PARANASAL AIR SINUSES

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Introduction

- Air-containing cavities in the bones around nasal cavity.

- Paranasal air sinuses develop as mucosal diverticulae of nasal cavity, invading the adjacent bones.

- Paranasal air sinuses perform the following functions:
  - Make the skull lighter.
  - Add resonance to the voice.
  - Act as air conditioning chambers by making the inspired air moist and warm.
  - Aid in growth of facial skeleton.

- Paranasal air sinuses are lined by respiratory epithelium and respiratory mucosa is highly vascular and contains a large number of cavernous spaces and sinusoids to warm the air.

- Respiratory mucosa also contains a large number of serous glands and secretion of these glands makes the air moist.
Classification

- Paranasal air sinuses are named after the bones containing them, *viz*,
  - Frontal air sinuses.
  - Ethmoidal air sinuses.
  - Maxillary air sinuses.
  - Sphenoidal air sinuses.

- All paranasal air sinuses are present in rudimentary form at birth except frontal air sinuses.
Relationship to the Orbit

- Frontal air sinus - above.
- Ethmoidal air sinuses - medial.
- Maxillary air sinus - below.
- Sphenoidal air sinus - behind.
Frontal Air Sinuses
Introduction

- Frontal air sinuses are not present at birth.
- Start developing 2 or 3 years after birth.

**Number:** 2.

**Shape:** Triangular.

- Lie between inner and outer tables of frontal bone.

- Right frontal air sinus is separated from the left by a septum.
Drainage & Nerve Supply

- **Drainage** - Drains into **anterior part of hiatus semilunaris** of middle meatus through frenonasal duct.

- **Nerve Supply** - Supraorbital nerve.
Measurements

- Height - ~ 3 cm
- Width - 2.5 cm
- Anteroposterior - 1.8 cm
Relations of Frontal Air Sinus

Anterior-
- Superciliary arch of forehead.

Posterior-
- Meninges and frontal lobe of brain.

Inferior-
- Roof of nose.
- Roof of orbit (medial part).
- Ethmoidal air cells.
Applied Aspects

Frontal Headache (Office Headache)

- Headache from frontal sinusitis shows characteristic periodicity.

- It starts on waking, gradually increases and reaches its peak by about midday and then starts subsiding.
Applied Aspects contd...

Frontal Lobe Abscess-

- Infection of frontal air sinus may spread posteriorly into frontal lobe of brain causing frontal lobe abscess.
Orbital Cellulitis-

- Infection of frontal air sinus may spread inferiorly into orbit causing orbital cellulitis.
Maxillary Sinus
(Antrum of Highmore)
Introduction

- Largest paranasal air sinus.
- Present in body of maxilla.
- First to develop.
- Appears around 4th month of intrauterine life.
Maxillary Sinus contd...

SHAPE- Pyramidal.

Base-
• Directed medially.
• Formed by a part of lateral wall of nose.
• Opening or ostium of the sinus is present in the upper part of base, close to the roof.

Apex-
• Directed laterally.
• Extends into zygomatic process of maxilla.

Roof-
• Formed by the floor of orbital cavity.
• Infraorbital nerve and artery traverse the roof in a bony canal.

Floor-
• Formed by the alveolar process of maxilla.
• Lies ~1.25 cm below the floor of nasal cavity.
Floor of Maxillary Sinus contd...

- The level of floor corresponds to the ala of nose.

- Normally the roots of first and second molar teeth project into the floor.

- Sometimes roots of third molar, first and second premolars may project into the floor.

- Rarely, root of canine may project into the floor.

- Sometimes roots of teeth are separated from the sinus only by a thin layer of mucosa.
Base of Maxillary Sinus

- It is formed by medial surface of body of maxilla and some other bones.
- In maxilla, medial surface of its body presents a large maxillary hiatus.
- In the skull, base of maxillary sinus presents a small opening (ostium).
Reduction of large maxillary hiatus to small ostium

- It occurs by the following bones:
  - Uncinate process of ethmoid.
  - Descending process of lacrimal.
  - Ethmoidal process of inferior nasal concha.
  - Perpendicular plate of palatine.
Maxillary Sinus contd...

**Anterior wall**
- Has a curved bony canal for anterior superior alveolar nerve – **Canalis Sinuosus**.

**Posterior wall**
- Separates the sinus from infratemporal and pterygopalatine fossae.
- It is pierced by the posterior superior alveolar nerves and vessels.
Drainage

- In posterior part of hiatus semilunaris of middle meatus.
Arterial Supply

- Anterior superior alveolar artery.
- Middle superior alveolar artery.
- Posterior superior alveolar artery.
Lymphatic Drainage

- Submandibular lymph nodes.
Nerve Supply

- Anterior superior alveolar nerve.
- Middle superior alveolar nerve.
- Posterior superior alveolar nerve.
Maxillary Sinusitis-

- Maxillary sinus is the most commonly infected paranasal air sinus.
- The opening of maxillary sinus is in a disadvantageous position for natural drainage.

Sources of infection:
- Infected nose.
- Carious upper premolar and molar teeth.
- Infected frontal and anterior ethmoidal air sinuses.
Surgical Drainage of Maxillary Sinus

**Antral puncture (Antrostomy)** -
- Trocar and canula are passed below the inferior nasal concha in an outward and backward direction.

**Caldwell-Luc operation** -
- Maxillary sinus is opened through gingiva-labial sulcus.
Carcinoma of Maxillary Sinus-
- Arises from mucosa of the sinus.

Clinical Features-
Due to upward invasion:
- Proptosis (protrusion of eyeball).
- Diplopia (double vision).
- Pain and anaesthesia over the face below the orbit.

Due to downward invasion:
- Swelling or even ulceration of palatal roof of oral cavity.

Due to medial invasion:
- Nasal obstruction.
- Epistaxis.
- Epiphora (overflow of tears).

Due to lateral invasion:
- Swelling on the face and palpable mass in gingiva-labial sulcus.

Due to posterior invasion:
- Referred pain to upper teeth.
Ethmoidal Sinuses
Introduction

- Present within labyrinth of ethmoid bone.

- Between upper part of lateral nasal wall and orbit.

- 3 groups:
  - Anterior (up to 11 air cells).
  - Middle (1-3 air cells).
  - Posterior (1-7 air cells).
Drainage

- **Anterior group** drains into middle part of *hiatus seminularis* of middle meatus.
- **Middle group** drains on the surface of *bulla ethmoidalis* of middle meatus.
- **Posterior group** drains into posterior part of *superior meatus.*
Applied Aspects

Ethmoidal Sinusitis-
- Often associated with infection of other sinuses.

Clinical Features-
- Localized pain over bridge of nose.
- Due to invasion into the orbit-
  - Orbital cellulitis.
Sphenoidal Sinuses
Introduction

Number-
• 2 (right and left)

- Lie within the body of sphenoid bone.
- Separated from each other by a bony septum.
Drainage

• Into sphenethmoidal recess.
Relations

Sphenoidal air sinus

Optic chiasma (OC)  Pituitary gland (PG)

Superior

Anterior

Sphenethmoidal recess

Posterior

Pons

Inferior

Nasopharynx

Sagittal section

Relations of sphenoidal Air sinuses

Cavernous venous sinus

Internal carotid artery

Lateral

Sphenoidal air sinuses

Coronal section
Sphenoidal Sinusitis -

• One of The Most Dangerous Sinus Infection.

• It is rare in isolation.

• It is usually a part of pansinusitis.

• It may be associated with infection of posterior ethmoidal sinuses.
Thank You!