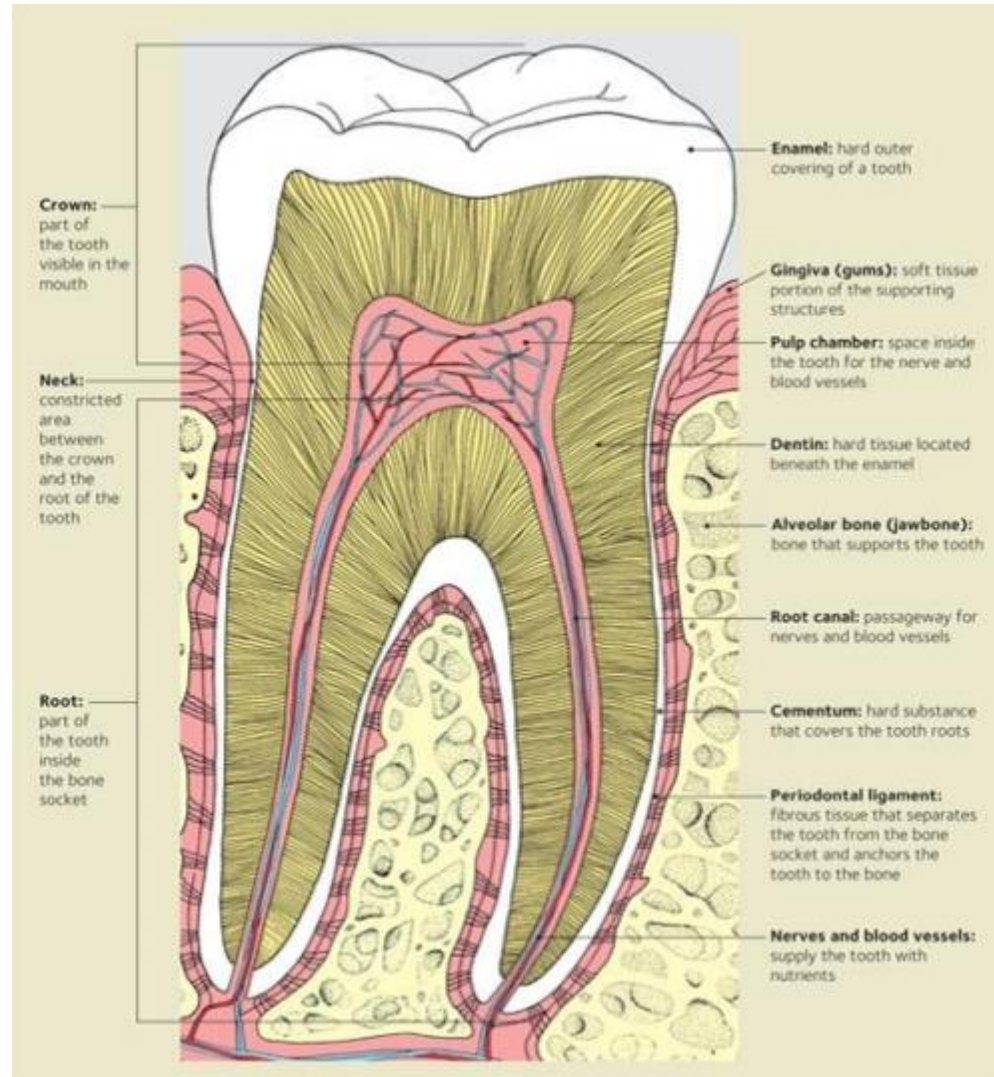


NORAMAL RADIOLOGICAL ANATOMY OF THE TEETH



NORAML ANATOMY OF THE TOOTH

ALVEOLAR BONE

Bone tissue

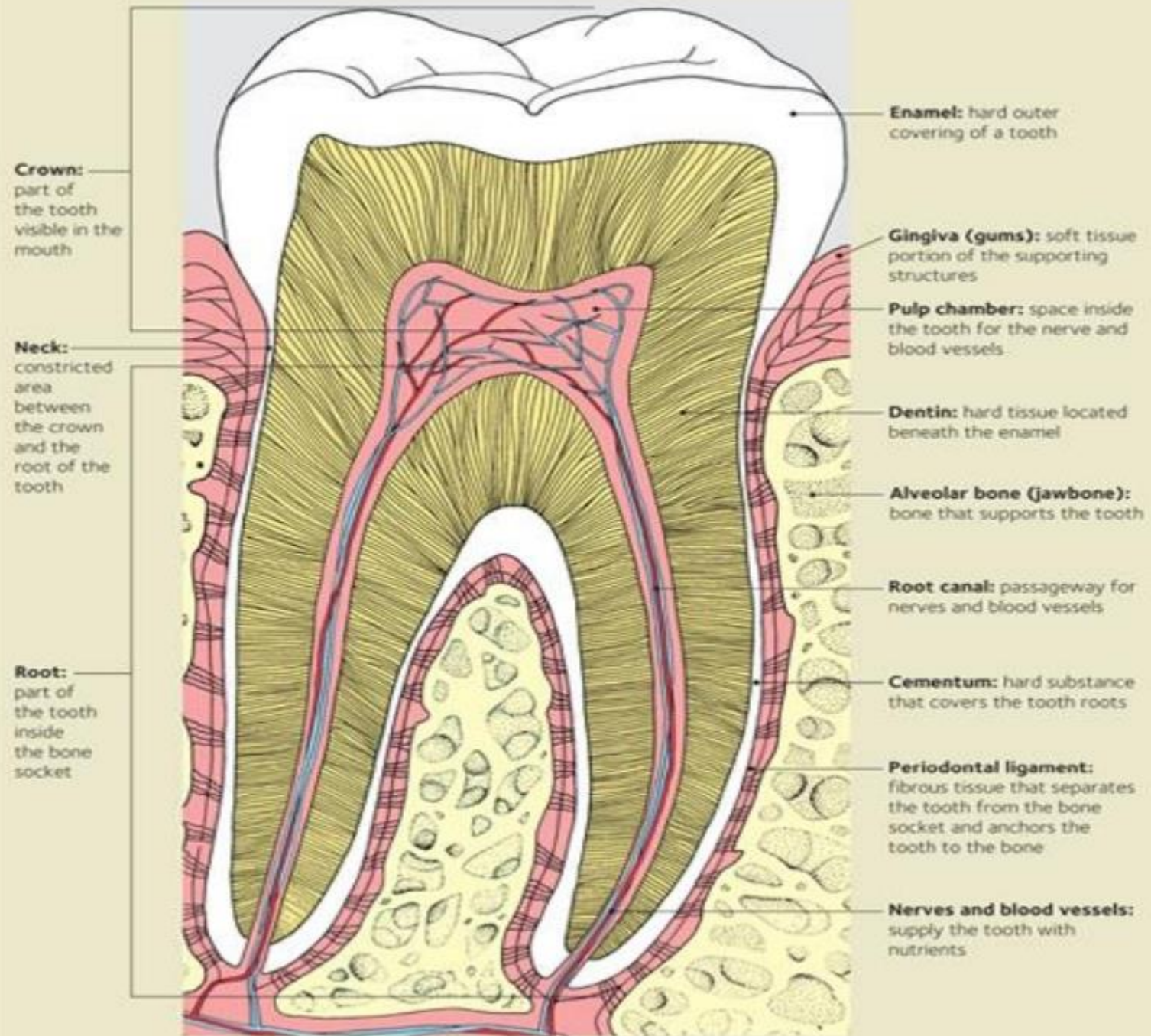
□ is a specialized form of connective tissue and is the main element of the skeletal tissues.

is composed of cells and an extracellular matrix in which fibers are embedded.

is unlike other connective tissues in that the extracellular matrix becomes calcified

Types of bone tissue:

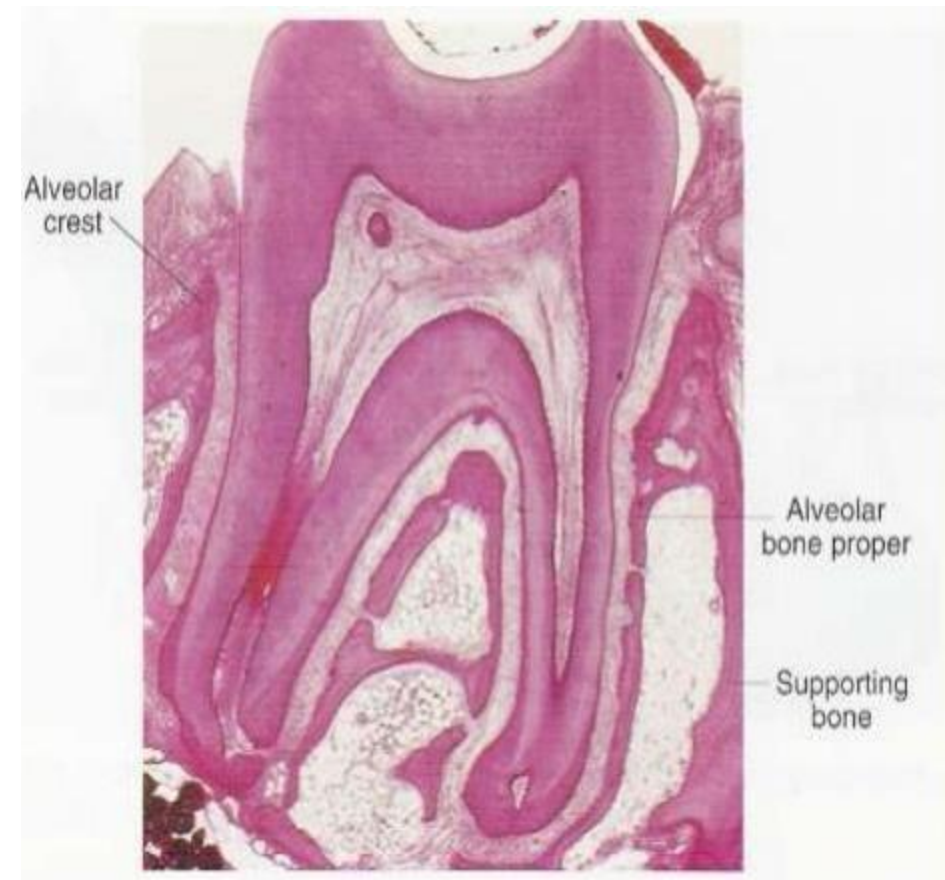
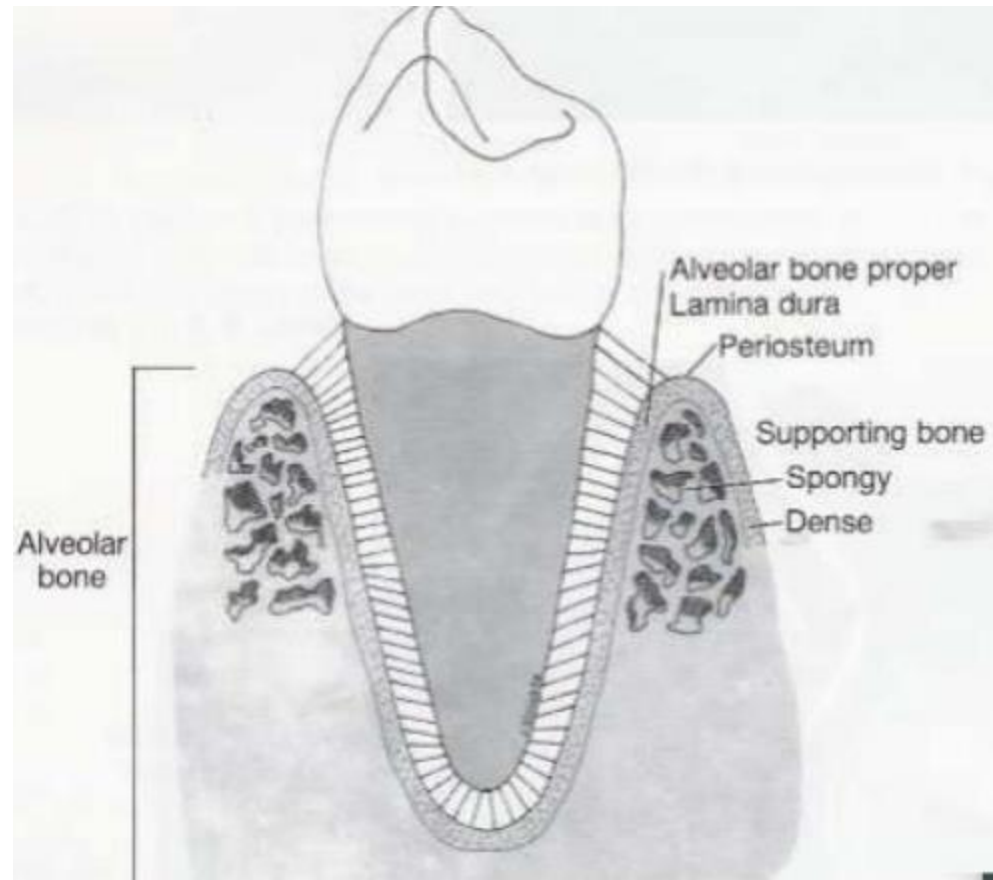
1. Compact (Cortical) bone
2. Spongy (Cancellous) bone



NORAML ANATOMY OF THE TOOTH

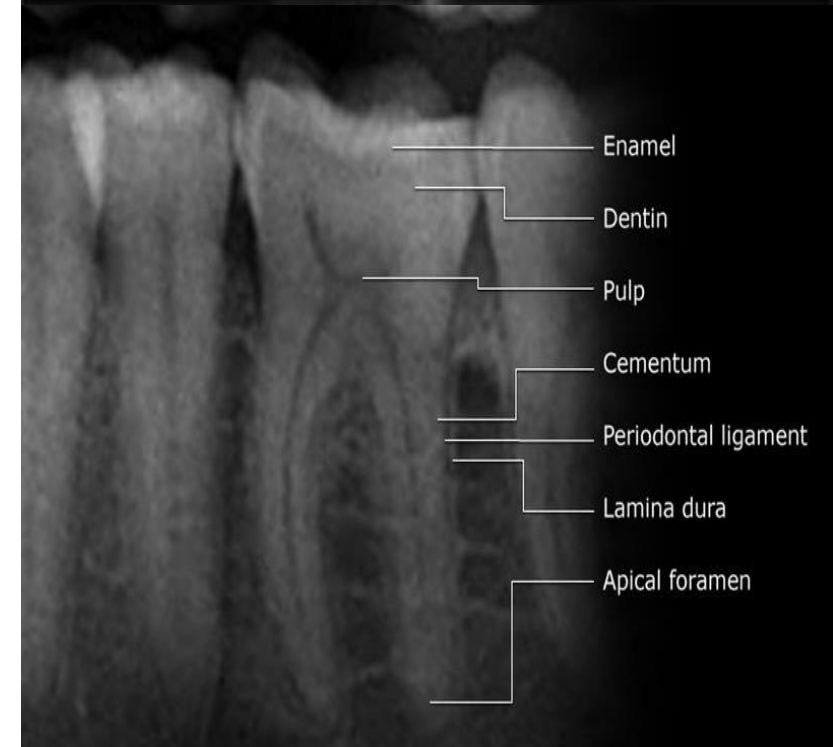
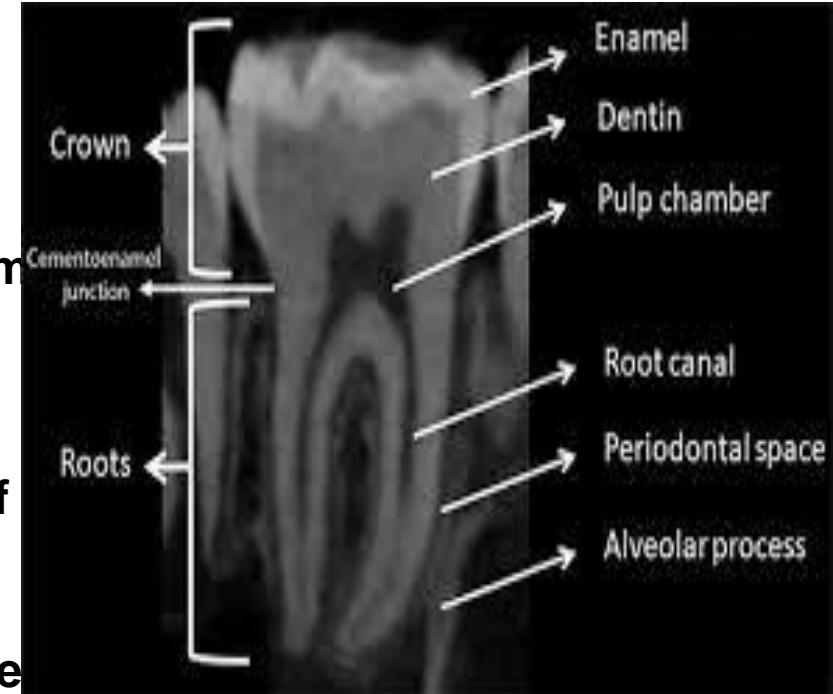
FUNCTIONS OF BONE

1. **Support:** provides framework that **supports** and **anchors all soft organs**.
2. **Protection:** skull and vertebrae surround soft tissue of the nervous system, and the rib cage protects vital thoracic organs.
3. **Movement:** skeletal muscles use the bones as levers to move the body.
4. **Storage:** fat stored in the interior of the bones. Bone matrix serves as a storehouse for various minerals.
5. **Blood Cell Formation:** hematopoiesis occurs within the marrow cavities of the bones



NORAML ANATOMY OF THE TOOTH

- **Enamel.** Hard calcified tissue covering the dentin in the crown of tooth. Because it contains no living cells, tooth enamel cannot repair damage from decay or from wear. Only a dentist can correct these conditions.
- **Anatomical Crown.** The visible part of the tooth. It is normally covered by enamel.
- **Gums (also called gingiva.)** Soft tissues that cover and protect the roots of the teeth and cover teeth that have not yet erupted.
- **Pulp Chamber.** The space occupied by the pulp—the soft tissue at the center of your teeth containing nerves, blood vessels and connective tissue
- **Neck.** The area where the crown joins the root.
- **Dentin.** That part of the tooth that is beneath enamel and cementum. It contains microscopic tubules (small hollow tubes or canals). **When dentin loses its protective covering (enamel),** the tubules allow heat and cold or acidic or sticky foods to stimulate the nerves and cells inside the tooth, causing sensitivity.
- **Jawbone (Alveolar Bone.)** The part of the jaw that surrounds the roots of the teeth.
- **Root Canal.** The portion of the pulp cavity inside the root of a tooth; the chamber within the root of the tooth that contains the pulp.
- **Cementum.** Hard connective tissue covering the tooth root, giving attachment to the periodontal ligament.



•Periodontal Ligament.

A system of collagenous connective tissue fibers that connect the root of a tooth to its socket.

Teeth are composed primarily of dentin, with an enamel cap over the coronal portion and a thin layer of cementum over the root surface.

A number of **anatomic landmarks** are visible in dental radiographs.

Knowledge of the location and normal appearances of these landmarks is important in identification and orientation of radiographs.

This knowledge is valuable to the **dental officer in determining** whether the area is normal or abnormal

RADIODENSITY:

Radiolucent vs. Radiopaque

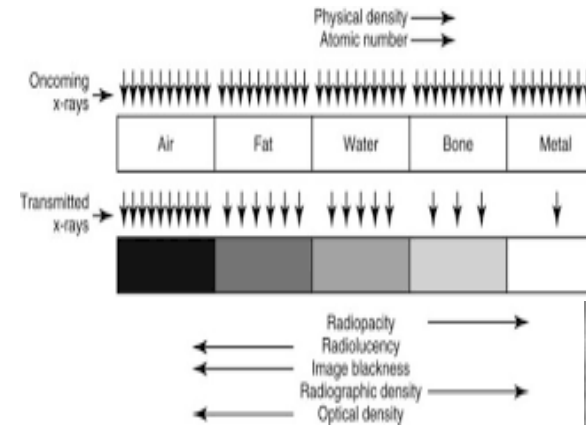
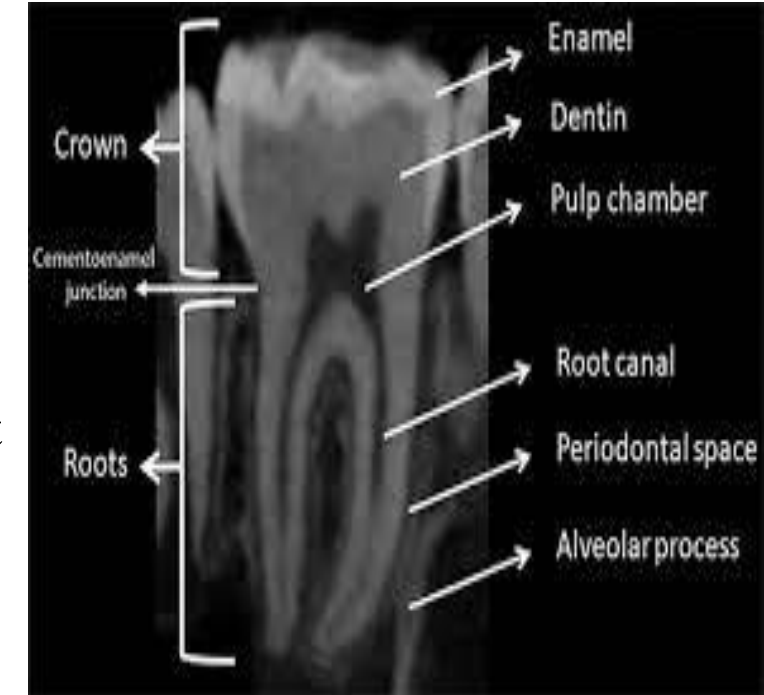
Structures that are cavities, depressions or openings in bone such as a sinus, fossa, canal or foramen will allow x-rays to penetrate through them and expose the receptor (dental film).

These areas will appear **radiolucent or **black** on radiographic images.

Structures that are bony in origin absorb or stop the penetration of the x-rays and, therefore, do not reach the receptor.

These areas appear **radiopaque or **white** on radiographic images.

Some structures partially absorb radiation and are represented in varying degrees of radiopacity.



Radiographic Appearance of Enamel :

ENAMEL appears more **radio-opaque** than other tissues. It is 90% mineral **causes greater attenuation** of X-ray photons.

DENTIN :

75% mineral content less radiopaque than enamel. Radiopacity similar to bone.

ENAMELODENTINAL JUNCTION appears as a **distinct interface** separating these two structure

CEMENTUM:

50% mineral content and it appears as a very thin layer on the root surface. It is usually not so apparent radiographically.

CERVICAL BURNOUT:

Radiographs sometimes show diffuse radiolucent areas with ill defined borders present on the mesial or distal aspects of the teeth in the cervical region.

These regions appear between the edge of the enamel cap and the crest of the alveolar ridge.



REASON FOR CERVICAL BURN OUT :

Normal configuration of the affected teeth, results in decreased X-ray absorption in the areas in question. Perception of these areas is due to contrast with the adjacent ,relatively radiopaque enamel and alveolar – bone.

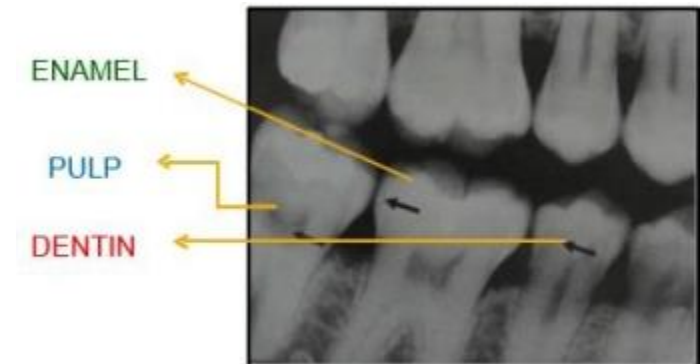
It should not be **confused with root caries** which has similar appearance

PULP:

It is composed of soft tissues so it **appears radiolucent**.

Pulp chambers and root canals extend from the interiors of the chamber till the **root apices**. It is seen radiographically also as apical foramen. In some cases, it may exit on the side of the canal. Lateral canals may end at the apex as a discernible foramen or may exit at the side of the root.

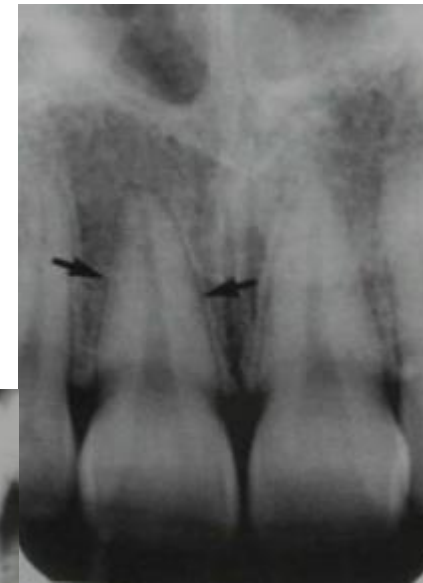
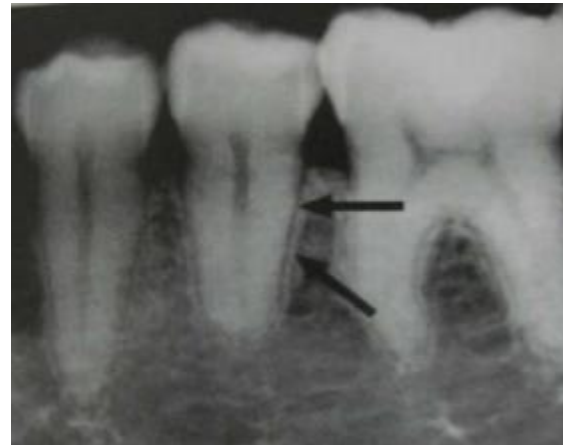
The pulp canals of a developing tooth root diverge and walls of the root taper to a knife edge. **A radiolucent area** is seen surrounding it in the trabecular bone. **It is surrounded** by the hyperostotic bone. **IT IS THE DENTAL PAPILLA WITH ITS BONY CRYPT** .Its **radiographic evaluation** helps in determining the stage of maturation of the developing tooth



THE SUPPORTED STRUCTURES :

PERIODONTALIGAMENT :

It is composed of collagen so appears as a radiolucent space between the root and lamina dura. **It is thinner** in the middle of the root and slightly wider near the alveolar crest and the apex ,**suggesting that the fulcrum of the physiologic movements** is in the region where **PDL** is thinnest.



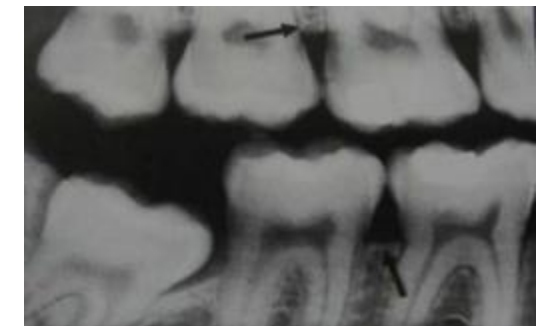
LAMINA DURA :

It is a **thin radiopaque** layer of dense bone surrounding the tooth socket. Its radiographic appearance is due to attenuation of the X-ray beam as it passes tangentially through the thickness of the bone. It is thicker than the surrounding trabecular bone and thickness increases with increase in amount of occlusal stress

ALVEOLAR CREST:

It is the radiopaque gingival margin of the alveolar process which surrounds the teeth. It is considered normal if it is **1.5mm** or less from the CEJ.

It shows apical recession with the age or periodontal disease



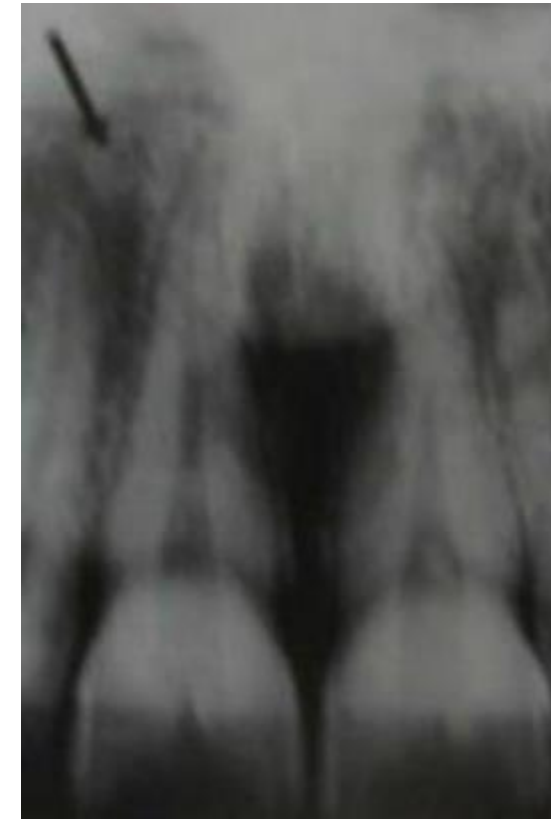
RADIOGRAPHIC FEATURES OF THE CANCELLOUS BONE

Also called as the **trabecular bone** or the spongiosa.

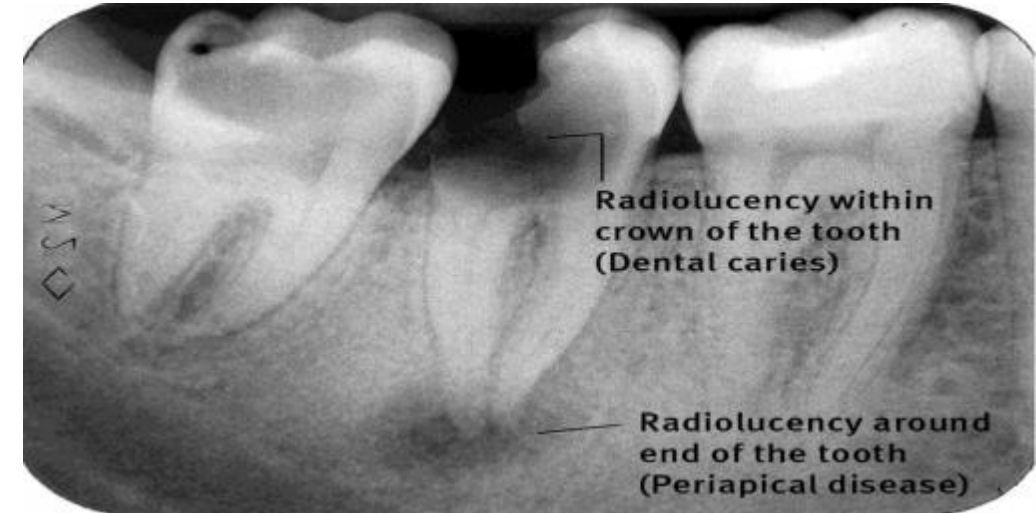
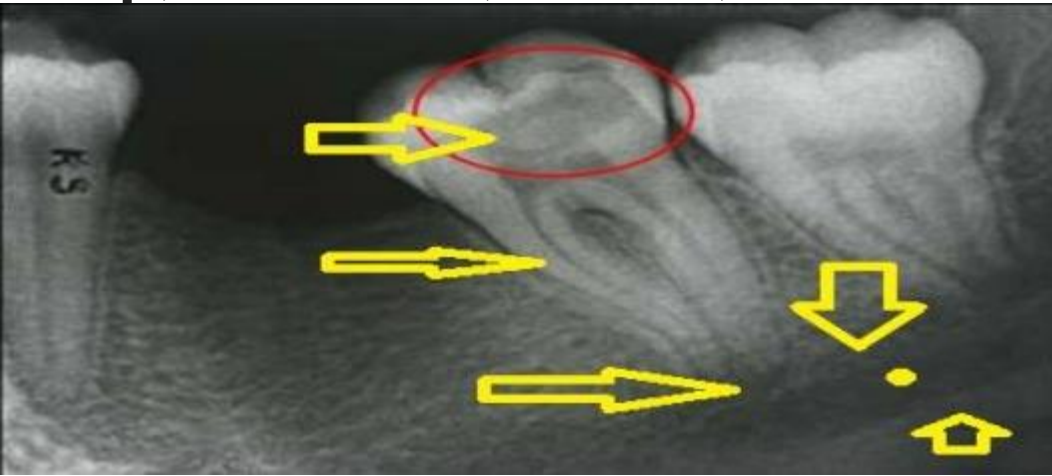
Lies between the **cortical plates** in both the jaws.

It is composed of **thin radiopaque plates** and rods surrounding many **small radiolucent pockets of marrow**.

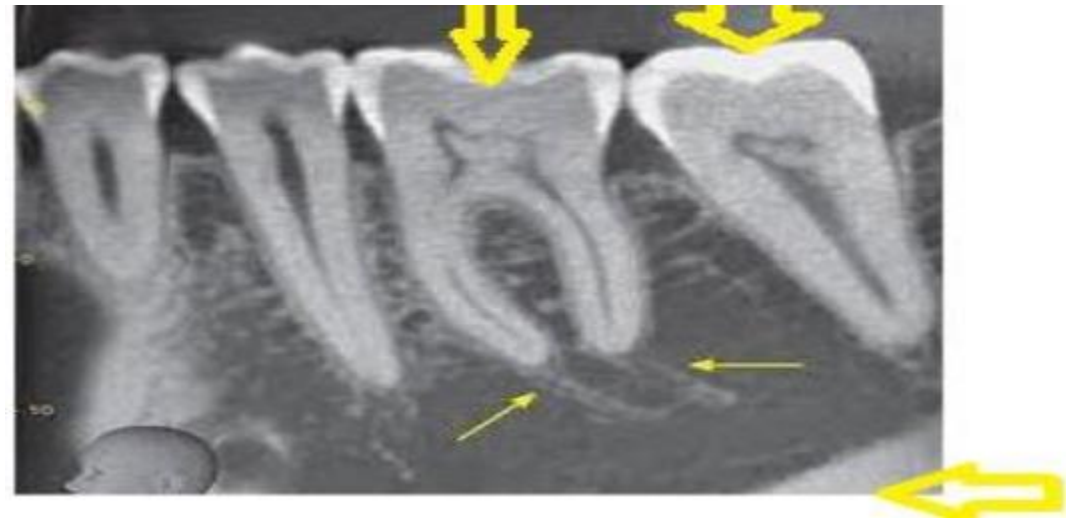
In posterior maxilla, it is similar to anterior maxilla but **marrow spaces are larger**.



Radiolucent – Refers to structures that **are less dense and permit the x-ray beam to pass through them**. Radiolucent structures appear dark or black in the radiographic image. Like:
Pulp, foramens, canals, soft tissue, sinus , inection

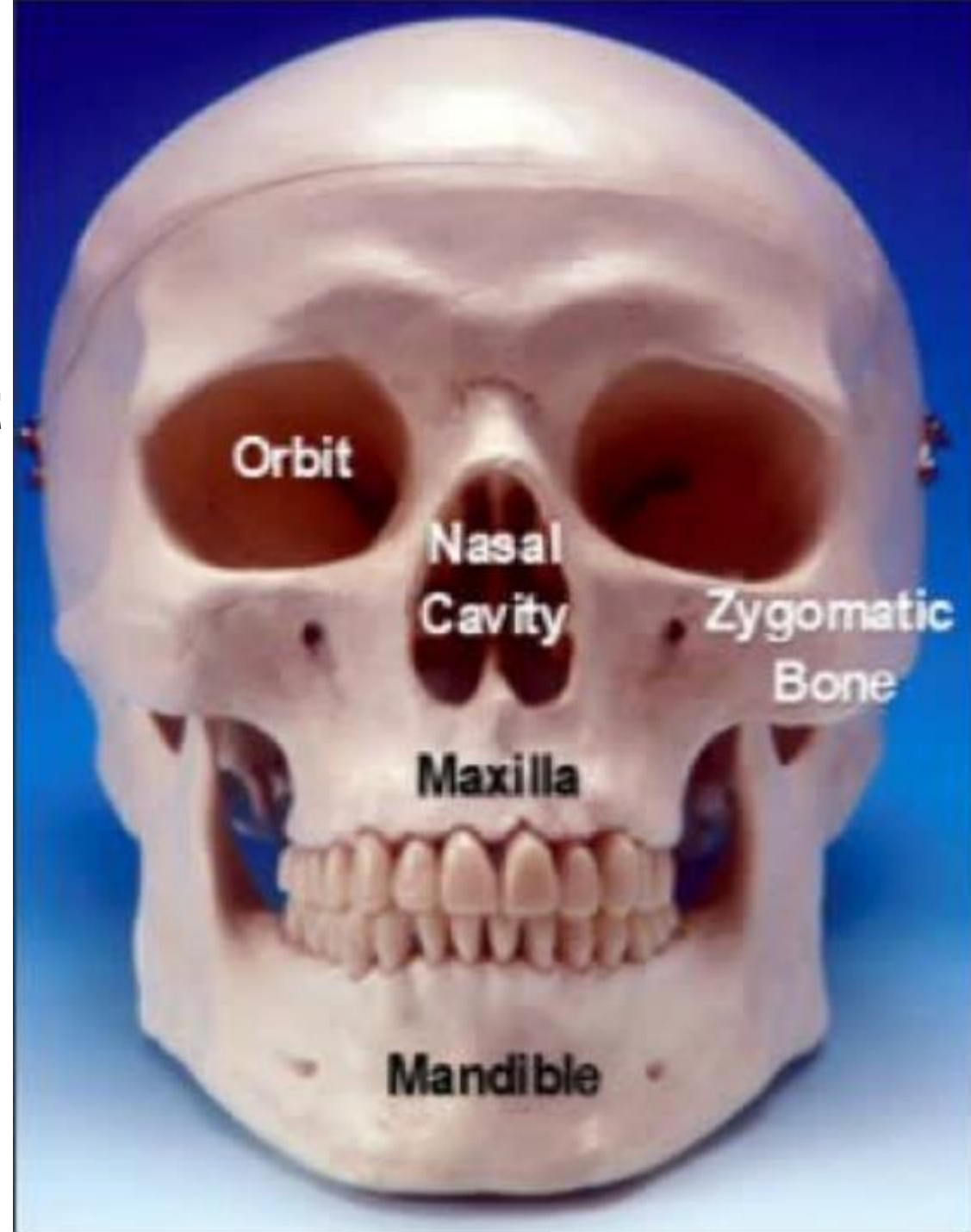


Radiopaque – Refers to structures that are dense and resist the passage of x-rays.



General Anatomy of the Maxilla and Mandible

The photograph below denotes the gross structures that are recorded on intraoral radiographic images. These basic structures include the nasal cavity, the zygomatic bone, the maxilla and the mandible. Labeled for general reference is the right orbit of the eye.



ALVEOLAR PROCESS

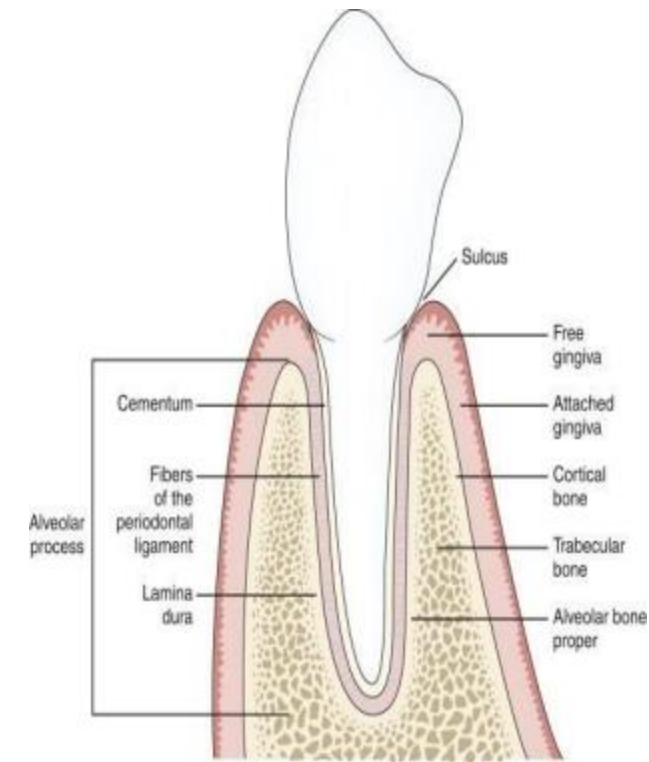
Is the **thickened ridge** of bone that contains the tooth sockets on bones that bear teeth

- The specialized bone structure that contains the alveoli or sockets of the teeth and supports the teeth.
- If the teeth are lost the alveolar process disappears It is
- composed mainly of two parts: alveolar bone proper
- Supporting bone
- is the thickened ridge of bone that contains the tooth sockets on bones that bear teeth.
- The alveolar process contains a region of compact bone adjacent to the periodontal ligament called Lamina dura.
- Maxilla and Mandible
- Are the tooth-bearing bones

Lamina Dura

this part which is attached to the cementum of the roots by the periodontal ligament.

- Is the bone lining the alveolus
- In clinical radiographs, it commonly appears as a dense white line
- dense white line



Intraoral Radiographic Anatomy

Maxillary Anatomical Landmarks

The maxilla is the upper dental arch that contains the maxillary alveolar process, the maxillary teeth and the maxillary sinuses. It sits on either side of the nasal cavity and below the orbits. There are characteristic landmarks both in the **anterior** and **posterior** segments of the maxilla that can be observed on **maxillary periapicals**

Maxillary Anterior Landmarks

Nasal fossae – The nasal fossae (plural; singular - fossa) are the nasal openings located above the maxillary **anterior teeth**. The fossae are divided in the midline into right and left chambers.

Radiographically, the nasal fossae appear as vertically oblong radiolucent structures bounded by bone.

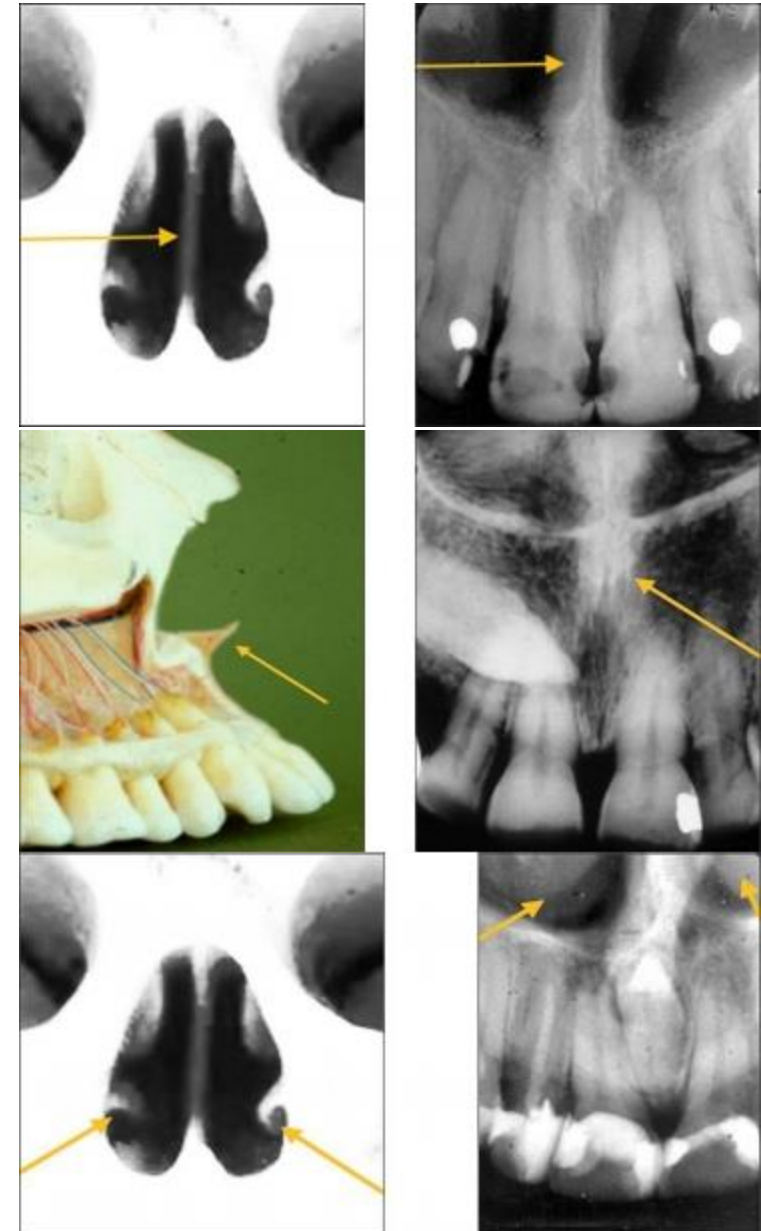
These structures can be seen on maxillary central incisor periapical views and partially on lateral incisor and canine periapicals



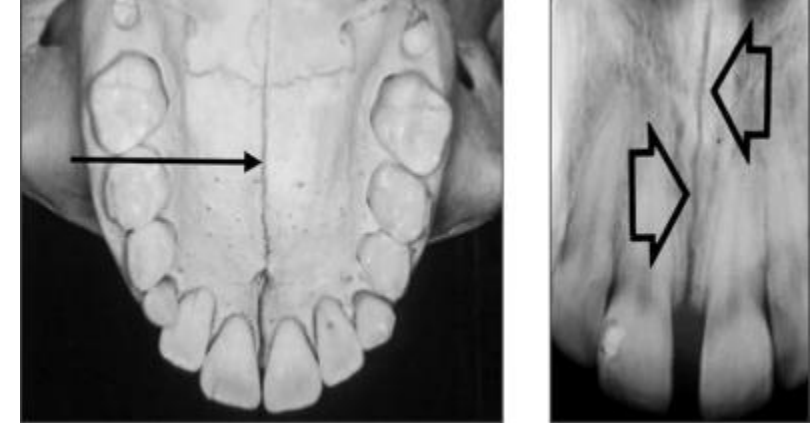
Nasal septum – The nasal septum is a bony vertical band-like midline structure that divides the nasal cavity into right and left chambers. The nasal septum is a radiopaque landmark visible on maxillary central **incisor periapicals**

Anterior nasal spine – The anterior nasal spine (ANS) is a bony projection located at the base of the nasal septum in the maxillary midline. Radiographically, the **ANS appears as a V-shaped** or triangular point radiopacity. This structure is recorded on maxillary central incisor **periapicals**

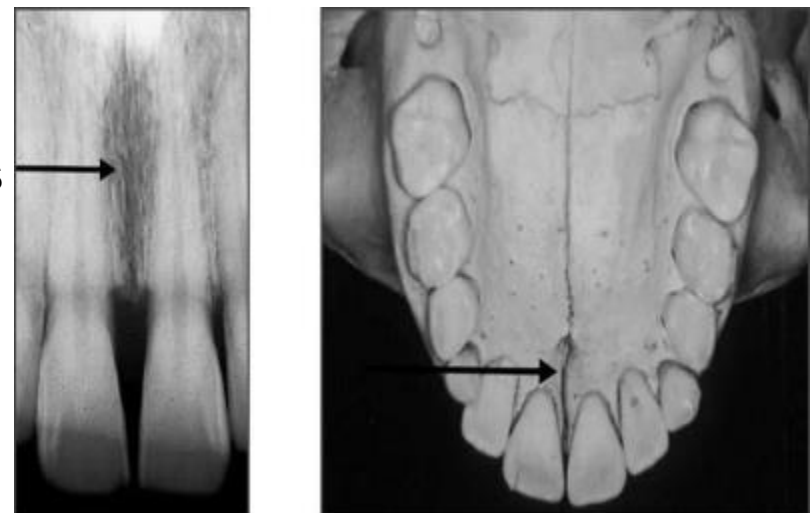
Inferior nasal concha – The inferior nasal concha or turbinate bone projects into the inferior aspect of the nasal fossa from the lateral walls of the nasal cavity. These bilateral radiopaque structures (conchae) are sometimes visible on **central and lateral incisor periapical**



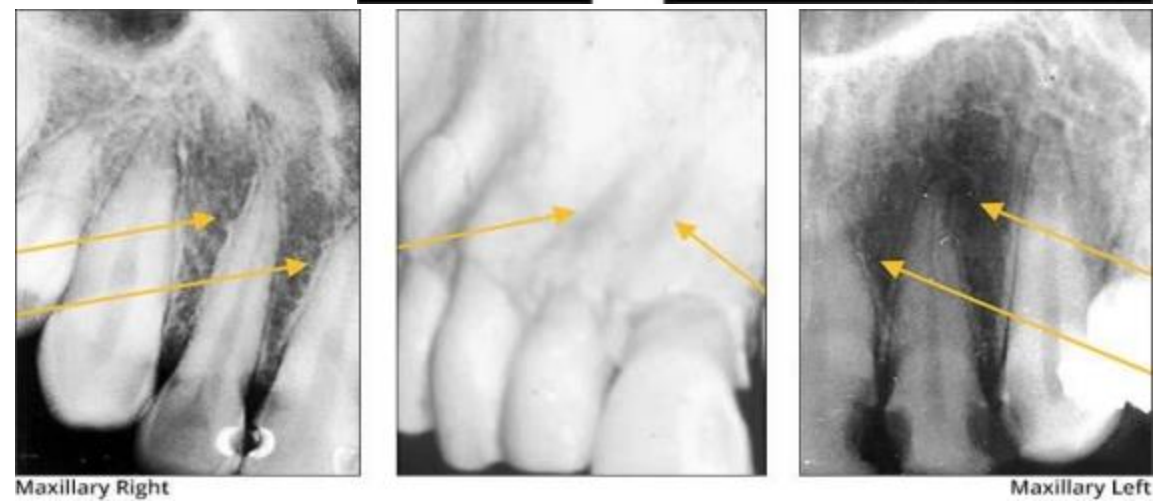
Mid-palatine suture – The mid-palatine suture is the interface of the two halves of the premaxilla where they come together in the midline. **The mid-palatine suture is also referred to as the median palatal suture.** It courses from the alveolar crest through the midline to the posterior aspect of the hard palate. This structure appears radiographically as a thin vertical linear radiolucency in the midline on **maxillary central incisor periapicals**



Incisive foramen – The incisive or nasopalatine foramen is located in the midline on the lingual aspect of the hard palate above the central incisor teeth crowns. The foramen is the termination of the nasopalatine canal. Radiographically, it appears between the roots of the central incisor teeth as a round to oval radiolucency less than one centimeter in diameter. It has a range of sizes and shapes, so variation is not unusual. This structure is **recorded on maxillary central incisor periapicals**



Lateral fossa – The lateral fossa is a slight dip or depression in the bone on the labial aspect of the maxilla near and around the lateral incisor tooth root. This diffuse radiolucency appears bilaterally and is recorded on **lateral incisor and canine periapicals**. It is sometimes referred to as the **canine fossa**.



Superior foramina of nasopalatine canal

The nasopalatine canal originates at two foramina in floor of the nasal cavity.

Radiographically, it can be recognized as two radiolucent areas above the apices of the central incisors in floor of the nasal cavity near its anterior border and both the sides of the septum.



NASOLACRIMAL CANAL

The nasal and maxillary bones form the nasolacrimal canal. It runs from

the medial aspect of the **antero inferior border of the orbit inferiorly**, to

drain under the inferior conchae into the nasal cavity



Inverted Y –

The inverted Y is a radiographic landmark that depicts where the nasal fossa crosses the maxillary sinus. The boundary between them is shaped like an **upside-down letter Y**, hence its name. The periapicals below demonstrate the **inverted Y**, a classic radiographic landmark of the right and **left anterior maxilla**. The fossa is positioned toward the midline while the sinus extends toward the posterior aspect of the maxilla. **Typically, the inverted Y sits apical to the maxillary lateral incisor and canine teeth.** No comparable structures are found in the mandibular lateral incisor and canine areas which differentiates maxillary from mandibular anterior periapicals



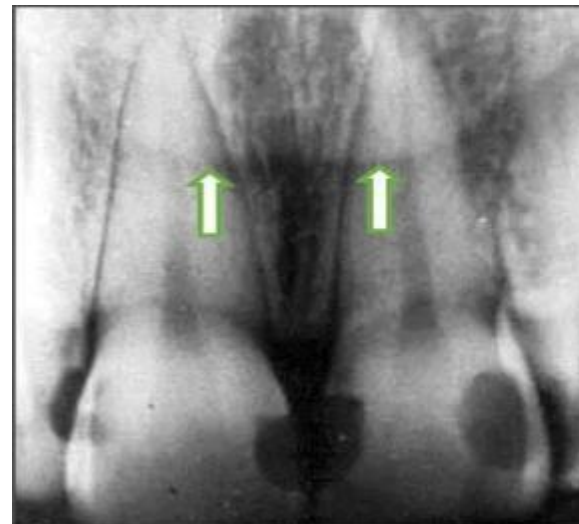
Maxillary right lateral-canine periapical



Maxillary left lateral-canine periapical

Nasal soft tissue –

The soft tissue of the nose, including the tip and ala (**corner of the nose**), often can be seen superimposed over the roots of the teeth on anterior periapicals. The nasal soft tissue appears **radiopaque**



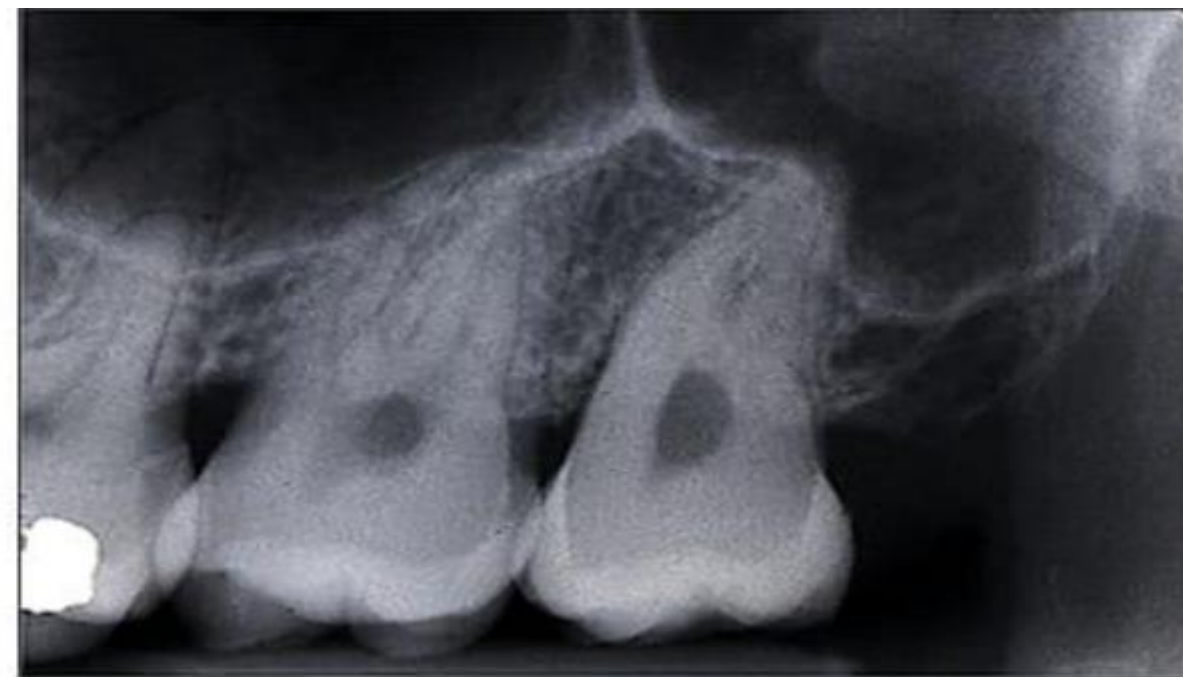
Maxillary Posterior Landmarks

Maxillary sinus –

The maxillary sinus is one of the paired paranasal sinuses. This prominent radiolucent air-filled cavity is located above the posterior teeth on the right and left sides of the maxilla. The sinus cavities are horizontally oblong bilateral structures with fine radiopaque borders. The maxillary sinus may contain septa which appear as radiopaque lines within the body of the sinus cavity. The size of the maxillary sinus can be quite variable and sometimes encroaches into the alveolar process, especially when posterior teeth are missing. Typically, the sinus appears uniform right to left. The maxillary sinus is sometimes referred to as the maxillary antrum and can be observed on both maxillary premolar and molar periapicals and partially on lateral- canine periapical



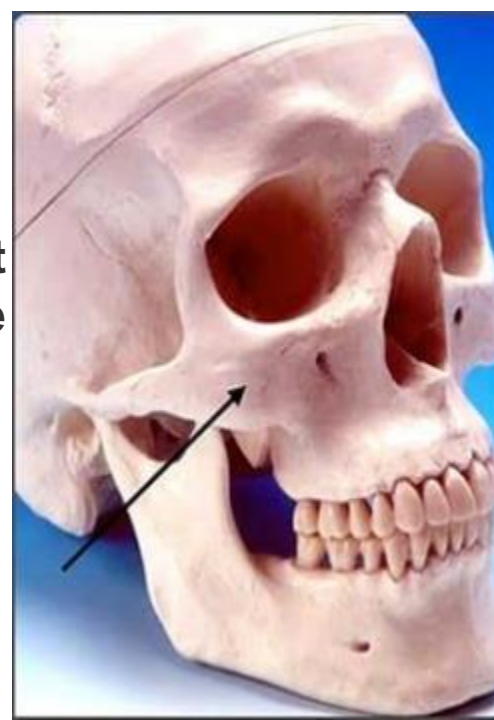
Maxillary right molar periapical



Maxillary left molar periapical

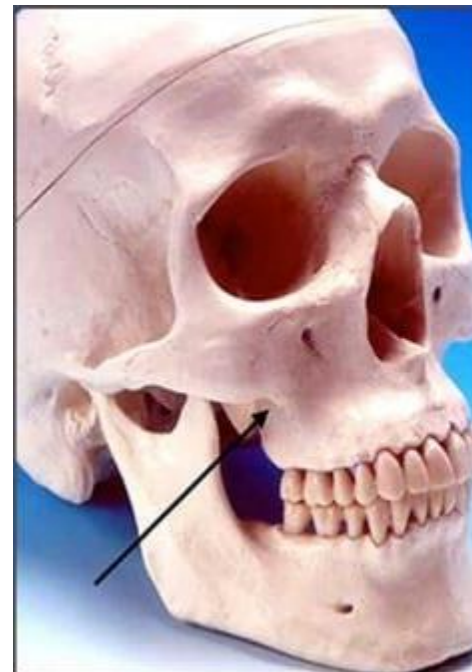
Zygomatic bone

The zygomatic bone or cheek bone attaches to the right and left sides of the posterior maxilla. The zygomatic bone, quadrangular in shape, broadens as it extends posteriorly. This bilateral radiopaque structure is also known as the malar bone. **The zygomatic bone can be seen on maxillary premolar and molar periapicals**



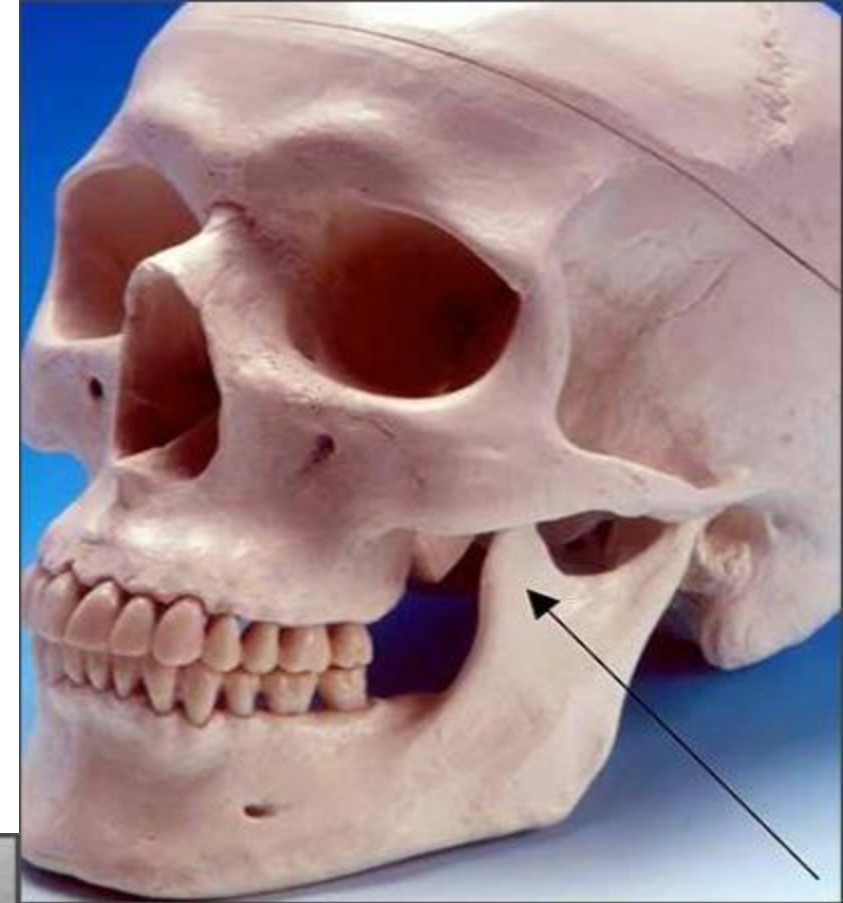
Zygomatic process

The zygomatic process is the radiopaque U- shaped structure representing where the zygomatic bone attaches to the maxilla. The zygomatic process of the maxilla is the most anterior aspect of the zygomatic bone. The process is positioned toward the midline while the bone extends posteriorly away from the midline. **This structure is sometimes referred to as the malar process and can be seen on maxillary premolar and molar periapicals.**

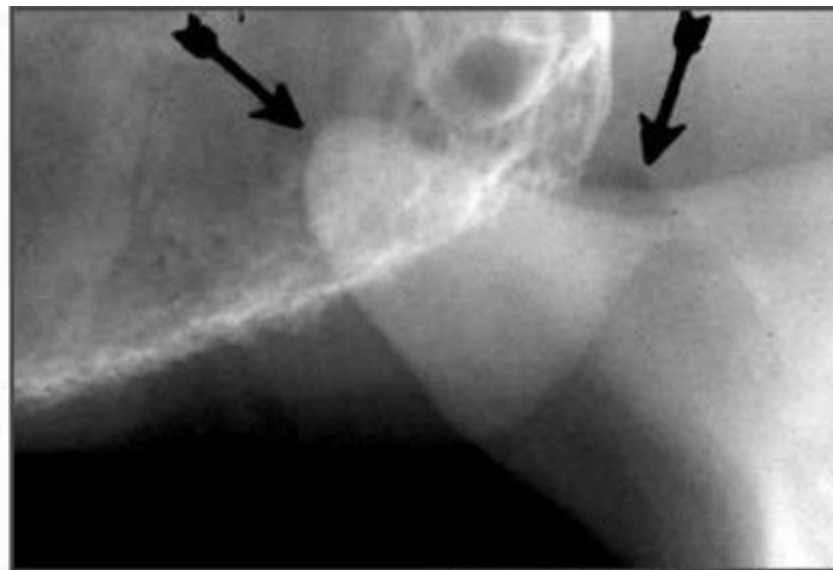


Coronoid process

The coronoid process of the mandible is the triangular bony portion of the anterosuperior aspect of the ramus. This mandibular structure can be recorded on maxillary molar periapicals as the ramus moves forward when the patient's mouth is open. It appears as a bilateral triangular or thumb-like radiopacity on posterior maxillary images. **The triangular portion projects forward toward the midline. The coronoid process is the only mandibular structure recorded on maxillary molar periapicals**



Maxillary right molar periapical



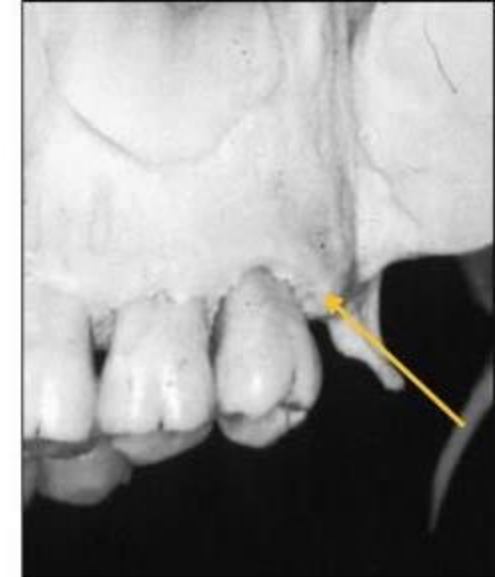
Maxillary left molar periapical

Maxillary tuberosity

The maxillary tuberosity is the rounded end of the alveolar process of the maxilla. This radiopaque structure appears bilaterally on maxillary molar periapicals and often on maxillary premolar periapicals and molar bitewings. **The tuberosity curves** upward at the end of the maxillary alveolar process. The tuberosity gives a smile appearance to the maxilla and the dentition particularly on bitewings.

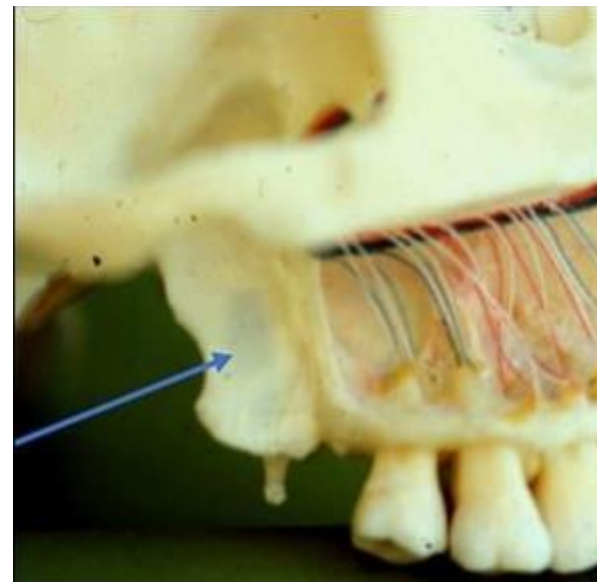


Maxillary left molar periapical



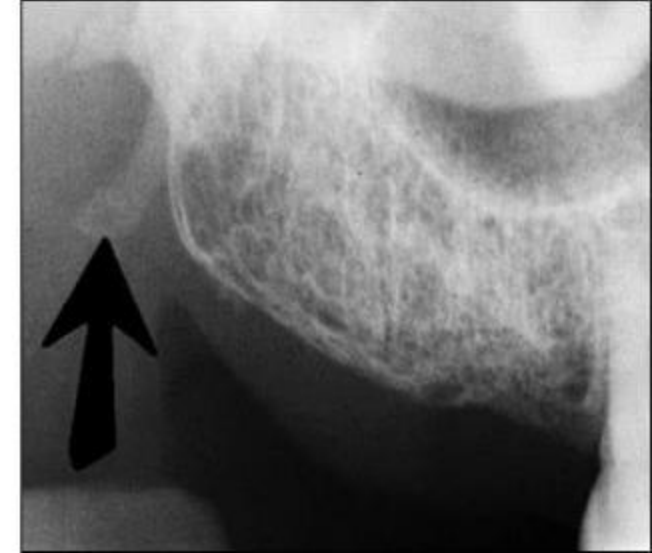
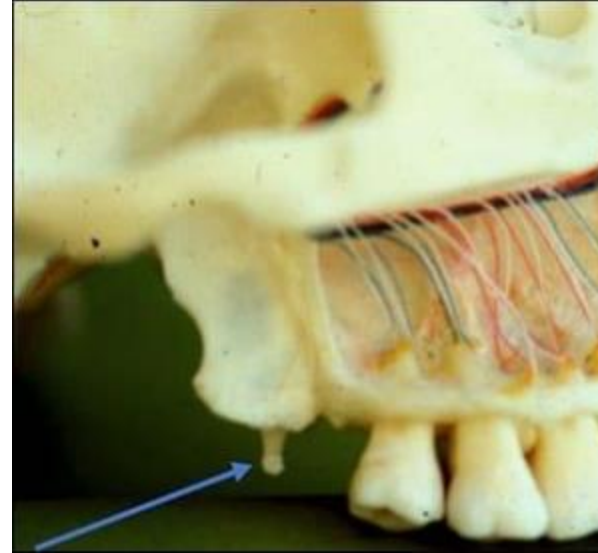
Pterygoid plates

The lateral and medial pterygoid plates are located behind the maxillary tuberosity. They project a single image configured like a thin wing of bone extending posteriorly from the tuberosity. **This bilateral radiopacity is occasionally recorded on maxillary molar periapicals when the receptor is positioned adequately posterior.**



Hamular process

The hamular process or pterygoid hamulus is a tiny finger or hook-like projection of bone that extends inferiorly from the medial pterygoid plate. This bilateral radiopacity occasionally appears on maxillary molar **periapicals and molar bitewings** when the receptor is positioned sufficiently posterior to record it.



Summary of Maxillary Landmarks

NEXT PAGE

Landmark	Brief Description	Radiolucent / Radiopaque	Periapical	Bilateral / Unilateral	Alternate Name
Anterior Nasal Spine	Triangular Point	Radiopaque	Central Incisor	Unilateral	
Coronoid Process	Triangular	Radiopaque	Molar	Bilateral	
Hamular Process	Finger-like	Radiopaque	Molar	Bilateral	Pterygoid Hamulus
Incisive Foramen	Round/Oval	Radiolucent	Central Incisor	Unilateral	Nasopalatine Foramen
Inferior Nasal Concha	Round/Oval	Radiopaque	Central Incisor	Bilateral	Inferior Nasal Turbinate
Inverted Y	Upside-down Y	Radiopaque	Lateral Incisor Canine	Bilateral	
Lateral Fossa	Diffuse	Radiolucent	Lateral Incisor	Bilateral	Canine Fossa
Maxillary Sinus	Horizontally Oblong	Radiolucent	Premolar / Molar	Bilateral	Maxillary Antrum
Maxillary Tuberosity	Rounded	Radiopaque	Molar	Bilateral	
Mid-palatine Suture	Vertical line	Radiolucent	Central Incisor	Unilateral	Median Palatal Suture
Nasal Fossa	Vertically Oblong	Radiolucent	Central Incisor Lateral Incisor Canine	Bilateral	Nasal Cavity
Nasal Septum	Vertical Band	Radiopaque	Central Incisor	Unilateral	
Pterygoid Plates	Wing of Bone	Radiopaque	Molar	Bilateral	
Zygomatic Bone	Quadrangular-shaped	Radiopaque	Premolar / Molar	Bilateral	Malar Bone

Mandibular Anatomical Landmarks

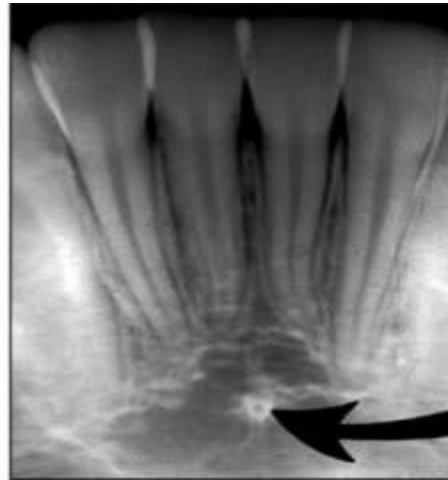
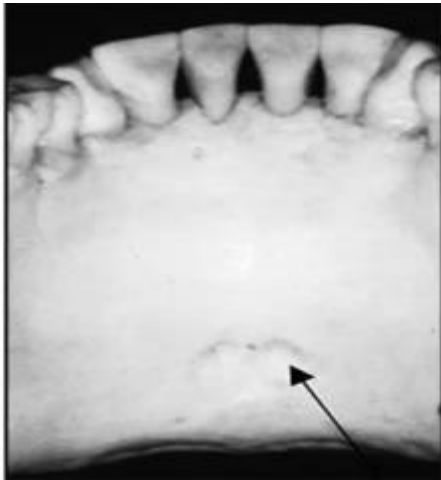
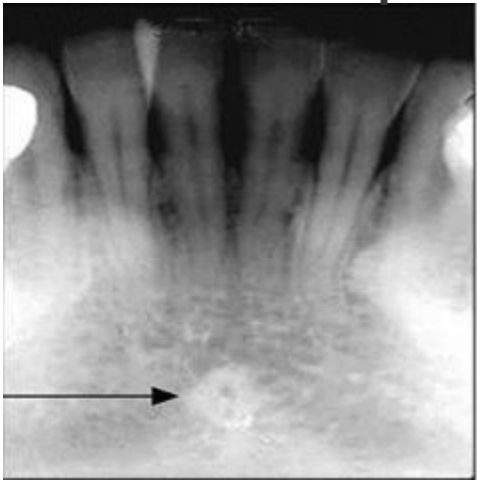


Mandibular Anatomical Landmarks

The mandible is the lower dental arch that contains the mandibular alveolar process, the mandibular teeth and consists of the body (horizontal aspect) and ramus (posterior vertical aspect) intersecting at the angle.

Genial tubercle

– The genial tubercle is a spiny protuberance or prominence (sometimes two) of bone located in the midline on the lingual aspect of the mandible below the roots of the incisor teeth. This structure serves as the locus of attachment for the genioglossus and geniohyoid muscles. Although variable in appearance, the tubercle often produces a ring-like or doughnut-shaped radiopacity on mandibular incisor periapicals. The genial tubercle is also referred to as the mental spine.



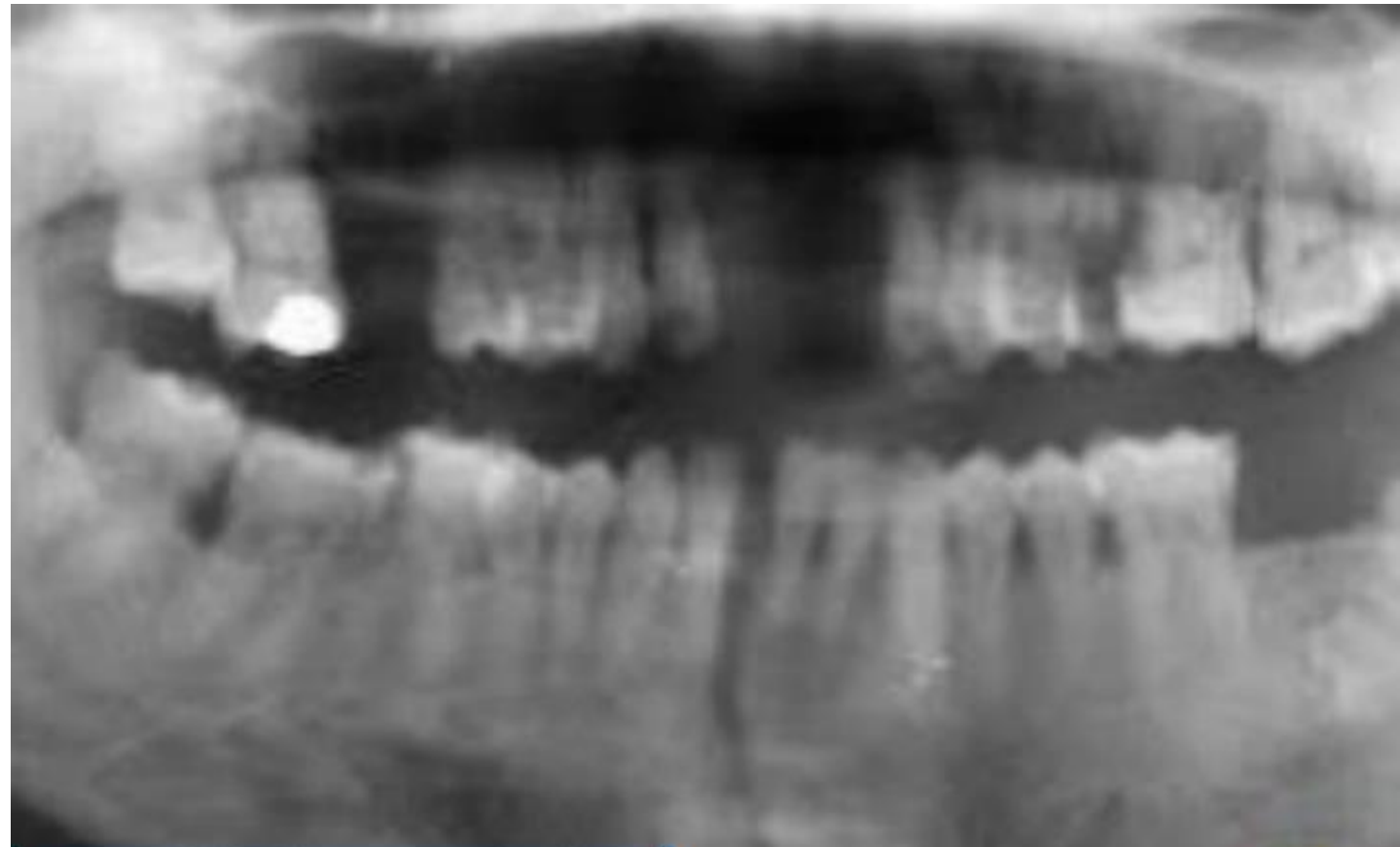
MANDIBULAR SYMPHYSIS :

The region of mandibular symphysis in infants demonstrate a radiolucent line through the midline of the jaw between the images of the forming deciduous central incisors.

The suture usually fuses by the end of 1 year of life and is no longer radiographically apparent.



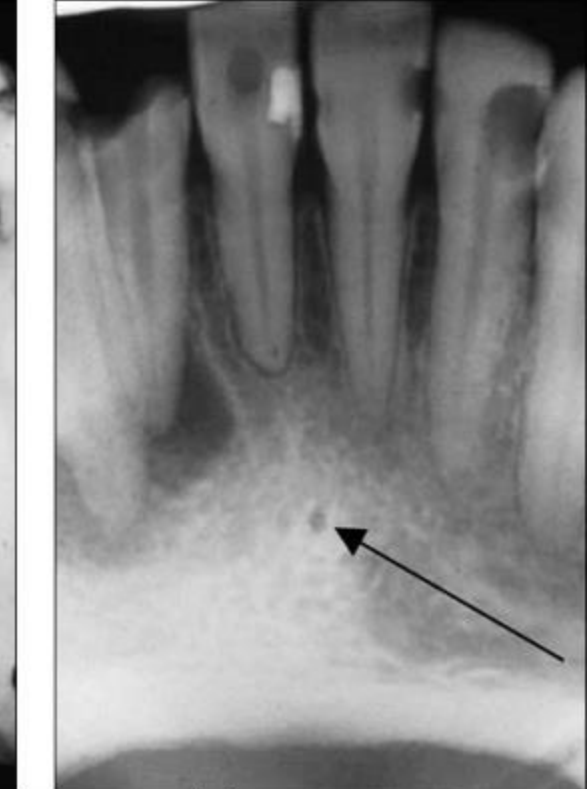
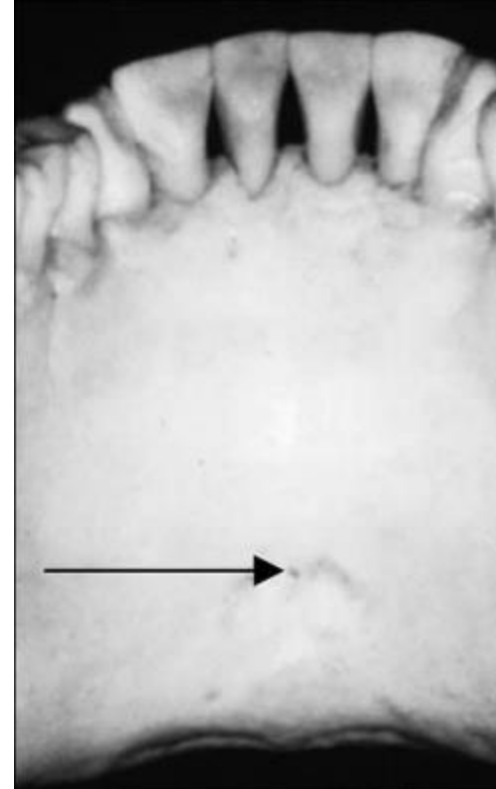
**Mandibular symphysis
In a new born infant**



**Mandibular symphysis
fracture**

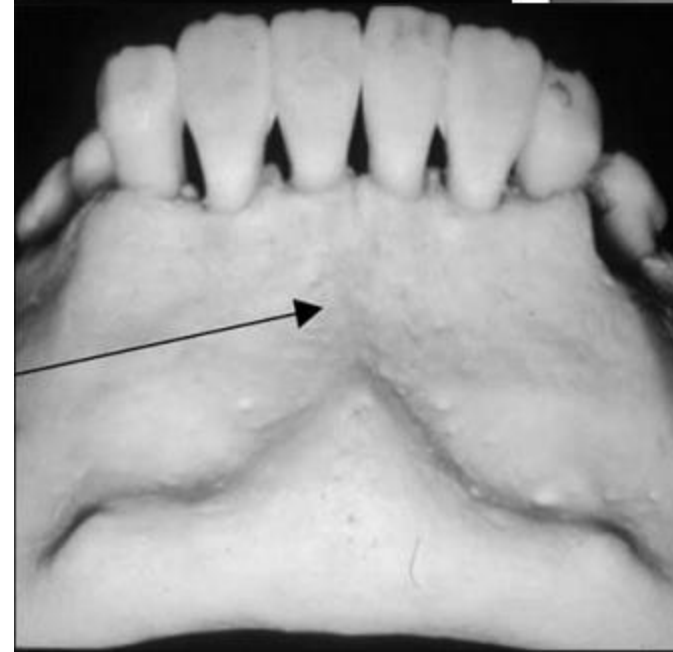
Lingual foramen

– The lingual foramen is a small pin-point opening in bone on the lingual aspect of the anterior mandible for the lingual nerve and arteries. The lingual foramen appears in the midline below the apices of the central incisor teeth. This dot-like radiolucency is frequently surrounded by the genial tubercle. The lingual foramen is recorded on mandibular incisor periapicals.



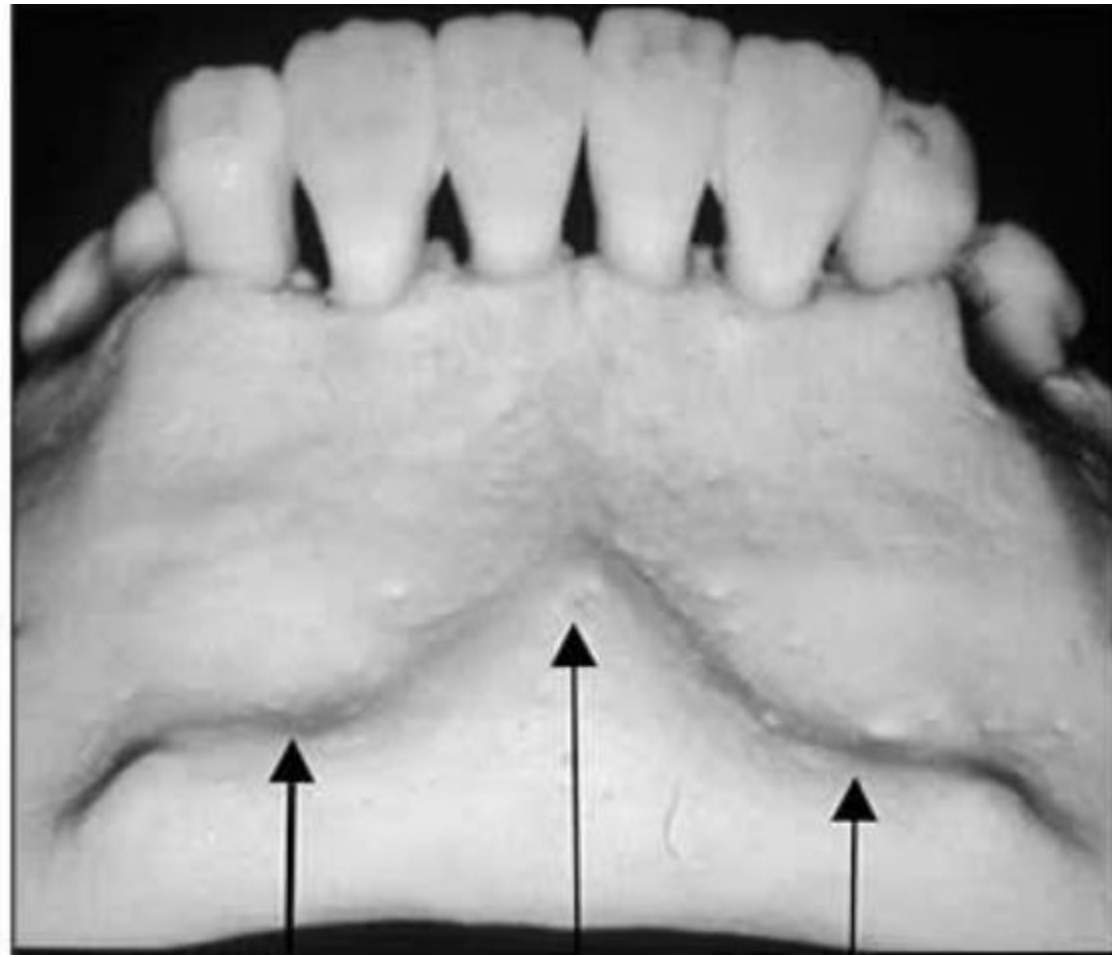
Mental fossa

– The mental fossa is a depression in the bone on the labial aspect of the mandible. It has a diffuse radiolucent appearance above the mental ridge. The mental fossa varies in its prominence depending on the thickness and density of the anterior mandible.



Mental ridge

- The mental ridge is a prominence of bone on the labial surface of the anterior mandible. This structure presents as an inverted V-shaped radiopaque ridge that extends from the premolar to canine area on each side meeting in the midline. The mental ridge varies in its presentation with some individuals displaying very distinct ridge anatomy while others, little or no evidence of its presence. This mandibular landmark can be recorded on incisor and partially on the lateral aspect of canine periapicals



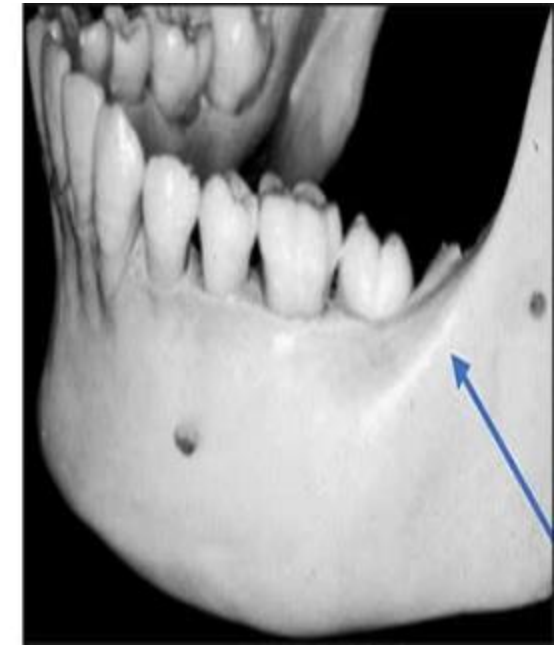
Mental foramen

– The mental foramen, the primary landmark of this area, is a circular radiolucent structure located below the roots of the mandibular premolar teeth. This structure is the opening for passage of the mental nerve and vessels and can be observed on mandibular premolar and the lateral aspect of canine periapicals. This bilateral radiolucency can be misinterpreted as a periapical lesion. However, it is easily differentiated upon closer examination of the tooth and its supporting structures



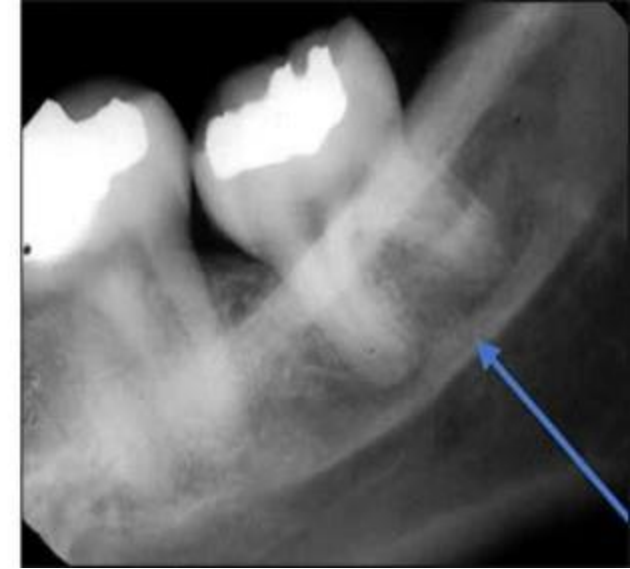
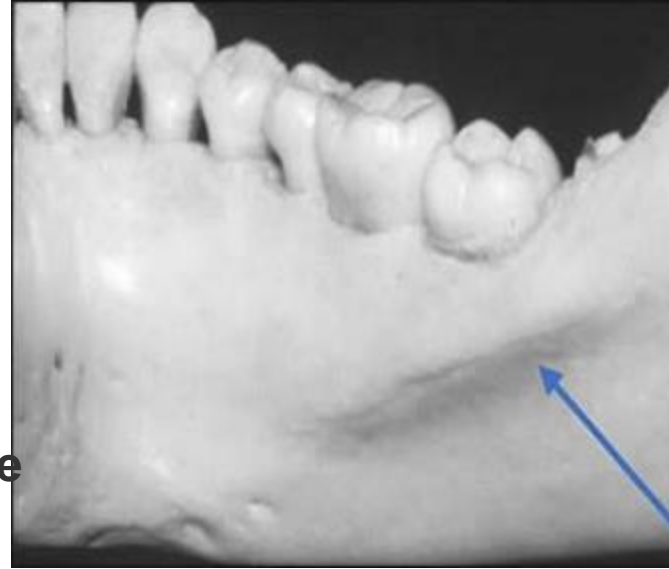
External oblique ridge

– The external oblique ridge or line is the bony anterior border of the ramus located on the outer aspect of the mandible. This ridge has a downward diagonal course and is seen on most mandibular molar periapicals and molar bitewings. It is more prominent and appears more frequently than the internal oblique ridge which will be discussed next. This bilateral radiopaque landmark gives the mandible and the dentition a smile appearance.



Internal oblique ridge

- The internal oblique ridge is the bony ridge found bilaterally on the lingual aspect of the posterior mandible. This radiopaque ridge is variable in its appearance ranging from highly defined to barely visible. When recorded on molar periapicals, it runs parallel to but below the external oblique ridge. The internal oblique ridge is sometimes referred to as the mylohyoid line.



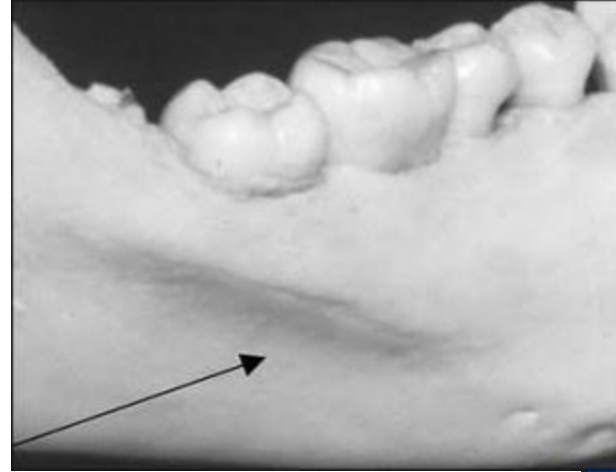
Mandibular canal

- The mandibular canal is the pathway in bone where the inferior alveolar nerve and blood vessels course through the mandible. The canal extends from the mandibular foramen (This foramen is not recorded on mandibular periapicals.) within the ramus anteriorly to the mental foramen. This tubular bilateral radiolucency often demonstrates fine radiopaque boundaries. The mandibular canal is recorded on mandibular premolar and molar periapicals. It is also referred to as the inferior alveolar nerve canal.



Submandibular fossa

– The submandibular fossa is a depression in bone on the lingual aspect of the posterior mandible. The fossa is located bilaterally below the internal oblique ridge or mylohyoid line. This concavity is where the submandibular salivary gland rests. The submandibular fossa presents as a diffuse bilateral radiolucency typically with few trabeculae. It can appear unusually radiolucent, enticing the novice clinician into thinking a bony lesion is present. The submandibular fossa is recorded on premolar and molar periapicals. **This structure is also referred to as the submandibular gland fossa or mandibular fossa**



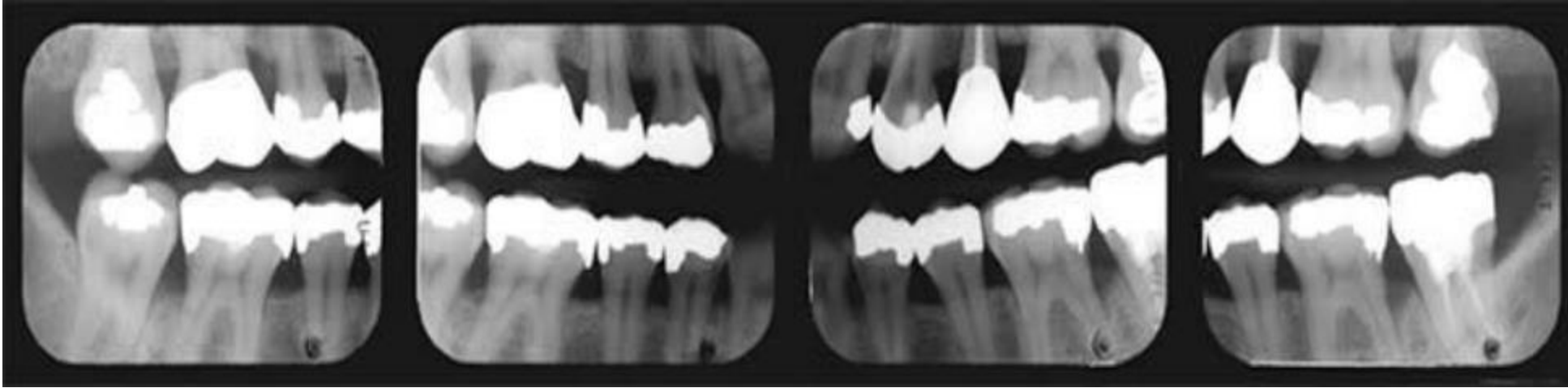
Lower border

– The lower border of the mandible appears as a radiopaque band of dense cortical bone demarcating the inferior aspect of the mandible. This structure can be observed on any mandibular periapical view, especially when the x-ray beam angulation is excessive.



Summary of Mandibular Radiographic

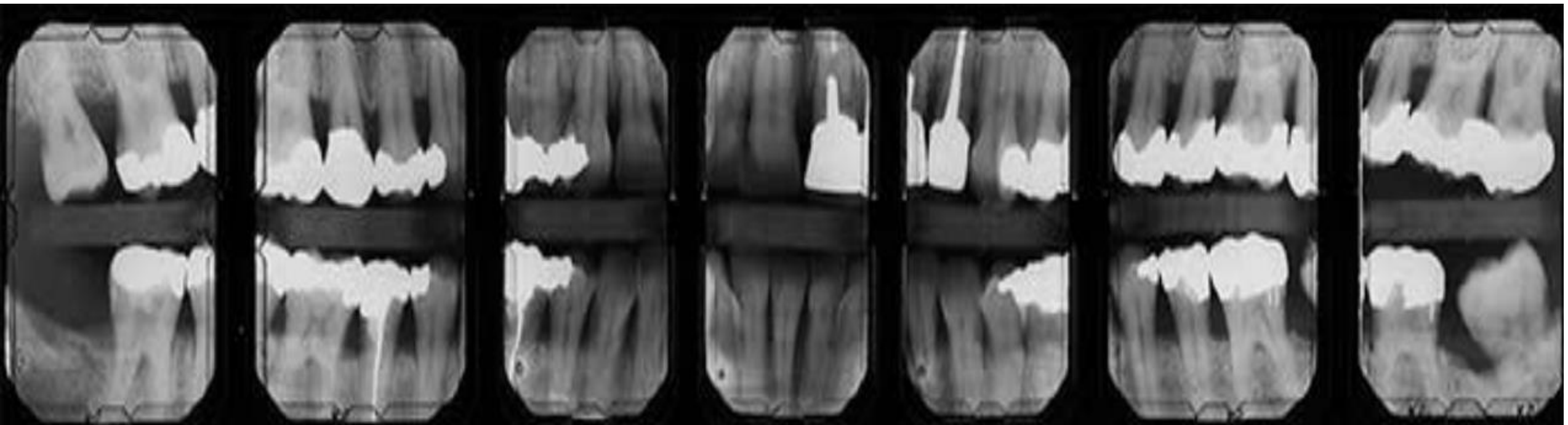
Landmarks. Landmark	Brief Description	Radiolucent / Radiopaque	Periapical	Bilateral / Unilateral	Alternate Name
External Oblique Ridge	Diagonal Line	Radiopaque	Molar	Bilateral	Exteranal Oblique Line
Genial Tubercle	Doughnut-shaped	Radiopaque	Cental Incisor	Uniilateral	Mental Spine
Inferior Border of Mandible	Horizontal Band	Radiopaque	Any Mandibular	Bilateral	Lower Border
Internal Oblique Ridge	Diagonal Line	Radiopaque	Molar	Bilateral	Mylohyoid Line
Lingual Foramen	Pinpoint dot	Radiolucent	Central Incisor	Bilateral	
Mandibular Canal	Tubular	Radiolucent	Premolar Molar	Bilateral	Inferior Alveolar Nerve Canal
Mental Foramen	Circular	Radiolucent	Premolar Canine	Bilateral	
Mental Fossa	Diffuse	Radiolucent	Central Incisor	Unilateral	
Mental Ridge	Inverted V	Radiopaque	Central Incisor Lateral Incisor Canine	Bilateral	
Submandibular Fossa	Diffuse	Radiolucent	Premolar Molar	Bilateral	Submandibular Gland Fossa Mandibular Fossa



BITWING VIEWS:

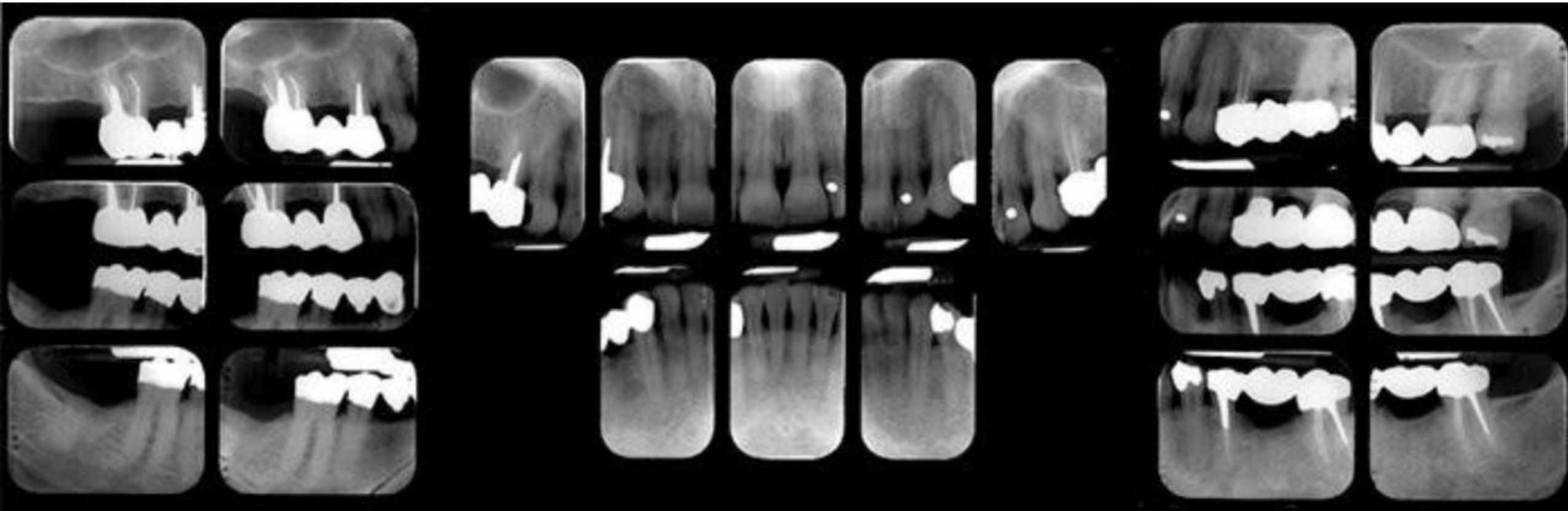
There are several landmarks recorded on **molar bitewing** radiographs whether vertical or horizontal in **orientation**.

The most common structures observed are the **external oblique ridge** and **maxillary tuberosity**.



FULL MOUTH VIEWS:

The full mouth surveys below exhibit many of the anatomical structures presented in this course. Examine each survey to identify which structures are present.

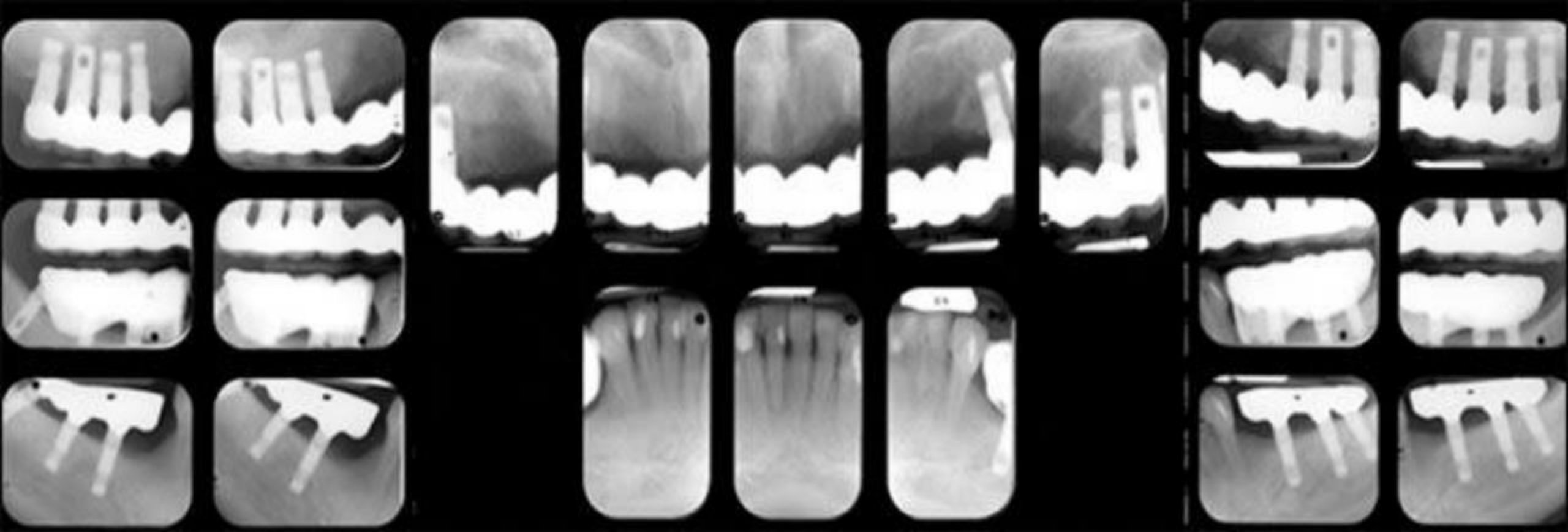


Visible Structures

Maxilla: zygomatic bone, zygomatic process, maxillary sinus, maxillary tuberosity, inverted Y, lateral fossa, incisive foramen, nasal soft tissue, mid-palatine suture

Bitewings: maxillary tuberosity, external oblique ridge

Mandible: external oblique ridge, mandibular canal, mental foramen, mental ridge, genial tubercle, lingual foramen



Visible Structures

Maxilla: zygomatic bone, zygomatic process, maxillary sinus, maxillary tuberosity, **inverted Y**, nasal concha, nasal fossa, nasal septum, nasal soft tissue, anterior nasal spine, incisive foramen

Bitewings: external oblique ridge

Mandible: external oblique ridge, mandibular canal, inferior border of the mandible, mental foramen, mental ridge, genial tubercle, lingual foramen



Visible Structures

Maxilla: zygomatic bone, zygomatic process, maxillary sinus, maxillary tuberosity, pterygoid plates, coronoid process, inverted Y, nasal fossa, nasal soft tissue, lateral fossa, anterior nasal spine, incisive foramen

Bitewings: external oblique ridge

Mandible: external oblique ridge, internal oblique ridge (faint), mandibular canal, submandibular fossa, mental foramen, mental fossa, genial tubercle, lingual foramen

THANK YOU!

The image features a celebratory graphic. At the top, the words "THANK YOU!" are written in a large, white, bold, sans-serif font. Below the text, a series of colorful, 3D rectangular bars of varying heights and colors (green, yellow, red, blue) rise from the bottom left towards the top right. Each bar is topped with a 3D star of the same color. The overall composition is dynamic and festive, set against a plain white background.