BONE INFECTION & TUMORS

Dr. Rihab Musaab
Radiography
Principles of disease
Semester four
Osteomyelitis

- Means infection of bone
- Acute: less than 1 month
- Chronic: more than 1 month
- Can be part of a systemic infection but commonly an isolated bone infection

Etiologic agents are

- Pyogenic bacteria
- Tuberculosis
- Syphilis
Organisms reach bone by

- Hematogenous spread.
- From surrounding infected soft tissue or joint.
- Direct implantation in compound fractures or orthopedic procedures.
Causative organisms

- Most commonly staph. aureus.
- E.coli in neonates.
- Salmonella in sickle cell anemia.
- M.tuberculosis.
- Mixed bacterial infection
POTT’s DISEASE (osteomyelitis of the spine, may be accompanied by cold abscess)
Pathogenesis

• Bacterial infection results in inflammation, ischemia and bone necrosis.
• Dead bone is called sequestrum.
• New bone forms a shell surrounding dead bone called involucrum.
• Subperiosteal abscesses may form
• Rupture of abscess gives rise to draining sinus in the skin.
Development of Osteomyelitis

Fig 64-1
Clinical presentation

- Acute onset of fever
- Malaise
- High t.w.b.c
- Throbbing pain over affected bone.
- Restricted movement
- Chronic infection in a quarter of unresolved acute cases, it usually occurs in undertreated cases and when there is delay in diagnosis.
- Chronic infection with acute flare-ups
Complications of chronic osteomyelitis.

- Pathologic fractures
- Sepsis and spread to other organs
- Draining sinus
- Development of squamous cell carcinoma in sinus tract
- Septic Arthritis
- Abscess
- Amyloidosis
- Disability
Diagnosis and treatment

- X-rays; characteristic lytic lesions.
- Blood and wound cultures.

Treated by:
- Vigorous antibiotic therapy according to cultures, often for long periods.
- Surgical drainage of abscess and debridement.
- Resting of limb
- Good nursing and rehabilitation in chronic cases.
A circumscribed, oval cavity surrounded by a zone of sclerosis at the proximal tibia (Brodie’s abscess)

This is a lateral view X-ray of left tibia and fibula. There is a marked periosteal reaction at the diaphysis (Type IIb subacute OM)
BONE TUMORS
General considerations

• Primary bone tumors are much less than secondary tumors.
• Primary tumors are often unifocal, secondary tumors are often multifocal.
• All age groups affected, but some tumors occur in certain age
• Almost every bone can be affected, but some tumors prefer certain locations
• Most of the tumors give osteolytic lesion in X-ray, but few are osteoblastic
Bone tumors

• Bone tumors are classified into:
  – Primary bone tumors
  – Secondary bone tumors (Metastasis)

• Most are classified according to the normal cell of origin
BONE TUMORS

According to cell of origin:

• Bone-forming tumors (from osteoblasts)
• Cartilage-forming tumors (from chondroblasts)
• Miscellaneous tumors
• Hematopoietic tumors (multiple myeloma, lymphoma)
• Fibrous tumors
Classification of primary bone tumors

A. Bone-Forming Tumors

- **BENIGN**
  - Osteoma:
  - Osteoid osteoma:
  - Osteoblastoma:
- **Malignant:**
  - Primary osteosarcoma (most common primary tumor)
  - Secondary osteosarcoma
Classification of primary bone tumors

B. Cartilage-Forming Tumors

**BENIGN**:  
- Osteochondroma  
- Chondroma

**MALIGNANT**:  
- Chondrosarcoma (second most common primary tumor)
• **C. Miscellaneous Tumors**
  • Giant-cell tumor (usually benign)
  • Ewing sarcoma (malignant)

• **D. Tumor-like lesions**
  • Fibrous Cortical Defect (benign)
  • Fibrous Dysplasia (benign)
Age of Tumors

• Less than 20 years.....osteoid osteoma, osteoblastoma, osteosarcoma, Ewings.

• 20-40......Giant cell tumors, Secondary Osteosarcoma, chondrosarcoma, Lymphoma, Mets.

• 60 years...Metastasis, Multiple Myeloma, Chondrosarcoma, MFH, Fibrosarcoma.
Site or location of Tumors

**BENIGN TUMORS**

**EPIPHYSIS**
- Chondroblastoma
- Giant cell tumor

**METAPHYSIS**
- Osteoblastoma
- Osteochondroma
- Non-ossifying fibroma
- Osteoid osteoma
- Chondromyxoid fibroma
- Giant cell tumor

**DIAPHYSIS**
- Enchondroma
- Fibrous dysplasia

**MALIGNANT TUMORS**

**DIAPHYSIS**
- Ewing sarcoma
- Chondrosarcoma

**METAPHYSIS**
- Osteosarcoma
- Juxtacortical osteosarcoma
Radiographic Features of the Various Tumors

• Benign: well circumscribed, no reaction and sclerotic border.

• Malignant: ++++reaction, large, permeative, destructive and moth eaten.

• Metastasis: more than one bone
• Benign tumor

Malignant tumor
Bone-Forming Tumors:

1) **Osteoma**:
- Age: 40-50 yrs.
- Site: on or inside the skull, paranasal sinuses and facial bones
- Exophytic growth: Round-to-oval sessile projection from subperiosteal surfaces
- Usually single
- Multiple lesions are feature of Gardner syndrome.
- Usually slow-growing benign tumors
- Presentation: sinus obstruction, disfigurement and pressure on brain.
2-Osteoid Osteoma &
3-Osteoblastoma

• Both are benign bone tumors with similar histologic features
• Grossly both tumors round to oval, hemorrhagic and gritty
• Differ in:
  Size
  Sites of origin
  Symptoms
  Behavior
<table>
<thead>
<tr>
<th></th>
<th><strong>Osteoid Osteoma</strong></th>
<th><strong>Osteoblastoma</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>10-20 years</td>
<td>10-20 years</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td>2:1 M:F</td>
<td>2:1 M:F</td>
</tr>
<tr>
<td><strong>Site</strong></td>
<td>Femoral neck</td>
<td>Spine</td>
</tr>
<tr>
<td><strong>Pain</strong></td>
<td>Mod.-severe Worse at night, Aspirin response 90%</td>
<td>dull aching pain Worse at night, not relieved by Aspirin</td>
</tr>
<tr>
<td><strong>Nidus size</strong></td>
<td>present</td>
<td>present</td>
</tr>
<tr>
<td></td>
<td>Less than 2cm</td>
<td>larger</td>
</tr>
<tr>
<td><strong>Recurrence</strong></td>
<td>No</td>
<td>10%</td>
</tr>
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</table>
4-OSTEOSARCOMA
(OSTEOGENIC SARCOMA)

LATE TEENS
KNEES
METAPHYSSES
PAINFUL!!!
Osteosarcoma

- Most common primary malignant tumor of bone, followed by chondrosarcoma
- Age: 10-20 years:
  - 75% in patients below 20 years of age (primary type)
  - 25% old age (secondary to Paget disease)
- Site: Metaphyses of long bones of limbs (60% occur around the knee)
- M : F ratio = 1.6 : 1
Risk factors for secondary osteosarcoma

- Paget disease of bone
- Ionizing radiation
- Fibrous dysplasia
- Chronic osteomyelitis
- Bone infarcts
- Mutation of some genes (retinoblastoma gene).
Osteosarcoma

Distal femoral osteosarcoma with prominent bone formation extending into the soft tissues. The periosteum, which has been lifted, has laid down a proximal triangular shell of reactive bone known as a Codman triangle (arrow).
osteosarcoma
Clinical features

- Presenting symptoms:
- Pain
- Swelling
- Pathological fracture
- Marked increase in the serum alkaline phosphatase.
- Early hematogenous spread to the lungs, liver and brain.
CARTILAGE FORMING TUMORS
1-OSTEOCHONDROMA (EXOSTOSIS)

• Common, Cartilage AND Bone present, looks like a mushroom, bone with a cartilage cap
• Often MULTIPLE as a hereditary syndrome
• M>>>F
• PELVIS, SCAPULAE, RIBS
2-CHONDROSARCOMA

- Chondrosarcomas comprise a variety of tumors sharing the ability to produce neoplastic cartilage
- Second most common primary bone tumor & occur in older age group
- Rarely involves distal extremities
EWING SARCOMA

• SMALL ROUND BLUE CELL TUMOR, LOOKS LIKE LYMPHOMA MICROSCOPICALLY
• NEUROENDOCRINE CELL ORIGIN
• CHROMOSOME ABNORMALITY
• AFFECTS MAINLY CHILDREN MORE IN WHITES MORE IN MALES
SECOND most COMMON bone malignancy in CHILDREN

• ONION SKIN PATTERN OF PERIOSTEAL REACTION IN X-RAY
FIBROUS CORTICAL DEFECT

• COMMON, usually LESS THAN 1 CM

• CHILDREN >2

• IF MORE THAN 5-6 CM, they are then called NON-OSSIFYING FIBROMA
THANK YOU