RADIOGRAPHIC INTERPRETATION

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INTERPRETATION

- the ability to read what is revealed on a dental radiograph
- any dental professional with training can interpret findings on a radiograph
- an additional pair of eyes is always a help!

We will be reviewing:

- all normal anatomic structures
- artifacts
- deviations from normal
- interpretation of decay
- interpretation of periodontal disease

Law of Symmetry

- If you see a variation of normal on one side, check the opposite side next

RADIOGRAPHIC ANATOMY

TYPES OF BONE

- CORTICAL
  - outer layer
  - compact bone
  - resists the passage of the x-ray beam
  - appears radiopaque

- CANCELLOUS
  - arranges like a “lattice”
  - soft, spongy bone located between two layers of cortical bone
  - appears mainly radiolucent
PROMINENCES OF BONE

ALL APPEAR RADIOPAQUE

 PROCESS
- a prominence or projection
- coronoid process of the mandible

 RIDGE
- a linear prominence or projection
- internal and external oblique ridges of mandible

 TUBERCLE
- small bump or nodule of bone
- genial tubercles

 TUBEROSITY
- rounded prominence of bone
- maxillary tuberosity

SPACES AND DEPRESSIONS IN BONE

 CANAL
- tube-like passageway that contains nerve and blood vessels
- mandibular canal

 FORAMEN
- opening or hole
- mental foramen

 FOSSA
- broad, shallow, scooped-out area
- submandibular fossa

 SINUS
- hollow space, cavity or recess
- maxillary sinus

Normal Anatomy Mandibular

![Mandibular Anatomy Diagram]

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MAXILLARY MIDLINE AREA
1. outline of nose
2. incisive foramen
3. lateral fossa
4. nasal fossa
5. nasal spine
6. border of nasal fossa
7. nasal spine
8. median palatine suture

MAXILLARY CANINE AREA
1. lateral fossa
2. nasal fossa
3. border of nasal fossa and maxillary sinus
4. maxillary sinus
5. canine eminence
6. overlapping

MAXILLARY PREMOLAR AREA
1. floor of sinus
2. maxillary sinus
3. septum in sinus
4. zygomatic process
5. zygoma
6. lower border of zygomatic arch

MAXILLARY MOLAR AREA
1. border of sinus
2. maxillary sinus
3. zygomatic process
4. zygoma
5. septum in sinus
6. lower border of zygomatic arch
7. hamular process
8. maxillary tuberosity
9. coronoid process

MANDIBULAR MIDLINE AREA
1. mental ridge
2. nutrient canal
3. nutrient foramen
4. genial tubercles
5. lingual foramen
6. inferior border of mandible

MANDIBULAR CANINE AREA
1. nutrient canal
2. mandibular torus
MANDIBULAR PREMOLAR AREA
1. mandibular torus
2. external oblique ridge
3. internal oblique ridge
4. submandibular fossa
5. mandibular canal
6. mental foramen

MANDIBULAR MOLAR AREA
1. external oblique ridge
2. internal oblique ridge
3. submandibular fossa
4. mandibular canal

Pneumatization of Maxillary Sinus

PANORAMIC ANATOMY

Review of Normal Panoramic Anatomy
Review of Normal Panoramic Anatomy

- Lower border, maxillary sinus
- Anterior border, maxillary sinus
- Posterior border, maxillary sinus
- Ghost image, opposite mandible
- Soft palate shadow
- Lower border, maxillary sinus
- Ghost image, opposite mandible

Mandibular notch

Coronoid process, mandible

Hyoid bone

1 bone, 2 images

Mandibular foramen

Mandibular canal

Articular eminence

"True" image of hard palate

Neck of mandible

Lingula of mandible

Mental foramen

FRANKFORT PLANE

The Frankfurt plane passes through the floor of the orbit and the external auditory meatus

MIDSAGITTAL PLANE

The mid-sagittal plane divides the body into half into right and left sides

PANORAMIC TECHNIQUE ERRORS
PATIENT POSITIONED TOO FAR BACK
- anterior teeth widened and blurred

PATIENT POSITIONED TOO FAR FORWARD
- anterior teeth narrowed and blurred

CHIN TOO HIGH

CHIN TOO LOW
- an exaggerated smile is seen
- condyles approach upper area of film

HEAD TILTED OFF CENTER

HEAD TILTED OFF CENTER
- posterior teeth on one side are magnified
INTERPRETATION OF CARIES

Interpreting Dental Caries

Drawing indicating the area to examine for interproximal caries. For interproximal caries, view the area where two adjacent teeth contact, apical down to the area where the gingival margin would most likely be (boxed area). Cervical burnout is most likely to be imaged apical to the gingival margin.

Caries Comparison

1. incipient
2. moderate
3. advanced
4. severe

Severe Interproximal Caries

Cervical Burnout
OCCLUSAL CARIES

Seen as a round radiolucency on molars

ROOT CARIES

Dental Caries

Vertical angulation
(A) Improper vertical angulation (excessive obliterates viewing of surface carious lesion. (B) Proper vertical angulation shows interproximal caries.

Dental Caries

Horizontal angulation. (1) Improper horizontal angulation prevents viewing interproximal caries. (2) Improved horizontal angulation, but caries difficult to view. (3) Proper horizontal angulation shows interproximal caries.

Radiograph of occlusal caries. This radiograph shows (1) severe occlusal caries, which appears as a large radiolucent lesion in the first molar.
Dental Caries

Radiograph of buccal or lingual caries. Buccal or lingual caries on this mandibular second premolar appears as a round radiolucency (superimposed over the pulp chamber).

Dental Root Caries

Radiograph of cemental (root) caries. The large radiolucency on the distal surface of the distal root of the first mandibular molar.

Conditions Resembling Caries

Bitewing radiograph. This radiograph shows: (1) large occlusal caries, (2) radiolucient lines or mach band effect (an optical illusion caused by overlapped enamel), (3) interproximal caries, and (4) cervical burnout.

The Role of Radiographs in Periodontal Disease Diagnosis

- must use paralleling technique
- must use long cone
- approximately 30-50% change in bone mineral content is needed before bone loss can be detected on a radiograph
- radiographs do not provide accurate diagnosis of early bone loss

INTERPRETATION OF PERIODONTAL DISEASE
EXPOSURE TECHNIQUE

The bisecting technique will distort the bone level. With the paralleling technique, the height of the crestal bone is accurately recorded.

ACTIVE DESTRUCTIVE PROCESS

- rough and irregular interdental septal bone
- alveolar bone below the crest has minimal bone opacity

STATIC DESTRUCTIVE PROCESS

- smooth surface of alveolar bone
- radiopaque “capped” areas over crestal bone

Normal Bone in Posterior

- What does normal look like?

Mostly Healthy Periodontium

- Normal alveolar bone parallel to CEJ and 1-2mm below
Radiographic Signs of Periodontal Disease

- lack of continuity of the lamina dura
- widening of the periodontal ligament space
- decrease in crestal bone height
- crestal irregularities
- angular bone loss (triangulation)
- bony defects
- furcation involvement

WIDENED PERIODONTAL LIGAMENT SPACE

RAMP-LIKE APPEARANCE

- buccal or lingual wall is destroyed, the other is intact
- probing will confirm which wall is destroyed

TRIANGULATION

INTERSEPTAL BONE CHANGES

A. healthy crestal bone
B. fuzziness and break in lamina dura

FURCATION INVOLVEMENT
**OSSEOUS CRATER**

**LOCAL PREDISPOSING AND FUNCTIONAL FACTORS OF PERIODONTAL DISEASE**

**LOCAL PREDISPOSING FACTORS**
- calculus
- overhanging margins
- open interproximal contacts
- deficient margins of crowns
- improperly adapted fixed and removable prostheses
- overcontoured restorations and crowns
- plaque retention around clasps of partials
- excessive occlusal forces from partials
- food impaction

**LOCAL FUNCTIONAL FACTORS**
- occlusal forces that exceed the adaptive capacity of the supporting periodontal tissues
- crown root ratio
- root morphology

**CROWN/ROOT RATIO**
- A measurement of the amount of bone that supports the tooth
- It is the ratio of the amount of tooth (root and crown) not covered by bone to the amount of root in bone
- Example: if 12 mm of the tooth is not surrounded by bone and 6 mm of root is surrounded by bone, the crown/root ratio is 12:6, or 2:1

**INADEQUATE CROWN TO ROOT RATIO**
PERIO CASE TYPES

PERIO CASE TYPE I
- There is no bone loss associated with Type I disease.
- The normal healthy alveolar crest is located approximately 1.5 to 2 mm apical to the CEJ.
- In the anterior, a healthy alveolar crest appears pointed and very radiopaque.
- In the posterior, the alveolar crest appears flat, smooth, and radiopaque.

PERIO CASE TYPE II
Early Periodontitis - mild bone loss (up to 30%)

PERIO CASE TYPE III
Moderate Periodontitis - moderate bone loss (30-50%)

PERIO CASE TYPE IV
Severe Periodontitis - severe bone loss (50% or more)

Interpretation of Pathology, Anomalies, and Trauma
**EXTERNAL RESORPTION**
- caused by trauma, orthodontics, chronic inflammation, tumors, cysts, impacted teeth
- apex of root appears blunted
- not associated with any signs or symptoms
- no treatment

**INTERNAL RESORPTION**
- occurs within the crown or root of the tooth
- involves the pulp chamber, pulp canals, and surrounding dentin
- may be caused by trauma, pulp capping, and pulp polyps
- asymptomatic, tooth may require endo or extraction

**Internal Resorption**

![Internal Resorption](image)

**Atrophic Pulp**

![Atrophic Pulp](image)

**Pulp Stone (Pulp Polyp)**

![Pulp Stone](image)

**Abscess**

![Abscess](image)
Periodontal abscess

**Condensing Osteitis (Sclerosing Osteomyelitis)**
- radiopacity below the apex of a nonvital tooth with a history of chronic pulpitis
- reaction of the bone to low-grade inflammation
- tissue build-up rather than tissue breakdown
- may vary in size and shape and does not appear to be attached to the tooth
- tissue eventually calcifies
- no treatment is necessary

**Sclerotic Bone (Osteosclerosis)**
- radiopacity seen below the apices of vital, noncarious teeth
- unknown cause
- not believed to be associated with inflammation
- lesion varies in size and shape and is not attached to the tooth
- asymptomatic

**Hypercementosis**
Multiple Roots

Mesiodens
- supernumerary tooth between the maxillary central incisors
- usually smaller with a conically shaped and short root

Mesiodens

Hypodontia
- congenital absence of one or a few teeth
- most common in the permanent dentition
- third molars, second premolars and lateral incisors most commonly affected
- familial tendency

Hypodontia

Hyperdontia
Hyperdontia
▶ extra or supernumerary teeth
▶ more frequent in the maxilla
▶ familial or genetic component
▶ commonly occurs in third molar, lateral incisor and premolar regions
▶ may also be seen as maxillary fourth molars

Microdontia
▶ permanent teeth that are considerably smaller than normal
▶ usually occurs bilaterally
▶ often a familial trait
▶ maxillary lateral incisor most common “peg lateral”
▶ also commonly seen in third molars

Macrodontia
▶ teeth that are larger than normal
▶ term should not be applied to teeth that are enlarged due to magnification, gemination or fusion

Dens in Dente

Enamel Pearl
**Gemination (twinning)**
- one tooth splits in two
- appears as an incompletely divided or bifid tooth

**Fusion**
- union of tooth buds at the level of the dentin
- incisors most frequently involved

**Concrescence**
- is a condition of teeth where the cementum overlying the roots of at least two teeth join together
- incidence is reported to be highest in the posterior maxilla

**Cementoma**
- most common site is in the mandibular anterior
- teeth are vital and patient is asymptomatic
- may resemble acute pulpitis but teeth are vital
- may start out as radiolucent and as it calcifies it becomes more radiopaque
- should be removed particularly if it changes in size

**Odontoma**
- benign structure
- made up of tooth structures that have been laid down in a manner in which tooth anatomy cannot be identified

**Dentigerous Cyst**
- cyst that develops in the follicle around an unerupted tooth
- most are incidental
- should be removed and biopsied
- biopsy is the only way to differentiate this type of cyst from others

**Ameloblastoma**
- most commonly found in the mandibular molar region near the ramus
- may be associated with an impacted molar
- unencapsulated and invasive
- are not sensitive to radiation
- must be surgically removed
- usually requires removal of large segments of jaw bone and teeth
**Dentinogenesis Imperfecta**
- excessive imperfect dentin
- opalescent teeth
- pulp canals may be obliterated
- treatment - crown coverage

**Amelogenesis Imperfecta**
- hereditary condition affecting the enamel formation
- complete or partial absence of enamel
- treatment - crown coverage

**Lead Apron**

**Fractured Mandible**
Usually located 2.5 cm posterior to the angle of the mandible adjacent to the space between C3 and C4