesion (including some normal bone around the lesion).

X-Ray 3

Osteosarcoma

Description:

This is a plain X-Ray of a part of femur, knee joint, proximal tibia and fibula; showing a bone mass arising from the metaphysis of femur.

- It probably is an osteosarcoma.

Why are you saying that it is an osteosarcoma?

1. Location: The most common site of osteosarcoma is around knee joint
2. Sunburst appearance (blue arrow)
3. Codman's triangle (yellow arrow).

Do you classify bone tumors?

The recent WHO classification of bone tumors is based on the recognition of the dominant tissue.



Example:

Predominant tissue	Example of benign tumor	Example of malignant tumor
Bone	Osteoblastoma	Osteosarcoma
Cartilage	Chondroma	Chondrosarcoma
Fibrous tissue	Fibroma	Fibrosarcoma
Giant cell tumor	Benign osteoclastoma	Malignant osteoclastoma
Vascular tissue	Hemangioma	Angiosarcoma
Mixed	Chondromyxoid fibroma	---
Other tumors	Neurofibroma	Adamantinoma

Can you describe the Enneking staging for benign bone tumors?

Table 1

Enneking staging for benign musculoskeletal tumors based on radiographic characteristics of the tumor host margin

Stage	Description
Latent	Well-demarcated borders
Active	Indistinct borders
Aggressive	Indistinct borders

What is the most common bone tumor?

Secondary metastasis from other tumors.

What is the most common primary malignancy of bone?

Multiple myeloma.

What is the 2nd most common primary malignancy of bone?

Osteosarcoma.

What is the age group commonly affected?

10-25 years.

What are the clinical features?

- Pain
- Swelling
- Pathological fracture.

What are the mode(s) of treatment?

Combined approach including:

1. Surgical excision of affected area
2. Radiotherapy
3. Chemotherapy.

What are the types of chemotherapy?

1. Neo-adjuvant: Given before surgery
2. Adjuvant: Given after surgery.

What are the advantages of neo-adjuvant chemotherapy?

1. Downstaging of tumor
2. Reduction in size of tumor, makes the tumor resectable
3. Reduction in vascularity, less chances of bleeding
4. Assessment of sensitivity to chemotherapy.

What are the disadvantages of chemotherapy?

1. Wound complications
2. Delay of surgery due to side effects of chemotherapy.

What is the advantage of adjuvant chemotherapy?

Destruction of residual malignant tissues after surgery.

What are the complications of osteosarcoma?

1. Pathological fracture
2. Metastasis
3. Severe torrential hemorrhage.

What are the types of fracture according to the mechanism of fracture?

1. Traumatic fracture: Caused by traumatic injury
2. Stress fracture: Caused when a normal bone is exposed to repeated stress
3. Pathological fracture: Fracture when a bone is already weakened by some underlying pathological process.

X-Ray 4

Fibrous dysplasia

Description:

This is a plain X-Ray of left forearm with elbow joint showing *broadening and thickening of lower ulna*.

The bone is replaced by fibrous tissue (arrow).

- So, it seems to be fibrous dysplasia.



X-Ray 5

Fracture shaft of humerus

Description:

This is a plain X-Ray of shaft of humerus with elbow joint, showing an oblique fracture, which is displaced laterally.

What is the nature of this fracture?

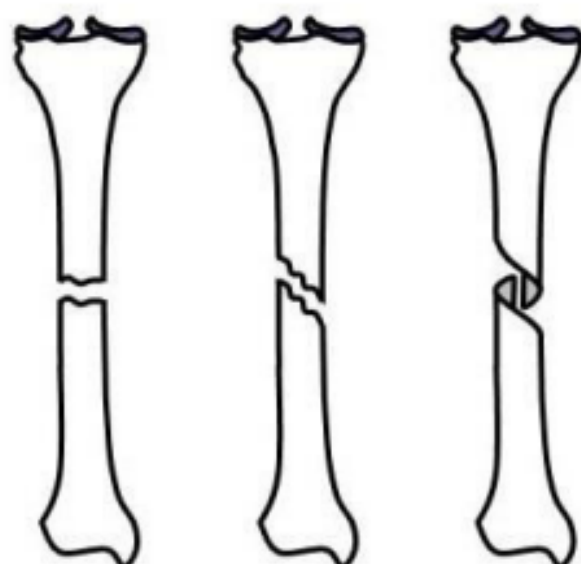
Most likely traumatic fracture as the bone is healthy.

Mention the types of fracture according to geometry.

It is of 3 types:

1. Transverse
2. Oblique
3. Spiral.





Right to left:
Transverse, oblique and spiral

What are the common clinical features of a fracture?

- Pain
- Swelling
- Tenderness
- Movement restriction
- Loss of rotational movement.

Can you classify fracture according to the integrity of skin?

It is of 2 types:

1. Open
2. Closed.

What are the complications of a fracture?

- Mal-union
- Non-union
- Compartment syndrome.

What are the features of microvascular compromise in a distal limb?

- Pallor (earliest feature)
- Pain (on passive stretching)
- Paresthesia

- Paralysis
- Pulselessness (occasionally occur).

X-Ray 6

Secondary osteoarthritis

Description:

This is a plain X-Ray of pelvis and upper part of femur showing the following features in the left side:

1. Irregular margin of femoral head and acetabulum
2. Reduced joint space.
- So, it is a case of secondary osteoarthritis.

Name some common causes of secondary osteoarthritis.

1. Avascular necrosis of femur
2. TB hip.



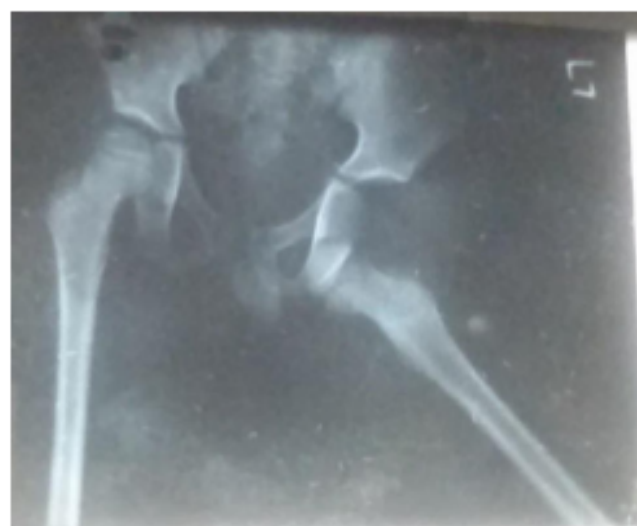
X-Ray 7

Anterior dislocation hip

Description:

It is a plain X-Ray of pelvis with portions of femur showing following features on the left side:

1. Complete loss of contact between 2 articular surfaces (head of femur and acetabulum)
2. Abduction and external rotation deformity
3. Lesser trochanter more visible.



- So, it seems to be anterior dislocation of hip.

Do you know the deformities you may find in dislocation of hip?

- Posterior dislocation (commoner): FA(b)IR: Flexion Abduction Internal rotation
- Anterior dislocation: Opposite to posterior dislocation: Flexion Adduction External rotation.

X-Ray 8

Posterior dislocation hip

Description:

This is a plain X-Ray of pelvis along with upper portions of femur showing:

1. Adduction and external rotation
 2. Lesser trochanter not visible.
- So, it seems to be posterior dislocation of hip.

Can you tell some complications of posterior dislocation of hip?

Immediate complications:

1. Sciatic nerve injury
2. Superior gluteal artery injury (causing hemorrhage).

Remote complications:

1. Avascular necrosis of femur
2. Myositis ossificans.



X-Ray 9

GCT

Description:

This is a plain X-Ray of right knee joint showing irregular expansile osteolytic lesion with multiple septations (marked by arrow) appearing like *soap bubble*.

- So, it seems to be a giant cell tumor/ osteoclastoma.

What do you know about the aggressiveness of this tumor?

It is a benign but locally aggressive tumor.

What is the treatment of choice?

Radical excision with reconstruction of the area.

What are the methods of reconstruction?

1. Curettage
2. Bone grafting.

What is the advantage of using bone-cement in times of reconstruction?

Exothermic reaction of bone cement kills residual tumor cells effectively.

What are the complications of GCT?

1. Pathological fracture
2. Deformity
3. Recurrence after surgery
4. Malignancy.

