



# Simplifying anatomy for primary Draf 2A frontal sinusotomy

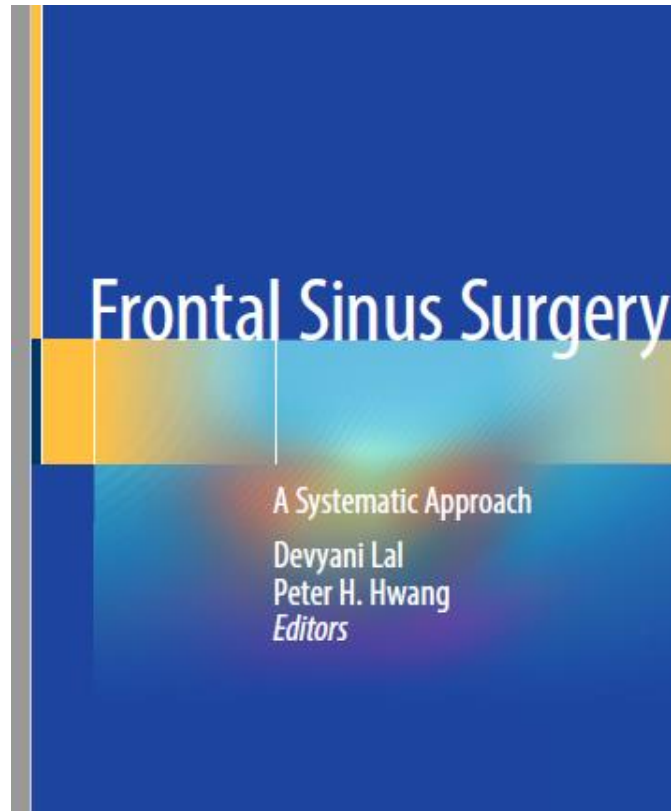
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Rush University, Chicago, IL  
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# Disclosure Information

No relevant financial disclosures, conflicts of interest



Illustrations from Frontal Sinus Surgery, Springer 2019;

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# Objectives

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- 1: Explain anatomy critical to Draf 2A frontal sinus surgery
- 2: Demonstrate anatomy-guided steps for Draf 2A procedure in primary settings

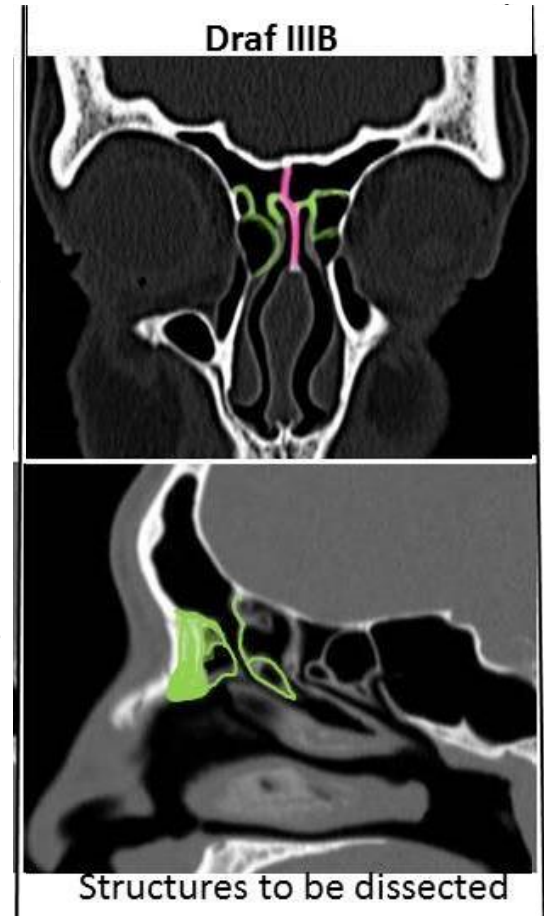
# Question

What aspect of Draft 2a are you most interested in learning about?

- a. CT Review and correlation with endoscopic landmarks
- b. Surgical planning & technique
- c. Surgical technique & instrumentation

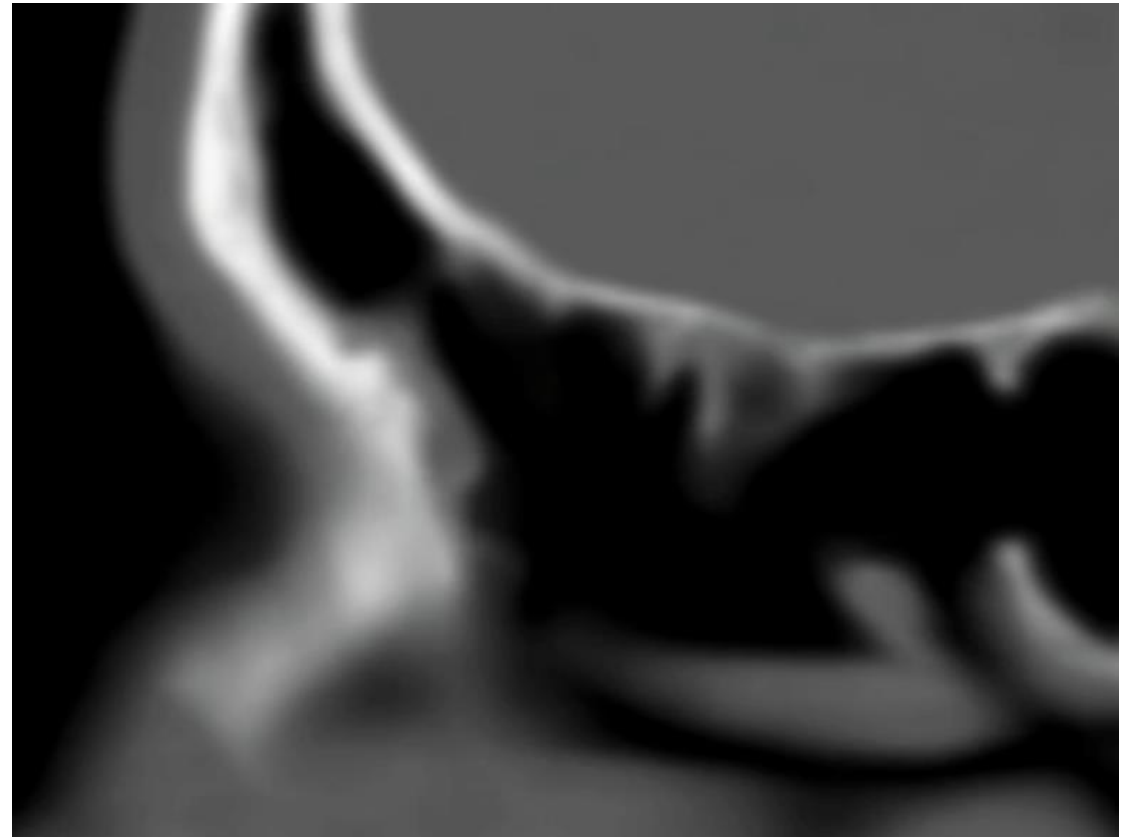
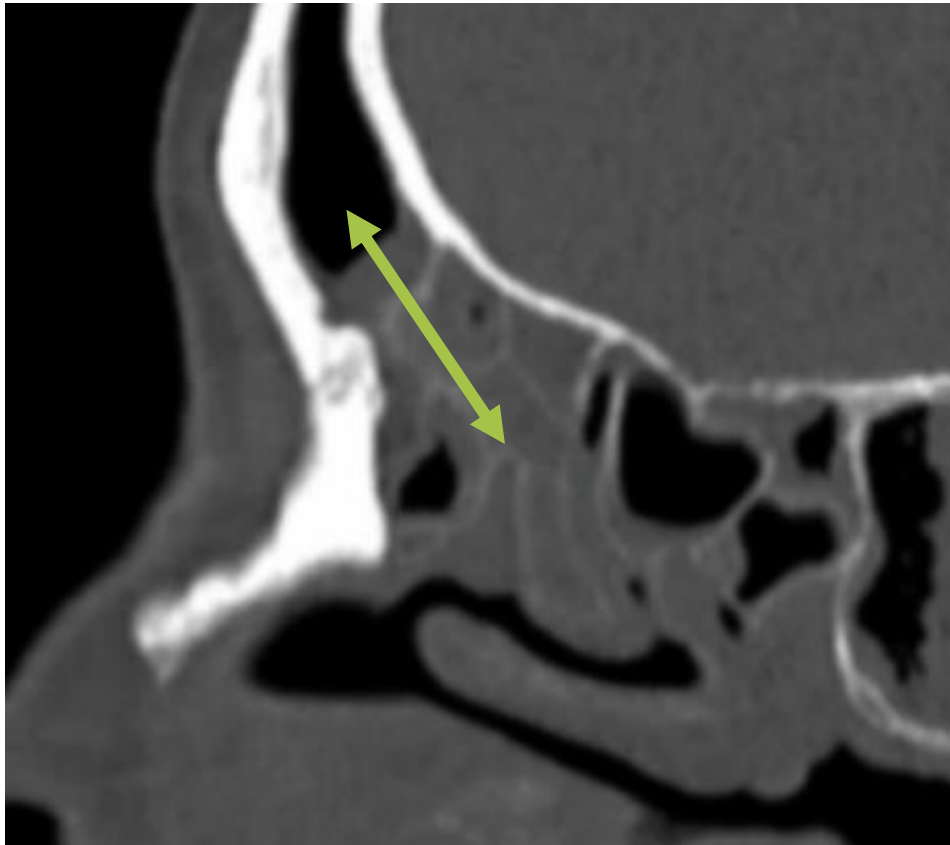
# Endoscopic Frontal Techniques

Procedure	Description
<b>Draf I</b>	Removal of ethmoidal cells inferior to frontal ostium without formal instrumentation of the frontal ostium
<b>Draf II A</b>	Complete removal of all anterior ethmoidal cells of the frontal outflow tract with or without frontal os widening
<b>Draf II B</b>	Draf type IIA sinusotomy plus widening of neo-ostium to the nasal or interfrontal sinus septum by removal of the frontal sinus floor
<b>Draf III (Endoscopic Modified Lothrop procedure)</b>	Marsupialization of both frontal sinuses into one cavity opening into the nose from lamina papyracea to lamina papyracea, and anterior frontal table to posterior frontal table



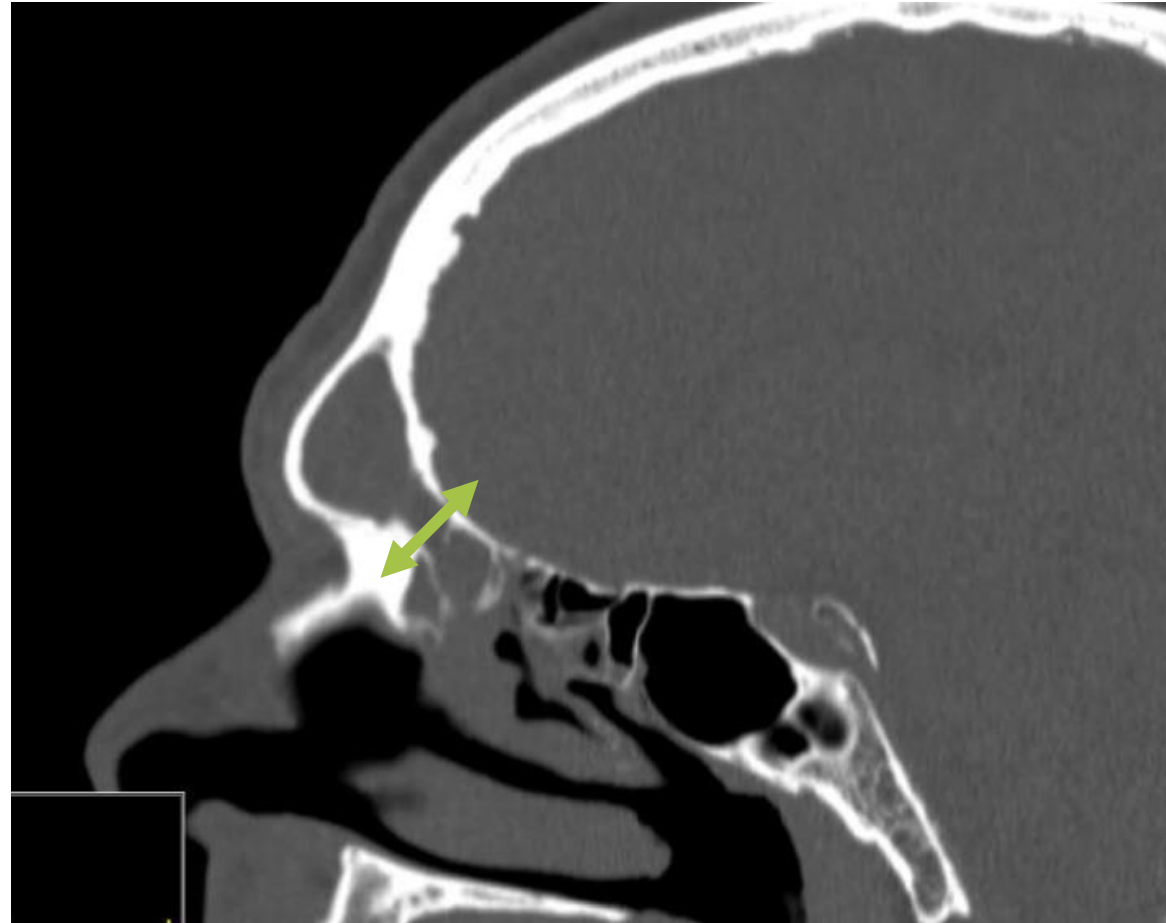
## What is a Draf 2A?

Dissection of all frontoethmoidal cells above and below frontal ostium,  
with/without formal widening of frontal os (until middle turbinate attachment)  
with/without removal of nasal beak  
(without removal of middle turbinate, septum)



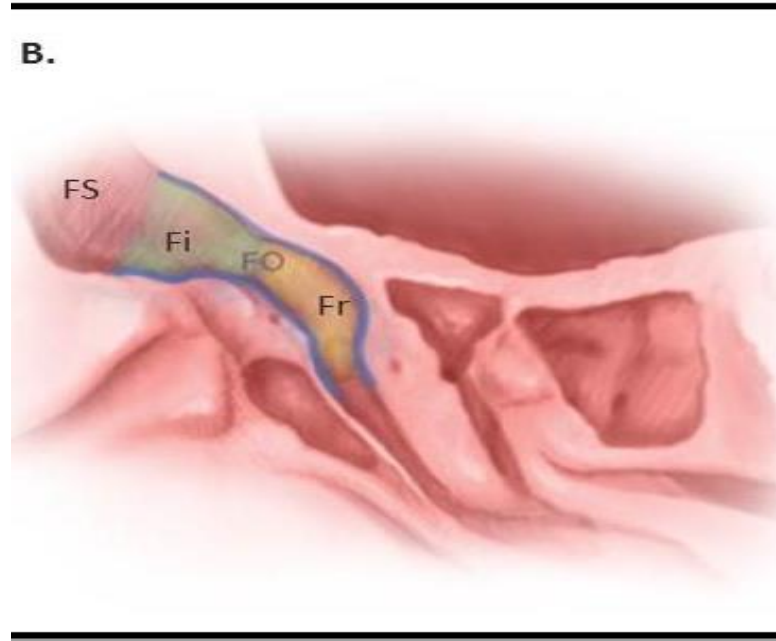
## Anterior Ethmoidectomy is Not Draf 1

Dissection of all frontoethmoidal cells below ostium

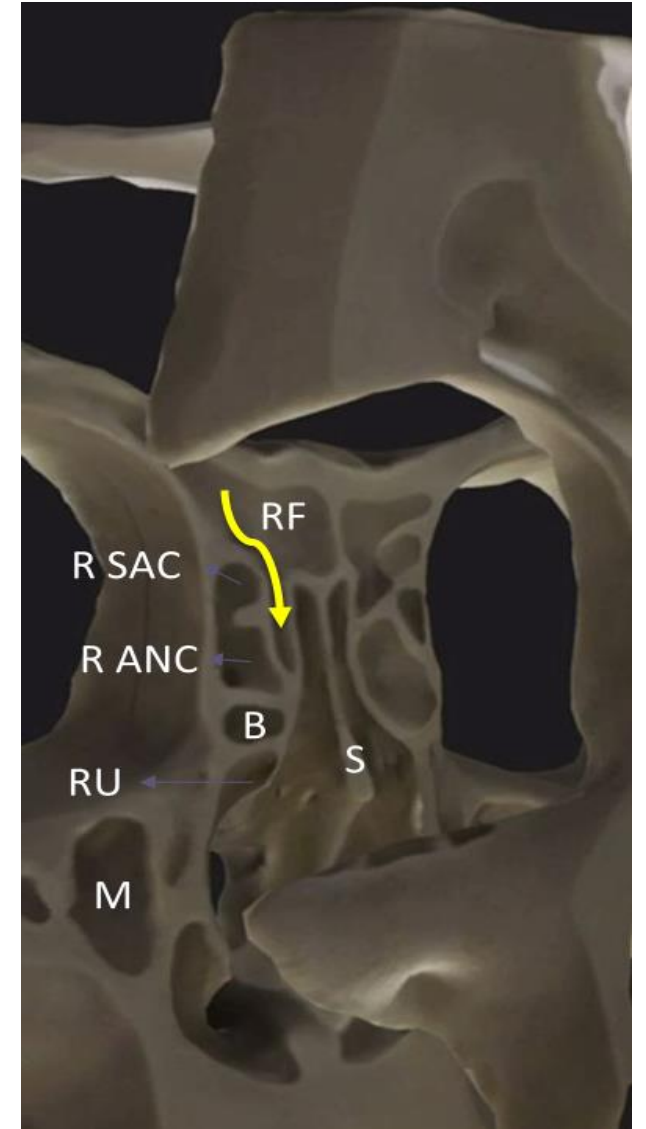


Mastering Draf 2a allows you to master the Draf 1, Balloon Dilation!

# Frontal Sinus Drainage Pathway/ Frontal Outflow Tract

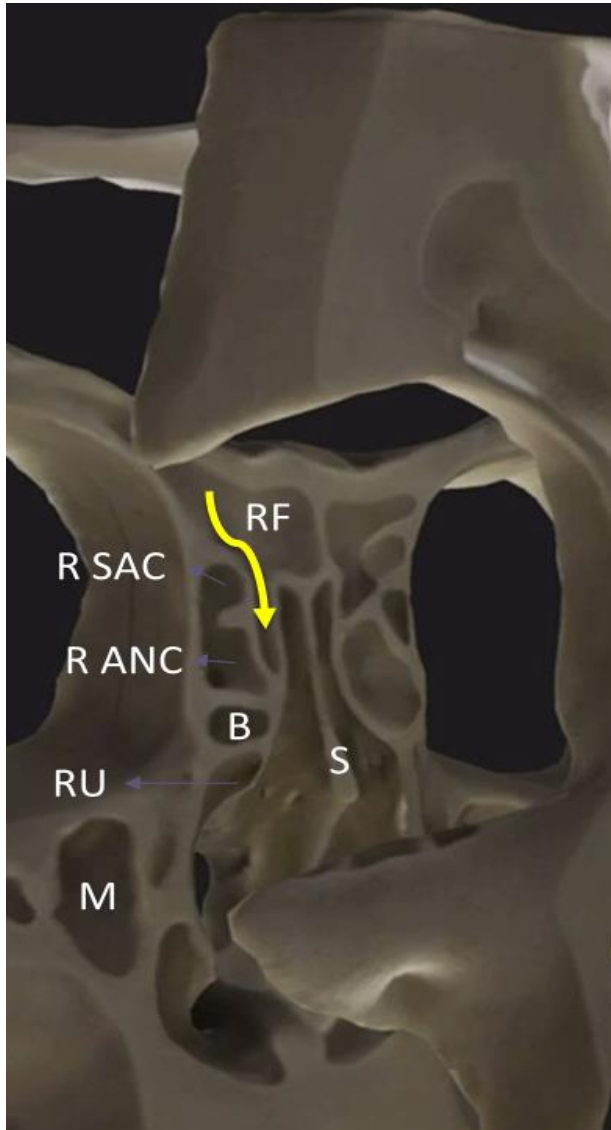


- Hour-glass shaped space through which frontal sinus drains into nose
- Includes frontal infundibulum (Fi) superior to ostium (Fo) & frontal recess (Fr) inferior
- Frontal ostium only 3- 4mm wide; tolerates trauma poorly
- Ostium lies in the medial and posterior part of frontal floor

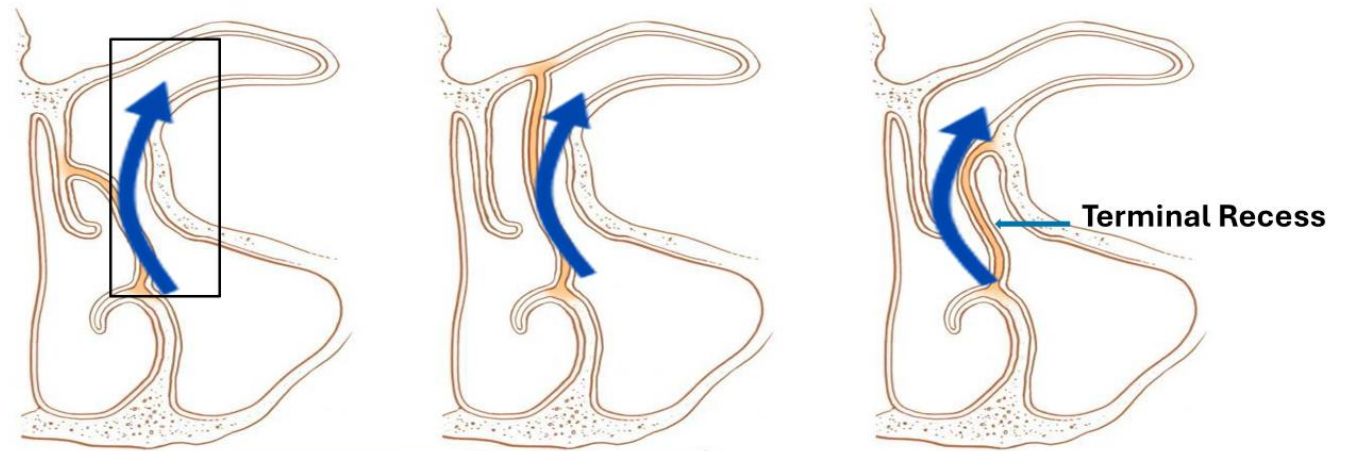




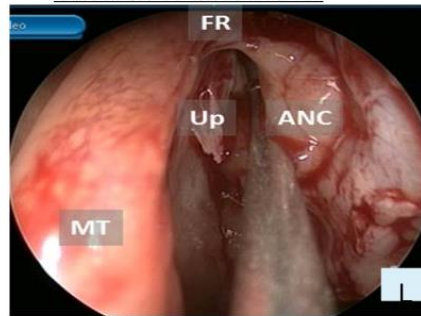
# Frontal Outflow Tract is Medial or Lateral to Uncinate Process



Superior Uncinate Attachment Near Frontal Recess → Access Medial or Lateral?



Lateral to unciate

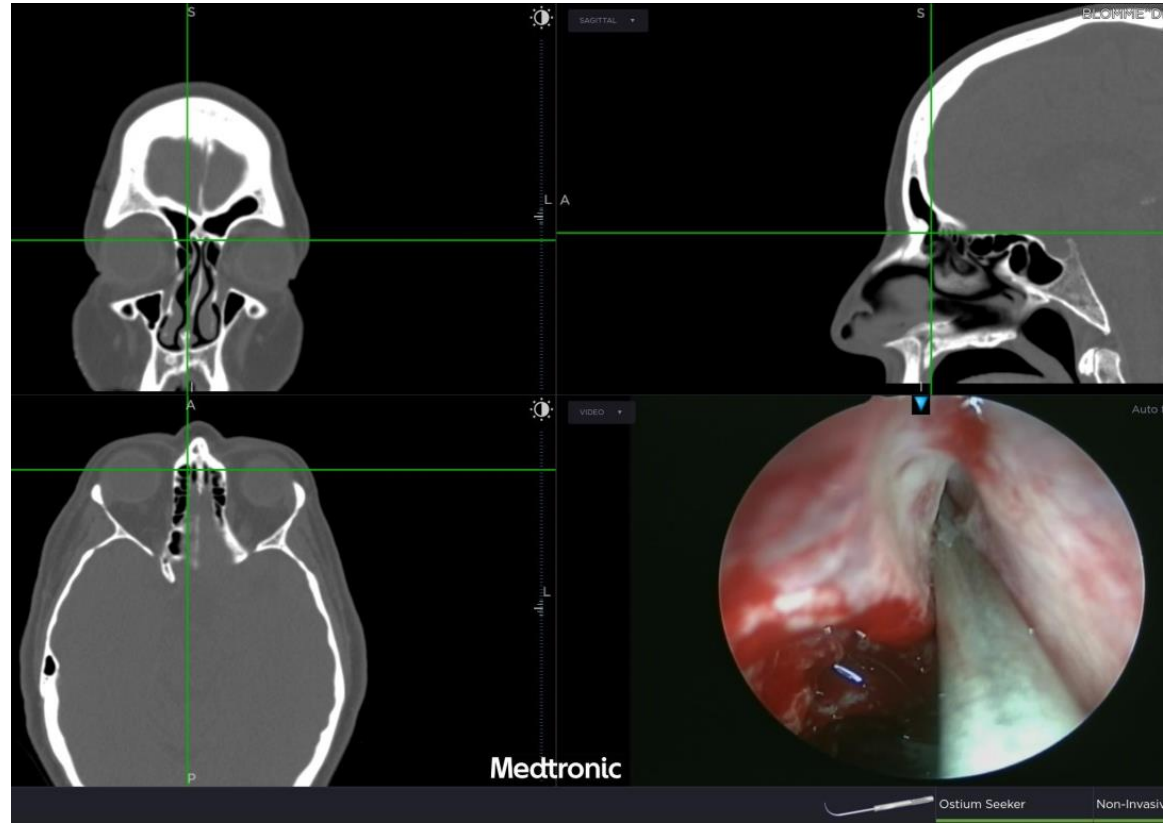
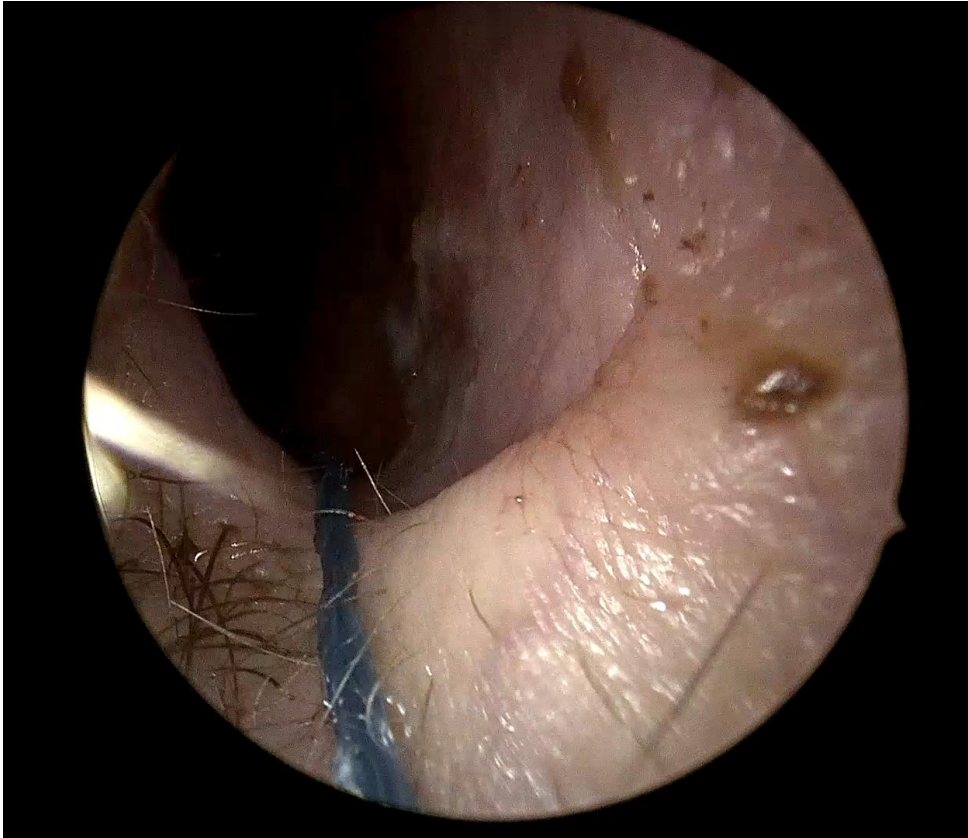


Most commonly access is medial to unciate



# Probing the Frontal Outflow/ Ostium

Between Agger and Bullar cells, medial or lateral to Uncinate



Angle of probing (and Ballooning) through frontal recess should always be anterior to avoid CSF leak  
Frontal sinus is the MOST anterior Sinus and its ostium is located postero-medially  
Never force the probe

## A-P Dimension, High frontal cells Impact Surgical Difficulty

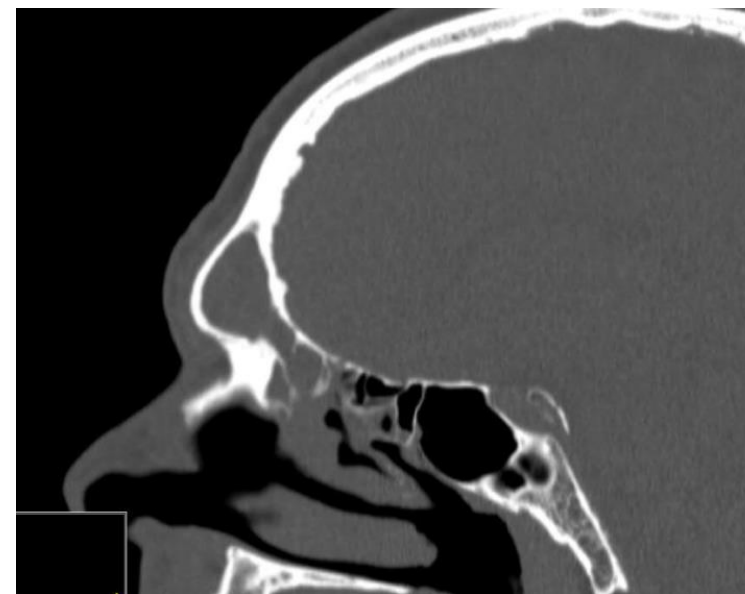
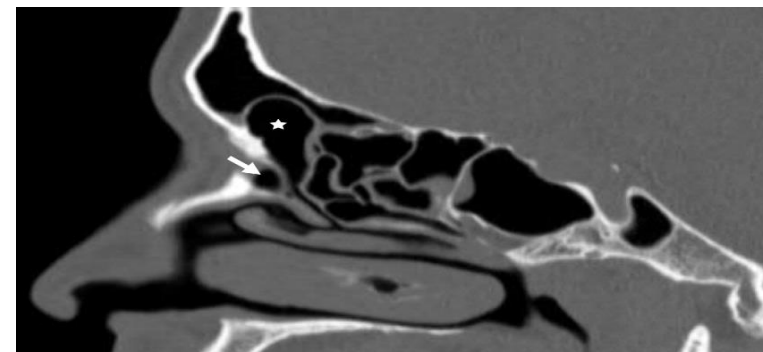
TABLE 1. ICC classification A\*

	Wide AP diameter ( $\geq 10$ mm)	Narrow AP diameter (9–6 mm)	Very narrow AP diameter ( $\leq 5$ mm)
Cells below ostium (agger nasi, SAC, SBC)	Less complex (Grade 1)	Moderate complexity (Grade 2)	High complexity (Grade 3)
Cells encroaching into the ostium (SAFC, SBFC, SOEC, FSC)	Moderate complexity (Grade 2)	High complexity (Grade 3)	Highest complexity (Grade 4)
Cells extending significantly into frontal sinus (SAFC, SBFC, SOEC, FSC)	High complexity (Grade 3)	Highest complexity (Grade 4)	Highest complexity (Grade 4)

High cells &  
narrow AP  
diameter  
increase  
complexity

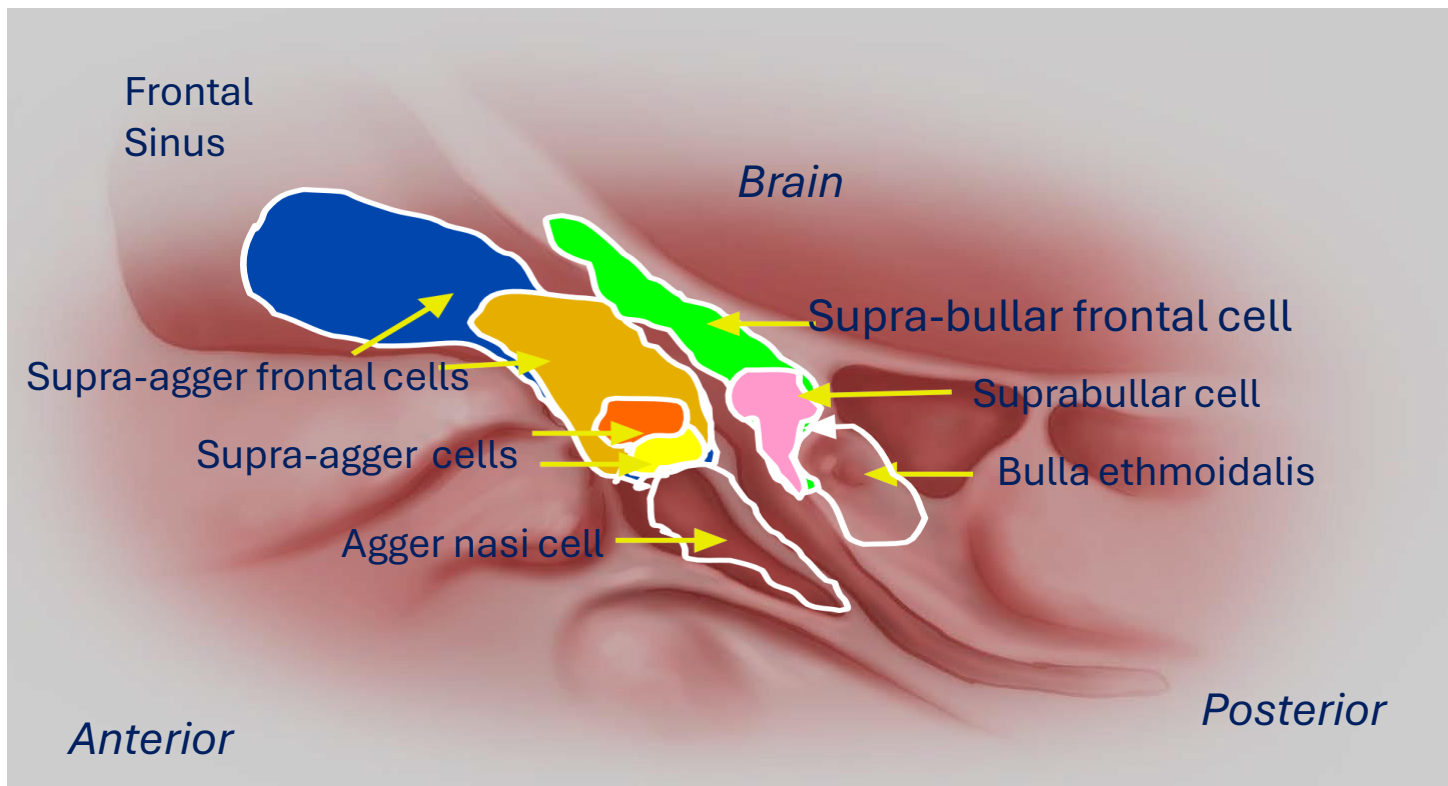
\*AP refers to the frontal ostium anterior-posterior diameter as measured from the frontal beak to the skull base at its narrowest distance on the parasagittal CT scan. Classification of the cells is from the recent IFAC.<sup>7</sup>

AP = anterior-posterior; CT = computed tomography; FSC = frontal septal cell; IFAC = International Frontal Sinus Classification; SAC = supra agger cell; SAFC = supra agger frontal cell; SBC = supra bulla cell; SBFC = supra bulla frontal cell; SOEC = supra-orbital ethmoid cell.



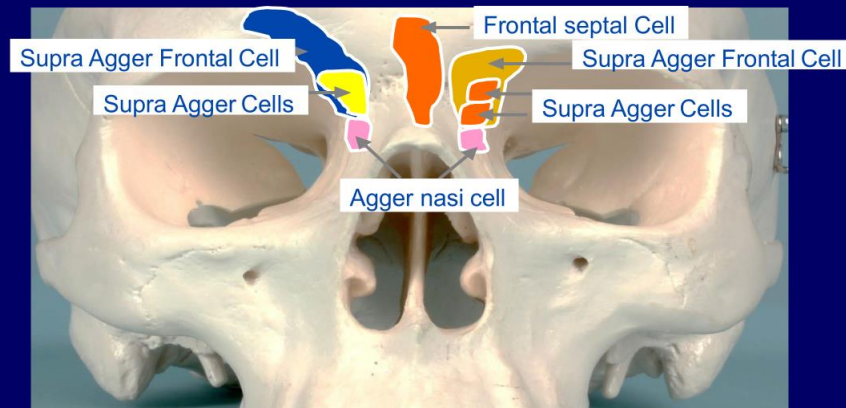


# Fronto-ethmoidal cells determine outflow anatomy, complexity of surgery and must be identified for surgery

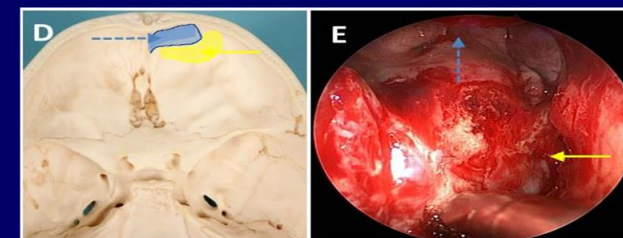
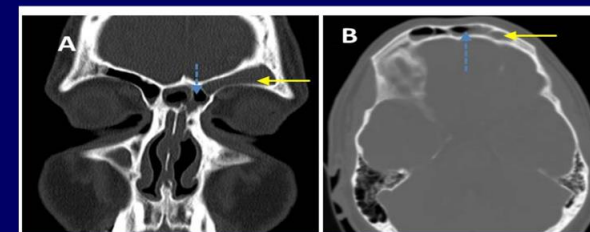


Anterior: Agger, supra-agger, supra-agger frontal  
 Posterior: Bulla, suprabullar, supra-bullar frontal, supra-orbital  
 Medial: inter frontal, septal

## Frontal Cells: New Terminology



Wormald PJ, et al. The International Frontal Sinus Anatomy Classification (IFAC) Classification.



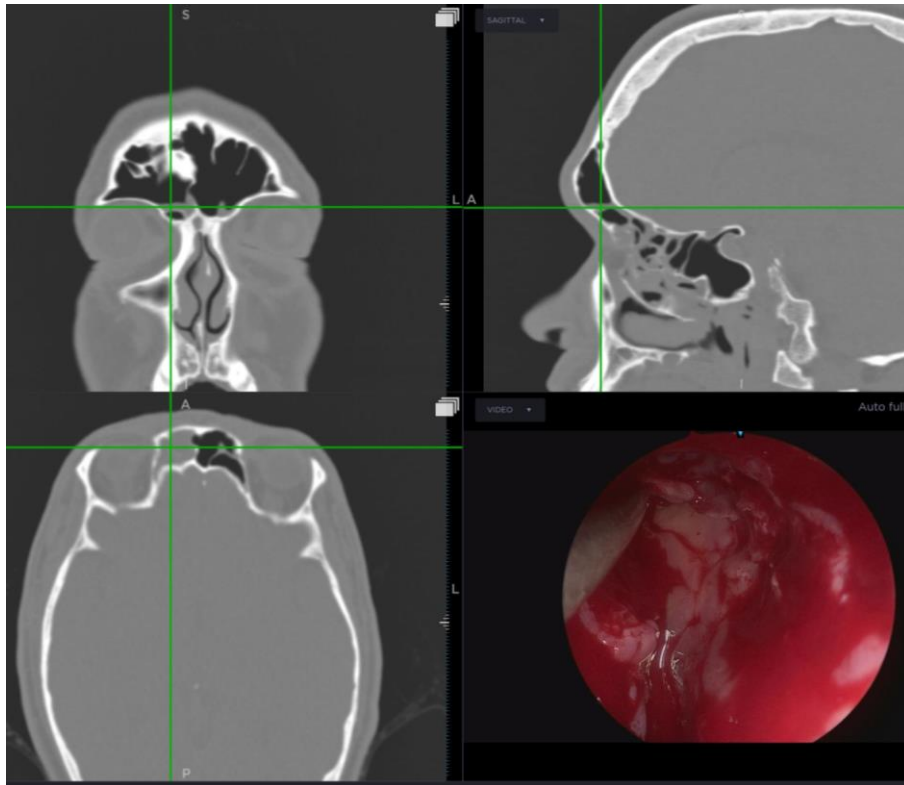
Supraorbital cell (yellow arrow) opens posterior and lateral to the true frontal sinus (blue arrow)

# High Cells can Be often Mistaken for Frontal Sinus

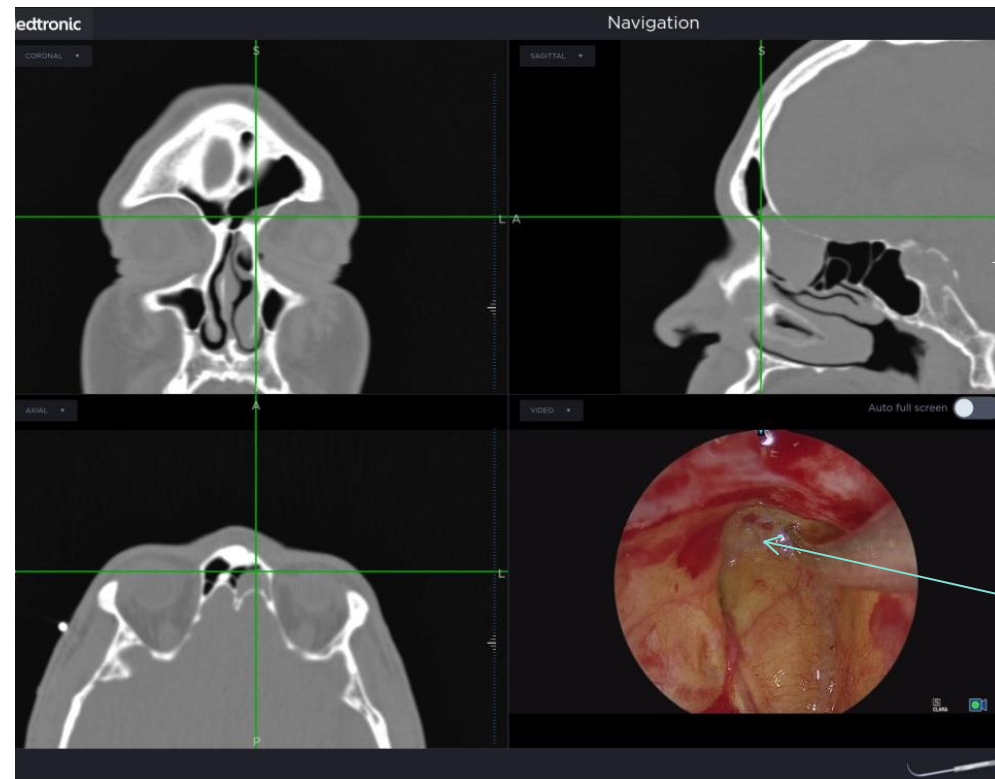
Always lie lateral to true Frontal Sinus

Frontal Probe will stop after hitting cap of cell of Supra-agger/ bullar

Supra-agger cells anterior and lateral



Supra-bullar cells posterior and lateral



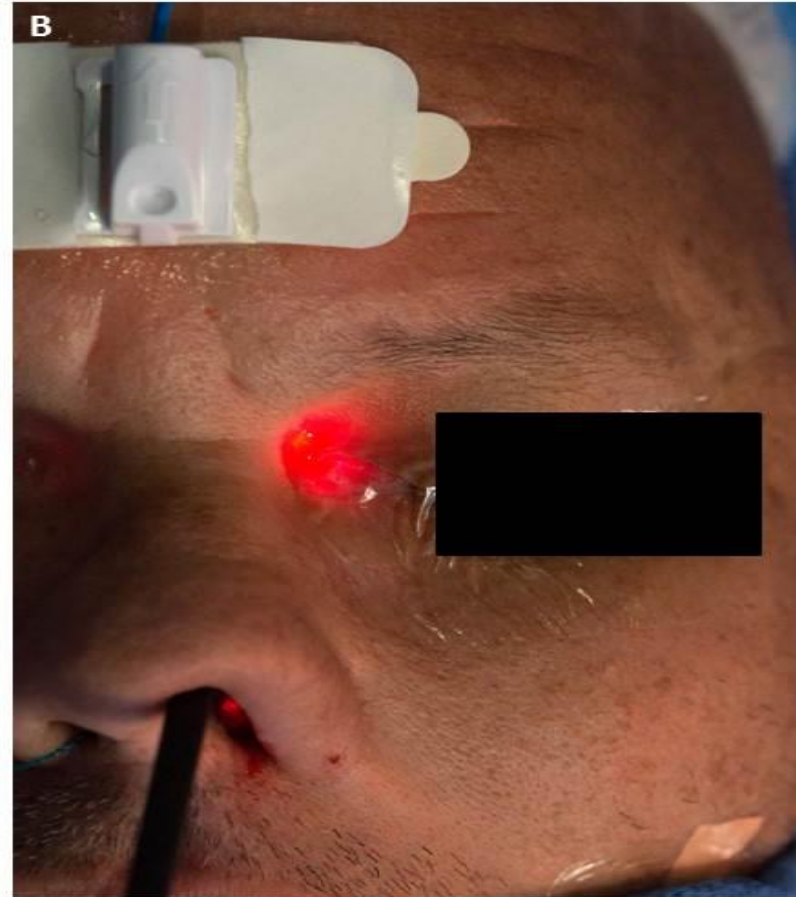
Probe on cap of SBC

Balloons will tend to go posterior and fall into suprabullar cells, and dilation may block true frontal

# Trans-illumination Can Help distinguish Frontal Sinus from High Ethmoid Cell



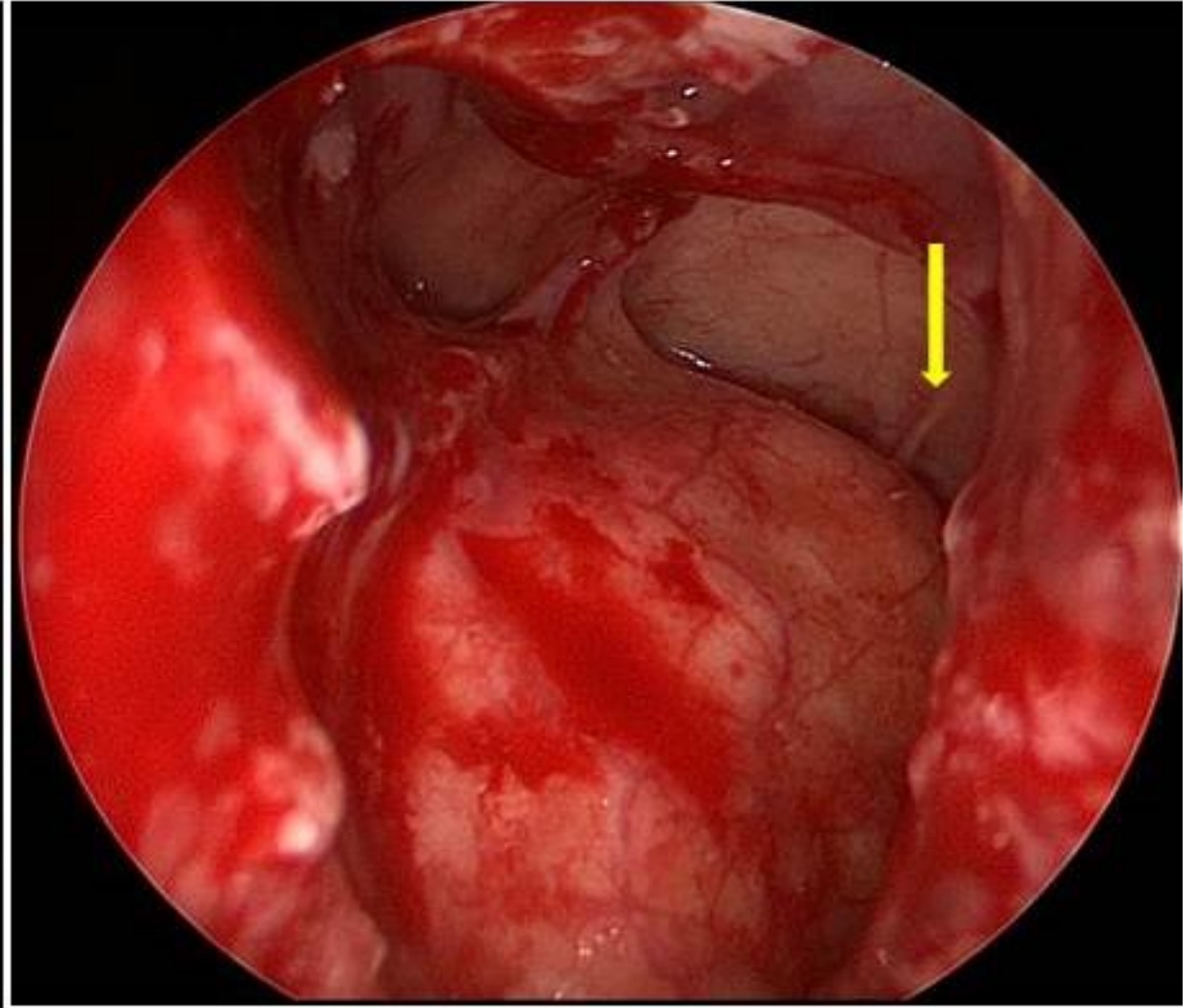
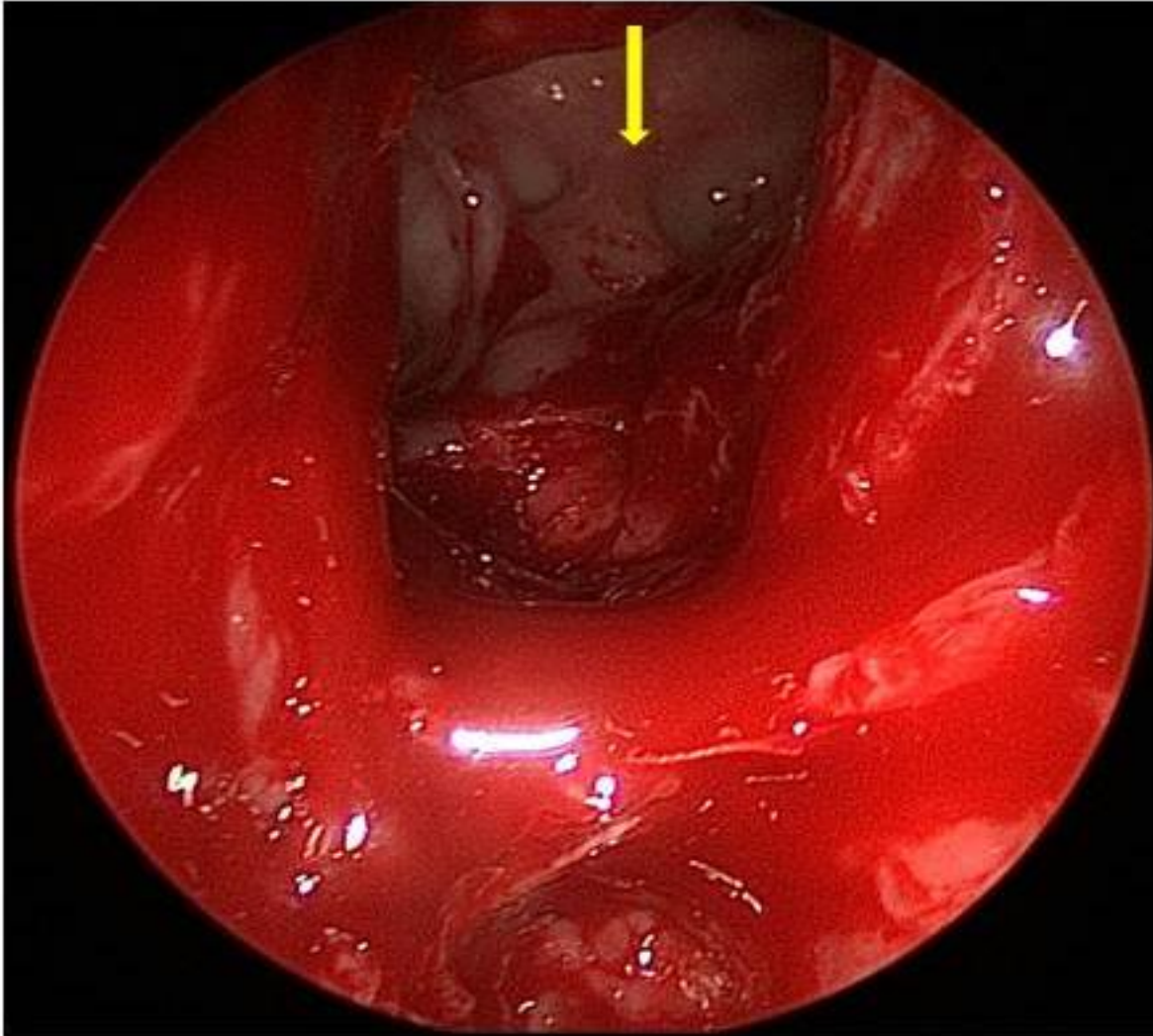
Frontal Sinus: Brightest transillumination in forehead



High Ethmoid Cell: Brightest transillumination in Medial canthal area



Frontal Sinus has a Sagittal Ridge on Roof  
Best seen on 45 or 70 degree endoscopy (high ethmoid cells don't)

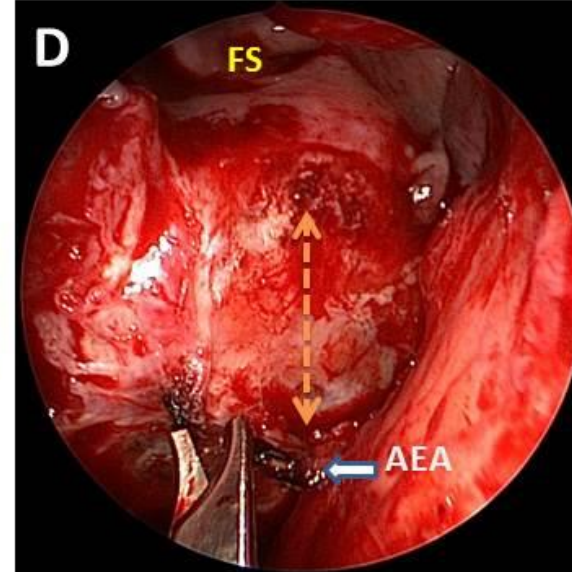
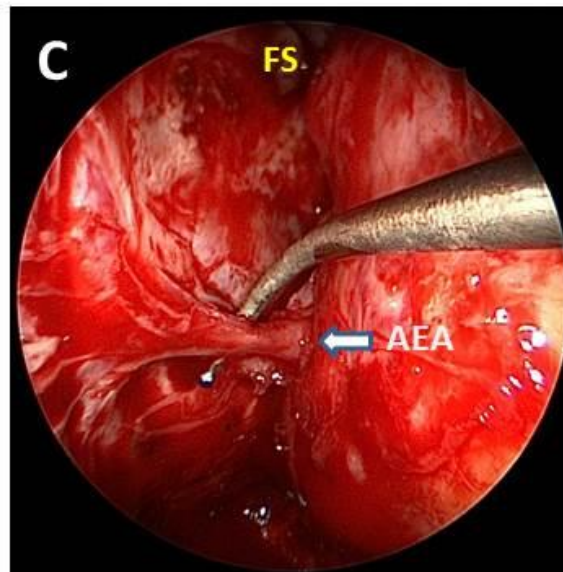
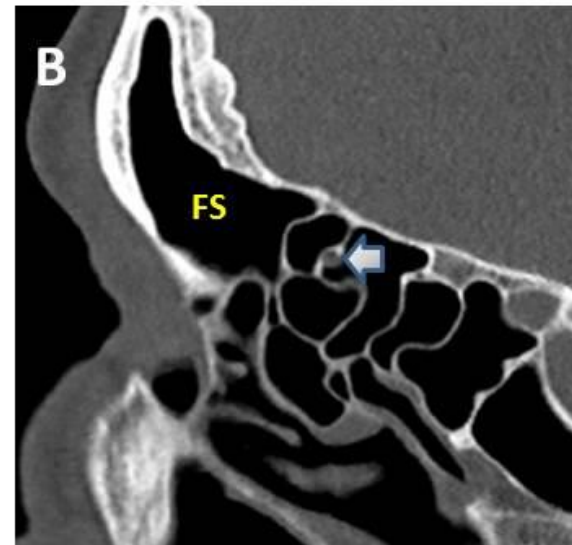
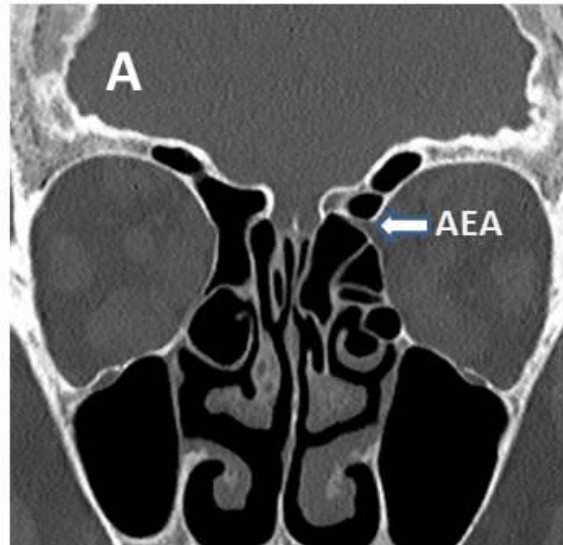


# Anterior Ethmoid Artery Should be Identified and Avoided

AEA lies in Suprabullar area ONE space behind frontal ostium

It is in the posterior aspect of the First Suprabullar/Supra-orbital cell

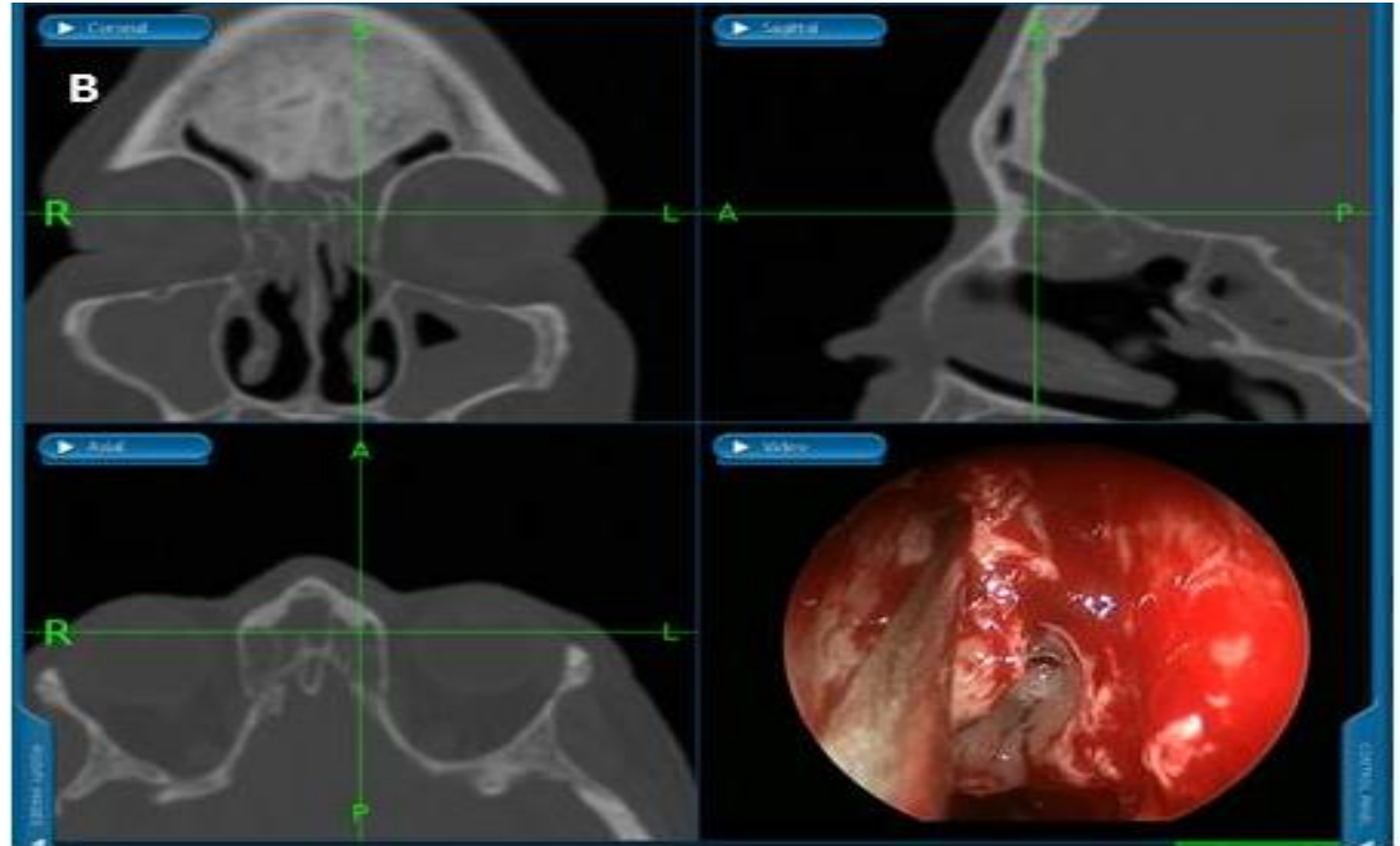
Anterior ethmoid artery



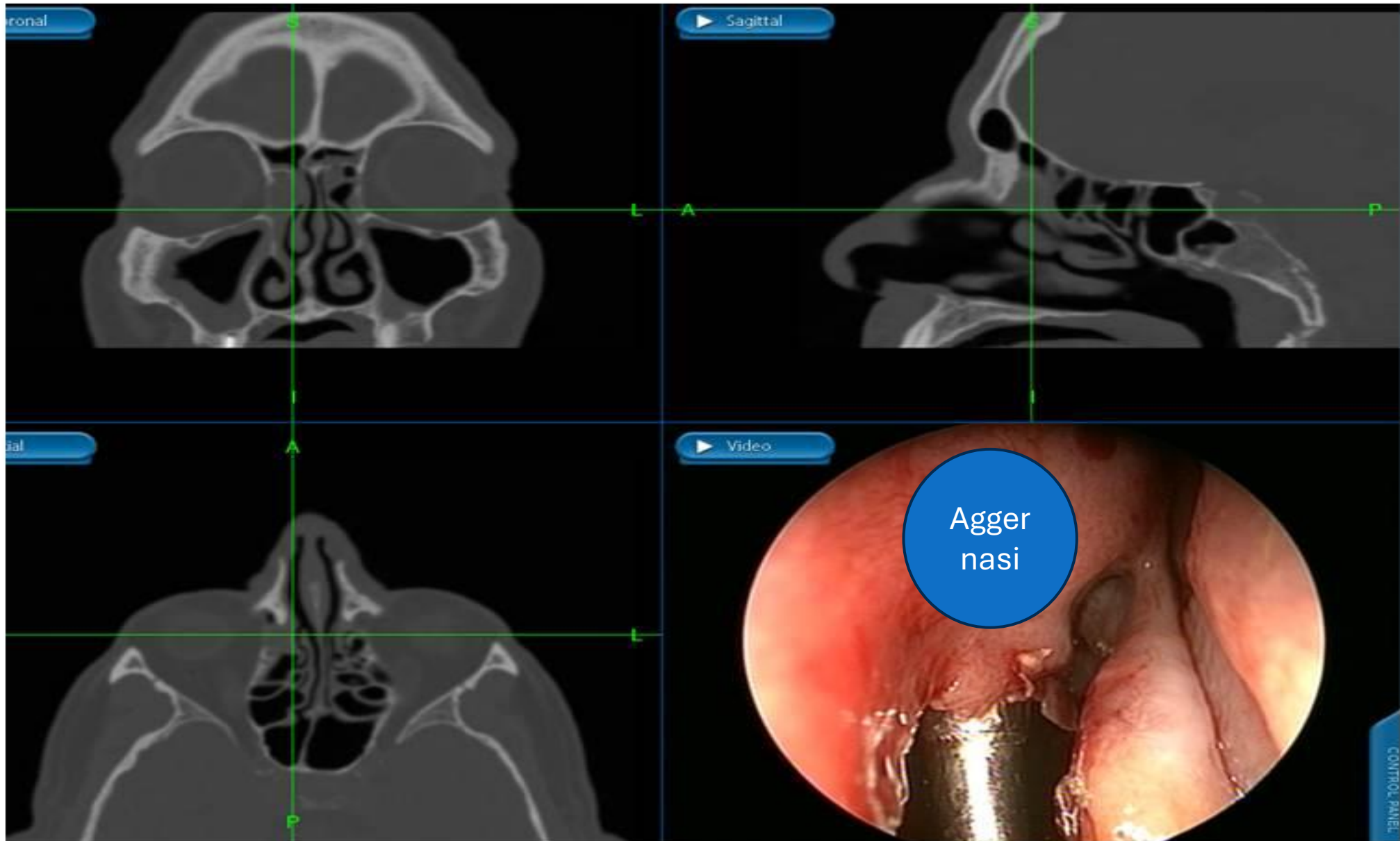


# Mastering Anatomy: Translating CT into surgical dissection

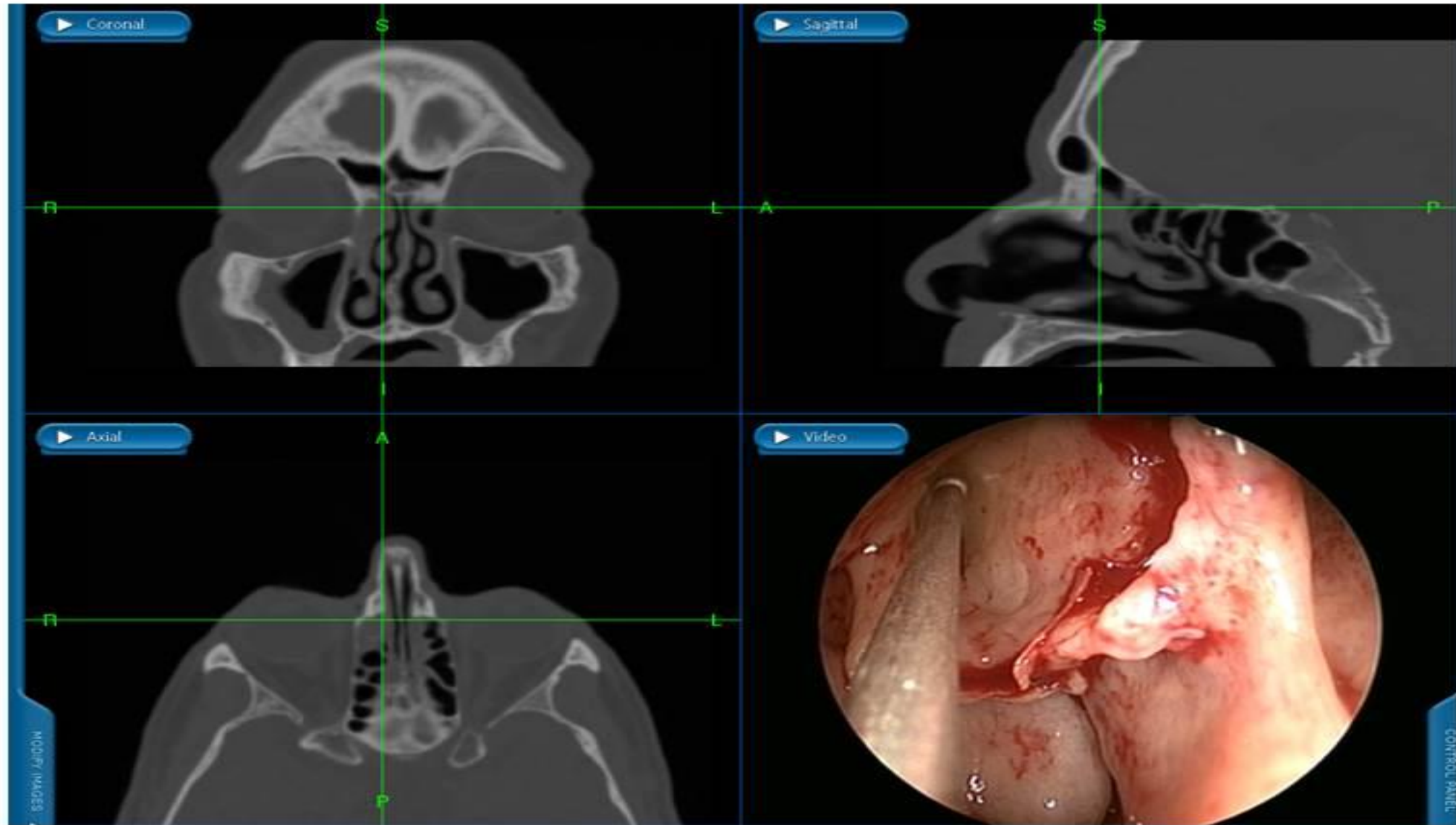
Use linked views on Navigation systems to master correlation of CT landmarks with with endoscopic landmarks



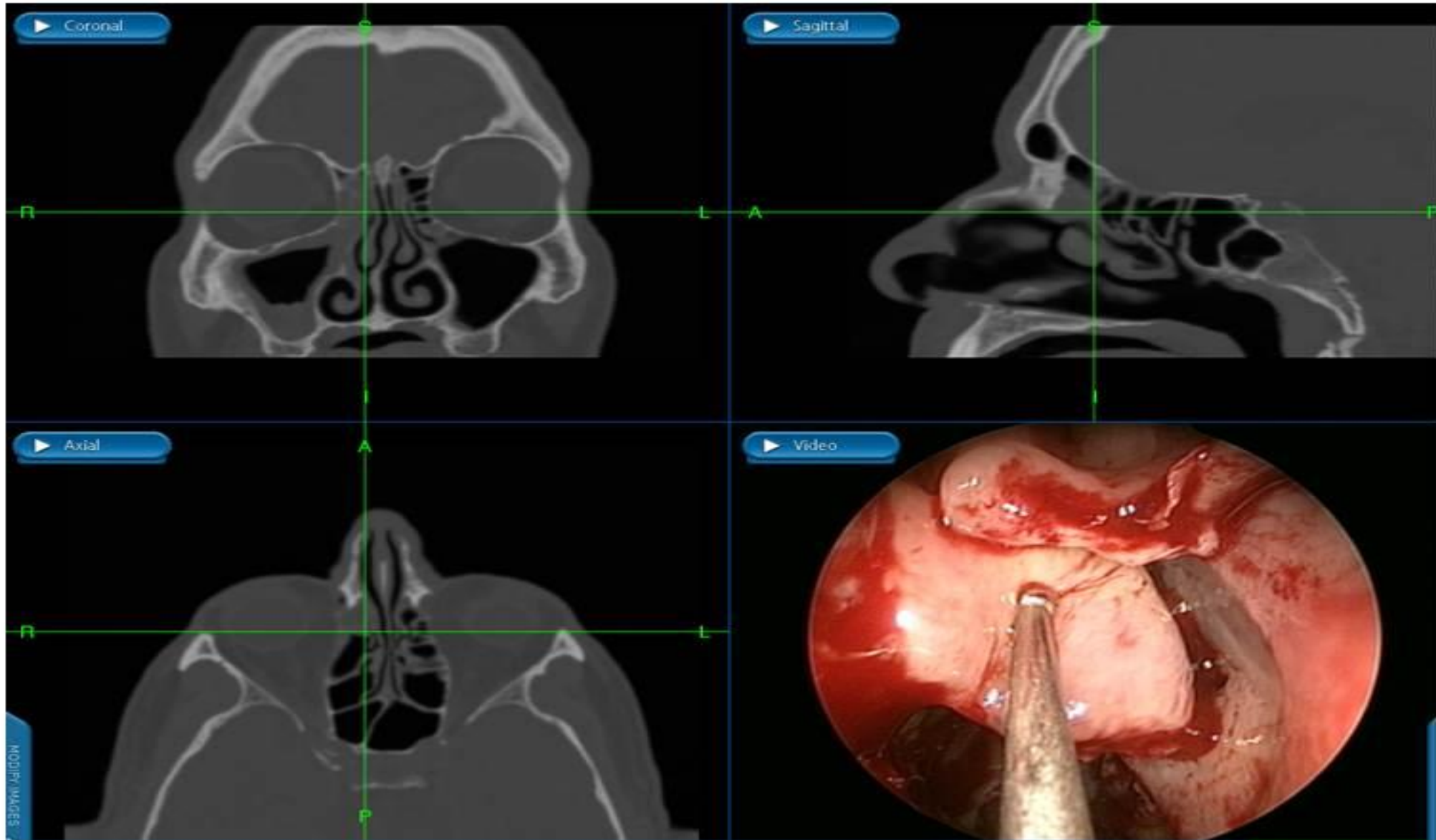
# Uncinate Process



# Cap of Agger Nasi Cell

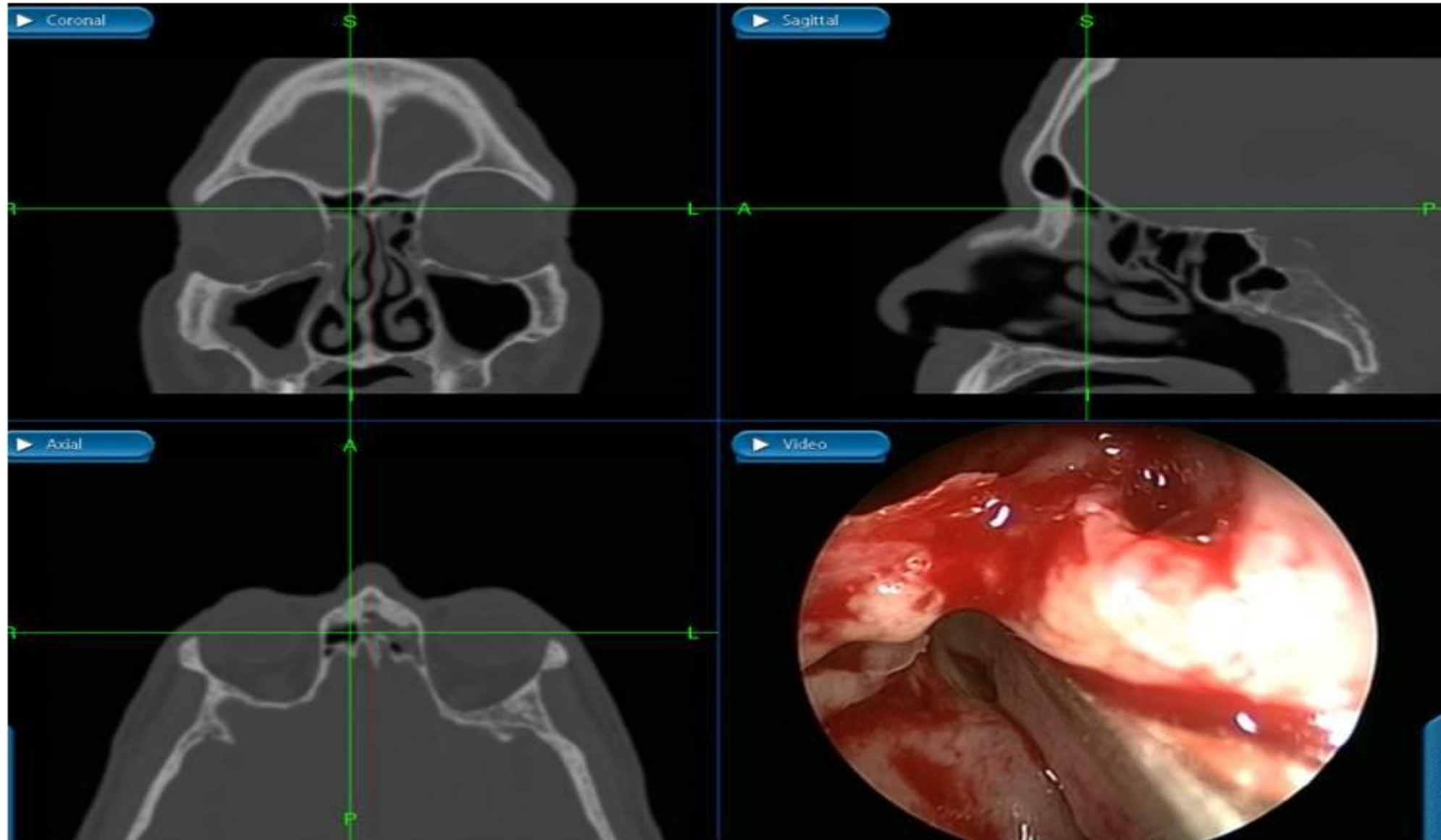


# Anterior face of Ethmoidal Bulla

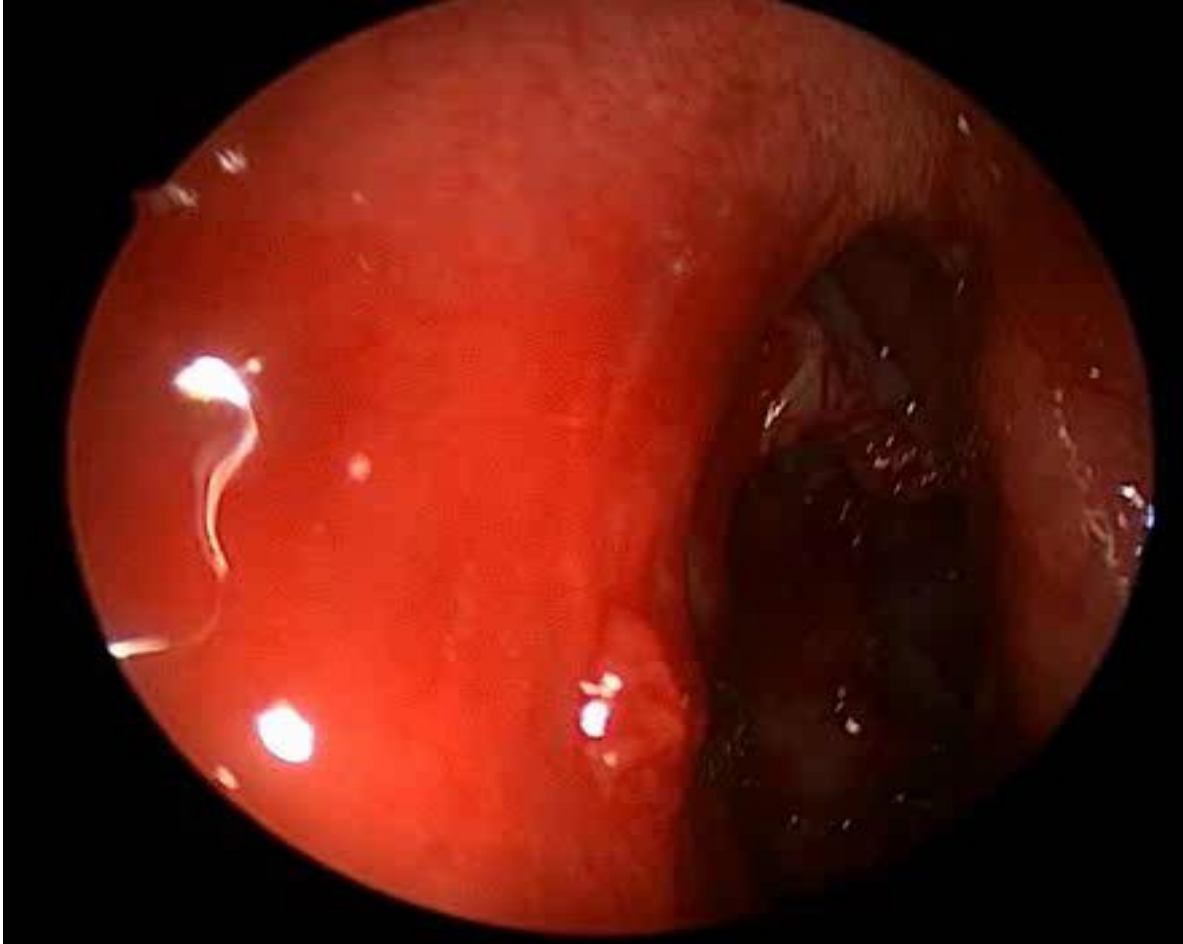




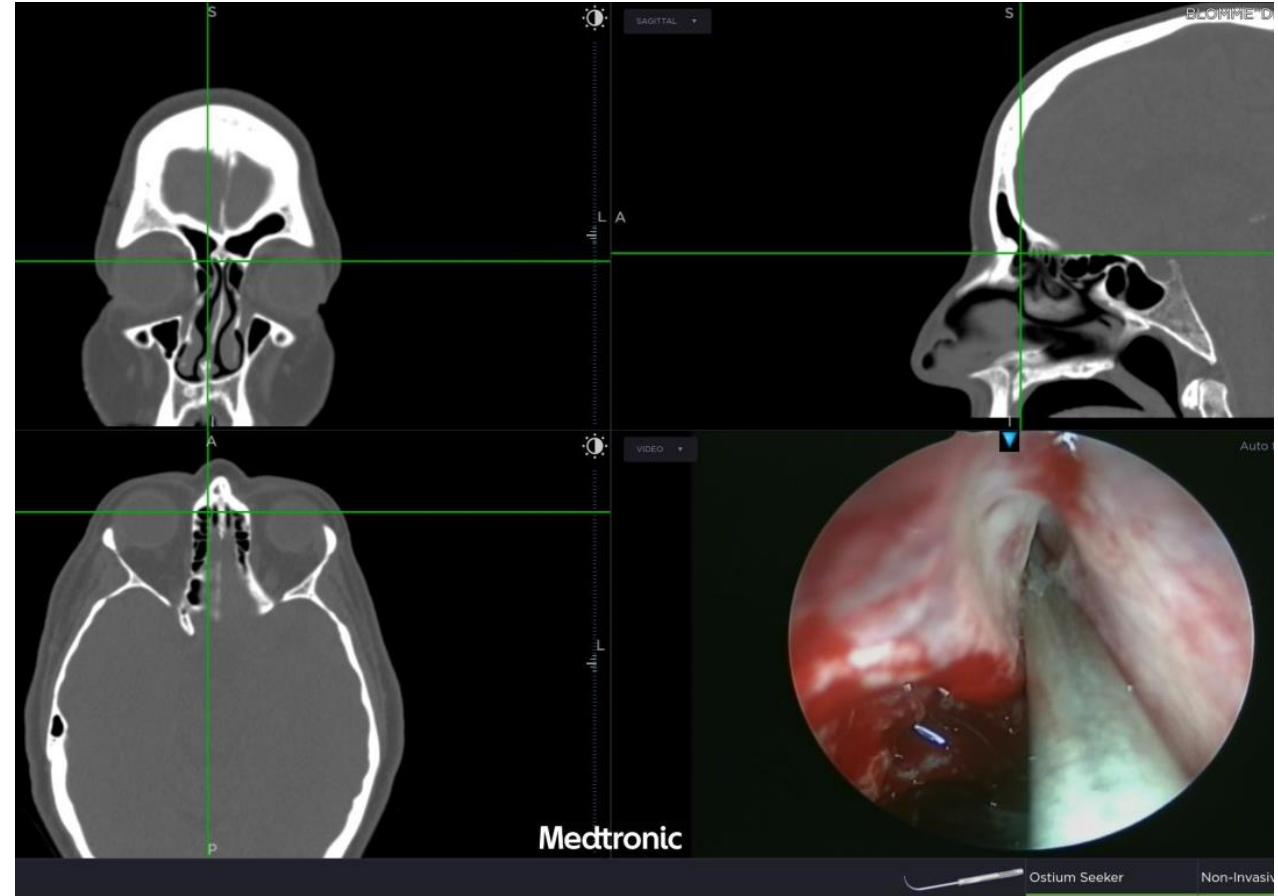
# Frontal Ostium



# Maxillary Os Helps Localize area of Probing for Frontal Ostium?

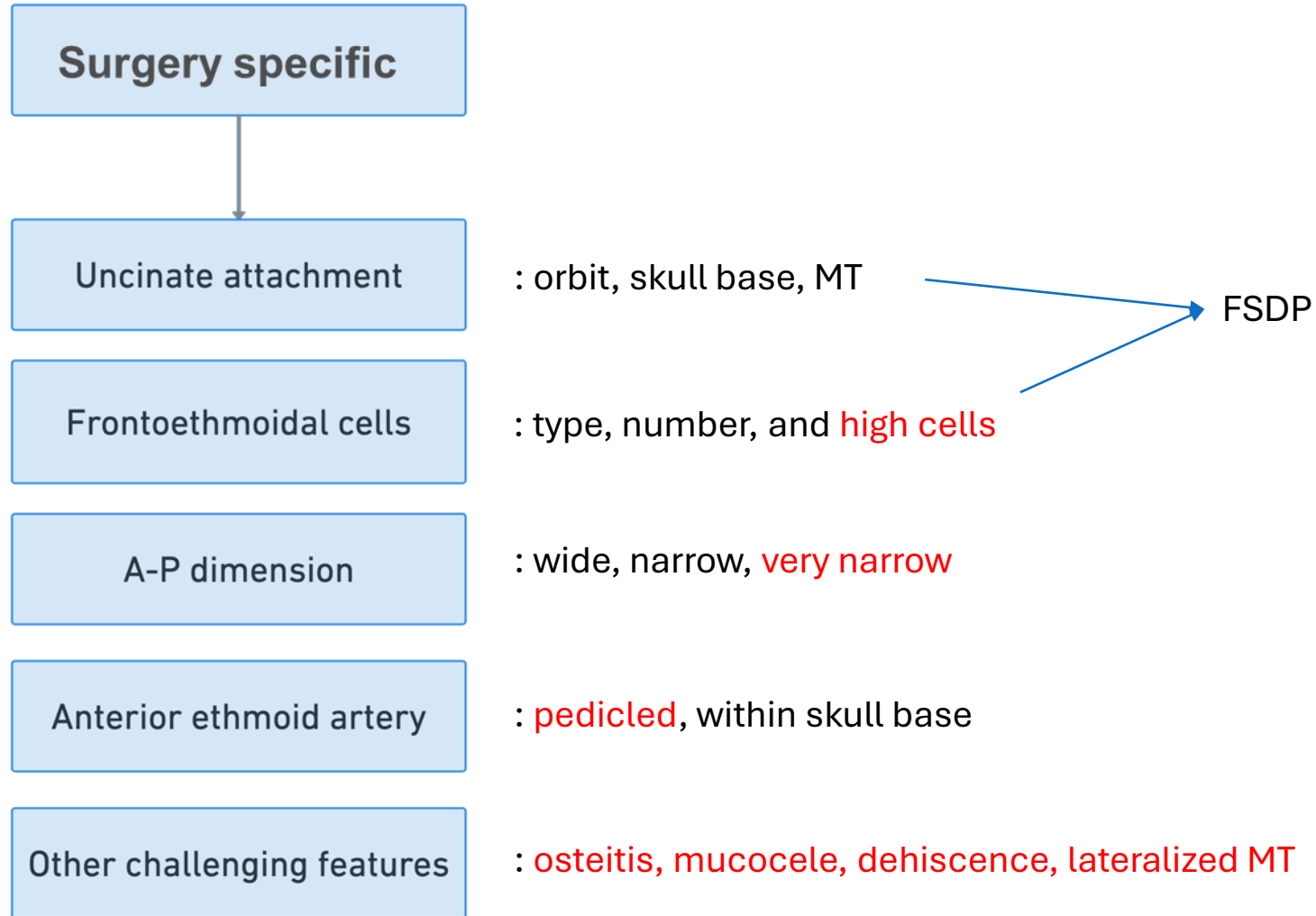


30 degree endoscopy, Right side



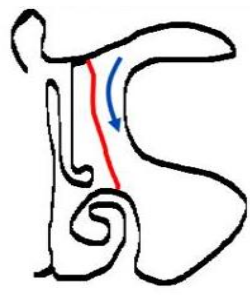
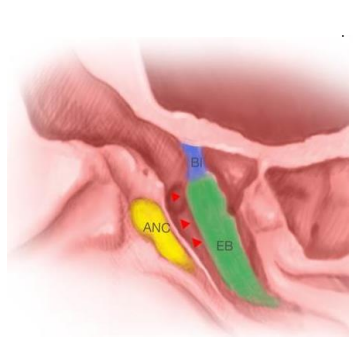
Frontal os should be just posterior to the uncinata/agger complex; maxillary ostium is just posterior to the anterior attachment of uncinata

# Summarizing Anatomy for Surgical Planning: Checklist



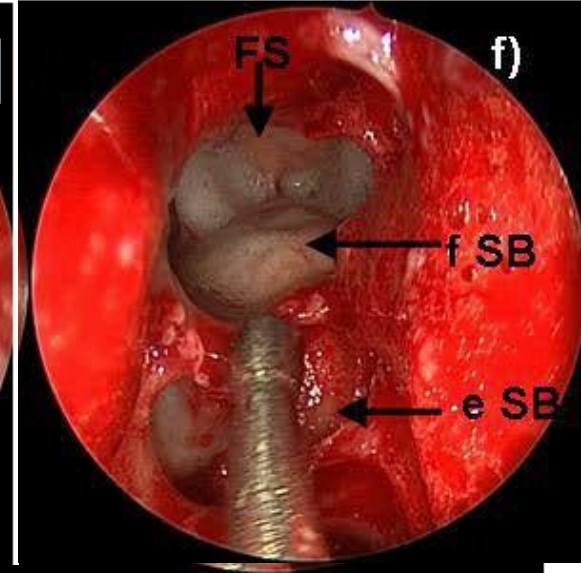
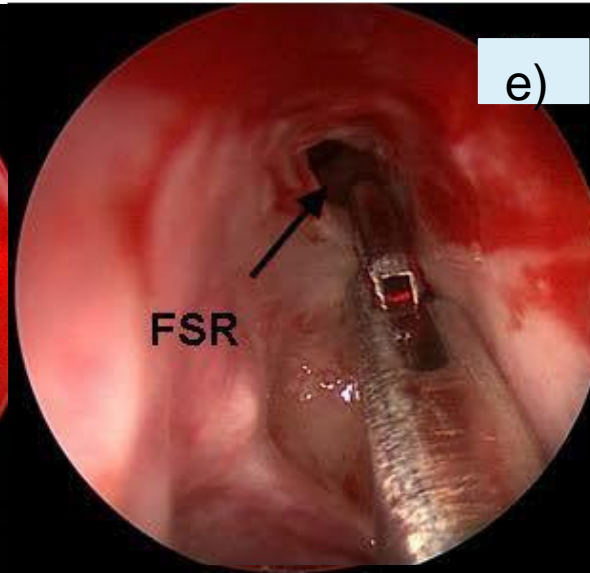
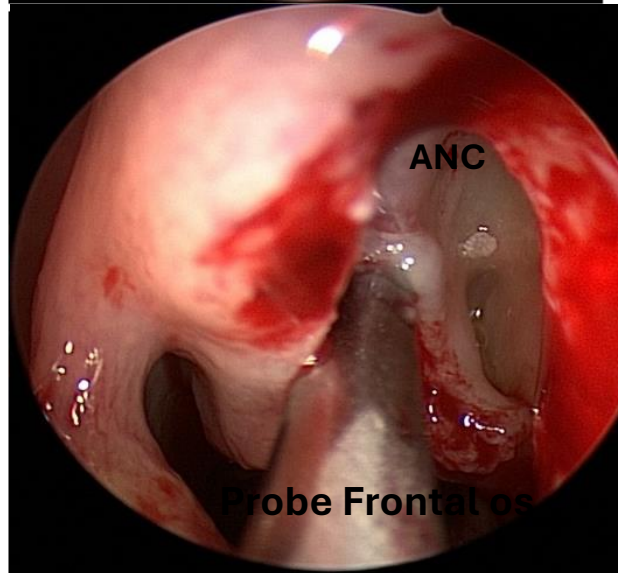
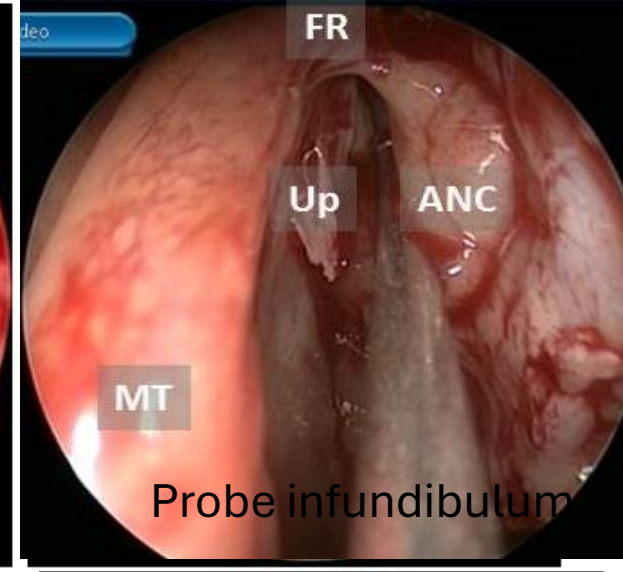
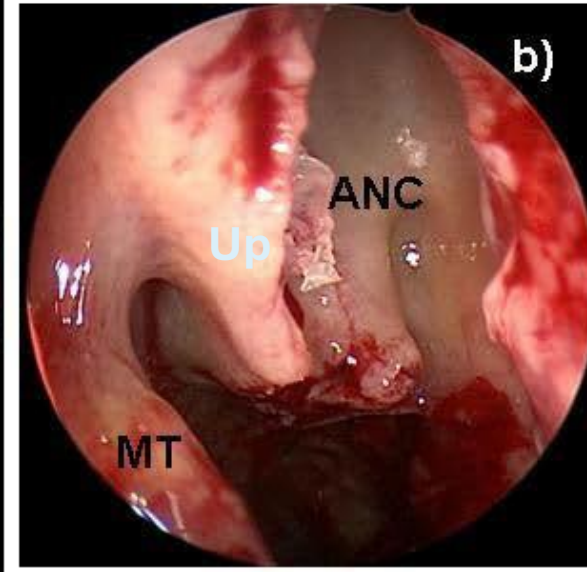
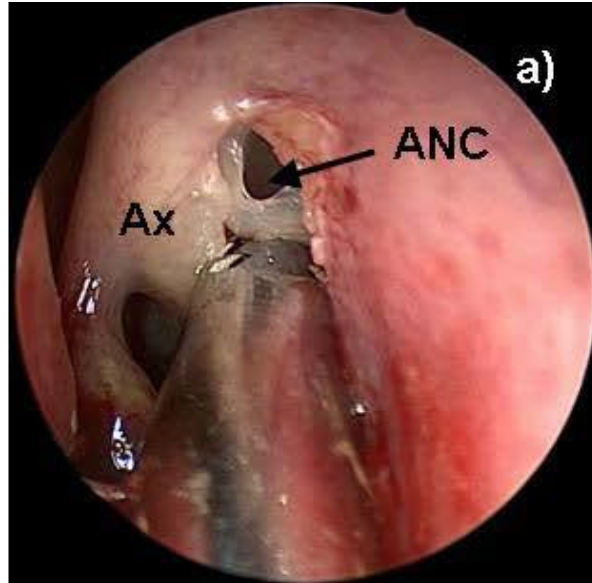
**POSTOP CARE and DEBRIDEMENT are Essential**





# Steps in Draf 2a Frontal Dissection

- a. Open axilla (Ax), ethmoid infundibulum → expose agger nasi cell (ANC)
- b. Uncinate process (Up) attaches to skull base
- a. Probe lateral to uncinata (in ethmoid infundibulum)
- b. Remove ANC cap with curette above & behind (“uncap the egg”)
- c. Identify, widen frontal ostium (angled endoscopes)
- d. Dissect skull base (SB) posterior



## Left Frontal Sinusotomy



# Draf 2a for Primary Surgery

## Review CT findings

Uncinate attachment

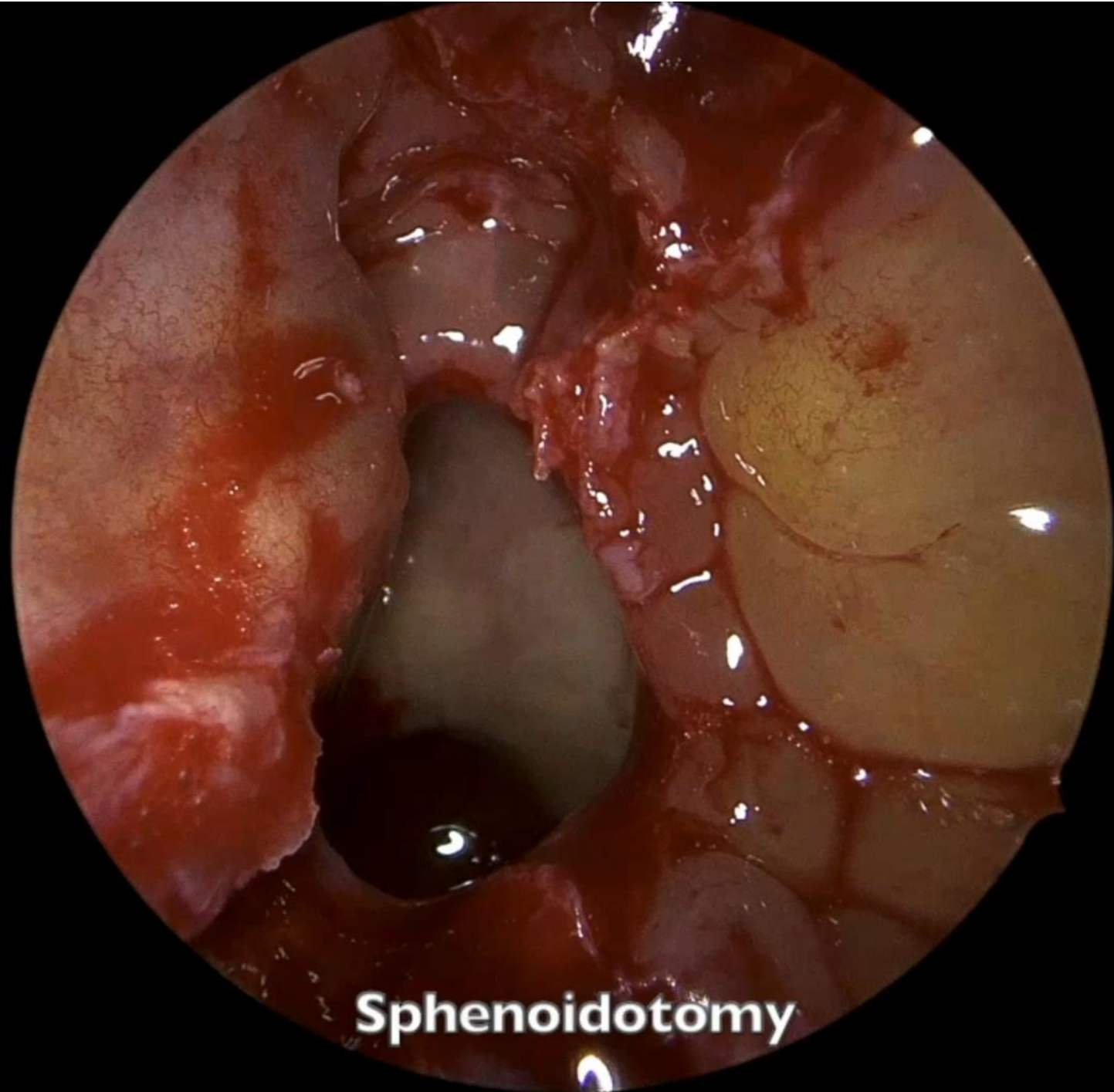
Frontoethmoidal cells

A-P dimension

Anterior ethmoid artery

Other challenging features





**Sphenoidotomy**

# Case 1 Insights

- Draf 2a works for most primary cases
- CT review is critical for success and safety
- Incorporate the natural os
- Mucosal preservation is key
- Intentionally manage the middle turbinate
- No routine frontal stenting is necessary

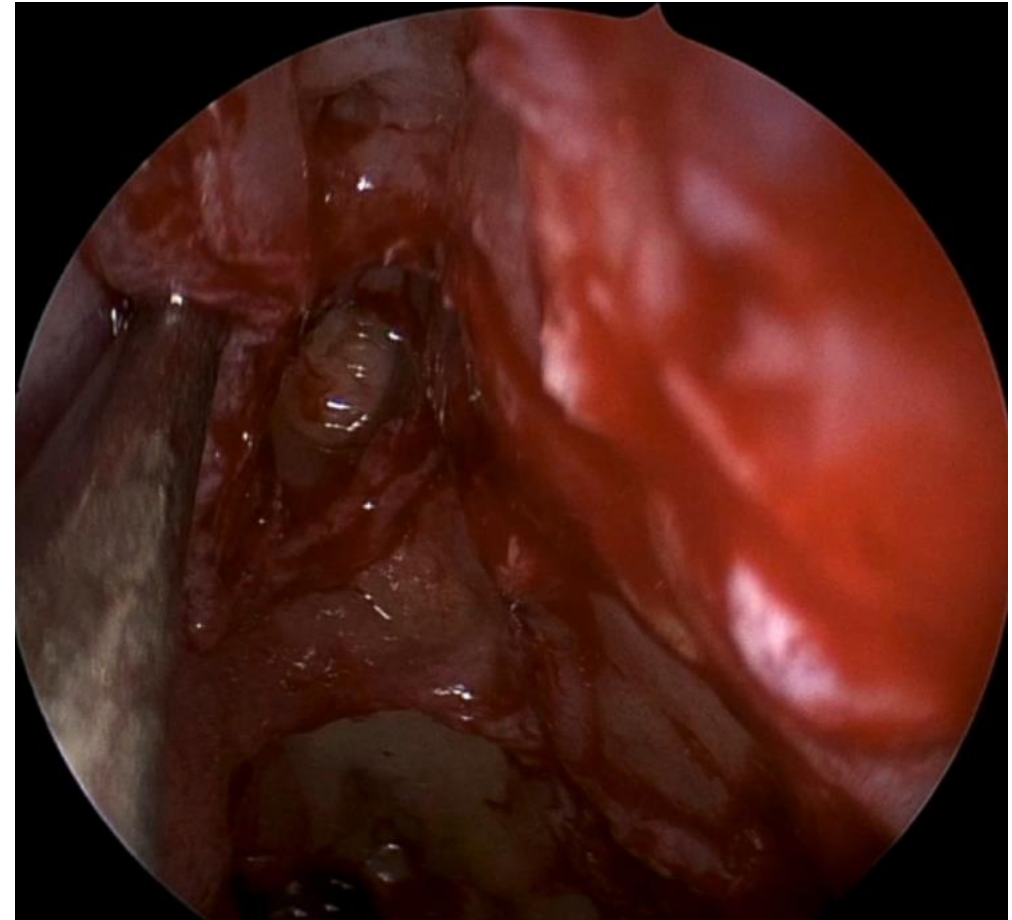
Uncinate attachment

Frontoethmoidal cells

A-P dimension

Anterior ethmoid artery

Other challenging features



## Stenting: Does not widen Narrow / incompletely dissected tract; May help with mucosalization and decreasing inflammation

- If there is abrasion of outflow mucosa
- Significant polypoid mucosa within the frontal sinus
- Drilling with exposed bone in outflow tract
- Acutely inflamed frontal sinus
- Hold mucosal grafts in position
- Stenosing frontal sinus in the office



# Case 2: Draf 2a Recognizing High Ethmoidal Cells

## Review CT findings

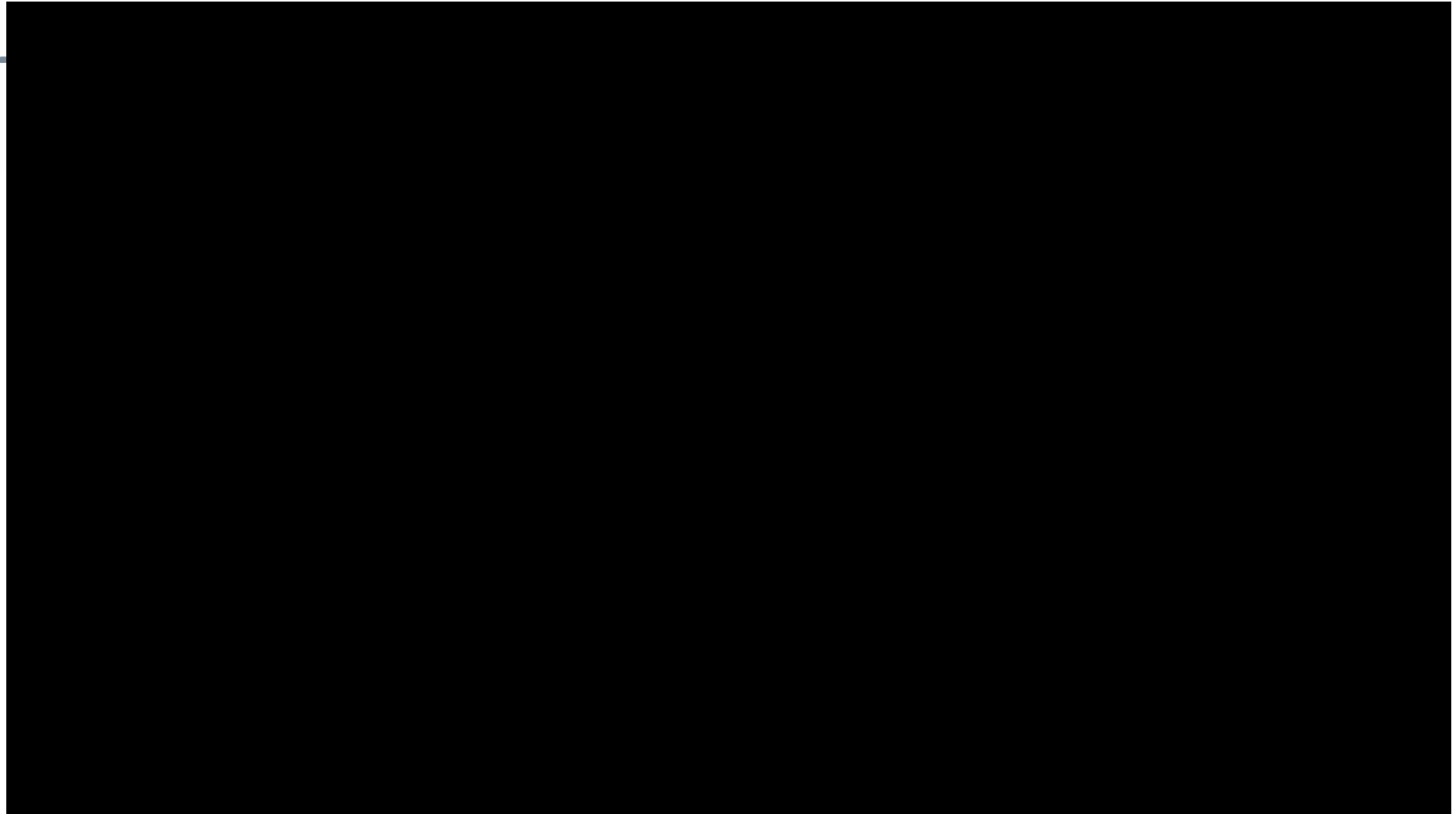
Uncinate attachment

Frontoethmoidal cells

A-P dimension

Anterior ethmoid artery

Other challenging features





# Case 2 Insights

- CT review is critical for success and safety
- Must dissect all cells above and below the frontal os
- Mucosal preservation
- Create the widest marsupialized cavity leveraging all cells
- Specialized frontal instruments are critical for dissection
- Navigation helps with confirmation of anatomical landmarks and spaces

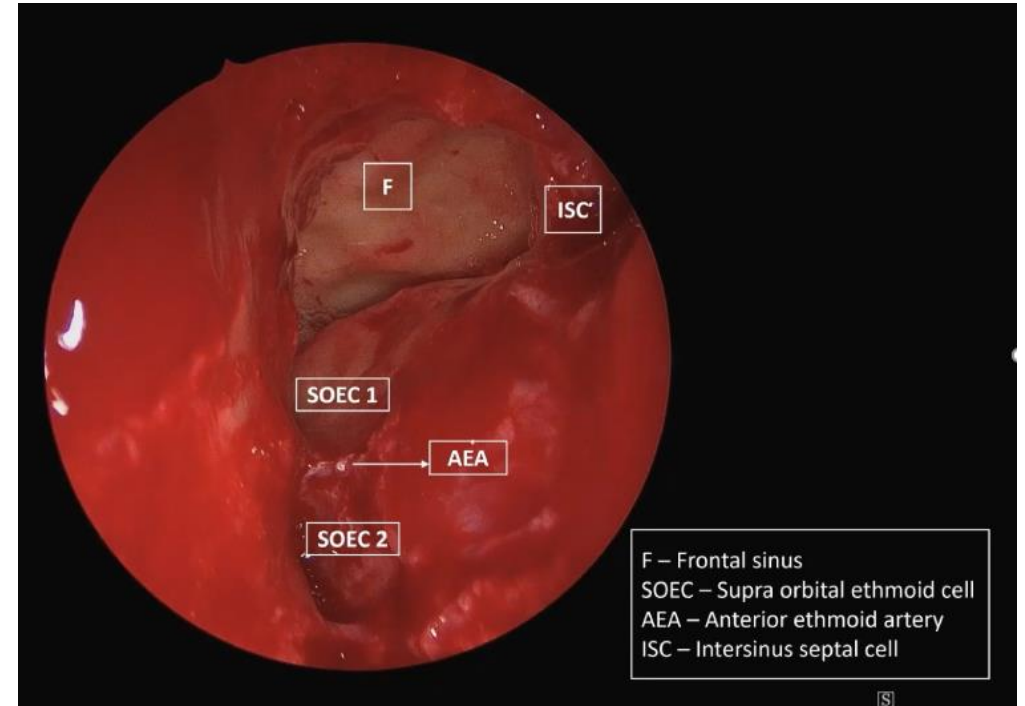
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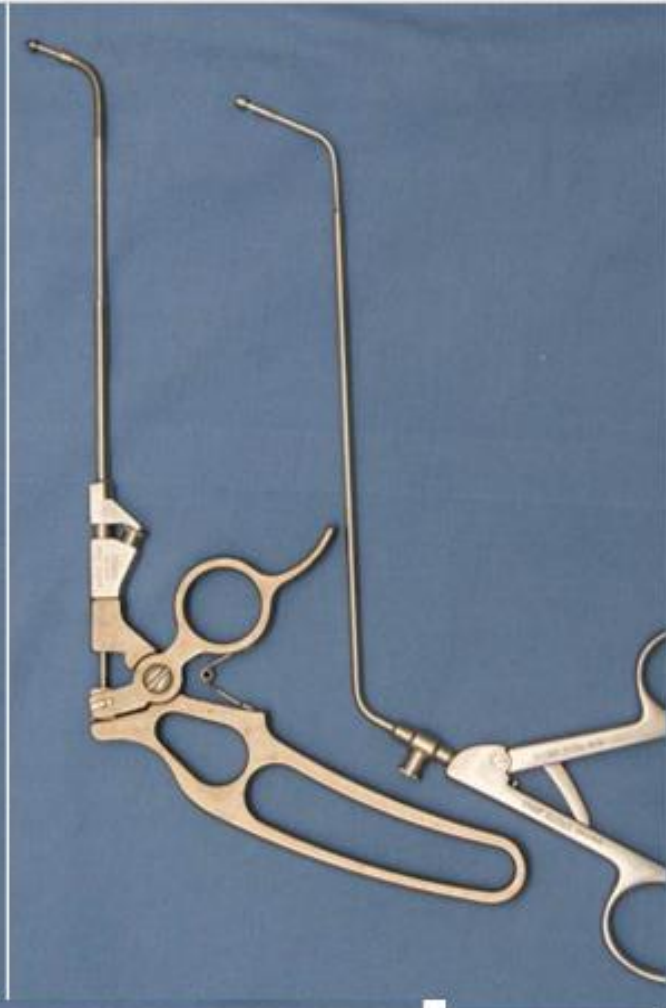
Frontoethmoidal cells

A-P dimension

Anterior ethmoid artery

Other challenging features



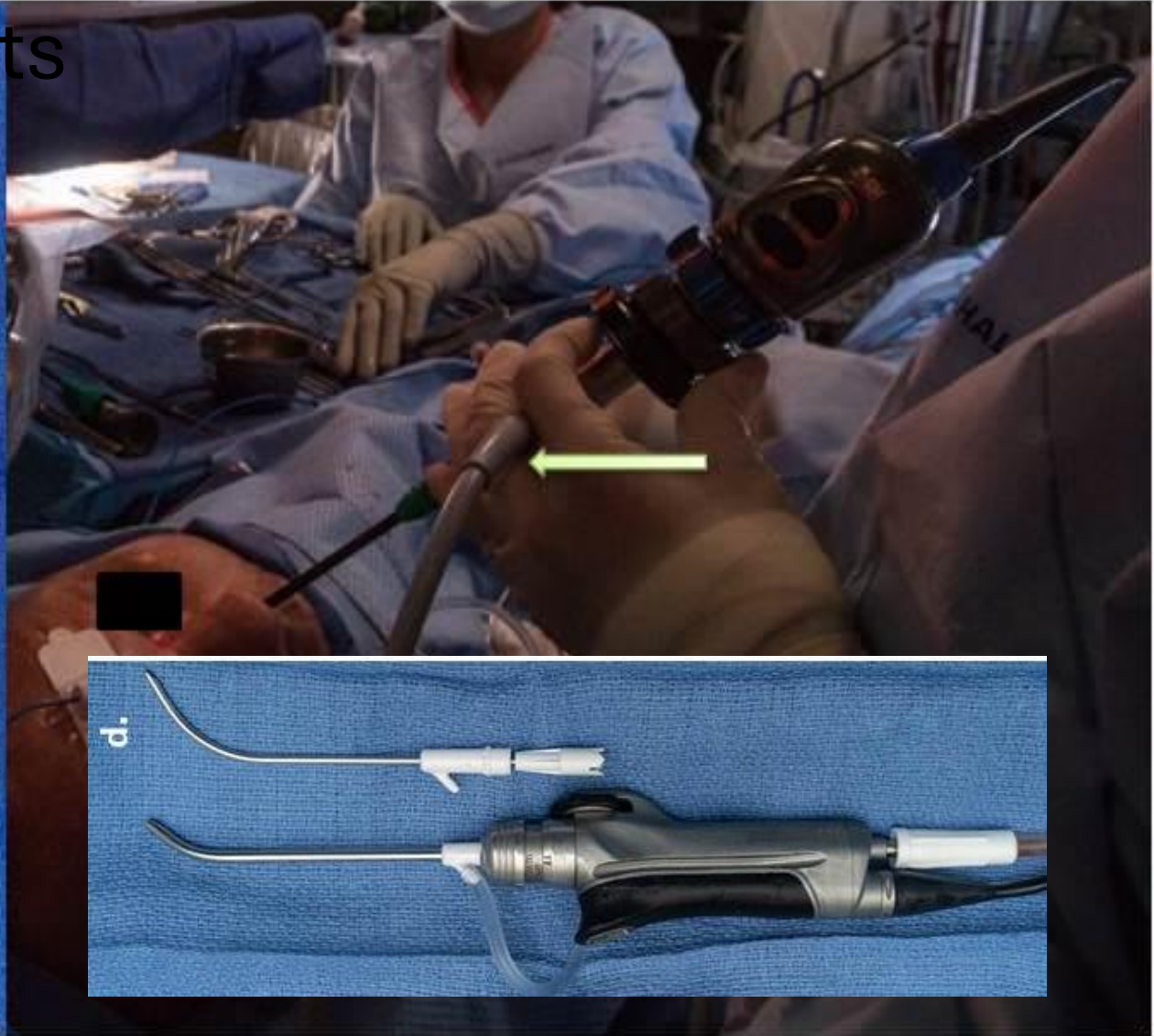


**Basic Frontal Instruments**





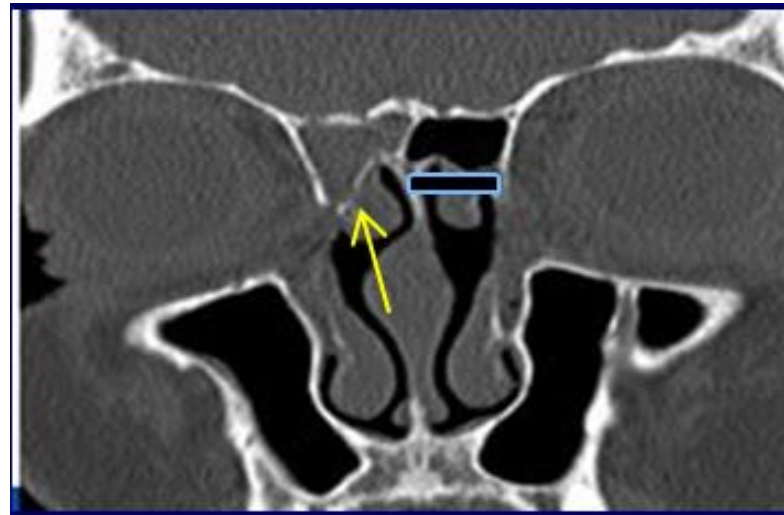
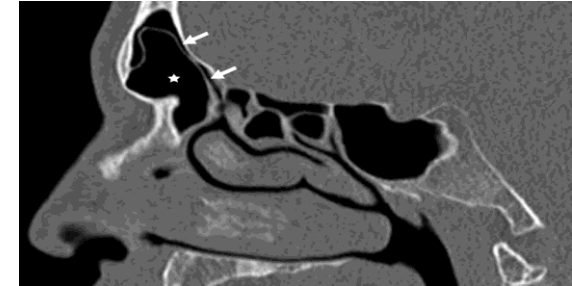
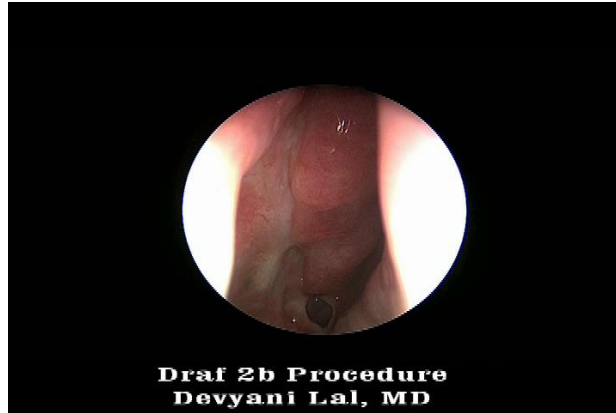
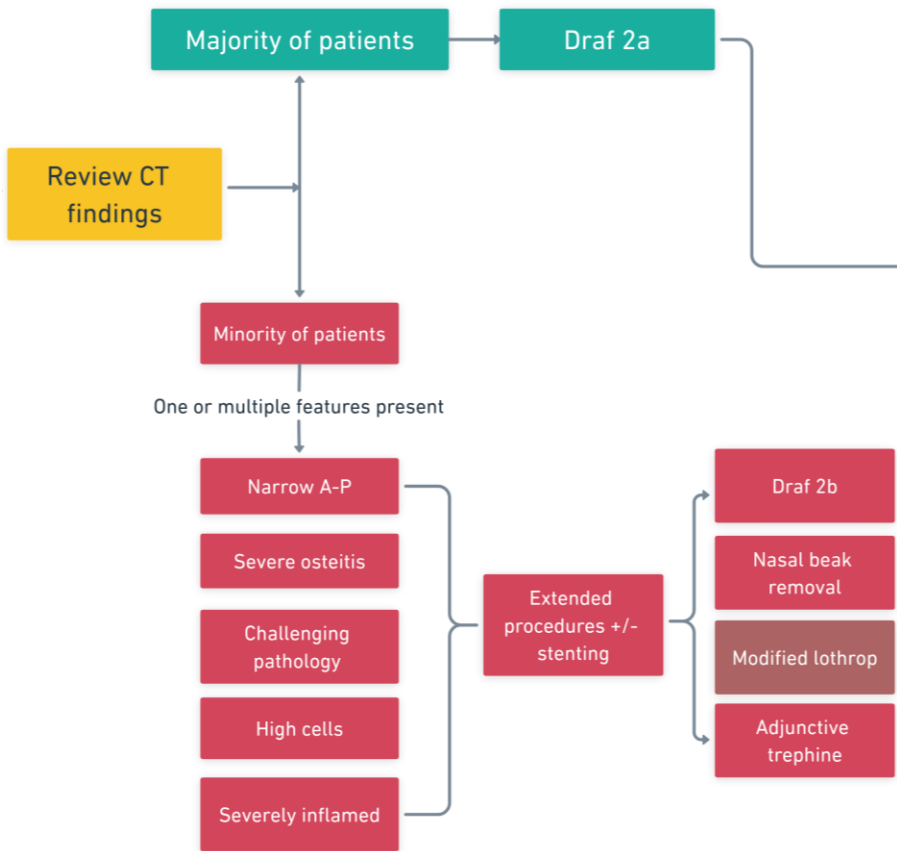
# Endoscopes and Powered Microdebridgers



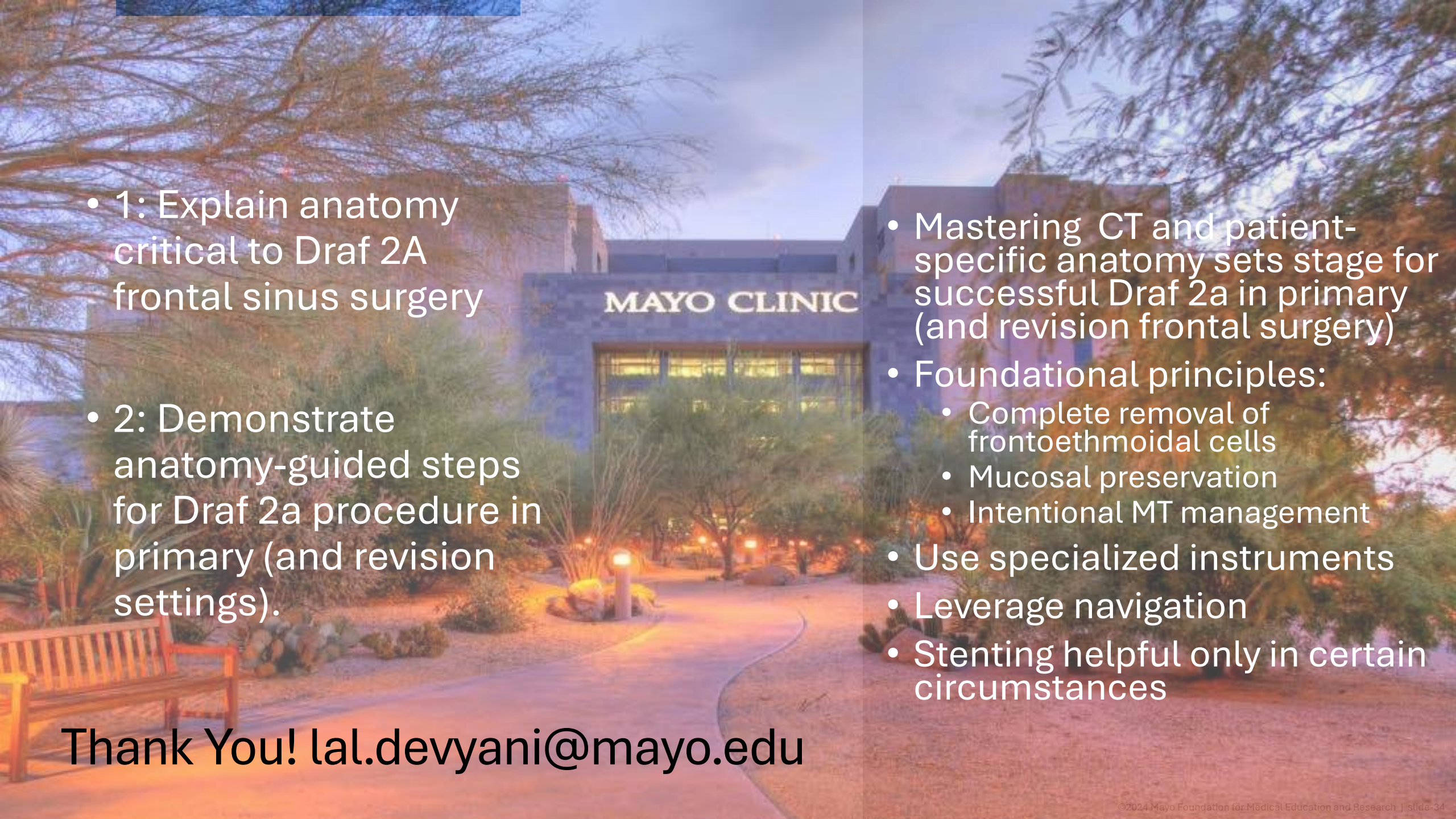
Reverse Angled Endoscope (30, 45, 70 degrees), Irrigating Sleeves



# Recognize when a Draf 2a will NOT Suffice





A photograph of the Mayo Clinic building at dusk. The building is a large, multi-story structure with a prominent entrance. The words "MAYO CLINIC" are illuminated in white letters above the entrance. The sky is a deep blue, and the building's windows are lit up. In the foreground, there is a paved walkway, some desert landscaping including cacti and small trees, and a wooden bench on the left. The overall atmosphere is serene and professional.

- 1: Explain anatomy critical to Draf 2A frontal sinus surgery

- 2: Demonstrate anatomy-guided steps for Draf 2a procedure in primary (and revision settings).

- Mastering CT and patient-specific anatomy sets stage for successful Draf 2a in primary (and revision frontal surgery)

- Foundational principles:
  - Complete removal of frontoethmoidal cells
  - Mucosal preservation
  - Intentional MT management

- Use specialized instruments

- Leverage navigation

- Stenting helpful only in certain circumstances

Thank You! [lal.devyani@mayo.edu](mailto:lal.devyani@mayo.edu)



## Case 3: Draf 2a when Nasal Beak Removal helps

### Review CT findings

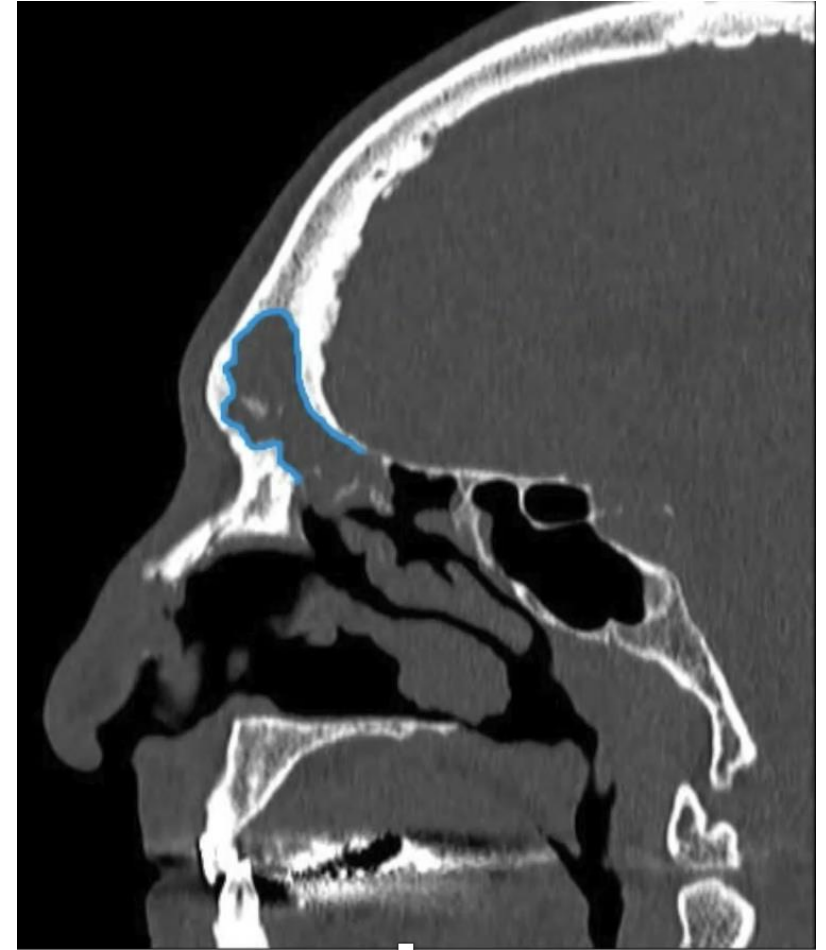
Uncinate attachment

Frontoethmoidal cells

A-P dimension

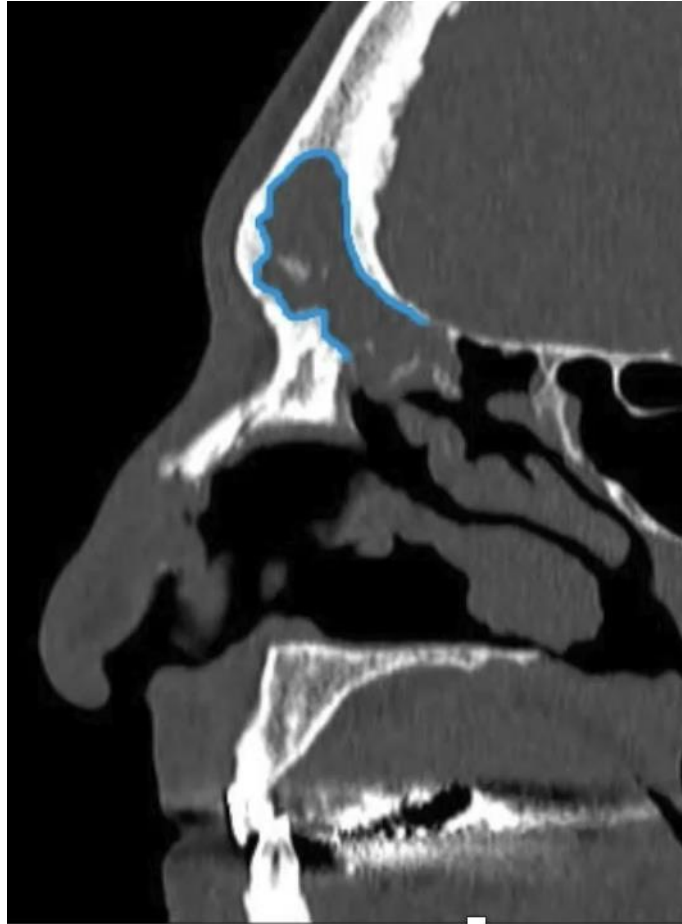
Anterior ethmoid artery

Other challenging features



## Case 4 Insights

- Removal of nasal beak is helpful in challenging cases
- Stenting may be helpful in setting of exposed bone
- 4 mm diamond burr



## Case 3: Nasal Beak Removal



## Case 2

Primary Frontal Sinus Surgery  
"Complex" Dissection  
Left Draf 2a

Devyani Lal, MD

## Case 3 Insights

- Draf 2a is the workhorse for most primary (and revision) frontal surgery for nasal polyps
- CT review is critical for success and safety
- Mucosal preservation is key
- Wide dissection is required for polyps

Uncinate attachment

Frontoethmoidal cells

A-P dimension

Anterior ethmoid artery

Other challenging features

Well Healed Sinuses after ESS

Office Nasal Endoscopy with 30 Degree Endoscope