Radiographic Interpretation:
Anatomic Landmarks, Caries & Dental Materials

Radiographic Anatomy Basics:
The Tooth

[Image of a dental X-ray with annotations]

[Diagram of a tooth with labeled parts]
Radiographic Anatomy Basics: Anterior

Anterior Radiograph of maxillary midline area. (1) Incisive foramen, indicated by an irregularly shaped, rounded radiolucent area. Also seen are the (2) outline of the nose, (3) nasal fossa (radiolucent), (4) nasal septum (radiopaque), (5) border of nasal fossa, (6) anterior nasal spine, and (8) median palatine suture.

Where is the vomer bone?
Radiographic Anatomy Basics: Canine Area

- Maxillary canine area
  - (1) lateral fossa
  - (2) nasal fossa
  - (3) inverted Y (intersection of the borders of nasal fossa and maxillary sinus)
  - (4) maxillary sinus

- Note the dense radiopaque area caused by overlapping of the mesial surface of the first premolar over the distal surface of the canine. This overlapping is common in this region of the oral cavity because of the curvature of the arch.

Activity: What are the DM on tooth #8?

Radiographic Anatomy Basics: Anterior Region

- Soft tissue of the nose in the path of the x-ray beam.
- The resultant radiograph will most likely show an image of the soft tissue, outlining the tip of the nose (magnified).

Radiographic Anatomy Basics: Premolar Area

- Maxillary premolar area
  - (1) border (floor) of maxillary sinus
  - (2) maxillary sinus
  - (3) septum in maxillary sinus dividing the sinus into two compartments
  - (4) zygomatic process of maxilla
  - (5-6) zygoma and lower border of zygomatic arch

Activity: Can you identify 1-6 in this picture?
Radiographic Anatomy Basics: Molar Area

Maxillary molar area. Identify: hamulus (hamular process), maxillary tuberosity, and coronoid process (mandible).

Maxillary molar area. (1) border (floor) of maxillary sinus, (2) maxillary sinus, (3) zygomatic process, (4) zygoma, (5) maxillary tuberosity (bone), and (6) coronoid process of the mandible.

Activity: What tooth number is this?

Activity: What is the thin radiolucent line here?

Radiograph of maxillary molar area. This radiograph shows (1) hamulus (hamular process), (2) coronoid process of the mandible, (3) maxillary tuberosity (bone), and (5) maxillary sinus.

Soft tissue outline of maxillary tuberosity.

Zygomatic process.

Activity: Which is radiolucent: PDL or lamina dura?

Can you identify the PDL on tooth #24?

Radiographic Anatomy Basics: Lower anterior

Mandibular Lower anterior. (1) mental ridge, (2) nutrient canal, (3) genial tubercles, (4) lingual foramen, and (6) inferior border of mandible (radiopaque band of dense cortical bone) often seen when excessive vertical angulation.

Activity: What is this?
Radiographic Anatomy Basics: Lower Canine Area

Mandibular canine area. 1. nutrient canal 2. torus mandibularis (lingual torus) appears radiopaque (bone)

Activity: Can you see the calculus on the lower anterior?

Radiographic Anatomy Basics: Lower premolar- molar area

Mandibular premolar area. 1. torus mandibularis. 2. oblique ridge (external). 3. mylohyoid line or internal ridge. 4. submandibular fossa. 5. mandibular canal. 6. mental foramen

Activity: Why do you see the cortical bone or inferior border of the mandible here?

Radiographic Anatomy Basics: Molar Area

Mandibular molar area. 1. oblique ridge (external). 2. mylohyoid line (or internal ridge). 3. submandibular fossa and 4. mandibular canal

Radiograph of mandibular molar area

1. oblique ridge (external). 2. mylohyoid line (or internal ridge). 3. submandibular fossa and 4. mandibular canal
<table>
<thead>
<tr>
<th>TABLE 16-1</th>
<th>Anatomical Landmarks Distinguishing Maxillary Radiographs From Mandibular Radiographs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>Maxillary Anatomical Landmarks</td>
</tr>
<tr>
<td>Incisor</td>
<td>Incisive foramen</td>
</tr>
<tr>
<td></td>
<td>Median palatine suture</td>
</tr>
<tr>
<td></td>
<td>Nasal fossa</td>
</tr>
<tr>
<td></td>
<td>Nasal septum</td>
</tr>
<tr>
<td>Carine</td>
<td>Anterior nasal spine</td>
</tr>
<tr>
<td></td>
<td>Inverted Y</td>
</tr>
<tr>
<td></td>
<td>Lateral fossa</td>
</tr>
<tr>
<td>Premolar</td>
<td>Maxillary sinus</td>
</tr>
<tr>
<td>Molar</td>
<td>Maxillary sinus</td>
</tr>
<tr>
<td></td>
<td>Zygomatic process of maxilla</td>
</tr>
<tr>
<td></td>
<td>Zygoma</td>
</tr>
<tr>
<td></td>
<td>Maxillary tuberosity</td>
</tr>
<tr>
<td></td>
<td>Hamulus</td>
</tr>
<tr>
<td></td>
<td>Coronoid process of mandible</td>
</tr>
</tbody>
</table>

**BQ:** Know whether a structure is radiolucent or radiopaque

<table>
<thead>
<tr>
<th>TABLE 19-1</th>
<th>Radiopaque and Radiolucent Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiopaque</td>
<td>Radiolucent</td>
</tr>
<tr>
<td>Bone</td>
<td>Canal</td>
</tr>
<tr>
<td>Border (wall)</td>
<td>Foramen</td>
</tr>
<tr>
<td>Process</td>
<td>Fossa</td>
</tr>
<tr>
<td>Ridge</td>
<td>Meatus</td>
</tr>
<tr>
<td>Spine</td>
<td>Sinus</td>
</tr>
<tr>
<td>Tubercles</td>
<td>Space (PDL)</td>
</tr>
<tr>
<td>Tuberosity</td>
<td>Suture</td>
</tr>
</tbody>
</table>

Diagram showing a flowchart to determine if a structure is radiopaque or radiolucent.
Anatomy:
Panoral Radiograph

1. Condyle
2. Mandibular notch
3. Coronoid process
4. Parasial pair
5. Mental foramen
6. Angle of mandible
7. Coronoid process and subcondral fossa
8. Mandibular canal
9. Apical foramen
10. Soft tissue (ear lobe)
11. Zygoma
12. Zygomatic process
13. Hard palate
14. Ext. auditory meatus

Activity: What tooth number is this?

Air spaces

Activity: What was the operator error here (excessive smile)?

1. Tongue  2. soft palate/uvula  3. ear lobe
FIND: orbit; incisive foramen; anterior nasal spine; nasal conchae; hard palate; maxillary sinus; floor of maxillary sinus; tooth #29; median palatine suture; submandibular fossa; bite block; air or open spaces; mandibular canal.
Dental Caries in Radiographs

**Vertical angulation**

- **Improper vertical angulation (excessive)**
  - Improper vertical angulation obscures viewing this proximal surface carious lesion.
- **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

Interpreting Dental Caries

Diagram of classification of dental caries
(1) Enamel caries less than halfway through the enamel (incipient caries) (2) Enamel caries penetrated over halfway through the enamel (moderate caries) (3) Caries definitely at or through the dentino-enamel junction (DEJ), but less than halfway through the dentin toward the pulp (advanced caries) (4) Caries that has penetrated over halfway through the dentin toward the pulp (severe caries) - probably will need endodontics
Can you identify the FRANK carious lesion?

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

Drawing indicating the area to examine for interproximal caries. To best detect proximal surface 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.

Root caries? Can be deceiving....

Radiograph of occlusal caries:
This radiograph shows severe occlusal caries, which appears as a large radiolucent lesion in the first molar. Is this on the occlusal? Can you see the decay?
Dental Caries

Radiographic versus clinically-always use BOTH

Dental Caries

Radiograph of buccal or lingual caries on the mandibular second premolar appears as a round radiolucency (superimposed over the pulp chamber)--so which is it?
Radiograph of recurrent caries. This radiograph shows (1) radiolucent caries under the metallic restoration.

Conditions Resembling Caries:
Yes, it can be confusing!

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

Periapical pathology:
The radiograph shows (1) caries on the distal surface of the left central incisor and (2) a round radiolucent lesion that is a periapical abscess (from the deep decay) needs endo.

Radiographic Appearance of Dental Restorative Material

<table>
<thead>
<tr>
<th>Metallic Dental Materials</th>
<th>Non-metallic Dental Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amalgam</td>
<td>Composite</td>
</tr>
<tr>
<td>Gold</td>
<td>Porcelain</td>
</tr>
<tr>
<td>Stainless steel</td>
<td>Acrylic resins</td>
</tr>
<tr>
<td>Retention pins</td>
<td>Silicate</td>
</tr>
<tr>
<td>Post and core</td>
<td>Base</td>
</tr>
<tr>
<td>Silver points</td>
<td>Temporary filling</td>
</tr>
<tr>
<td>Orchidectomy appliances</td>
<td>Gutta percha</td>
</tr>
<tr>
<td>Implants</td>
<td>* Sealsants * matrix composites same material</td>
</tr>
</tbody>
</table>

Dental materials. This radiograph shows several metallic and non-metallic dental materials. Since all the metals are equally radiopaque, their size and shape is observed to determine the type of material. The materials present in this radiograph are (1) amalgam (2) PFM (porcelain fused to metal) (3) post and core (4) gutta percha (5) base (6) full metal crown (7) retention pin and (8) metal pontic (part of the three-unit bridge).
Radiographic Appearance:
Dental Restorative Material

Comparison of radiopaque and radiolucent appearance of (1) radiopaque and (2) radiolucent restorative materials (composites, acrylic or silicates) on the central incisors and (3) radiopaque appearance of the porcelain-fused-to-metal crowns on the lateral incisors. The overexposure (darkness) of this radiograph makes it difficult to view the porcelain on the patient’s right lateral incisor.

Overhang (excess filling material): (1) This bitewing radiograph reveals an amalgam overhang on the mandibular first premolar. (2) Base material: Note the many shapes and sizes of the amalgam restorations in this radiograph – can you tell the differences in the Classifications of each?

Fragments of amalgam seen under the soft tissue; probably left after an extraction. (Clinically, the gingiva appears bluish-purple; this is called an amalgam tattoo.)
Restorative Materials

What are these dental materials?

1) Aluminum crown

Can you tell the difference between a FGC & an aluminum? What about a SS crown?

Restorative Materials & Decay

1) Radiolucent restorations (composites) on the mesial surface of the lateral incisor and distal surface of the central incisor. Under both restorations = BASE material

2) The radiolucencies on the mesial surfaces of both central incisors are carious lesions

**How can you tell the difference between decay & radiolucent composite restorations?**
Retention pins ((1)) Radiopaque pins help retain the radiolucent Class IV composite restorations. 
(2) Small radiopaque Class I amalgam restorations (in lingual pits). 

(1) Post and core-large radiopacities within the root canal. 
(2) Endodontic filling material will also be present when a post and core restoration is observed. 
(3) Amalgam restorations. (tooth #19 should now have a crown).

Restorative Materials

Composite (radiolucent) = material w/o barium

Post (on anterior tooth w/ endodontics)

Orthodontic appliances (1) external resorption caused by trauma of orthodontic treatment (pic on right); 
(2) pic on top shows ortho band on #15.
Restorative Materials

Normal bone levels just below CEJ (2-3 mm's)

Do you see the calculus?
Bone Levels