RADIOANATOMY OF THE SKULL AND MANDIBLE

DR. REYES | 08/03/2026

OUTLINE

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II. Skull Radiography
  A. Skeletal Survey
  B. Ventriculoperitoneal Shunt
  C. Major Landmarks Used for Skull Radiography
  D. Radiographic Views of the Skull
III. Skull Sutures
  A. Coronal
  B. Lamdoidal
  C. Sagittal
  D. Metopic
  E. Occipitomastoid
  F. Pareitomastoid
  G. Sphenosquamousal
  H. Pterion
  I. Asterion
IV. Parts of the Temporal Bone
V. Craniosynostosis
VI. Fontanelle
  A. Anterior
  B. Posterior
  C. Sphenoidal
  D. Mastoid
VII. Radiographic Views of the Skull
  A. Towne
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  C. Waters
  D. Axiolateral Oblique Temporomandibular joint

LEGENDS

Must know	Lecturer	Book	Presentation	Old Trans
❗	👩‍⚕️	📖	🖥️	📝

OBJECTIVES

- Describe the skull's basic architecture
- State the indications for skull radiography
- Match each standard view to what it shows
- Identify the major sutures, fontanelles, and landmarks
- Locate the paranasal Sinuses and maxillary bone and outline their developmental timeline.

SKULL

- Rests on the superior aspect of the vertebral column
- Cranial bones are divided into the vault and the floor
- Facial bones are also included in the skulls
- composed of several separate bones united at immobile joints called sutures
  - 👩‍⚕️ All are connected by sutures except for mandible (connected to the skull through its joint: temporomandibular joint)

4 Sutures

- Coronal Suture
- Sagittal Suture
- Lamboid Suture
- Squamous Suture

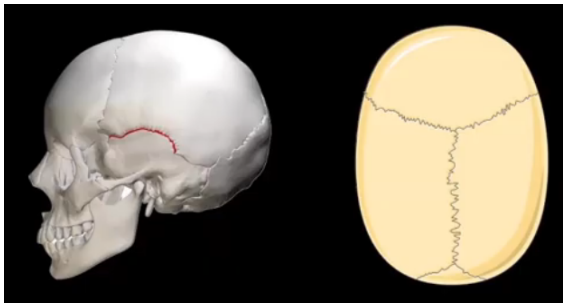


Figure 1. Skull and its sutures (Doc's ppt)

- The cranium is divided into the Cranial Vault and Cranial Base
  - 👩‍⚕️ No bone divides them. There is only an imaginary line.
    - Line starts at the **glabella**
    - Goes above the **supraorbital margin**
    - Continues over the **external acoustic meatus**
    - Continues above the **external occipital protuberance**

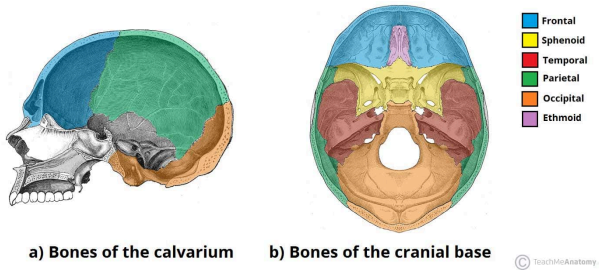


Figure 2. Cranial Vault vs Cranial Base (Doc's ppt)

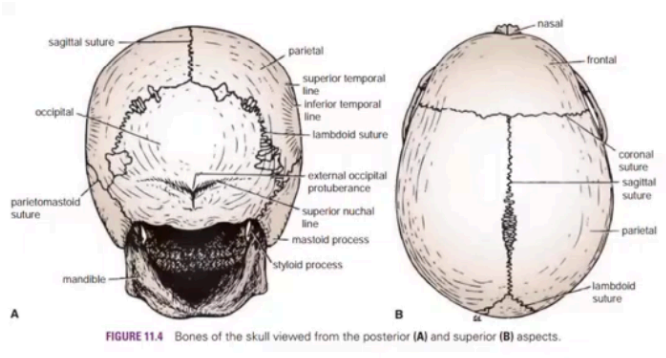


Figure 3. Skull and its bones + sutures (Doc's ppt)

- 👩‍⚕️ 22 skull bones
  - 8 Cranial bones
  - The rest are Facial bones

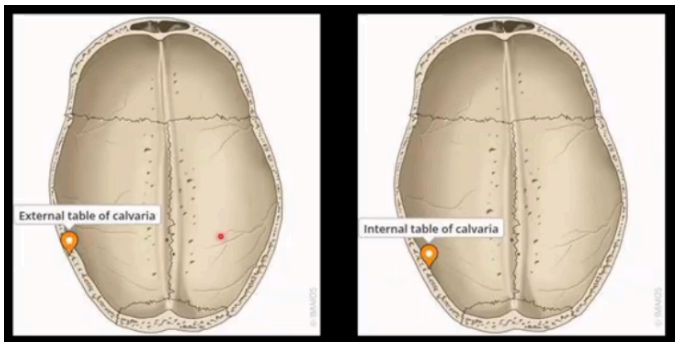


Figure 4. Skull Outer and Inner Table (Doc's ppt)

- 👩‍⚕️ The skull consists of an outer and inner table
  - Both are cortical bones
    - Harder layer
  - In between the tables lies the "Diploe"
    - Spongy bone

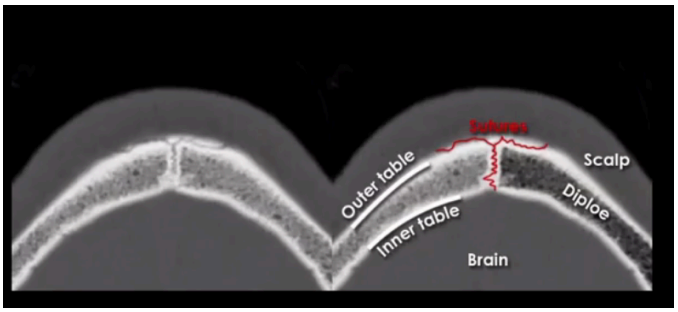


Figure 4. Skull Layers(Doc's ppt)

SKULL RADIOGRAPHY

- Radiological investigation of the skull vault and associated bony structures
  - 2 dimensional
- Was considered an essential step in assessing patients with suspected neurological disease
- Seldom requested and often a last resort
- Indications include:
  - Trauma
  - Detect/Exclude metallic foreign body materials
  - Assess surgical implants
  - Skeletal survey
  - 👩‍⚕️❗Go to BPE intro to radiology to understand **ALADA (as low as diagnostically acceptable)**, etc.

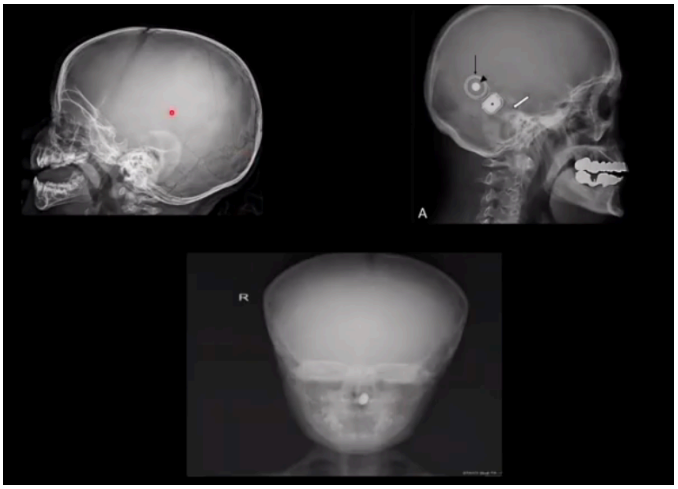


Figure 5. Skull Radiography Demo (Doc's ppt)

- ❗Watch the demo for a more in-depth experience
  - 1st Pic = Skull Fracture
  - 2nd Pic = Cochlear implant
  - 3rd Pic = Foreign body

A. SKELETAL SURVEY

- 👩‍⚕️A series of radiographs that are performed systematically to cover the whole skeleton
  - Head, thorax, pelvis, spine, extremities, etc.
  - Rule out some diseases

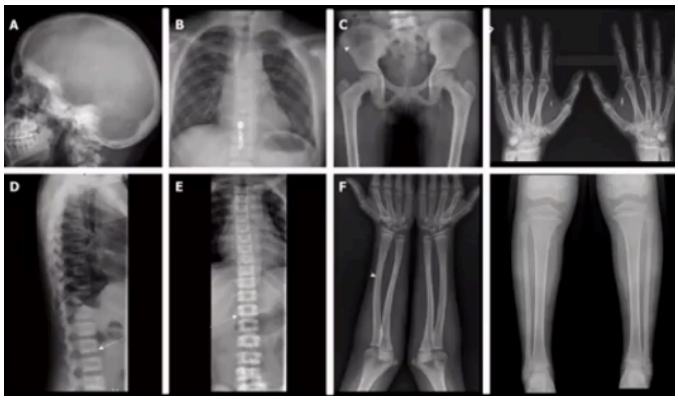


Figure 6. Skeletal Survey (Doc's ppt)

B. VENTRICULOPERITONEAL SHUNT

- 👩‍⚕️Done when there is hydrocephalus
  - Especially when it is impairing the brain
  - CSF is shunted out into the peritoneal cavity
  - These can be seen on radiographs

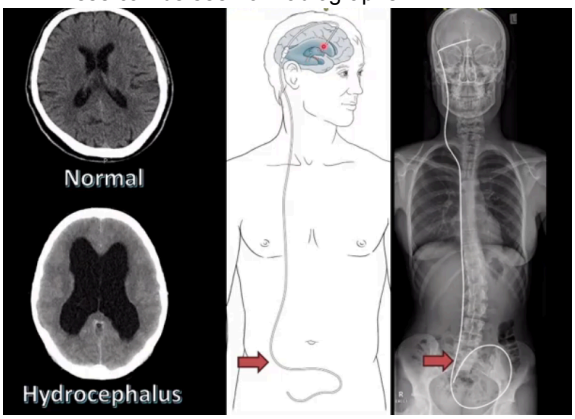


Figure 6. Ventriculoperitoneal Shunt (Doc's ppt)

C. MAJOR LANDMARKS USED FOR SKULL RADIOGRAPHY

- 👩‍⚕️Used for consistency
- No need to memorize, but need to familiarize
  1. Vertex
  2. External Occipital Protuberance EOP
  3. External Auditory Meatus
  4. Outer Canthus of Eye
  5. Infra-orbital point\
  6. Nasion (Nose Bridge)
  7. Glabella
  8. Acanthion
  9. Angle of the Mandible
  10. Mental Point

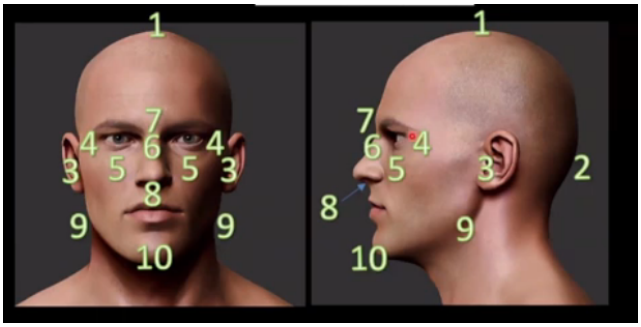


Figure 7. Major Landmarks (Doc's ppt)

D. RADIOGRAPHIC VIEWS OF THE SKULL

- Standard Projections:
  - AP or PA view
    - Anterior -> Posterior = AP
      - Patient faces the source
      - Behind is the detector
    - Posterior -> Anterior = PA
      - Opposite of PA
  - Lateral view
  - Towne view
  - Caldwell view
  - Waters view

AP and PA view

- Non-angled radiograph of the skull
- Provides an overview of the entire skull
- Medial and lateral displacements of skull fractures

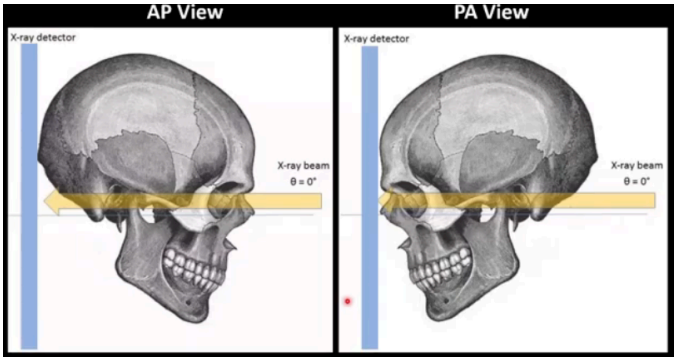


Figure 8. AP and PA view **direction of beam** (Doc's ppt)

- The PA view decreases the radiation dose to the eyes compared with the AP view
- Increased magnification of the facial bones
- Overlap of facial bone structures makes it harder to evaluate

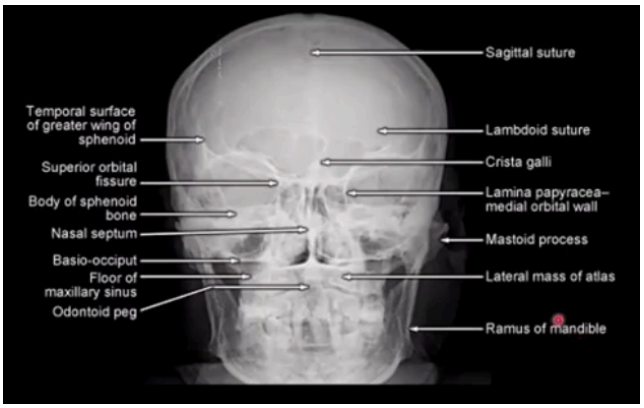


Figure 9. Labelled AP/PA Skull Radiograph (Doc's ppt)

Lateral view

- The sagittal midline of the patient's head is parallel to the image detector
- Provides an overview of the entire skull as well

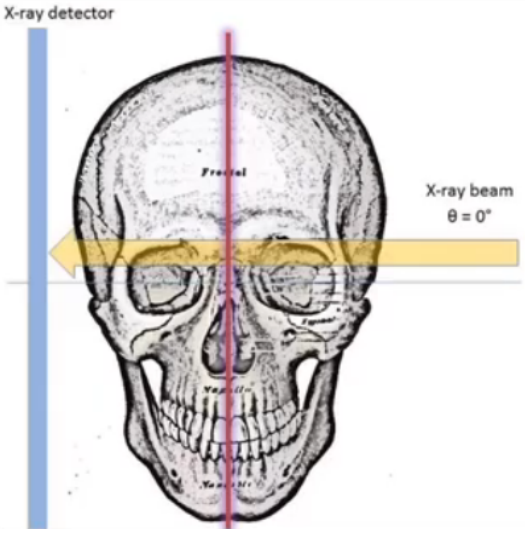
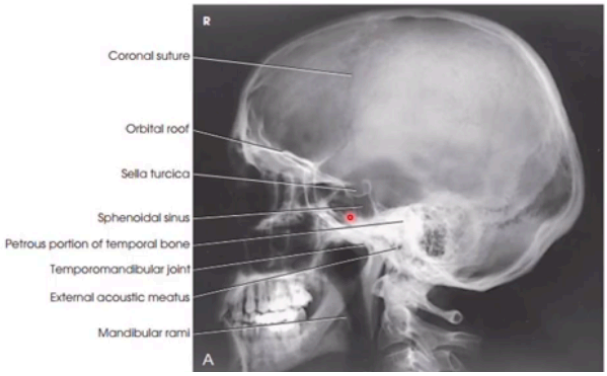


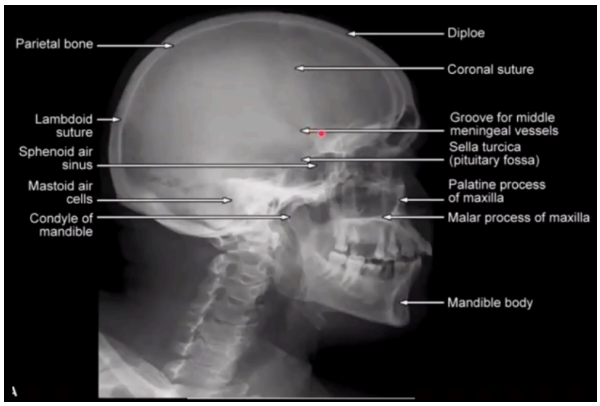
Figure 10. Lateral view **direction of beam** (Doc's ppt)

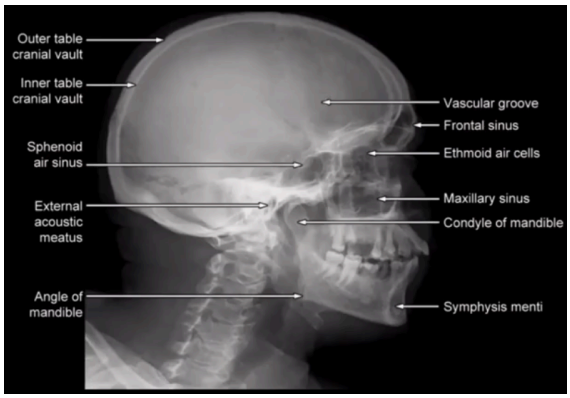
- Evaluates for skull fractures, in addition to neoplastic changes
- May demonstrate air-fluid levels in the sphenoid sinus, an indication of basal skull fracture
- 👩‍⚕️You may see structures and/or deformations that are present in Lateral view that you cannot observe from AP/PA view
  - The opposite is also true.



Figure 11. Actual Lateral view Skull Radiograph (Doc's ppt)







Figures 12-14. Labelled Lateral Skull Radiograph (Doc's ppt)

SKULL SUTURES

- Fibrous joints
- Outer layer of the dura mater becomes continuous with the periosteum
- Divided by their general location
  - Calvarial
  - Facial
  - Basal

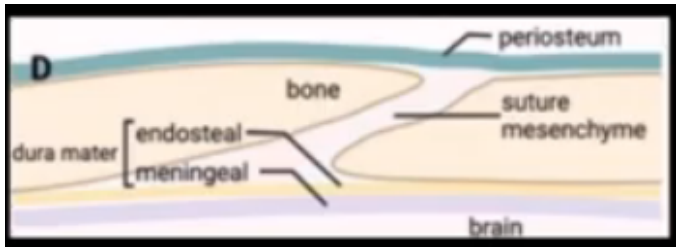


Figure 15. Skull Suture parts (Doc's ppt)

- Usually named by the bones they join (though not all)
- **Calvarial**
  - Coronal
  - Sagittal
  - Lambdoid (occipitomastoid)
  - Metopic
  - Squamosal
  - Sphenosquamosal
- **Basal**
  - Frontoethmoidal
  - Petrosquamous
  - Petroclival
  - Sphenoethmoidal
  - Sphenopetrosal
- **Facial**
  - Frontozygomatic
  - Frontomaxillary
  - Frontolacrimal
  - Temporozygomatic
  - Zygomaticomaxillary
  - Parietotemporal (parietomastoid)
  - Occipitotemporal (occipitomastoid)
  - Sphenofrontal
  - Sphenozygomatic
  - Lacrimomaxillary
  - Nasomaxillary

A. CORONAL SUTURE

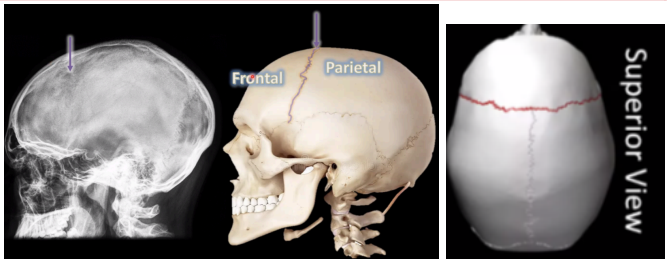


Figure 16. Coronal Suture

- 👩 Pinagdidikit ung frontal and parietal bone
- Fuse at 24 years of age
- **craniocyanostosis** → premature suture
- Hati is from anterior to posterior – parang nagsuot ng crown
- Cut ay pababa

B. LAMBDOIDAL SUTURE

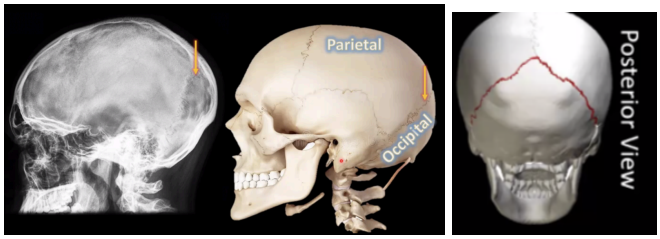


Figure 17. Lambdoidal Suture

- 👩 Fuses around 26 years
- Lambdoidal kasi nagfoform ng lambda na sign sa gitna

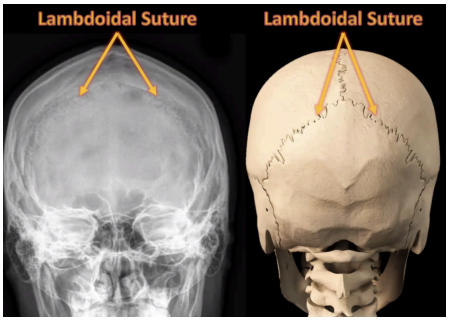


Figure 18. Lambdoidal Suture

C. SAGITTAL SUTURE

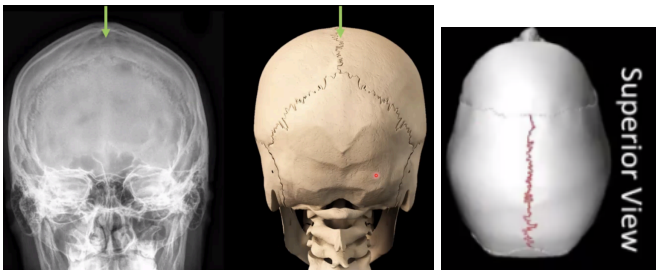


Figure 19. Sagittal Suture

- 👩Normal fusion is 22 years of age
- Sagittarius → star sign with bow and arrow → so imagine that the arrow pierced through sa gitna
- Separates right and left parietal lobes

D. METOPIC SUTURE

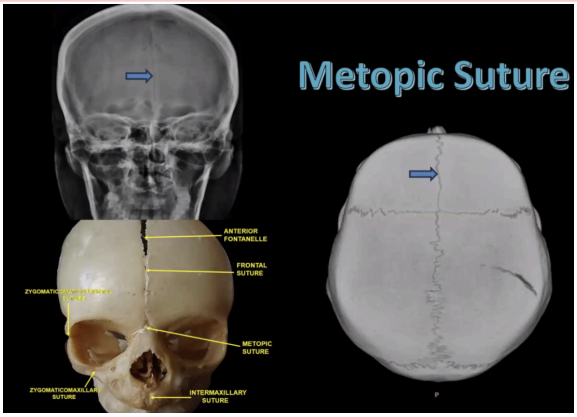


Figure 20. Metopic Suture

- 👩Fuse at 3 to 9 months of age
- Wala na usually by preschool age ung iba nagffuse pag adult na
- No clincal implication but it is rare
- Baka mapagkamalan na fracture

E. OCCIPITOMASTOID SUTURE

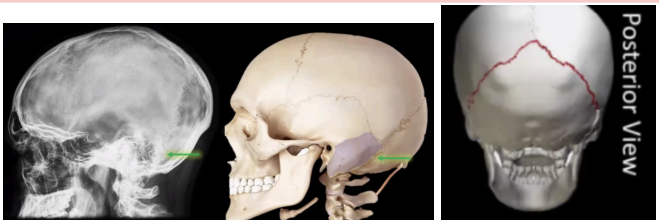


Figure 21. Occipitomastoid Suture

- fuses occipital and mastoid bone

F. SQUAMOUS / PARIETOMASTOID SUTURE

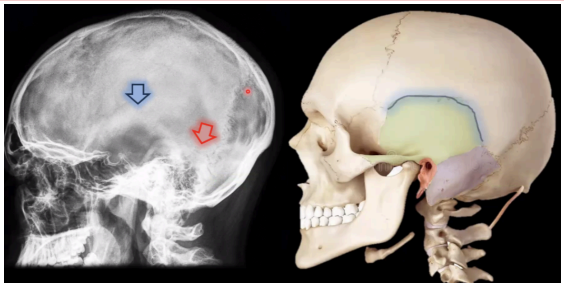


Figure 22. Squamous/Parietomastoid Suture

- blue: squamosal/squamous suture
  - Squamous is continuous to parietotemporal
- red: parietotemporal/ parietomastoid suture

G. SPHENOSQUAMOSAL SUTURE

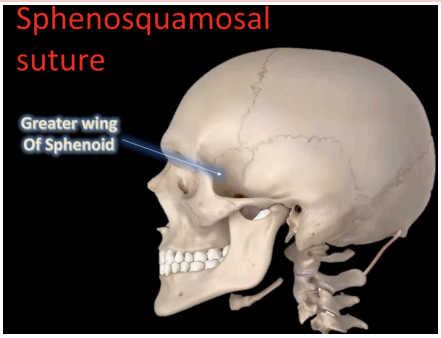


Figure 23. Sphenosquamosal Suture

H. PTERION

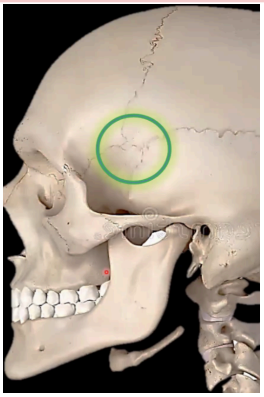


Figure 24. Pterion

- H-shaped landmark on the side of the calvarium representing the junction of four skull bones:
  - the greater wing of the sphenoid bone
  - squamous portion of the temporal bone
  - frontal bone
  - parietal bone

Clinical Significance

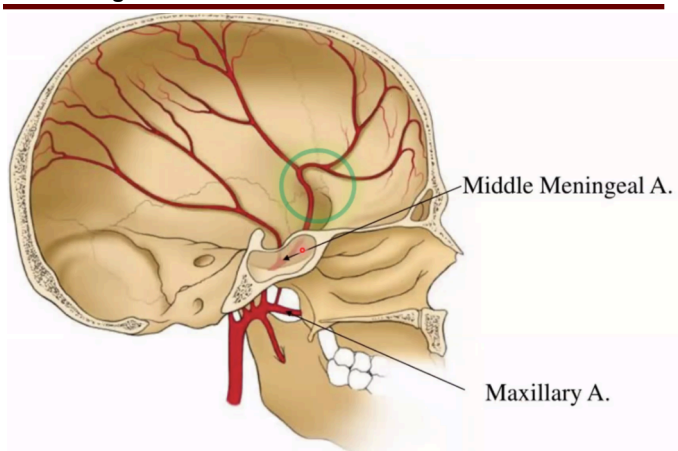


Figure 24. Cranial Vault

- If nagkaron ng trauma tas tinamaan ung artery, pwede mag hematoma (inside brain → epidural and subdural)
- Epidural → expected for trauma patients

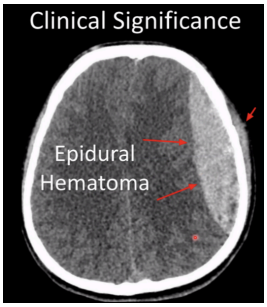


Figure 25. Epidural Hematoma

I. ASTERION

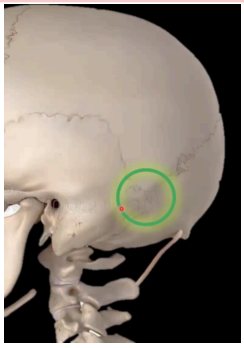


Figure 26. Asterion

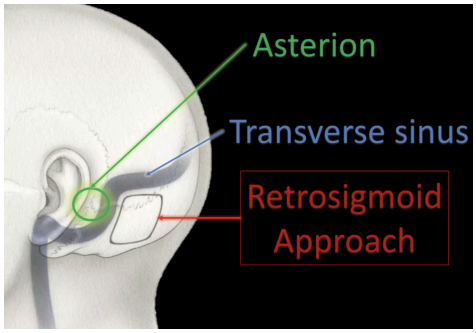


Figure 26. Asterion

- the asterion is the junction on the side of the posteroinferior calvarium where three sutures meet:
  - parietomastoid suture
  - lambdoid suture
  - occipitomastoid suture

PARTS OF THE TEMPORAL BONE

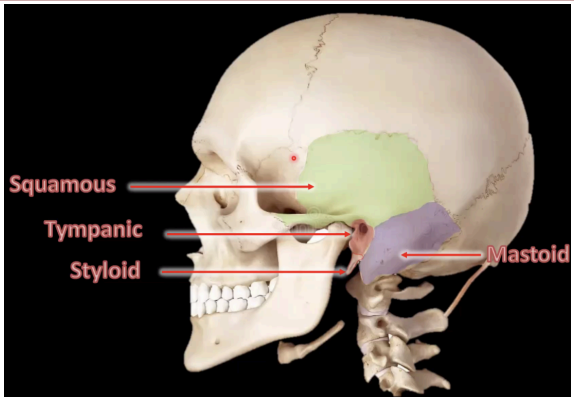


Figure 27. Parts of the Temporal Bone

- Squamous → thinnest and pinakalabas
- Nageextend ang temporal hanggang zygomatic bone
- Tympanic → nagahouse sa external acoustic meatus

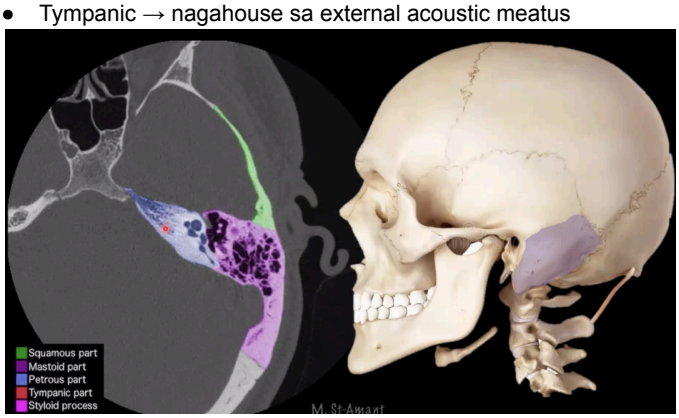


Figure 28. Mastoid

- Petrous part → base is attached to mastoid bone

CRANIOSYNOSTOSIS



Figure 29. Sagittal Synostosis

- refers to the premature closure of the cranial sutures
- the skull shape then undergoes characteristic changes depending on which culture(s) close early

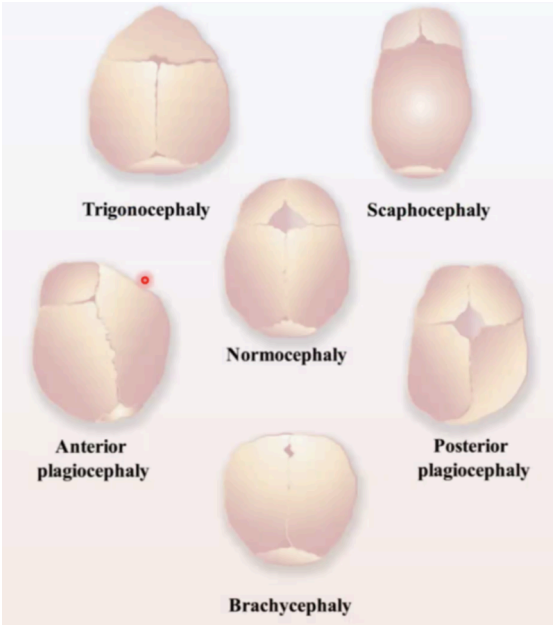


Figure 30. Craniosynostosis

- Trigonocephaly → frontal suture close; mukhang triangle
- Scaphocephaly → sagittal suture close; itsura parang boat; pahaba, di na mageexpand from left to right; 22 years
- Posterior plagiocephaly → lambdoid suture
- Anterior plagiocephaly → coronal suture

- Brachycephaly → both coronal sutures fuse

FONTANELLES

- soft membranous regions of the fetus and neonate calvarium where the corners of three or four developing flat bones meet and allow for the growth over the skull over the developing brain
- (6) fontanelles
  - (1) anterior fontanelle
  - (1) posterior fontanelle
  - (2) anterolateral (sphenoidal) fontanelles
  - (2) posterolateral (or mastoid) fontanelles

Anterior Fontanelle

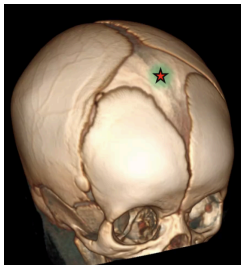


Figure 31. Anterior Fontanelle

- the largest fontanelle
- closes (fuses) at 18-24 months of age to become the bregma

Posterior Fontanelle



Figure 32. Posterior Fontanelle

- triangular soft membranous gap (fontanelle) at the junction of the lambdoid and sagittal sutures
- fuses at 2 months of age to become the lambda

Sphenoidal Fontanelle

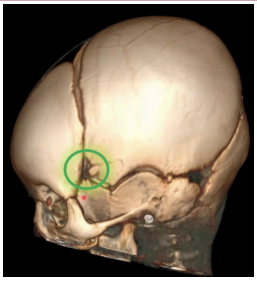


Figure 33. Sphenoidal Fontanelle

- anterolateral fontanelle
- paired fontanelle
- fuses at 6 months of age to become the pterion

Mastoid Fontanelle

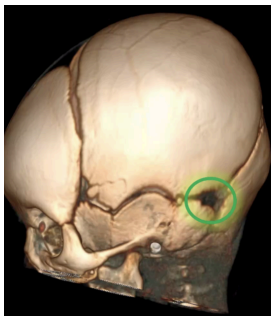


Figure 34. Mastoid Fontanelle

- posterolateral fontanelle
- paired fontanelle
- fuses in the second year of life to become the asterion

CLINICAL SIGNIFICANCE

- **Sunken fontanelle**
  - may indicate dehydration
- **Bulging fontanelle**
  - can signal increased intracranial pressure, infection, or trauma
- **Delayed closure**
  - seen in conditions like hypothyroidism, Down syndrome, or cleidocranial dysostosis
- **Premature closure**
  - associated with craniosynostosis, affecting skull shape and brain development

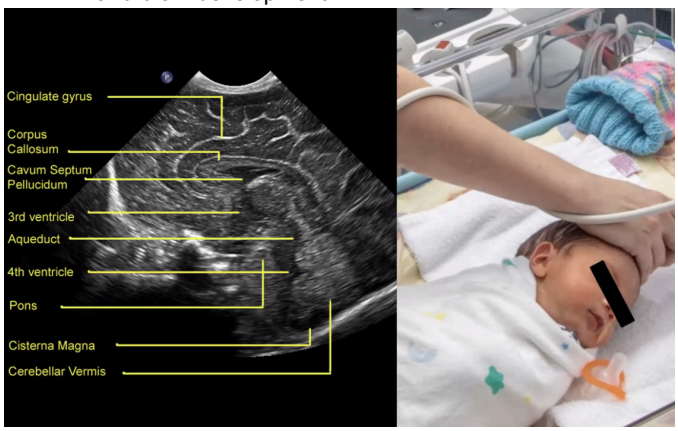


Figure 35. Ultrasound of the brain

Skull Suture and Fontanelle Fusion

Table X. Skull Sutures and Age of Fusion

Suture	Ages of Fusion
Posterior Fontanelle	2 months
Sphenoidal Fontanelle	6 months
Metopic Suture	3-9 months
Mastoid Suture	6-18 months
Anterior Fontanelle	18-24 months
Sphenosquamosal Suture	6-10 years
Occipitomastoid Suture	16 years of age
Sagittal Suture	22 years of age
Coronal Suture	24 years of age
Lambdoid Suture	26 years
Squamosal Suture	60 years of age

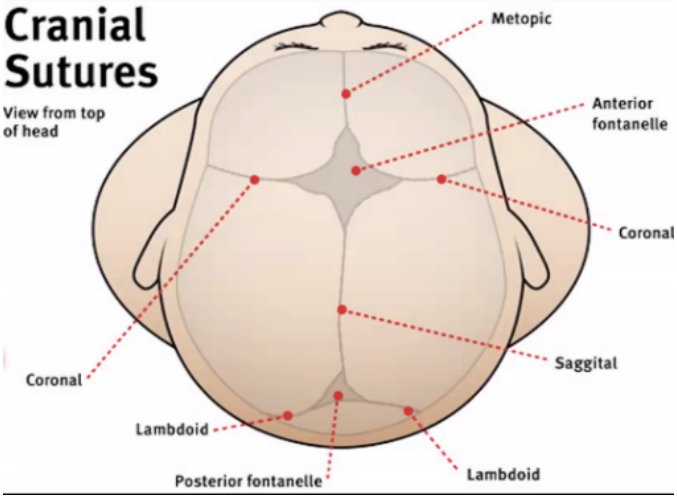
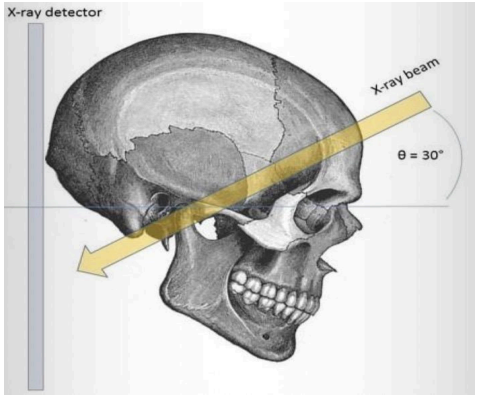


Figure 36. Cranial Suture

RADIOGRAPHIC VIEWS OF THE SKULL

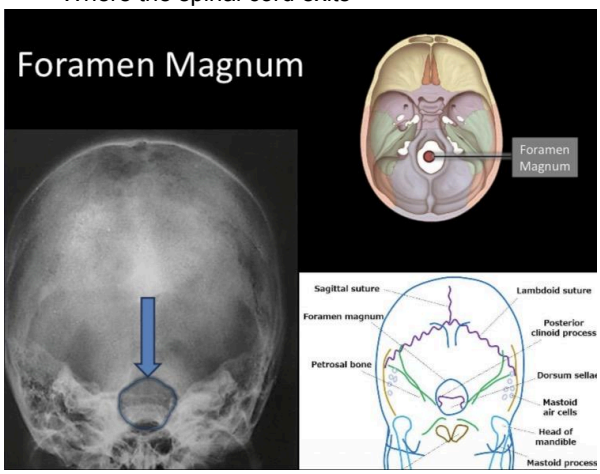
A. TOWNE VIEW

- AP Axial Projection
- An angled AP radiograph of the skull
- The projection is used to visualize the
  - Petrous ridge
  - Dorsum sellae
  - Posterior clinoid processes



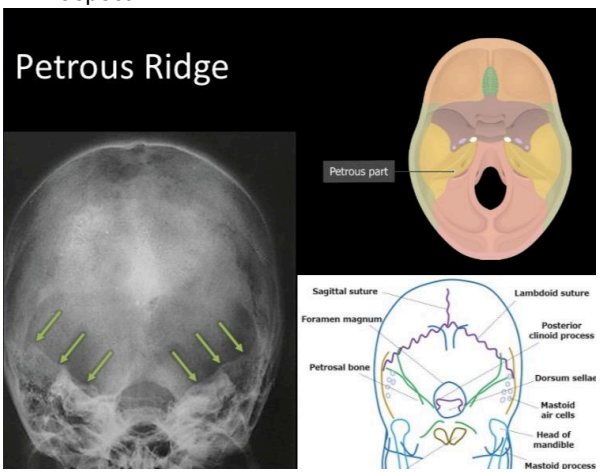
Foramen Magnum

- Appears as midline, oval, radiolucent aperture at the skull base
- Where the spinal cord exits

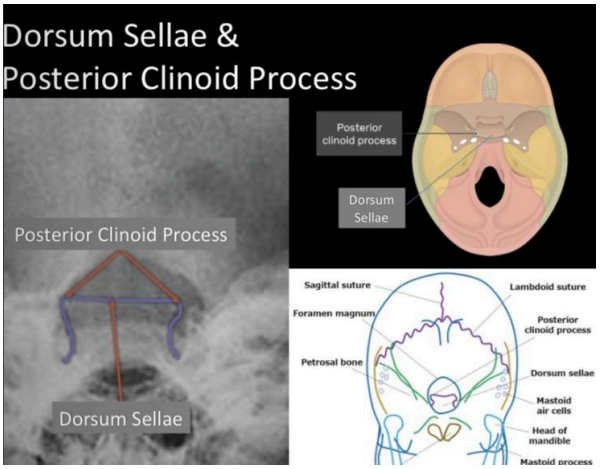


Petrous Ridge

- Appears symmetrically on either side of the foramen magnum
- A part of the temporal bone, located at the media aspect



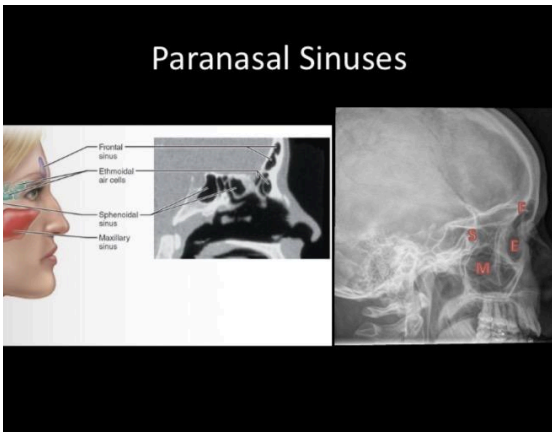
Dorsum Sellae & Posterior Clinoid Process



- Rectangular or square shaped bony prominence located on the posterior surface of the sphenoid bone
- Forms the posterior bone of the sella turcica (saddle shaped bone that houses the pituitary gland)
- **DORSUM SELLAE** is visualized as a dense midline ridge overlapping the radiolucent outline of the foramen magnum
- Superior border: Posterior clinoid process which are symmetrically bony prominences that frames the dorsum sellae
- When properly positioned, the dorsum sellae is centered and projected within the foramen magnum and petrous ridges lining its boundaries

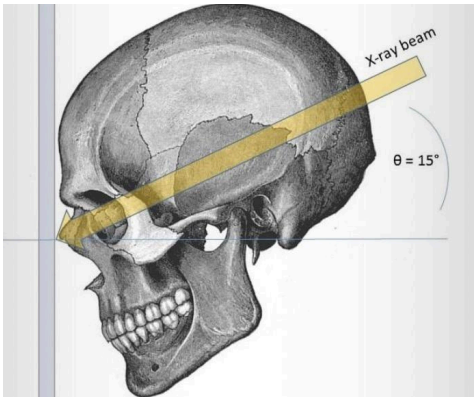
Paranasal Sinuses

- Paired mucosal lined air cavities within the facial and cranial bones that surround the nasal cavities
- Developed as out pouching of the nasal mucosa and serve to lighten the skull, humidify and warm inspired air, enhance voice resonance and provide a protected crumple zone for the brain



B. CALDWELL VIEW

- Caudally angled PA radiograph of the skull, designed to better visualize the paranasal sinuses, especially the frontal sinus.
- Patient's forehead is placed against the image detector
- Forehead and nose are both touching the detector
- Orbitomeatal line is running perpendicular to the detector.



Frontal Sinus

- Radiolucent cavities above the nasal bridge, outlined by the frontal bone's anterior table

Ethmoid Sinus

- Air cells situated between the orbits and behind the nasal bridge

Maxillary Sinus

- Paired radiolucent cavities below the orbital floors
- Limited outline present in Caldwell's projection

Sphenoid Sinus

- This view provides only a partial outline of the sphenoid air cells against the ethmoidal complex

Mastoid Air Cells

- Fine "honeycomb" radiolucencies posterolateral to the petrous ridges
- Represents the pneumatised mastoid portions of the temporal bones

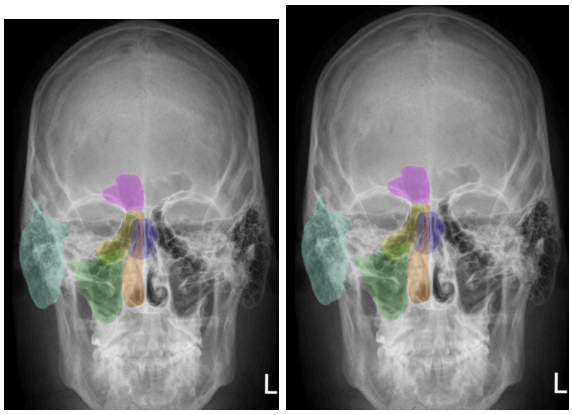


Fig X. Frontal Sinus (Pink), Ethmoid Sinus (Yellow), Maxillary Sinus (Green), Sphenoid Sinus (Purple Color), Mastoid Air Cells (Blue Green)

C. WATERS VIEW

- Also known as Occipitomental (OM) view
- An angled PA radiograph of the skull, with the patient gazing slightly upwards
- It can be used to assess for facial fractures, as well as for acute sinusitis
- If clinically highly suspicious for facial fractures, CT is more sensitive

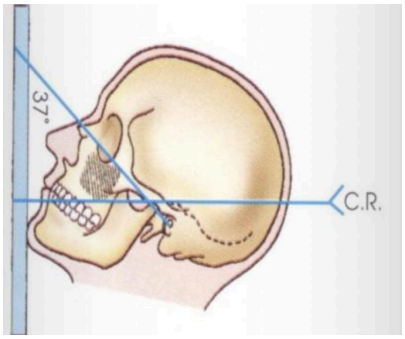


Figure X. Waters View

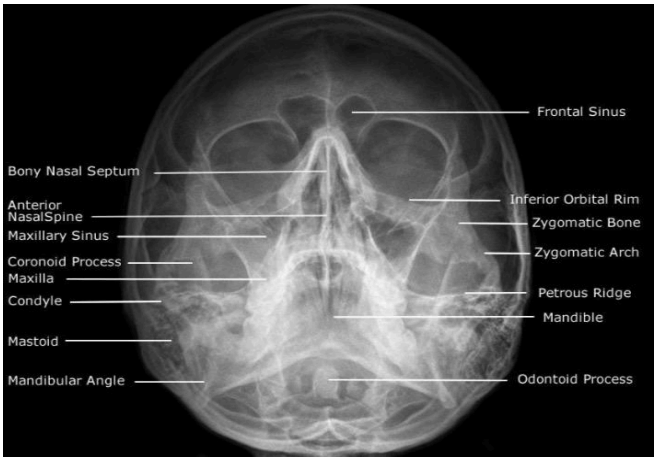


Figure X. Petrous Ridges

- Petrous ridges are positioned inferior to the maxillary sinuses floors

Growth and Development of PNS

Sinus	Prenatal Development	Presence at Birth	Pneumatization Onset	Significant Growth Period	Adult Size Achieved
Ethmoid	Begins ~12 weeks' gestation	Present as small air cells	In utero via ethmoidal cells	Rapid postnatal growth until ~8 years	Near puberty (~12–14 yrs)
Maxillary	Rudimentary by 4 months' gestation	Present as small cavities	In utero, continues after birth	Marked expansion at 3–5 years	By ~12–15 years
Sphenoid	Initial condensation in late gestation	Rudimentary at birth	Around 2–3 years of age	Progressive enlargement 3–7 years	By ~14–16 years
Frontal	Absent prenatally	Not present	Begins ~4–5 years of age	Noticeable pneumatization 6–8 years	By ~15–18 years

D. AXIOLATERAL OBLIQUE TEMPOROMANDIBULAR JOINT (TMJ) VIEW

- The patient is seated upright with the side of interest closest to the detector
- The head is placed in a true lateral position
  - Inter-pupillary line or IPL perpendicular and Mid Sagittal plane parallel to the detector.
- Allows for visualization of the:
  - articular tubercle
  - mandibular condyle and fossa
- Clinical indications include trauma, the presence of joint noises, trismus, and occlusal alterations

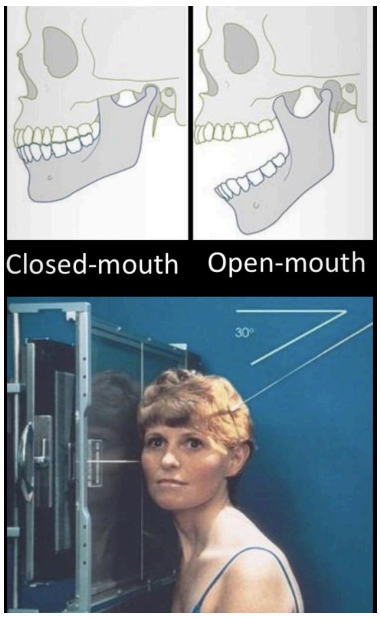


Figure X. Axiolateral Oblique Temporomandibular Joint Visualization

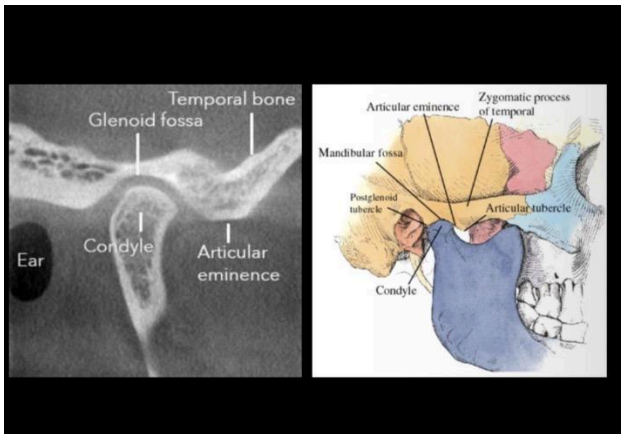


Figure X. Axiolateral Oblique Temporomandibular Joint View

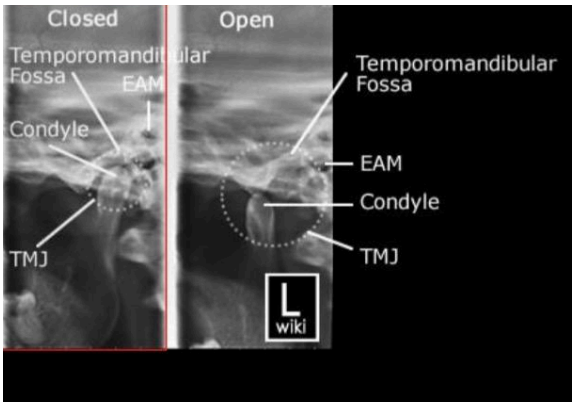


Figure X. Radiologic View of the Temporal fossa

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1. Moore, (2023), Clinically Oriented Anatomy 9th Edition
2. Dr. Reyes Lecture on Radioanatomy of the Skulls and Mandible