Panoramic Radiography: Normal Variants and Pathology

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It's a type of Tomogram

Fundamentals

Sliding centre of rotation

Focal Trough

Three-dimensional curved zone or image layer in which structures are reasonably well defined.

Focal trough

Real Image

Composite of in-focused and blurred images

Focal trough

Formed when the object is in between the center of rotation and image receptor.
Real/actual shadows
- Maxilla
- Mandible
- Air Spaces
- Soft Tissues

ARTIFACTS
- Ghost Images
- Lead Apron Artifact
- Patient Positioning Errors
- Cassette Positioning Errors

Structure which are often ghosted are
- Hyoid bone
- Cervical spine
- Inferior border of mandible
- Earrings, tongue rings
- Neck chain
- Chin rest
- (R) or (L) markers of the machine
- Neck chains
- Earrings, tongue rings
- Shoulder straps of protective apron

Double images may be double images
Double images are formed in zone in central region
Common double images include
- Hard palate
- Soft palate
- Hyoid bone

Positioning/setup errors
Know your technical
E. POSITIONING OF THE SPINE

If the patient is not sitting or standing with a straight spine, the cervical spine appears as a pyramid shaped radiopacity in the center of the film.

POSITIONING OF THE LIPS AND TEETH

- If the lips are not closed on the bite block, a dark radiolucent shadow obscures the anterior teeth.
- If the tongue is not in contact with palate, a dark radiolucent shadow obscures the apices of the posterior teeth.

Palatoglossal Air Space

Structures smaller on the side to which head is turned, larger on opposite side.
I. DISTORTION DUE TO PATIENT MOVEMENT
Prolonged exposure results in increased horizontal dimension of the image.

Mandibular incisors shortened, V-shaped mandible

HEAD TIPPED DOWN

Squared-off mandible, palate superimposed over maxillary teeth

HEAD TIPPED UP

Anterior teeth narrower and blurred

Teeth too posterior

Anterior teeth wider and blurred
Forgot to remove denture
Crooked implants?

Panoramic Radiography, what are we looking at?

Is it a good film?

Systematic evaluation
Try to evaluate radiographs the same way every time

Gestalt
- Clarity
- Contrast
- Symmetry
- Distortion

Look at the films the same way every time...
- Avoid tunnel vision
- Start on periphery and work your way to center
- Look at the condyles, spine, orbits, sinuses, nasal cavity; bony borders
- Use opposite side for comparison
- Count teeth
- Evaluate dentition and bony base
- Identify and describe abnormalities

Assess radiograph
Assess radiograph

Description of lesions
- Location
- Density
- Size
- Shape
- Border
- Contents
- Effects on neighboring structures

Assessment of Lesion

Lesions in structures adjacent to the jaws

Calcified Stylohyoid Ligament

Tonsillolith

Tonsillolith

Tonsillolith
Carotid Artery Calcifications

Sialolith in Submandibular Gland

Calcified Lymph Node: Scofula

Phlebolith in a hemangioma

Antral Pseudocyst
Radicular cyst

Trauma

Lesions within the Jawbones
Lions and tigers and bears, oh my!

Patterns of Fracture

Description of lesions
- Location
- Density
- Size
- Shape
- Border
- Contents
- Effects on neighboring structures

When you hear hoof beats...
...common things are common

With pathology, think differential diagnosis
TYPES OF CEMENTO-OSSEOUS DYSPLASIAS: -

- Based on their clinical and radiological features, grouped into
  1. Periapical cemento-osseous dysplasia
  2. Focal cemento-osseous dysplasia
  3. Florid cemento-osseous dysplasia

Radiography:
- Well defined radiopaque up to 3 cm below the apex with intact lamina dura

Focal Sclerosing Osteomyelitis

Histopathology:
- Cemento-osseous dysplasia
  1. Periapical Cemento-osseous Dysplasia
  2. Mandibular incisor
  3. More than one tooth is affected
  4. Tooth vital
  5. More common in black females
  6. Middle age (around 40) and rare before 20
  7. Asymptomatic, typically discovered on routine radiographic examination
Periapical Cemento-osseous dysplasia

- **Radiography**
  1. Early lesion appears as rounded radiolucent area related to the apex and continue with PDL.
  2. Later produce solid radiopaque mass

- When not associated with a tooth apex called as **focal cemento-osseous dysplasia**

Cemento-osseous dysplasia

- **Radiography**
  1. Early stage:
     - Lesion appears well defined and well marginated
     - Mixed radiopaque and radiolucent
     - Middle age black women
     - Typically symmetrical and bilateral
  2. Later stage:
     - Bone destruction and unilocular radiolucency
     - Some times all four quadrants involved

Cemento-osseous dysplasia

- **Florid cemento-osseous dysplasia**:
  1. Aka Gigantiform cementoma
  2. Less common
  3. Represent an exuberant and severe form of periapical type
  4. Middle age black women
  5. Typically symmetrical and bilateral
  6. Sometimes all four quadrants involved

- **Radiopaque masses with radiolucent spicules at the root**

CEMENTOBLASTOMA

- Benign ectomesenchymal neoplasm of cementum and forms a mass of cementum-like tissue as a mass forming around a tooth, usually a mandibular first molar.
- Mostly affect young adults, particularly males.
- They are slow-growing and the jaw is not usually expanded.
- May rarely cause gross bony swelling and pain.
- Radiographically, there is typically a radiopaque mass with thin radiolucent margin, attached to the roots of a tooth.
- Resorption of related roots is common, but the tooth remains vital.

- **Treatment is enucleation**
Complex odontoma
- Disordered mass of dental hard tissue
- Tooth tissues but not teeth!
- Most common site are posterior mandible or maxilla

Compound odontoma
- Tiny teeth
- May be malformed
- Most common sites are anterior maxilla

Well defined radiolucent Lesions
Is that a cyst?

Radicular cyst

ORAL PATHOLOGY
Periapical Cyst / Radicular Cyst / Apical Periodontal Cyst
1. Types of radicular cyst (periapical cyst)
   a. Apical
   b. Central
   c. Cystic
   d. Mucous
   e. Mucocystic
   f. Mucous retention

Bone cystic lesions
1. Odontogenic cyst
2. Malignant
3. Metastatic
4. Myelomatous
5. Benign

Radicular cyst
Nasopalatine Duct Cyst

Some consider it as a hamartoma.

- Limited to young, extremely uncommon in patients > 30 years.
- Maxilla > mandible.
- Anterior region > posterior region.
- Female > male.
- Rarely exceeding 3 cm in diameter.
- Lesion appears as a well-circumscribed unilocular radiolucency that involves the crown of an unerupted tooth, frequently a canine.
- Radiolucency extends beyond the cemento-enamel junction.

Cysts of the maxillary sinus

OKC

Fibrous dysplasia

- A self-limiting disease characterized by fibrous replacement of medullary bone by metaplastic woven bone that eventually replaced by dense lamellar bone.
Fibrous dysplasia

- Limited to a single bone.
- Accounts for 90% to 95% of all cases.
- Monostatic: 70%.
- Polyostotic: 30%.
- Multifocal: 5%.
- Maxilla & Mandible are most commonly affected.
- Involvement in the jaw bone maxilla is more frequent.
- Start in childhood.
- Slow growing painless, smooth, rounded bony swelling with facial asymmetry.
- Enlargement can cause malocclusion and displacement of teeth.
- Sometimes prevent tooth eruption.

No pain on palpation.

- Maxillary lesions may cause epiphora, proptosis, and orbital dystopia.
- Mandibular lesions occur in molar and premolar regions.
- Protuberance and increase the depth of jaw.

Fibrous dysplasia — Radiography:

1. Radiolucent area with fine orange peel textures.
2. Borders are difficult to define because of gradual transition to normal.
3. Initially resemble cyst-like radiolucencies resembling faint bone trabeculae.
4. The disease is self-limiting.
5. Large lesions surgical excision.

Ground glass appearance

Cotton wool appearance

- Dental radiographs also show the classical cotton wool appearance.
- Extensive hypercementosis can be noted.

Cotton wool appearance

Paget’s disease of Bone

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Cotton wool appearance

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Cotton wool appearance

Ground glass appearance
Multiple Myeloma

BRONJ

OSSIFYING FIBROMA

- Ossifying fibroma (OF) is a well-circumscribed, sometimes encapsulated neoplasm composed of fibrous tissue containing varying amounts of calcified material.
- This calcified material may be bone, cementum-like spheres or a mixture of both.
- It has been suggested that the origin of the tumor is odontogenic or from periodontal ligament.
- But identical tumors have been reported in orbital, frontal, ethmoid, sphenoid and temporal bone, leaving these prior theories of origin open to question.
Ossifying fibroma

**Juvenile Ossifying Fibroma**

- Uncommon lesion of bone.
- Differentiated from ossifying fibroma on the basis of age incidence, site predilection and clinical behavior.
- However, histologically the distinction from OF is not so clear.
- Two patterns recognized – trabecular and psammomatoid.

**Clinical Features:**

- **Age Incidence:** Patients younger than 15 years of age.
- **Sex Incidence:** Equal.
- **Site Predilection:**
  - Most commonly involves orbital and frontal bones.
  - Maxilla is involved more commonly.

**Clinical Features:**

- **Signs & Symptoms:**
  - Most tumors show rapid growth.
  - In such cases, pain and paresthesia may be noted.
  - Psammomatoid variant frequently appears outside the jaws, mostly arising in the orbital and frontal bone and paranasal sinuses.
  - Cortical expansion and facial asymmetry is seen with jaw lesions.
  - Orbital and nasal involvement may cause exophthalmus, proptosis and nasal obstruction.

Osteosarcoma

**Osteosarcoma** *(Osteogenic sarcoma)*

- Malignancy of mesenchymal cells that have the ability to produce woven or immature bone.
- Commonest malignancy arising within the bone along with hemopoietic neoplasms.
- Majority arise from within the bone (intramedullary), some may be peripheral (juxtacortical).

**Clinical Features:**

- **Age Incidence:** 3rd and 4th decades.
- **Sex Incidence:** Commoner in males.
- **Site Predilection:** Long bones and U / L jaws.
**Signs & symptoms:**
- Swelling and pain - commonest symptoms.
- Loosening of teeth, paresthesia and nasal obstruction (in case of maxillary tumors) may also be noted.

**Treatment**
- For smaller lesions, complete local excision.
- Rapidly growing lesion, wider resection may be required.
- Recurrence rate is about 30% to 58%.

**RADIOGRAPHIC FEATURES:**
- Radiographic features vary from densely sclerotic to completely radiopaque.
- Periphery of lesions usually indistinct and ill defined.
- The characteristic “sunburst” appearance can be noted in about 25% of jaw tumors.
- Produced by osteophytic bone production.

**Mixed radiopacity – radiolucency (mottled)**
- To completely radiopaque
- Periphery of lesions usually indistinct and ill defined.

**In summary:**
- Start with good radiographs
- Good radiographs start with good patient positioning
- Systematically evaluate the radiographs
- Evaluate pathology based on the seven descriptors
- Correlate with the clinical exam and history
- Can the diagnosis be made based on current information
- For many lesions, biopsy is required to make the final diagnosis