بسم الله الرحمن الرحيم
Interpretation

Presented by

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Steps of lesion description

**Radiographic view:**  e.g. panorama, periapical

**Site:** maxilla, mandible  anterior, posterior, premolar-molar, ramus

**Size or extent**  e.g. from canine till molar mesial root

RL, RO or Mixed  localized or generalized

Well-(corticated or sclerotic) or ill-defined or surrounded by radiolucent rim

Unilocular or multilocular or multiple but separate (multifocal)+ expansion or destruction of cortical margin

Displacement or no displacement of teeth

Resorption or no resorption of roots
Periapical radiograph on the left side, premolar-molar area shows, large carious cavity, related to lower first molar with periapical rarifying osteitis surrounded with condensation or sclerotic bone (condensing osteitis).

DD
- Chronic infection
- Granuloma
- Radicular cyst.
Panoramic radiograph reveal, unilocular radiolucent area on the right side of the mandible at 1st molar area, the lesion have a well-defined, corticated border with slight downward pushing of IAC. The 1st molar shows a large carious cavity.

DD

Ameloblastoma
Radicular cyst
CGCG (Central Giant Cell Granuloma)
Periapical radiograph on the right side of the mandible shows an ill-defined radiolucent area with a large area of reaction sclerosis surrounding.

**DD**
- Chronic abscess
- Periapical granuloma
- Radicular cyst
Periapical radiograph shows, well-defined, corticated unilocular radiolucent lesion related to RR probably lower 1st molar.

DD  Radicular cyst
     Apical granuloma
     Apical scar
Periapical radiograph of upper anterior teeth on the left side shows a well-defined unilocular radiolucent lesion related to upper lateral incisor, the lesion causing slight resorption of tooth apex.

**DD**
- Periapical granuloma
- Radicular cyst
- Apical scar
Periapical radiograph for the lower molars on the right side shows a pericoronal unilocular well-defined radiolucent area, more or less arising from CEJ of impacted 8, the lesion produces slight expansion of superior cortex.

**DD**  
Dentigerous cyst  
Ameloblastoma  
COC (Calcifying Odontogenic Cyst)
Periapical radiograph of the maxillary premolar-molar area on the right side shows a well-defined radiolucent area related to the periapex of 5.

**DD**  Periapical granuloma
Radicular cyst
Apical scar
Periapical radiograph of maxillary lateral and canine area shows an abnormal bone (ground glass pattern) between lateral and canine.

DD
- Fibrous dysplasia
- Paget's disease
- Hyperparathyroidism
Panoramic radiograph shows a multilocular radiolucent lesion with well-defined border on the posterior body and ramus on the left side of the mandible, the lesion produces antero-inferior displacement of 7 and downward and posterior displacement of developing 8, also the lesion produces expansion of superior and inferior cortex.

DD
- Ameloblastoma
- Odontogenic fibroma
- Odontogenic Myxoma
Periapical radiograph on mandibular premolar-molar area on the left side shows, multilocular (tennis racket) radiolucent lesion mostly with well-defined border.

DD
- Odontogenic Myxoma
- Ameloblastoma
- Odontogenic fibroma
Panoramic radiograph shows, a unilocular radiolucent lesion extended from mesial root of 1st molar on the left side, crossing the midline and reach the root of 1st premolar on the right side, the lesion with well-defined border and produce resorption to most of the related tooth roots.

**DD**  
CGCG *(Central Giant Cell Granuloma)*  
Ameloblastoma  
Odontogenic fibroma
Panoramic radiograph shows a large multilocular (with wispy trabecular pattern) radiolucent lesion involving the left body and ramus of the mandible, the lesion with well-defined border and produce severe expansion (ballooning) of both superior and inferior cortex.

**DD**  Aneurysmal bone cyst  
CGCG (Central Giant Cell Granuloma)  
Ameloblastoma
Panoramic radiograph shows, a multiple but separate unilocular radiolucent areas involving both the right and left sides of the mandible. All the lesions with well-defined border. On the right side one of the lesion is pericoronal, related to crown of impacted probably 8, while the other lesion on the same side related to edentulous premolar and 1st molar area. While on the left side, the first lesion is pericoronal related to 8, and the other is apical to lower 7.

DD

Multiple OKC (Odontogenic Kerato-Cyst)
Multiple dentigerous cysts
Multiple myeloma
Lateral oblique radiograph reveals, a multiple but separate unilocular well-defined radiolucent areas in posterior mandible, the lesion mostly periapex.

DD  Multiple myeloma
    Metastatic carcinoma
    CGCG (Central Giant Cell Granuloma) of hyperparathyroidism
Panoramic radiograph of the right side shows, ill-defined ragged radiolucent area related to posterior body of the mandible, small sclerotic area appear in the center of the lesion probably is a sequestrum. Also recent extraction socket of 1st molar.

**DD**
- Osteomyelitis
- Osteoradionecrosis
- Sq cell carcinoma
Periapical radiograph for the mandibular anterior shows, homogenous RO area related to periapex of central and lateral incisors of the right side, it surrounded by a radiolucent halo (band) with well-defined border.

DD  Cementoma (periapical cemental dysplasia)
    Cementoblastoma
    Osteoblastoma
Cropped panoramic radiograph shows a unilocular well-defined radiolucent lesion on the posterior mandible and ramus on the left side, the lesion produce inferior displacement of the developing 7 and posterior displacement of developing 8, it extended from mesial root of 6 till the lower part of ascending ramus.

**DD**
- Dentigerous cyst
- Ameloblastoma
- Mural ameloblastoma
Cropped panoramic radiograph shows a unilocular well-defined radiolucent lesion on the posterior mandible and ramus on the left side, the lesion produce inferior displacement of the developing 7 and posterior displacement of developing 8, it extended from mesial root of 6 till the lower part of ascending ramus.

DD
- Dentigerous cyst
- Ameloblastoma
- Mural ameloblastoma
Maxillary topographic radiograph shows a unilocular, well-defined mixed RL-RO lesion, it contains ill-defined heterogeneous radiopaque masses.

**DD**
- COC (*Calcifying Odontogenic Cyst*)
- AOT (*Adenomatoid Odontogenic Tumor*)
- Ossifying fibroma
Cropped panoramic radiograph shows a unilocular, well-defined radiolucent lesion involving the posterior body and ramus on the left side. It extended from second premolar up to sigmoid notch of ascending ramus, the lesion also produce downward and backward displacement of developing 8 towards the angle of the mandible. Also it produces root resorption especially detected in 1st molar. There is thinning of inferior cortex without actual destruction.

DD
Dentigerous cyst
Ameloblastoma
Pindborg tumor
Periapical radiograph shows a pericoronal unilocular mixed RL-RO lesion, with well-defined border, small radiopaque foci (flecks) can be observed within the lesion.

DD
AOT
COC
Ossifying fibroma
Panoramic radiograph shows a multilocular (soap bubbles) well-defined radiolucent lesion related to posterior body and ramus on the right side. The lesion produces slight thinning and expansion of the inferior cortex and scalloped between molar roots, it extended from lower second premolar up to sigmoid notch of ascending ramus.

DD  Ameloblastoma
    OKC
    Odontogenic fibroma
Periapical radiograph of edentulous, probably mandibular molar area (due to superimposition of external oblique ridge) shows a unilocular well-defined, corticated radiolucent area which contain small radiopaque foci.

**DD**
- Residual cyst
- Primordial cyst
- Ameloblastoma
Lateral oblique radiograph shows a unilocular well-defined radiolucent area involving the posterior mandibular premolar-molar area and extended from 1st premolar till the anterior border of ramus of the mandible, the lesion produce slight expansion and thinning of the inferior cortex without destruction. It scalloped between the premolar roots.

**DD**
- OKC (Odontogenic Kerato-Cyst)
- Traumatic bone cyst
- Ameloblastoma
Cropped panoramic radiograph shows a unilocular well-defined radiolucent area related to posterior body on the right mandible, the lesion located below IAC and produce slight thinning of inferior cortex.

**DD**
- Latent bone cyst
- Neurolemmoma
- Neurofibroma
Panoramic radiograph shows, diffuse sclerotic area affecting the left body and ramus of the mandible with slight expansion of inferior and superior cortex.

DD
- Diffuse sclerosing osteomyelitis
- Paget's disease
- Osteoblastic metastatic carcinoma
Cropped panoramic radiograph reveals, ill-defined periapical radiolucent are related to lower 1st molar on the left side, together with periosteal reaction (proliferative periostitis---onion skin pattern) related to inferior cortex below 1st molar.

**DD**
- Garre's osteomyelitis (proliferative periostitis)
- Trauma
- Ewing's sarcoma
- Leukemia
Panoramic radiograph shows, a multiple but separate radiopacities involving both sides of the mandible, the lesions appear homogenous RO with radiolucent area surrounding.

DD
- Florid cemento-osseous dysplasia
- Multiple osteoma
- Multiple tori
Cropped panoramic radiograph shows a pericoronal unilocular mixed RL-RO well-defined, corticated lesion on the left side of the posterior mandible, the radiopacities inside are tooth density.

DD  Complex odontoma
    Ossifying fibroma
    Pindborg tumor
Well-defined, heterogeneous radiopaque mass away from bone (soft tissue).

**DD**  
Calcified lymph node  
Sialolith  
Phlebolith
Lateral oblique radiograph shows a densely radiopaque mass related to inferior cortex at molar area.

DD
- Osteoma
- Osteoblastoma
- Cementoblastoma
Cropped panoramic radiograph on the left side shows a unilocular well-defined radiolucent lesion, it scalloped between the premolar and molar roots without root resorption.

DD  Traumatic bone cyst
    OKC
    Odontogenic fibroma
Lateral oblique radiograph shows, ill-defined ragged radiolucent area related to premolar-mola4 area, radiopaque area in the center may probably an area of sequestration, together with discontinuity of inferior cortex suggesting pathological fracture.

**DD**
- Osteomyelitis
- Osteoradionecrosis
- Sq cell carcinoma
Cropped panoramic radiograph shows, RO lesion on the first molar area on the left side of the mandible, the lesion surrounded by thick radiolucent halo (band) and also large carious cavity was observed related to 7

**DD**
- Cementoblastoma
- Osteoblastoma
- Osteoid osteoma
Ameloblastoma

Is an odontogenic tumor usually described as a locally malignant tumor usually occurs with older age group. It may arise from remnant of dental lamina or enamel organ.

**Clinical features:** **Age:** 20-50 years.
- **Sex:** Females are more commonly affected.
- **Site:** Mandibular third molar region is the most common site.

-Ameloblastoma is painless and slowly growing; it can cause migration and loosening of teeth as well as root resorption and paraesthesia of the lip.
-It may expand the cortical plates, but frequently it erodes them and then invades the adjacent soft tissue.

**Radiographic features:** Unilocular lesion usually associated with an unerupted tooth.
-Often, there are multiple radiopacities within the lesion.
-Displacement or separation of adjacent root is common.
-It may be multilocular or unilocular. Or it may be honeycomb (numerous small compartments), which is due to numerous septa that may be present or soap bubble (large compartments that are variable in size) appearance.
-The radiolucency may typically cyst like that if the radiolucent area is associated with the crown of an unerupted or displaced tooth (similar to dentigerous cyst), likewise if the tumor has involved the roots of a functioning tooth it will resemble a radicular cyst.
-Also there is tendency for ameloblastoma to produce root resorption.

**Inter-dental ameloblastoma** arising between roots of the teeth similar to lateral periodontal cyst.

**N.B.:** Ameloblastoma occasionally formed from the epithelial lining of a dentigerous cyst (mural ameloblastoma).
CGCG (Central Giant Cell Granuloma)

It occurs most commonly in the mandible usually anterior to molars. The exact cause is still in doubt.

**Clinical features:** The lesion is painless and grows slowly by expanding the cortical plates, but it seldom perforates into the soft tissue.

**Radiographic features:** *Initially:* Solitary cyst-like radiolucency. *As it grows* soap bubbles type of multilocular radiolucency.
Fibrous dysplasia

It’s a lesion of bone that arises as a result of an abnormal proliferation of immature fibrous tissue.

**Clinical features:** It may produce asymmetry of the jaw (facial asymmetry) but usually no pain.

If the teeth are situated in an involved section of the jawbone, malocclusion, spreading or migration of teeth may be noted but no mobility.

Growth is slow and usually ceases on the 20 years or before.

**Radiographic features:**
- **Early stage:** Radiolucent lesion with diffused border.
- **Intermediate stage:** Smoky, mottled or hazy pattern produced by the poorly defined intense aggregations of small specules randomly distributed throughout the radiolucent area.
- **Mature stage:** Salt and pepper, ground glass or orange peel appearance (**finger print pattern**). Also, it may produce migration of related teeth and sometimes produces root resorption.
Paget's disease

It's a disease of the bone characterize by enlargement of the skull and maxilla (so if the patient wearing upper denture it become tight). The mature stage of Paget’s disease is characterized by enlargement of the skull and jaws usually the maxilla and rarely the mandible (it similar to florid cemento-osseous dysplasia but Paget’s disease usually affecting white man while florid affecting black).

**Radiographic features: Early stage:** Osteolytic stage characterized by decreased bone density, alteration of the trabecular pattern (ground glass appearance). **Late stage:** Osteoblastic stage characterizes by evidence of alternating regions of fibrosis and osteosclerosis giving *Cotton wool appearance* (*Large radiopaque patches or masses with minimal residual radiolucent areas*).

**Intra-oral dental radiograph:** Teeth related shows, first root resorption, followed by hypercementosis, complete or partial loss of lamina dura.

**N.B.:** serum alkaline phosphatase level (especially during osteoblastic phase) is commonly elevated during accelerated bone activity (whether resorption or apposition). High serum alkaline phosphatase level may suggest Paget's disease, biliary obstruction (liver disease) or pregnancy.

- Increase hydroxyproline in urine due to severe degradation of bone collagen.

**Complications:** development of osteosarcoma and giant cell tumor in the bones affected by the disease process.
Hyperparathyroidism

**Hyperparathyroidism:** Endocrine abnormality characterized by an increase in circulating parathyroid hormone (PTH), which stimulates osteoclasts to mobilize calcium from the skeleton *(99% of body calcium in the skeleton)*. Then, hypocalcemia also stimulates renal tubular reabsorption of calcium.

**Primary hyperparathyroidism:** Caused by benign tumor of one or four of parathyroid glands—produce elevation of PTH. Or it may be due to hyperplastic parathyroid gland. *There is increase of serum calcium level.*

**Secondary hyperparathyroidism:** It is due to compensatory increase of PTH due to hypocalcemia. It may be due to:

*Deficient metabolism of vitamin D in liver or kidney.*
*Poor absorption of vitamin D.*
*Inadequate dietary intake.*

All the above factors produce similar clinical and radiographic effects as primary type. *There is increase of urinary calcium.*

**Diagnosis:** Increase level of PTH and hypocalcemia.

**Clinical features:**

**Sex:** females: males 2:1 or 3:1.

**Age:** 30-60 years.

**Shape:** Symptoms related to hypocalcemia include renal and joint calculi, peptic ulcers, bone and joint pain, gradual loosening of teeth, drifting, and finally may lead to loss of teeth.

**Radiographic picture:** 4 principle features:

1) **Demineralization of the skeleton:** Unusual radiolucent skeletal image as bone matrix contains less amount of calcium.

2) **Skull:** Affect the entire calvarium in the form of granular appearance and loss of central (diploic) trabeculae and thinning of the cortical tables.

3) **Mandible:** Demineralization of the inferior border of the mandible and cortical lining of mandibular canal, thinning of the cortical outline of the maxillary sinuses.

**Loss of lamina dura** either partial or complete, tooth appear tapered (due to lamina dura accentuate to some extent the adjacent tooth root). This picture is not specific, it appear in other diseases as fibrous dysplasia and Paget’s disease.

4) **Osteitis fibrosa generalisata:** Localized destruction of bone by osteoclasts will produce radiolucent area of fibrosis (a rarefying osteitis with fibrous degeneration and cystic spaces).

**Some degree of phalange erosion** (erosion of bone from the subperiosteal surfaces of the phalanges of the hands).

5) **Brown tumors:** It is either peripherally or centrally, x-ray picture is an ill defined radiolucency. It is called giant cell tumor or brown tumor because the gross specimen appears brown or reddish brown.

6) **Brown tumors:** May be solitary (mistaken as central giant cell granuloma [microscopically identical]) or generalized (multiple), appear with ill-defined margin, may produce cortical expansion.

7) **Pathologic calcification:** Nodular calcification rarely affects the kidney and joint.

**Management:** Removal of the cause, surgical removal of parathyroid adenoma will correct the condition, except site of brown tumor (after its removal, it usually heals more sclerotic than normal).
Odontogenic fibroma (non-ossifying)

(Non-ossifying fibroma, ossifying fibroma, cementifying fibroma, cemento-ossifying fibroma)
- It speculated that the tumor originates from:
  * Dental papilla.
  * Dental follicle.
  Or * Periodontal ligament.

Clinical features: Site: It has a predilection for the mandible.
  Shape: Usually painless and asymptomatic.

Radiographic features: Well-defined radiolucency, may contain radiopaque foci (radiolucent/radiopaque lesion resemble calcifying odontogenic cyst and sometimes completely radiopaque give the appearance of coiled warm pattern in such case it should be differentiated from fingerprint pattern of fibrous dysplasia), causing spreading of teeth, but they do not characteristically cause root resorption.
Odontogenic Myxoma

It’s a benign tumor of bone. It is non-invasive neoplasm probably arises from dental papilla, dental sac or periodontal ligament. The gross appearance of the myxomatous tissues is amper, gelatinous and gooey.

Clinical features: Age: 10-30 years.
   Sex: Higher in females.

Site: Premolar-molar area of the mandible more than maxillary sinus area of the maxilla (4:3).
-It’s a slowly enlarging painless expansion of the jaw with possible spreading, loosening and migration of teeth in the involved area.
-Rarely there may be numbness of the lip and occasionally pain.

Radiographic features: It may be unilocular or multilocular (most common).
-May be a multilocular radiolucency in the form of soap bubble or honeycomb pattern (the loculi or internal septa may meet at sharp angles form angular or geometric shapes such as rectangles, triangles, squares and diamonds or meet at right angles forming a fish-skeleton appearance ---the previous shape indicating that the lesion is breaking out of the bone and extending into the soft tissue).
-May be well-defined or poorly defined borders.
-May be mixed radiolucent/radiopaque lesion.
Aneurysmal bone cyst

-It’s a false cyst.

**Pathogenesis:** Many theories about the nature of the lesion are that:

It may result due to local alteration in hemodynamics, leading to increase venous pressure and subsequent development of a dilated and engorged vascular bed in the bony area. Resorption of bone is then occurs, to which the giant cells are related, and this is replaced by connective tissue, osteoid and new bone.

It may be due to exuberant attempt at repair of hematoma of bone. But in the case of the aneurismal bone cyst it is postulated that the hematoma maintains a circulatory connection with the damaged vessels. This would produce a slow flow of blood through the lesion and account for the blood encountered when the lesion is entered.

Thus the only real difference between aneurismal bone cyst an giant cell granuloma is that in the latter lesion the damaged blood vessels fail to retain a circulatory connection with the lesion.

Arteriovenous fistula but due to hemodynamic forces lead to development of the lesion.

**Clinical features:** Slowly growing lesion.
- Mandible more commonly affected than maxilla.
- Slightly tender and teeth may be displaced.

**Aspiration:** venous blood.

**Radiographic features:** Unilocular or multilocular radiolucency that frequently balloons the cortex (blown out the bone) with well or ill-defined borders.
Multiple OKC (Odontogenic Kerato-Cyst) or primordial cyst

**Origin:** Usually arising from dental lamina or any of the remnants of odontogenesis.
This term is designated for a group of cysts of possible diverse origin, which have a number of highly characteristic clinical and microscopic features include:
1. They have a highest recurrence rate of any odontogenic cysts.
2. Contain cheesy, yellow, granular material in the cyst cavity.
3. They have a thin CT wall and a thin squamous type epithelial lining (4-5 cell layers thick) that is keratinized either para or orthokeratinized and without rete pegs.

*A primordial, follicular or radicular cysts* may prove to be a *keratocyst* on microscopic examination of the specimen.

**Clinical features:**
- **Site:** Mandible, angle region.
  - **Sex:** Male.
  - **Age:** Second and third decades.

**Radiographic features:** Radiolucent cyst-like image, have a hazy appearance and cloudy interior. Sometimes it will have scalloped borders and may even occur with a multilocular appearance.

**N.B.:** Keratocyst may transform into *ameloblastoma* or *carcinoma.*

The cyst recur in about 10% to 50% usually within 2 to 5 years after treatment, however some was suggested radiographic follow-up should be of at least 10 years.
Dentigerous cyst

Cystic changes that occur in an enamel organ (reduced enamel epithelium) after the crown have been formed.

**Clinical features:**

- **Site:** The teeth most frequently affected lower wisdom’s.
- **Age:** The highest incidence occurs during the second and third decade.
- **Sex:** Higher in males.
- **Shape:** It various from less than 2 cm in diameter to a massive expansion of the jaws.

Because a cyst is usually painless, delayed eruption of a tooth may be the only clinical sign suggesting pericoronal pathoses.

A painful cyst generally indicates the presence of infection.

**By aspiration:** Dentigerous cysts frequently yield a straw-colored liquid usually with cholesterol crystals, which may be seen in the aspirate when the syringe is slowly rotated against a relatively strong light.

About 10% of dentigerous cysts are odontogenic keratocysts.

**Radiographic features:** Well-defined radiolucency, usually with a hyperstotic border (may be unilocular or multilocular).

The multilocular appearance usually caused by ridges in the bony wall and not by the presence of complete internal septa.

The associated tooth may be displaced as a mandibular molar may be displaced to the inferior borders of the jaw or up to the ascending ramus or coronoid processes or the condyle. When the maxillary canine is involved, it may be displaced into the maxillary sinus or even to the floor of the orbit.
Multiple dentigerous cysts

Most dentigerous cysts are solitary, bilateral cysts are found in association with:

*Basal cell nevus syndrome (Gorlin Goetz syndrome).*
*Cleidocranial dysplasia.*
*Amelogenesis imperfecta.*
Multiple myeloma

It may be multiple (multiple myeloma) or single (single myeloma).

It’s a neoplasm in which there is proliferation of a single clone of abnormal plasma cells in the bone marrow (malignant plasma cell tumor).

It represents the most common primary malignant tumor of bone.

Clinical features: 30 % of cases, the jawbones are affected specially the premolar region and coronoid process.

When the mandible is involved, parasthesia or numbness of the lip may be a complain, may looseness and migration of the teeth.

At first the expansion is covered with normal mucosa but later chronic trauma produce an inflamed and ulcerated necrotic surface.

Radiographic features: Small, circular single or multiple separate well-defined radiolucencies (punched-out) and diffuse osteoporotic changes.
Metastatic carcinoma

A primary carcinoma may result in the development of multiple metastases in the skeleton.

The most common primary tumors that metastasize to the jaw are from the thyroid gland, breast, lung, GIT, prostate and kidney.

**Clinical features:** **Site:** premolar molar area of the mandible. When produces swelling, the exophytic lesion is usually dome shaped and covered with normal appearing mucosa. *Later* as it increases in size and traumatized its surface will frequently develop a mucositis and will ulcerate and become necrotic.

**Radiographic features:** Multiple small rounded and well-defined (punched out) Radiolucencies then as the lesions progress they become ill-defined in their margins. The disease may be appearing primary as a periodontal lesion (localized destruction of alveolar bone. So, *lesions of this type are well circumscribed or not usually depends on the aggressiveness of the tumor, the less-aggressively lesion behaves, the more circumscribed it appears on the radiograph*
Osteomyelitis

Inflammation of bone and bone marrow (i.e. abscess within the bone).

**Clinical features:** Local tenderness and swelling develop over the area of the abscess.

**Site:** Mandible affected more than the maxilla due to the less vascularity (absence of collateral circulation).

Also decrease spontaneous drainage in mandible than maxilla due to thicker and denser mandibular cortical plates tends to contain the purulent material within the bone thus promote the development of a more serious lesion but in the maxilla the spontaneous drainage is much better due to thinner cortical plates allow prevention the development of osteomyelitis.

**Also**

Fractures of the mandible are more common than fractures of the maxilla.

Fractures of the mandible anterior to the last tooth are the most common that in-turn involve the largest bulk of the more easily infected dense cortical bone.

Fractures of the maxilla usually follow lines of low mechanical resistance that do not involve areas of dense cortical bone.

**N.B.:** osteomyelitis is more common in the body of the mandible due to fractures in this site is usually compound (presence of intraoral communication with the fracture site) greatly increases development of osteomyelitis. Fractures of the ramus, condyle and Coronoid process seldom become infected because of thick coverage of these segments of the lower jaw by muscles and other tissues.

Regional lymphadenopathy.

A sinus or fistula from the abscess sometimes develops and discharges a purulent material.

Fetid breathe.

If teeth are involved, the patient complains that they are loose and tender.

**Radiographic features:** Chronic osteomyelitis may produce at least four different radiographic images.

A radiolucency with ragged borders (moth-eaten, several crisscrossing radiolucent tracts, ill-defined, vague or diffuse).

A radiolucency containing one or more radiopaque foci.

A dense radiopacy.

A salt and pepper appearance.

**Sequestra:** On the radiograph the sequestra specially the larger one are usually denser and better defined, with a sharp outline, than the surrounding vital bone. The increased density of the sequestra is the results of:

- Sclerosis that was induced before the bone became necrosis.
- Inflammatory reaction is probably stimulating the demineralization of the vital bone surrounding the sequestra, thereby enhancing the contrast.

The smaller sequestra may become less dense as they are slowly dissolved by the lytic action of the purulent fluid surrounding them.

**Pathogenesis:** the following description refers to untreated or antibiotic resistant osteomyelitis. Prompt antibiotic treatment may abort the infection at any early stage before radiological changes appears.

The susceptibility of the metaphysic (diaphysis, metaphysis and epiphysis) to acute osteomyelitis is in part explained by the dilated vascular sinusesoids of the marrow spaces where sluggish blood flow provides an ideal site for multiplication of bacteria. This initiates an acute inflammatory response with exudation of protein-rich fluid and neutrophil polymorphs. As intraosseous pressure rises, there is venous and later arterial thrombosis and local bone necrosis. Infection spread rapidly throughout the marrow spaces so that the medullary cavity is occupied by pus, which penetrates the Haversian systems of the metaphysial cortex, elevates the periosteum and forms a subperiosteal abscess. The periosteum of the adolescent (unlike that of the adults) is loosely attached and the abscess may surround much of the diaphysis, leading to thrombosis of penetrating arteries. Occlusion of both periosteal and endosteal vessels leads to necrosis of some or all of the diaphysis, the portion of dead bone being known as a sequestrum. Small sequestra, particularly in children, tend to be completely absorbed by osteoclastic activity, while larger ones usually persist for months or years, forming a nidus for repeated episodes of infection. As infection becomes less acute, subperiosteal new bone may form a shell around the dead bone (involucrum). This involucrum is irregular and often perforated, allowing pus to track into the surrounding soft tissues, ultimately reaching the surface and forming a discharging sinus.
Osteoradionecrosis

Irradiation + Trauma + Infection.
- Irradiation (40-80 Gy – 4000 – 8000 Rad) produce decrease of vascularity (affect the blood supply) and degenerative change in osteocytes and bone marrow (such bone has very low defensive power).

Location: Mandible due to:
  * Less blood supply.

Also
  * Therapeutic irradiation is more often directed to it.

Clinically:
- Pain.
- Swelling.
- Subperiosteal abscess and multiple draining fistulae.

Radiography: Similar to chronic suppurative Osteomyelitis (but it shows more spread due to absence of the body defense against the process of infection. Also, it shows late sequestration [more diffuse, late sequestration]).

Point to note: No actual differentiation between it and chronic suppurative osteomyelitis except by history of previous radiation for head region
Sq. cell carcinoma

-Is an odontogenic tumor usually described as a locally malignant tumor usually occurs with older age group. It may arise from remnant of dental lamina or enamel organ.

**Clinical features:**
- **Age:** 20-50 years.
- **Sex:** Females are more commonly affected.
- **Site:** Mandibular third molar region is the most common site.

-Ameloblastoma is painless and slowly growing; it can cause migration and loosening of teeth as well as root resorption and paraesthesia of the lip.

-It may expand the cortical plates, but frequently it erodes them and then invades the adjacent soft tissue.

**Radiographic features:** Unilocular lesion usually associated with an unerupted tooth.
- Often, there are multiple radiopacities within the lesion.
- Displacement or separation of adjacent root is common.

-It may be multilocular or unilocular. Or it may be honeycomb (numerous small compartments), which is due to numerous septa that may be present or soap bubble (large compartments that are variable in size) appearance.

-The radiolucency may typically cyst like that if the radiolucent area is associated with the crown of an unerupted or displaced tooth (similar to dentigerous cyst), likewise if the tumor has involved the roots of a functioning tooth it will resemble a radicular cyst.

-Also there is tendency for ameloblastoma to produce root resorption.

**Inter-dental ameloblastoma** arising between roots of the teeth similar to lateral periodontal cyst.
Nasopalatine cyst

The incisive foramen maximum diameter 5-6mm.
- The incisive canal cyst is situated within bone and thus shows a cyst like radiolucent enlargement of the canal. It is developmental in origin and arises in the remnants of the nasopalatine duct undergo proliferation and cystic degeneration.
- It must be differentiated from a radicular cyst as it may be projected over the apices of the central incisors.

Clinical features: Age: 40-60 years.  Sex: Higher in males.
- Usually asymptomatic and detected on a routine radiograph of the area, but may produce small well-defined swelling just posterior to the palatine papilla. This swelling is usually fluctuant and bluish if the cyst is near the surface. The deeper nasopalatine cysts are covered by normal appearing mucosa unless it is ulcerated.
- The lesion may also bulge into the nasal cavity and distort the nasal septum.
- A burning sensation or numbness over the palatal mucosa may be caused by pressure from the cyst on the adjacent nasopalatine nerve that occupies the same canal.
- In some cases cystic fluid may drain into the oral cavity via a fistula; the patient will usually detect the fluid and report a salty taste.

Radiographic features: its heart shaped radiolucency.

This heart shaped is due to:
The image of the radiopaque anterior nasal spine may intern be superimposed over the dark cystic cavity giving it a heart shaped.
The superimposition of the nasal septum over the cystic area may also impact a heart shaped appearance.

N.B.: If the cyst forms in the two branches of the canal appearing as two adjacent but separate cysts, also may be produce divergence of the central incisor roots.
Median alveolar cyst

**Origin:** It may arise from the enamel organ of a supernumerary tooth between the maxillary central incisors and in such case it will be a primordial cyst.

**Radiographic features:** Round or oval well-demarcated radiolucent lesion surrounded by a radiopaque border.

**N.B.:** Recent investigation by Kramer, Pindborg and Shear (1992) proved that the median alveolar cyst and median mandibular cyst are keratocyst derived from dental lamina in the midline of the maxilla and mandible respectively.
Mural ameloblastoma

Ameloblastoma arising from the epithelium lining the dentigerous cyst.

**Age:** under 30 years.

**Site:** mandibular third molar.

**Shape:** usually a symptomatic and discovered on the routine radiographic examination but on enlargement it produces swelling that result from expansion of the cortical plates. The swelling is initially hard and bony then, thinning of the cortical plate and the swelling is either soft or firm. The firm swelling is due to masses of tumor or fibrous tissue.

**Radiographically:** localized thinning and haziness of the hyperstotic radiopaque rim should prompt the clinician to suspect that a mural ameloblastoma may have penetrated the fibrous capsule of a follicular cyst. But recommended aspiration of the cyst fluid and injection of the radiocontrast solution into the cystic cavity demonstrate the presence of mural nodule.

**TTT:** Surgical excision and follow-up.

**Comment:** Here the surgical and pathology findings are important as well as the preoperative radiologist's report. If the lesion separates easily at surgery and if histopathologically the mural nodule does not extend much into the connective tissue wall of the original dentigerous cyst, probability of recurrence is very low. If, however, the lesion separates with difficulty from the adjacent bone and if the ameloblastomatous proliferation extends into the adjacent bone histologically, higher recurrence rates, up to 25%, have been reported. Suspecting the nature of the lesion presurgically with the aid of an oral and maxillofacial radiologist's report can lead to more aggressive surgery in areas of bony adherence and ultimately improve the prognosis.
AOT (Adenomatoid Odontogenic Tumor)

It is an odontogenic epithelial tumor that is most likely a hamartoma (an abnormal proliferation of tissues of structures native to the part) not a neoplasm.

- The lesion is not related to the ameloblastoma and this is important because the surgical treatment for adenomatoid odontogenic tumor requires only localized tumor removal rather than the more extensive surgical procedures required treating ameloblastoma.

**Clinical features:**

**Age:** Mostly 16 years.

**Sex:** Higher in females.

**Site:** 75% maxilla, usually incisor, canine and Premolar region and usually related to unerupted tooth (prediction for the anterior region of the jaws).

**Radiographic features:** Unilocular well-defined radiolucency associated with an unerupted tooth. The appearance may be similar to a follicular (dentigerous) cyst, and usually surrounded more than just the crown of unerupted tooth. The radiolucency may be accompanied with faint radiopaque foci (*the radiopaque flecks looking like figures such as snowflecks, paw print and donuts*), usually produce root displacement rarely produce root resorption. The lesion usually grow inward rather than outward that' why usually not produce detectable swelling.

**TTT:** Excision the lesion doesn't tend to recur.
Ossifying fibroma

**Age:** Young adults.

**Location:** Premolar-molar area of mandible.

**Clinically:** No pain, facial asymmetry and the related teeth are vital.

If untreated it will attain a much larger size, causing expansion of jaws.

The lesion may be termed “Ossifying” or “Cementifying” depending on the tissue present.

**Cemento-Ossifying Fibroma** is a mixture of bone and cementum in same lesions.

**Radiographic features:** **Early stage:** It appears as a well-defined radiolucency. **Later:** Mixed radiolucent/radiopaque. These lesions are more commonly well-circumscribed solitary lesions but sometimes multiple and diffuse.
Pindborg tumor

- It is a rare odontogenic tumor.

**Clinical features:**

- **Sex:** Higher in males.
- **Age:** 40 averages.

- **Site:** Mandible more common than maxilla. It occurs most commonly at the molar region of the mandible (usually affecting 1st and 2nd permanent molars), then molar region of the maxilla.

- Painless, slowly increasing expansion of the jaw.

- Small lesions were usually asymptomatic.

- 52% of cases were associated with unerupted tooth.

**It may have several radiographic appearances:**

A pericoronal radiolucency.

A pericoronal radiolucency with radiopaque foci.

A mixed radiolucent/radiopaque lesion not associated with an unerupted tooth.

A driven-snow appearance.

A dense radiopacity

1, 2 are the most common radiographic picture.
Residual cyst

Is that either:

a. Remained, as such, in the jaw when its associated tooth was removed.

b. Formed in residual epithelial rests from the periodontal ligament of the lost tooth.

**Clinically:**

**Age:** Older than 20 years, average, 52 years.

**Site:** Mostly affect maxilla.

Usually asymptomatic, although the patient may associate it with previous pain from a tooth that was lost from the area.

**Radiographically:** It is round to ovoid radiolucency that is usually well circumscribed and may be surrounded by thin radiopaque margin, it may be unilocular (most common) or multilocular.
Traumatic bone cyst

It’s classified as false cyst.

**Pathogenesis:** following trauma, intramedullary hemorrhage occurs, in the majority of cases, heals by organization of the clot and eventual formation of connective tissue and new bone. But in such condition, for unknown reason, there is failure of organization of the blood clot and subsequent degeneration of the clot that eventually produces an empty cavity within the bone.

The lesion then appears to increase in size by a steady expansion produced by progressive infiltrating edema on the basis of restriction of venous drainage. This expansion tends to cease when the cystlike lesion reaches the cortical layer of bone, so that expansion of the involved bone is not a common finding in the solitary bone cyst.

**Clinical features:** Half of the patients will give a history of trauma.
Mandible more than maxilla.
Premolar molar area more commonly affected followed by inferior region of the ramus then the incisor region.
Totally asymptomatic and occasionally the jaw show regional expansion.
The traumatic bone cyst is frequently found unexpected on routine radiographs.

**Aspiration:** negative.

**Radiographic features:** Round or oval radiolucency has a scalloped superior margin (scallops up in-between the roots) produced by its molding around the roots of mandibular premolar molar area. Usually has a well defined border in most areas.
Latent bone cyst

A defect that occurs in the posterior region of the body of the mandible (from the lingual side) near the inferior border simulates in some respects the radiographic appearance of epithelial lined cysts, although its borders tend to be more opaque and wide.

**Radiographic features:** The defect presents either an elliptical or a round radiolucent image situated slightly above the inferior border.

**Also the same condition may occur in relation to the sublingual salivary gland and produce radiolucency at the lower canine and in relation to parotid gland and produce radiolucency in relation to posterior ramus.**
Neurolemmoma

e.g. Neurolemmoma *(schwannoma)* arises from: *Schwann cells* that make up the inner layer covering the peripheral nerve.
Neurofibroma

It is a benign non odontogenic tumor. It involving the mandibular canal (produce elongation and broadening of the canal) appear radiographically and cyst-like radiolucency.
Diffuse sclerosing osteomyelitis

Occurs as the results of a balanced equilibrium between the virulence of the infection and the resistance of the host (is a proliferative reaction of bone to low-grade infection which either from: Infected pulp of a tooth or reaction generalized or diffused periodontal disease).

**Clinically:** Symptoms of chronic infection, tenderness, Pain and tenderness, Enlargement of the affected side because of the subperiosteal deposits of bone, regional lymphadenitis and draining sinus may accompany some cases.

**Radiography:** Ill defined radiolucency and sclerotic zones. *Early*, areas of sclerotic and osteolytic bone; *late*, increased sclerotic areas, involving almost all the jaw or both maxilla and mandible [the pattern is similar to that of the cotton wool appearance of Paget's disease].

**N.B.:** Bone scan shows, increase uptake due to active bone deposition.
Osteoblastic metastatic carcinoma

Metastatic tumors to the jawbone usually produce poorly defined, ragged radiolucencies. Although Osteoblastic metastasis to the jaws is rare, tumors from primary lesions in the prostate and occasionally from the breast may be of this type.

Metastatic prostate carcinoma to bone may develop as entirely radiolucent, entirely radiopaque (in such condition it give the permeative pattern (bone effacement, hazy pattern, in which the cortical margins not well defined and the bone margin of th lesion blends with surrounding bone), or mixed radiolucent-radiopaque lesions.

Whether a Metastatic tumor promotes osteoblastic activity in the tissue or organ involved apparently depends primarily on whether the Metastatic tumor cells produce significant levels of acid or alkaline phosphatase.

Other Metastatic tumors that are usually osteolytic may induce Osteoblastic activity in the tumor or neighboring bone, such lesions also appear on the radiograph as mixed radiolucent-radiopaque lesions.
Garre's osteomyelitis (proliferative periostitis)

**Age:** Usually affect a young person (younger than 30 years) with a periosteum capable of vigorous activity.

**Location:** Inferior border of the mandible below the first molar.

**Clinically:** Thickening of the cortex (2-3cm thick) [expansion of buccal or lingual plate of bone, hard swelling].

-Slight pain.

**Radiography:** A shadow of a thin convex shell of bone over the cortex may be seen. *Later*, the cortex thickens and become laminated with alternating radiopaque/radiolucent layers i.e. On occlusal radiograph ---shell made due to expansion of the cortex over the original cortex but without bone trabeculae inside (double cortex) as infection persist---increase bone trabeculation and appearance of layers of bone making (onion like feature) [remodeling after treatment].

**After removal of the cause, resolution of the swelling takes 2 to 6 months and up to 1 year. Thus patience, parental reassurance, and radiographic evidence of resolution are key to the follow-up plan (in resolution, the laminations first become indistinct, the subperiosteal new bone blends with the inferior border of the mandible. This is followed by remodeling which produces regression of the bony enlargement and a return of normal appearance of the cortex and bone in the region).**
Ewing's sarcoma

Is a malignant neoplasm arising from connective tissue of the bone marrow.

**Clinically:** **Age:** 5-25 years.

**Sex:** Males > females  2:1.

**Site:** Mandible > maxilla.

**Early:** Intermittent pain. **Later:** It becomes continuous.

**Radiographically:** **Early:** Mottled rarefaction. **Later:** Unilocular or multilocular ill-defined radiolucent lesions. When the lesion reaches the cortex it may stimulate the periosteum to produce layers of bone giving **onion skin** appearance.
Leukemia

Leukemia is a malignancy involving one of the leucocytes cell types. Marrow replacement by proliferating cells of the myeloid series causes general rarefactions of bone.

The radiographic appearance of the leukemia may vary from multiple punched out defects to solitary, moderately well-defined areas of osteolysis to generalized rarefaction. 

Worth (1966) described the following radiographic changes observed in the jaws of patients with leukemia or lymphosarcoma:

The formation of the tooth crypts may be partially or completely destroyed. The cortices of the tooth crypts may be partially or completely destroyed. There may be enlargement of the crypts with failure of bone formation about the apical portion of erupting or developing teeth. The developing tooth may assume an asymmetric position within the crypt with or without destruction of some or part of the crypt cortex. Incompletely formed crowns may be situated entirely above the alveolar crest, being completely elevated out of the bone. Partially formed tooth, especially those having incomplete root formation, may be found to have excessively rapid eruption.
Florid cemento-osseous dysplasia

**Age:** 42 years (average).

**Location:** Mandible. Usually affecting black females.

**Clinically:** Intermittent poorly localized pain. Bony swelling, mucosal ulceration and suppuration. Teeth are vital.

**Radiographic picture:** It usually multiple. At first glance, seem to demonstrate a pagetoid-like lesion, cotton-wool appearance with multiple irregularly shaped radiopaque areas. On closer examination, initially, well defined usually mixed radiolucent/radiopaque then, well defined radiolucent rims can be seen surrounding most of the radiopaque areas.

Teeth may show hypercementosis.

**Complications:** two complications
- Secondary infection.
- Sequestration of a cemento-osseous mass. Development of associated simple or traumatic bone cysts, which may be multiple and tends to recur after surgical curettage.
Multiple osteoma

3) Osteoma (Gardner’s Syndrome)

*Osteoma* is a benign tumor composed of bone. Skull is the most common site. Multiple osteomas may be associated with osteomas in other parts of the body.

*Multiple osteomas* in the large intestine may precede the onset of colonic polyps. Malignant changes may occur in these polyps.
Multiple tori

**Torus Palatinus:** An oval shaped radiopacity at the midline of the palatal, surrounded by radiopaque border, while the interior portion may show a normal trabecular pattern. Appear on the occlusal film as an oval shaped radiopacity.

**Torus Mandibularis:** Appear on the lingual surface of the mandible, more common in the premolar region. It may single or multiple, bilaterally and varies in size.
Complex odontoma

- Non-descriptor masses of dental tissues laid down in a bizarre and haphazard fashion and there is no resemblance of normal tooth arrangement.

**Site:** Mandible more common than maxilla. Most commonly in the premolar-molar region.

**Radiographic features:** Well-defined radiolucency with many radiopaque foci that vary greatly in size, shape and prominence.
Calcified lymph node

**Etiology:** Chronic infection.
- Tuberculosis.

**Location:** Usually at the submandibular angle.

**Clinically:** Asymptomatic.
- Single or multiple, hard and round.

**Radiography:** Complete or partial radiopacity (radiopaque and radiolucent).
- Projected over the posterior body and angle of the mandible.
Sialolith

Stones within the major and minor salivary glands or their ducts.

**Age:** Middle and old age.

**Location:** Wharton's duct and submandibular gland.

**Clinically:** History of pain and swelling at mealtime.

**Radiography:** Submandibular gland: The periapical view shows the stone superimposed over the premolar-molar areas. Also, it appears in the lateral oblique view.

- Parotid gland: The periapical view placing it in the buccal vestibule and also it appears in the A.P. view.
Phlebolith

Phleboliths are calcified thrombi occurring in venules, veins, or sinusoidal vessels of hemangiomas. They may occur singly or as multiple calcifications, are usually small radiopacities, may be round or oval, and may show concentric light and dark rings. When they are projected over the mandibular bone or the periapices of mandibular teeth, they may easily be confused with sialololiths.
Osteoblastoma

**Benign osteoblastoma (giant osteoid osteoma):**

**Age:** usually below 20 years of age.

**Sex:** Common in males.

Pain and swelling of the affected area.

**Radiographically:** Well or ill defined radiolucent area with varying degrees of calcification (mottled or mixed radiolucent-radiopaque appearance). It may show a central calcified mass surrounded by a radiolucent halo.
Cementoblastoma

**Age:** younger than 25 years.

**Location:** Second premolar or first molar areas of the mandible.

**Radiographically:** Well-defined radiopacity with radiolucent halo (zone).

**Other features:** Larger than hypercementosis, and separated from the surrounding bone by a radiolucent rim.
Osteoid osteoma

Osteoid osteoma:
It is a benign non-odontogenic tumor but others believe that it may result of trauma or inflammation *(that is why it is consider as and inflammatory condition coupled with neoplastic proliferation and this explain the cause of pain)*.

**Age:** usually young persons (mostly 5-10 years) seldom developing after 30 years

**Sex:** higher in females.

**Site:** Mandible specially body and condyle

Severe pain, localized swelling of soft tissue over the involved area of bone that usually tender.

**Radiographically:** small ovoid or round radiolucent area surrounded by a rim of sclerotic bone. The central radiolucency may exhibit some calcification. The lesion seldom is larger than 1 cm in diameter, but the overlying cortex does become thickened by subperiosteal new bone formation.
GOOD LUCK,