THE MAXILLARY SINUS

ANATOMY  FUNCTION

HISTOLOGY  DEVELOPMENT & GROWTH

CLINICAL CONSIDERATIONS
ANATOMY
The **MAXILLARY SINUSES** are the largest of the paranasal air filled spaces

![Image of maxillary sinuses]

**It is a 4-sided pyramid:**
The base facing the side of the nasal cavity and the apex pointing laterally towards the body of the zygoma
The four sides are related to THE SURFACES OF MAXILLA in the following manner:

- **Anterior** ➔ facial surface of the body.
- **Inferior (floor)** ➔ alveolar process.
- **Superior (roof)** ➔ the orbital surface.
- **Posterior** ➔ the infra temporal surface.
Opens into the nasal cavity through the **ostium**, an opening found on the highest part of the medial wall of the sinus top of the sinus, located within the **hiatus semilunaris** in the **middle meatus** of the nasal cavity.

Accessory openings (ostia) may be present in some individuals.
The permanent teeth:
• First molar.
• Second and third molars.
• Second and first premolars.
• Rarely the canine.

The Deciduous teeth:
• D
• E
• Rarely C

The floor of the maxillary sinus is related to the roots of the teeth in variable degrees:

• Between the roots of adjacent teeth & the roots of the same tooth.
• Elevated in spots to accommodate the apices of the roots
• Roots may protrude into the sinus cavity
ANATOMICAL VARIATIONS

Maxillary sinuses showing Septae (arrows) which appear to divide it into different and separate compartments

Posterior maxillary region revealing a large maxillary sinus which extends downward between the roots of the molar teeth and also into the region of the tuberosity (arrows)
**Sinus Pneumatization:**
an enlargement of the maxillary sinus, usually as part of the aging process and as a result of the loss of maxillary teeth.

Extension of the maxillary sinus into an edentulous space as a result of pneumatization (arrows).

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**BLOOD SUPPLY TO THE SINUS**

- **FACIAL ARTERY**
- **GREATER PALATINE ARTERY**
- **INFRAORBITAL ARTERY**

LYMPH DRAINAGE TO THE SUBMANDIBULAR LYMPH NODES
NERVE SUPPLY

Infraorbital

Superior alveolar nerves
  Anterior
  Middle
  Posterior

DEVELOPMENT & GROWTH
The sinus begins to develop at about 12 weeks of fetal life, arising by lateral invagination of the mucous membrane of middle nasal meatus forming a slitlike space.
Altered development or underdevelopment of maxillary sinus occurs either alone or in association with other anomalies, for example cleft palate, high palate, septal deformity, absence of a choncha, mandibulofacial dysostosis, malformation of the external nose, and pathologic conditions of the nasal cavity as a whole.

The occurrence of two completely separated sinuses on the same side. This occurs due to outpocketing of the nasal mucosa from two points, either from the superior or inferior meatus in addition to that from the middle meatus.

From a slit like cavity on the lateral wall of the middle meatus

Maxillary sinus gradually expands by pneumatization in pace with growth of the maxilla and alveolar process

It expands not only downwards but also forwards and backwards from its initial invagination
HISTOLOGY
The respiratory mucosa lines the **nasal cavity** and the **paranasal sinuses**, and it is continuous through their ostia.

The mucosa lining the maxillary sinus is a mucoperiosteum since it is directly connected to the periosteum of the bony walls of the sinus, and it is thinner than that of the nasal cavity.

This mucoperiosteum is frequently raised into folds and ridges, but it is easily stripped from the underlying bone in surgical procedures.
**EPITHELIUM**

Pseudostratified, ciliated columnar epithelium

Basal columnar non-ciliated cells

Goblet cell

**GOBLET CELLS:** produce mucin (protection)

**CILIA:** mechanically clear the passage from mucus and inhaled substances
LAMINA PROPRIA
(Fused with periosteum)

Loose collagen bundles, very few elastic fibers

Serous and mucous glands (secretions reach sinus lumen thru excretory ducts which pierce the basal lamina)

Blood vessels

Nerve fibers (myelinated and non-myelinated)
SPECIAL FEATURES

GOBLET CELLS: Columnar epithelial cells that secrete mucin. Cytoplasm contains many granules. Apical part contains microvilli to increase secretion area.

CILIA: made of 9+1 pairs of microtubules that make it possible for it to move. They are attached to the cell via basal bodies
FUNCTION

Lightens the weight of the skull

Protection

Moistens and warms inhaled air

Vocalization (resonance of voice).

May contribute in olfaction
PROTECTION:

**CILIA:** Mechanical removal of debris and mucus. Proper function of the cilia is dependent on adequate production of mucin and serous secretions.

**MUCIN:** Prevents water loss, provides mechanical barrier, traps particulate matter

WARMING AND MOISTENING

**SEROUS SECRETIONS:** Watery secretion that evaporates to humidify and moisten the air.

**VASCULARITY:** Warms air and keeps the inside of the Maxillary Sinus moist.

Moisture is critical for ciliary function. Dehydration even if for just a few minutes will deplete the mucous blanket, stop ciliary movement and cause ciliary degeneration.

However, after the degenerative causative agent is removed, the maxillary sinus has a high capacity of regeneration and will return to normal
Why are the Maxillary Sinus and the structures in the Oral Cavity associated?

- Close anatomical position between Maxillary Sinus and Maxillary Teeth
- Shared innervations with posterior Maxillary Teeth
- Rich vasculature in close proximity to both structures may enhance spread of infection
- In cases where bone is very thin or missing, the only tissue separating sinus and teeth is the mucous membrane
Infection of maxillary sinus of odontogenic origin
OROANTRAL FISTULA

Direct connection between the oral cavity and the lumen of the sinus

CAUSES:
1. Removing floor of sinus during extraction
2. Destruction due to periapical pathology
3. Broken root forced into the sinus

REFERRED PAIN

Close innervations may lead to confusing clinical findings when compared to symptoms...
REMEMBER THAT THE PATIENT IS A WHOLE HUMAN BEING, NOT JUST AN ORAL CAVITY.

MALIGNANCY

Malignancy of the Maxillary Sinus may produce the first symptoms in the oral cavity via loose teeth, bleeding gums, and sometimes pain.

IMPLANTS

When there isn’t sufficient bone to place an implant, a sinus lift is done.
RADIOGRAPHIC VIEWING OF THE MAXILLARY SINUS

**INTRA ORAL RADIOGRAPHS**

Pariapical radiographs

**EXTRA ORAL RADIOGRAPHS**

- OPG
- Occipito-mental (most imp one)
- Oblique Occlusal (anterior and posterior)
- Lateral cephalometric (sinuses will be superimposed)

Also, **CT scan** and **MRI**
OBLIQUE OCCLUSAL

CEPHALOMETRIC RADIOGRAPH