Radiographic Contrast

- The difference in densities between adjacent areas of the image
- Influenced by:
  - Subject contrast
  - Film contrast
  - Beam energy and intensity
  - Fog and scatter radiation

By adjusting kVp, contrast can be varied

- **High contrast films** can enhance detection of lesions where subject contrast between the lesion and healthy tissue is low
- **Examples include:**
  - Caries
  - Apical lucencies

- **Low contrast films** can enhance detection of subtle findings.
- **Examples include:**
  - Calculus
  - Soft tissue outlines
  - Small changes in crestal bone
Radiographic Density

The overall degree of darkening of the radiographic image. Three factors which determine radiographic density are:
- Exposure
- Subject thickness
- Object density

Radiographic Density

Exposure
- Determines the # of photons that are absorbed by the emulsion
- Four exposure factors
  - kVp
  - ma
  - Impulses (time)
  - Source to film distance

Radiographic Density

Object Density. The denser the object and higher the atomic #, the better the absorption of photons.

Radiographic Density

Subject thickness

In decreasing order of density:
- Metallic restorations
- Enamel
- Dentin
- Bone
- Fat/fluid
- Air

Subject Contrast

Influenced by:
- Thickness
- Density
- Atomic #

Relatively large differences in Subject Contrast of oral structures allow the image to be seen
Subject Contrast

Definitions

- **Radiodensity**: The degree to which the subject attenuates the x-ray beam
- **Radiopacity**: An area of the image where the beam has been relatively highly attenuated
- **Radiolucency**: An area of the image where the beam has been relatively minimally attenuated

Radiolucencies
- Marrow spaces
- Foramina
- Canals (N.B. the walls of the canal are opaque)
- Fissures
- Fossae
- Meati
- Sinuses
- Sutures
- Dental pulp

Radiopacities
- Bone
  - Condyles
  - Eminences
  - Processes
  - Tuberosities
  - Walls of canals
  - Tubercles
  - Ridges
  - Trabeculae
- Teeth
  - Enamel
  - Dentin
  - Cementum

The Teeth
- Enamel 90% mineralized
- Dentin 75% mineralized
- Cementum 50% mineralized
- Pulp Soft tissue

The Teeth
The Teeth

- Cervical burnout

Supporting Structures of the Teeth

- Trabecular bone

Bone in the Anterior Maxilla

- Trabeculae are thin and numerous
- Small marrow spaces

Bone in the Posterior Maxilla

- Similar pattern to anterior maxilla
- Slightly larger marrow spaces
Bone in the Anterior Mandible

- Trabeculae are somewhat thicker than in the maxilla
- Plates are in a horizontal pattern

Bone in the Posterior Mandible

- Horizontal Plates
- Larger marrow spaces than anterior mandible

Supporting Structures of the Teeth

- Crestal bone

Supporting Structures of the Teeth

- Lamina dura
- Periodontal ligament space

The joint between the tooth and the bone is a gomphosis. The periodontal ligament allows for movement around a center of rotation.
Supporting Structures of the Teeth

- Lamina dura and PDL

Landmarks in the Maxilla

- Intermaxillary suture
- Nasal Fossa
- Nose
- Lateral fossa

Landmarks in the Maxilla

- Incisive foramen
- Median palatine suture
- Pterygoid plates

Pterodactyl gr. *pteron*, wing
Landmarks in the Maxilla
- Anterior nasal spine
- Zygomatic process
- Pterygoid plates
- Coronoid process of the mandible
- Nasolabial fold

Coronoid Process
- From the Greek word for "Crow's Beak"

Landmarks in the Maxilla
- Lateral pterygoid plate
- Pterygo-maxillary fissure
- Zygomatico-temporal suture
- Zygomatic process of the maxilla

Maxillary Incisor
- $a = \text{nasal septum}$
- $b = \text{inferior concha}$
- $c = \text{nasal fossa}$
- $d = \text{anterior nasal spine}$
- $e = \text{incisive foramen}$
- $f = \text{intermaxillary suture}$
- $g = \text{soft tissue of nose}$

Nasal fossa

Landmarks in the Maxilla
- Intermaxillary suture
- Soft tissue of the nose
- Incisive foramen
Landmarks in the Maxilla

- Soft tissue of the nose

The red arrows point to the soft tissue of the nose. The green arrows identify the lip line.

Landmarks in the Maxilla

- Foramina of von Ebner

Landmarks in the Maxilla

- Nasopalatine canal

Landmarks in the Maxilla

- Incisive foramen

Landmarks in the Maxilla

- Incisive foramen
Landmarks in the Maxilla

- Anterior nasal spine

Maxillary Canine

a = floor of nasal fossa
b = maxillary sinus
c = lateral fossa
d = soft tissue of the nose

Lateral fossa. The radiolucency results from a depression above and posterior to the lateral incisor. To help rule out pathoses, look for an intact lamina dura surrounding the adjacent teeth.

Landmarks in the Maxilla

- Lateral fossa

Nasal Fossa

a = zygomatic process of maxilla
b = sinus septum
c = sinus recess
d = floor of the maxillary sinus
e = maxillary sinus

Maxillary Premolar

a = zygomatic process of maxilla
b = sinus septum
c = sinus recess
d = floor of the maxillary sinus
e = maxillary sinus
Landmarks in the Maxilla

**Nasolabial fold**

- a = zygomatic process of maxilla
- b = sinus septum
- c = sinus recess
- d = floor of the maxillary sinus
- e = maxillary sinus

**Maxillary Premolar**

- a = zygomatic process
- b = sinus recess
- c = sinus septum
- d = floor of the maxillary sinus
- e = maxillary sinus

Landmarks in the Maxilla

- Zygomatic Process and Maxillary Sinus

- a = maxillary tuberosity
- b = coronoid process
- c = hamular process
- d = pterygoid plates
- e = zygoma
- f = maxillary sinus

**Maxillary Molar**

- a = maxillary tuberosity
- b = coronoid process
- c = hamular process
- d = pterygoid plates
- e = zygoma
- f = maxillary sinus

Landmarks in the Maxilla

- Zygomatic Process and Maxillary Sinus
**Pneumatization.** From the Latin "filled with air" Expansion of sinus wall into surrounding bone, usually in areas where teeth have been lost prematurely. Increases with age.

**Landmarks in the Maxilla**
- Maxillary tuberosity
- Coronoid process of the mandible
- Hamular process

**Maxillary Tuberosity.** The rounded elevation located at the posterior aspect of both sides of the maxilla.

**Mucositis**  
**Halo effect**

**Landmarks in the Mandible**
- Mental ridges
- Mental foramen
- Mental fossa
a. lingual foramen
b. genial tubercles
c. mental ridge
d. mental fossa

Landmarks in the Mandible
- Mental foramen
- Inferior alveolar (Mandibular) canal

Landmarks in the Mandible
- Mylohyoid (Internal oblique) ridge
- Submandibular gland fossa
- Inferior border of the mandible

Landmarks in the Mandible
- External oblique ridge
- Inferior border of the mandible

Landmarks in the Mandible
- Genial tubercles
- Mental Ridge
Landmarks in the Mandible

a = Lingual foramen  
b = Mental ridge

d = mental fossa

Mental fossa. This represents a depression on the labial aspect of the mandible overlying the roots of the incisors. The resulting radiolucency may be mistaken for pathosis.

Mandibular Canine

a = mental ridge  
b = genial tubercles/lingual foramen  
c = mental foramen

Lingual foramen/ genial tubercles.
The red arrows identify the mandibular canal and the blue arrow points to the mental foramen.

**Landmarks in the Mandible**

- **Inferior border of the mandible**

**Mandibular Premolar**

- a = mylohyoid ridge
- b = mandibular canal
- c = submandibular gland fossa
- d = mental foramen

**Landmarks in the Mandible**

- **Submandibular gland fossa**

**Mandibular Molar**

- a = external oblique ridge
- b = mylohyoid ridge
- c = mandibular canal
- d = submandibular gland fossa
Landmarks in the Mandible

- **External oblique ridge**
- **Internal oblique ridge (a.k.a mylohyoid ridge)**

Mylohyoid (internal oblique) ridge. This radiopaque ridge is the attachment for the mylohyoid muscle. The ridge runs downward and forward from the third molar region to the area of the premolars.

External oblique ridge. A continuation of the anterior border of the ramus, passing downward and forward on the buccal side of the mandible. It appears as a distinct radiopaque line which usually ends anteriorly in the area of the first molar. Serves as an attachment of the buccinator muscle. (The red arrows point to the mylohyoid ridge).

The mandibular canal (red arrows identify inferior border of canal) usually runs very close to the roots of the molars, especially the third molar.
Restorations

- Gold
- Amalgam
- Titanium
- Stainless Steel
- Gutta Percha
- Porcelain
- Composites
- Cements and Liners

Restorations

- Metallic Restorations
- Bases and liners

Restorations

- Implant restorations

Restorations

- Stainless steel post
- Root-end amalgam

Restorations

- Porcelain
- Gold
- Gutta percha
- Stainless steel

Restorations

- Composites: Radiolucent and Radiopaque
Restorations

Posterior composites

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Questions

Thank you!