**Sinonasal Anatomy**

**Overview**
- Nasal cavity
- Anterior skull base
- Ostiomeatal complex
- Frontal sinus & recess
- Sphenoethmoidal region

**Global Anatomy**
- Nasal cavity centrally
- Paranasal sinuses surround
- Anterior cranial fossa above
- Oral cavity below
- Central skull base & nasopharynx behind

**Nasal Cavity**
- Boundaries
- Septum
- Turbinates & Meati
- Lamellae
- Drainage Pathways
- Variants

**Nasal Cavity - Nasal Septum**
- Bony & cartilaginous
- Ethmoid & vomer
- Septal cartilage
- Deviation (up to 80%)
  - Quantify it
  - At jxn of cartilage and vomer
  - Associated variants of MT
  - +/- Spur
  - ? Contact with lateral wall
- Reporting important → septoplasty prior to ESS
Sinonasal Anatomy
Nasal Cavity – Turbinates & Meati

- Turbinates
  - Inferior
  - Middle
  - Superior
  - (Supreme)
- Meati
  - Middle
  - Frontal, anterior ethmoid, & maxillary
  - Superior
  - Posterior ethmoid & sphenoid via SER
  - Inferior
  - NLD
- Sphenopalatine foramen

Sinonasal Anatomy
Nasal Cavity – Middle Turbinate

- Complex morphology
- Attachments
  - Anterior vertical
    - Oriented sagittally
    - Attaches to cribriform plate
  - Mid lateral
    - Oriented in an oblique then coronal plane
    - Attaches to lamina papyracea
  - “Basal lamella”
    - Divides anterior & posterior ethmoids
  - Posterior
    - Oriented axially
    - Attaches to medial max sinus wall

Sinonasal Anatomy
Lamellar Anatomy

- Bony "struts" develop in the cartilaginous olfactory capsule
- Generally oriented in a coronal/oblique coronal plane
- Have superior attachments to CP/FE & lateral attachments to lamina papyracea
  - Uncinate Process
  - Bulla lamella
  - Basal/ground lamella
  - Superior turbinate

Sinonasal Anatomy
Nasal Cavity – Drainage Pathways

- Patterns of disease
  - Infundibular
  - OMC
  - Frontal recess
  - Sphenoid recess


Sinonasal Anatomy
Nasal Cavity – Turbine Variants

- Concha Bullosa (24-55%)
  - CB & Pneumatized Inf Turb
- Paradoxical MTs (26%)
- Concha "Bullitis"
- Concha Retention Cyst
- Osteoma in Pneumatized VL

Anterior Skull Base

- Cribriform Plate
- Fovea Ethmoidalis
- Olfactory Recess
- Variants
Sinonasal Anatomy
Anterior Skull Base

Medial lamella of cribriform plate
Vertical lamella of middle turbinate
Lateral lamella of cribriform plate

Sinonasal Anatomy
Anterior Skull Base – Keros Classification

Sinonasal Anatomy
Anterior Skull Base - Olfactory Recess

- Located between septum and vertical lamella of MT
- ORO uncommon in the absence of ethmoid mucosal disease, prior ethmoidectomy or turbinectomy
- Consider neoplasm or cephalocele
- ENB
- MRI warranted

Cases Courtesy Christine Glastonbury MBBS

Sinonasal Anatomy
Anterior Skull Base - Variants

Ostiomeatal Complex

- Components
  - Uncinate Process
  - Ethmoid Bulla
  - Middle Turbinate
  - Infundibulum
  - Hiatus Semilunaris
  - Middle Meatus
  - Maxillary Sinus
  - Variants
Sinonasal Anatomy
Ostiomeatal Complex – Uncinate Process

- Uncinate Process
  - Variable attachments
  - Pneumatized (4%)
  - Everted
    - Can be mistaken for a double MT on endoscopy
  - Atelectatic
    - Max sinus hypoplasia & SSS
    - Predisposes to orbital injury in ESS

Sinonasal Anatomy
Ostiomeatal Complex – Maxillary Sinus

- Roof = orbital floor (V1)
- Floor = alveolar process of maxilla
- Ostium at superior medial wall
  - Drains into base of ethmoid infundibulum
- Reduced volume → predisposed to orbital penetration in ESS
  - Hypoplasia, SSS
- Hyperpneumatized → dental roots exposed & predisposed to recurrent odontogenic sinusitis

Sinonasal Anatomy
Ostiomeatal Complex – Ethmoid Variants

- Infraorbital ethmoid cell
  - “Haller” cell
  - Along orbital floor
  - Extend lateral to the plane of the lamina papyracea
  - Reported in 10-45%
  - Narrow ethmoid infundibulum

Frontal Sinus & Recess

- Frontal Sinus
- Frontal Beak & Ostium
- Frontal Recess
- Agger Nasi Cell
- Variants

Sinonasal Anatomy
Frontal Sinus and Frontal Recess

Sinonasal Anatomy
Frontal Sinus and Frontal Recess - Variants

• Frontal cells
  • Cells other than "named" cells
  • Agger nasi
  • Pneumatized CG
  • Intersinus septal cell
  • Within the frontal sinus or recess
  • Anterior to FR
• Types I-IV

Sphenoethmoidal Region

• Posterior Ethmoids
• Sphenoid Sinus & Ostium
• Sphenoethmoidal Recess
• Variants

Sinonasal Anatomy
Sphenoethmoidal Region

• Critical anatomic relationships
  • Optic nerve
  • Internal carotid artery
  • V2
  • Vidian nerve
  • Floor of sella
• Sphenoid septations
• Pneumatization variants
  • Anterior clinoid (6-13%)
  • Opticocarotid recess
  • Dorsum sella
  • Lateral and pterygoid recesses
• Dehiscent ICA (25%) & optic canal (24%)
• Sphenoethmoidal cells

Sinonasal Anatomy
Sphenoethmoidal Region - Variants

• Sphenoidal cells
  • “Onodi”
  • Posterior ethmoid cell extending lateral to sphenoid sinus
  • Reported in 3-14%
  • In proximity to CN2 & ICA
  • Horizontal septation is a clue on coronal imaging

Sinonasal Anatomy
Sphenoethmoidal Region

Sinonasal Anatomy
Sphenoethmoidal Region - Variants

Sinonasal Anatomy
Sphenoethmoidal Region

Early Anterior Clinoid Mucocele

Sinonasal Anatomy
Sphenoethmoidal Region - Variants

Key Points

• Knowledge of drainage pathways key to understanding functional anatomy and patterns of disease
• Recognize variants that may predispose to disease or ↑ risk of ESS complications
• Axial CT with coronal and sagittal reformed images demonstrate anatomy optimally