

Al Rasheed College of Dentistry
Oral Histology

Dr. Omar Faridh Fawzi
Lecture 21

Paranasal Sinuses

INTRODUCTION

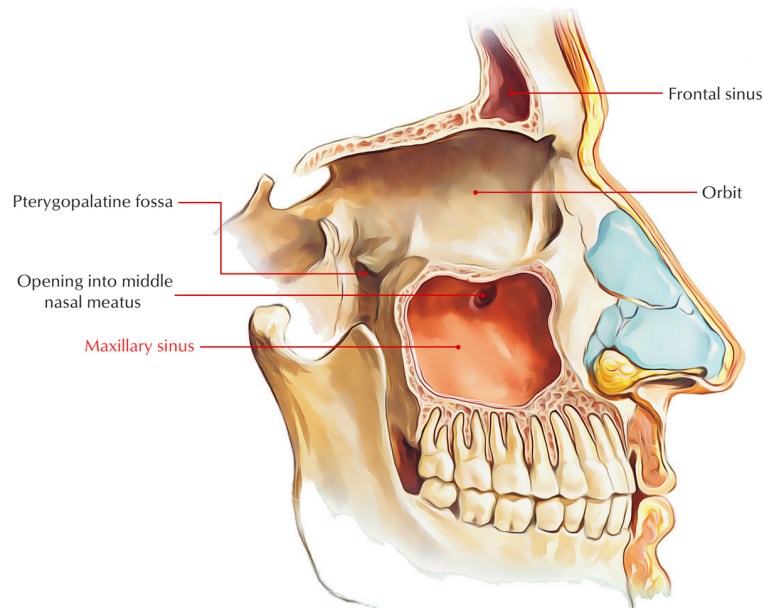
Paranasal Sinuses (PNS) are air containing bony spaces around the nasal cavity. These spaces communicate with the nasal airway and form the various boundaries of the nasal cavity and are named for the bones in which they locate.

There are 4 pairs of paranasal sinuses (bilaterally):

- a. Maxillary air sinus
- b. Frontal air sinus,
- c. Ethmoidal air sinus,
- d. Sphenoidal air sinus.

- **Definition (Maxillary air sinus)**

"Maxillary sinus is the pneumatic space that is lodged inside the body of the maxilla and that communicates with the environment by way of the middle nasal meatus and the nasal vestibule"



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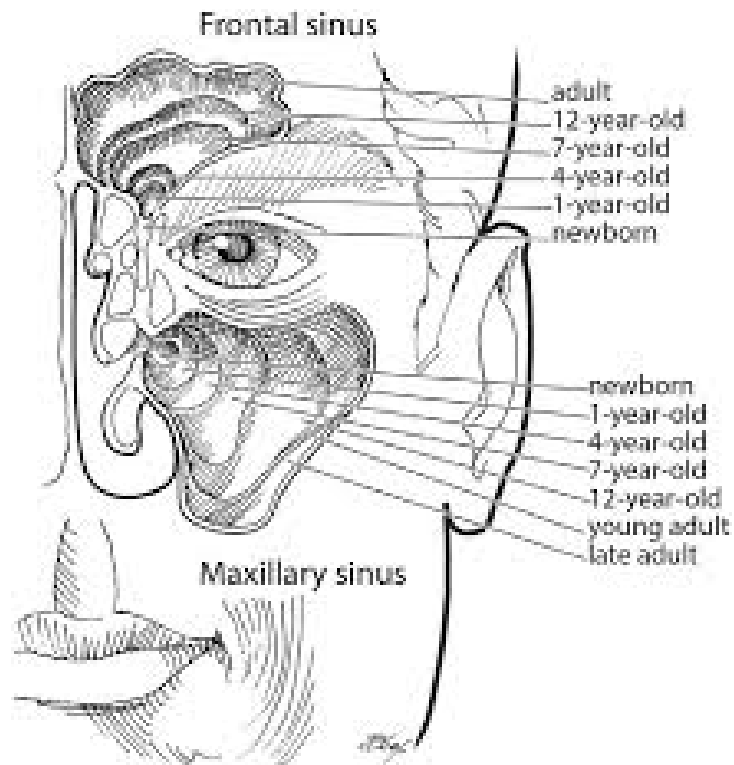
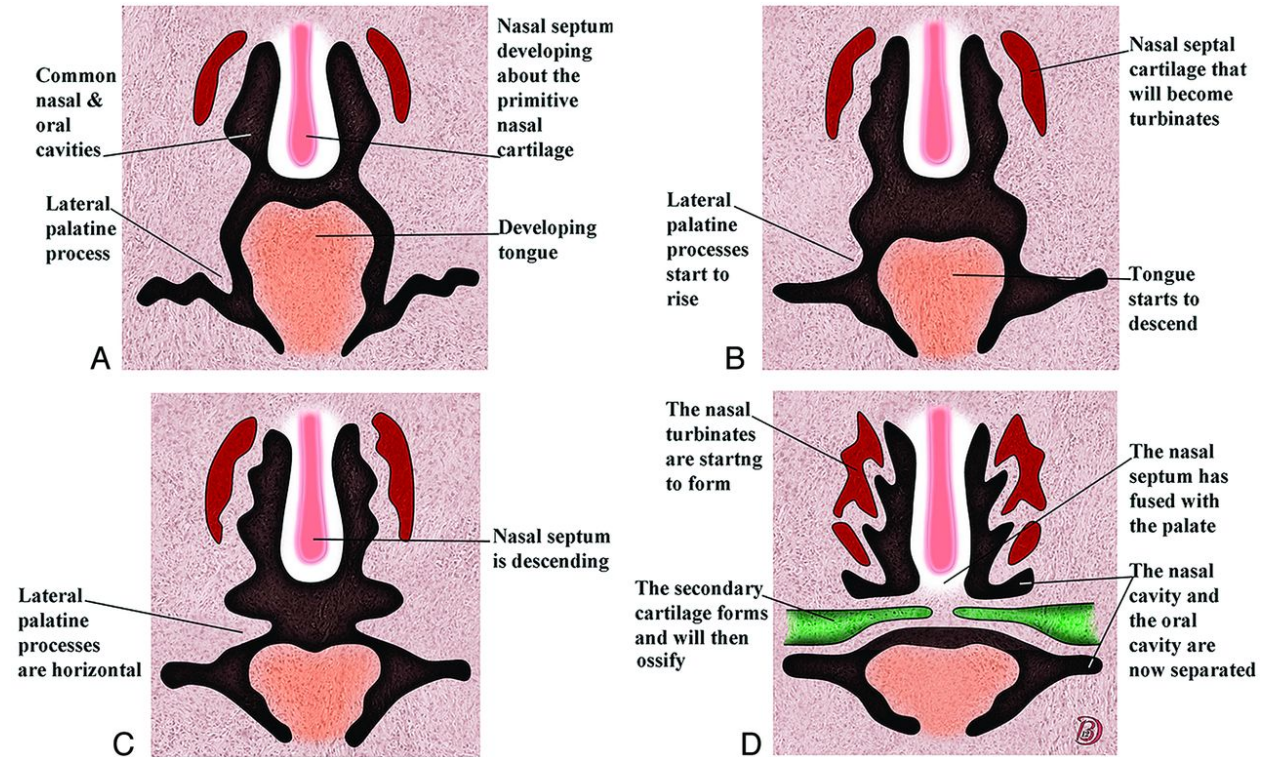
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- **Development**

- Maxillary sinus is the first of the PNS to develop.
- 4th week I.U.L. - dorsal portion of *1st Pharyngeal arch* forms the Maxillary process, which extends forward and beneath the developing eye to give rise to the maxilla.
- Initial development of the maxillary sinus follows a number of morphogenic events in the differentiation of nasal cavity
- Horizontal shift of the Palatal Shelves & fusion with one another.
- Nasal Septum separates the 2° Oral cavity from the two nasal chambers.
- Influences further expansion of the lateral nasal wall & 3 wall begin to fold.
- 3 Conchae & Meatuses arise
 - 3 Meatus
 - **Superior & Inferior Meatus**
 - Remain as shallow depressions along the lateral nasal wall for first half of I. U. life.
 - **Middle Meatus**
 - Expands immediately into lateral Nasal wall in an inferior direction occupying more of the further maxillary body
- **Development of sinus**
- starts at 12 weeks as an evagination of the mucous membrane in the lateral wall of the middle meatus of the nose when the nasal epithelium invades the maxillary mesenchyme
- In its development Maxillary Sinus is:
 - Tubular at birth
 - Ovoid in childhood
 - Pyramidal in adulthood

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DIMENSION OF SINUS FROM BIRTH TO OLD AGE

- From 0-3 years old: At birth filled with deciduous tooth germ, at 20th month there will be a posterior development and at 3 years old the maxillary sinus will be half adult size.
- From 3-4 years old: There will be an increase in the width of maxillary sinus with facial growth, the position of the maxillary sinus will be at 2nd deciduous molars and crypts of 1st permanent molars.
- 7-9 years old: The growth of maxillary sinus corresponds to permanent teeth eruption.
- 9-12 years old: Antral floor is the same level with nasal floor.
- 12-15 years old: Floor of maxillary sinus 5-12.5 below nasal floor and the floor of the sinus is at 1st molar, 2nd molar and 1st premolar.
- Old ages: Reposition of ridge with continued sinus pneumatization which leaves a thin layer of cortical bone separating sinus mucosa from oral mucosa.

Anatomy of Maxillary Sinus

- "Maxillary Sinus Previously called as Maxillary Antrum of Highmore
Largest of the PNS Pyramidal shape cavity within the body of the Maxilla.
- Pyramidal in shape with the base of the pyramid forming the lateral nasal wall and apex at the root of the zygoma

ROOF OF THE ANTRUM

Formed by floor of the orbit and is transversed by the infraorbital nerves. It is flat and slopes slightly anteriorly and laterally.

FLOOR OF THE SINUS

Curved rather than flat formed by alveolar process of the maxilla and lies about 1cm below the level of the floor of the nose closely related to root apices of the maxillary.

BOUNDARIES

1. ANTERIOR WALL

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Formed by the facial surface of the maxilla Canine fossa is an important structure of this wall.

2. POSTERIOR WALL

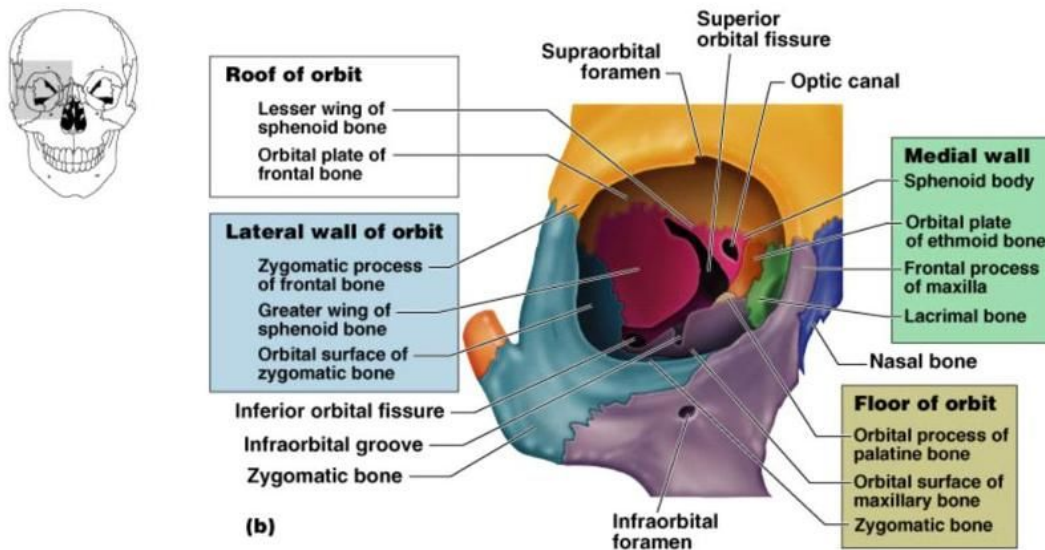
Formed by sphenomaxillary wall. A thin plate of bone separates the antral cavity from the infratemporal fossa .

3. MEDIAL WALL

Bounded by the nasal cavity. The opening of the sinus is closer to the roof and thus at a higher level than the floor

4. LATERAL WALL

Related to zygoma and cheek.

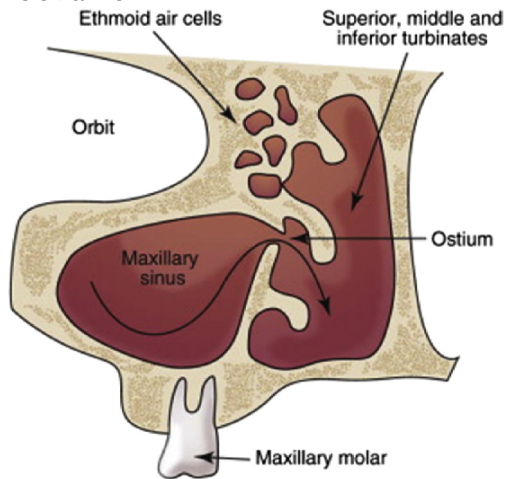


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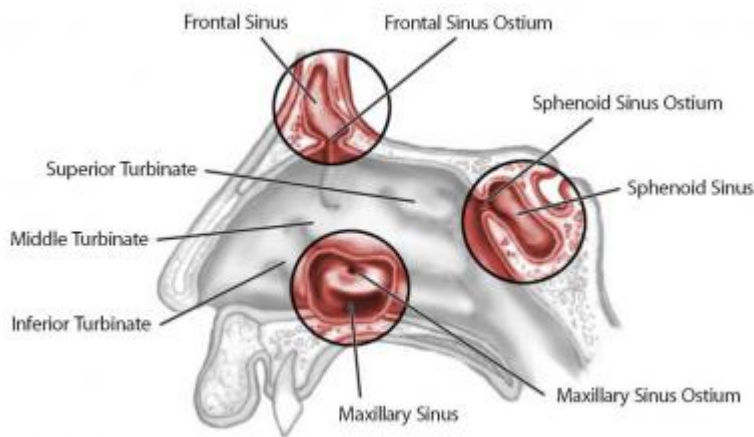
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anatomy and drainage pathway of the maxillary sinus. The

Ostium of the maxillary sinus is situated high up in medial wall and opens into the middle meatus of the nose in the lower part of the hiatus semilunaris. Poorly placed from the point of view of free drainage. An accessory ostium is also present behind the main ostium in 30% cases.



- **Arterial supply**
 1. Branch of third part of maxillary artery (pterygopalatine part)
 2. Posterior superior artery
 3. Infra-orbital artery
 4. Greater palatine artery.
- **Venous drainage**
 1. Anteriorly-Facial vein
 2. Posteriorly-Pterygoid venous plexus

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Infection from the maxillary sinus may spread to involve cavernous sinus via any of its draining veins as the pterygoid plexus communicates with the cavernous sinus by EMISSARY VEIN.

- **Nerve supply**
 1. Anterior superior alveolar n.
 2. Middle superior alveolar n
 3. Posterior superior alveolar n
 4. Infra-orbital nerve

- **Lymph drainage**
 1. Submandibular lymph nodes
 2. Deep cervical lymph node
 3. Retro pharyngeal lymph Nodes

- **Microscopic Features**
 - The maxillary sinus is lined with a mucous membrane of the respiratory type.
 - The antral mucous membrane is formed of:
 - An epithelial layer resting on a basement membrane.
 - A subepithelial connective tissue layer.

Epithelium

- The epithelium layer of maxillary sinus lining is thinner than that of nasal cavity.
- Lined by Ciliated Pseudostratified Columnar epithelium derived from olfactory epithelium of middle nasal meatus.
- Most numerous cells are Columnar ciliated cells
- Additional cells are Basal cells, Columnar non-ciliated cells, Goblet cells
 - **Ciliated Cells**
 - The cilia are composed of typical 9+1 pairs of microtubules & provide mobile apparatus to the sinus epithelium which moves

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Lecture 21

the debris, microorganisms, and the mucous film lining the epithelial surface of the sinus into the nasal cavity through the ostium.

○ Goblet Cells

- It is mucous synthesizing and secreting cells.
- It resembles an inverted wine glass with a short stack like basal end containing the nucleus and a swollen apical end containing mucin.
- It is an apocrine gland, i.e. it pours its secretion through rupture of its apical cell membrane that get regenerated. So, it has all the criteria of the synthesizing and secreting cells.

The subepithelial connective tissue layer

- It is formed of connective tissue cells, and intercellular substance of collagen bundles and few elastic fibers and it is moderately vascular.
- The lamina propria contains subepithelial antral glands composed of mixed glands formed of serous and mucous acini or mixed acini as well as myoepithelial cells.
- The antral glands are more concentrated in the lamina propria located around the ostium. The mixed secretory product of the antral glands reaches the sinus cavity through their excretory ducts.

Functions of Maxillary Sinus

1. Imparts resonance to the voice
2. Increases the surface area and lightens the skull
3. Moistens and warms inspired air
4. Filters the debris from the inspired air
5. Mucus production and storage
6. Limit extent of facial injury from trauma
7. Provides thermal insulation to important tissues
8. Serves as accessory olfactory organs.

Pathologic Conditions of Maxillary Sinus

1. Inflammatory - Maxillary sinusitis

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2. Traumatic - Fractured root, Sinus contusion, Blow out fracture, Zygomatic complex fracture
3. Calcification Antrolith
4. Cyst: Radicular cyst, Dentigerous cyst, Mucous retention cyst
5. Tumor Antral: Polyps Squamous cell carcinoma

