

# **PREVENTION (MINIMIZING) COMPLICATIONS IN ENDOSCOPIC SINUS SURGERY**

**Steven D. Schaefer, MD**

**Professor and Chair**

**Department of Otolaryngology**

New York Medical College  
The New York Eye and Ear Infirmary



## **SINUS SURGERY COMPLICATIONS**

### **PREVENTION AND RECOMMENDATIONS**

- **Intraoperative Hemorrhage**
- **Loss of Orientation**
- **Inability to Identify/Preserve Maxillary Ostium**
- **Inability to Identify/Preserve Sphenoid Ostium**
- **Inability to Identify/Preserve Frontal Ostium**
- **Penetration of Roof of Ethmoid**
- **Orbital Injury/Optic Nerve Injury**

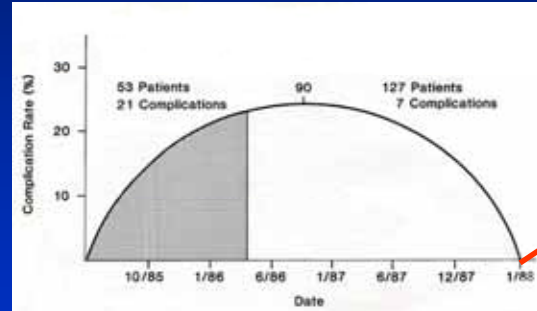
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# SINUS SURGERY COMPLICATIONS

## PROBLEM

- **Intraoperative Hemorrhage**
  - Reduces Visualization
  - Obscures Landmarks
  - Increases Operative Time
  - Increases Complications



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# SINUS SURGERY COMPLICATIONS

## RECOMMENDATION

- **Intraoperative Hemorrhage**
  - **Develop Routine for Prevention of Hemorrhage**
    - Time 0: Spray Vasoconstrictive Agent in Nose
    - Time 3mins: Place Cottonoids with Vasoconstrictive/ Anesthetic Agent Precisely in Nose
    - Time 8mins: Precisely Infiltrate Operative Field
    - Time 15mins: Begin Surgery
  - **Control Hemorrhage During Surgery or Stop**

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# SINUS SURGERY COMPLICATIONS

## RECOMMENDATIONS

- **Intraoperative Hemorrhage**
  - Understand the Pitfalls of Your Agents and Technique
    - Cardiovascular/CNS Effects
    - Intravascular Infiltration
    - Spread of Agent Beyond Surgical Field
    - General vs. Local Anesthesia
    - Patient and Procedure Selection

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# SINUS SURGERY COMPLICATIONS

## PROBLEM

- **Loss of Orientation**
  - Confusion of Landmarks/Intranasal Distances
    - Increase Risk of Intracranial and Orbital Complications
  - Myopic Surgery
    - Improper Use of Endoscope Leading to Distortion of the Surgical Field and Loss of Depth of Field

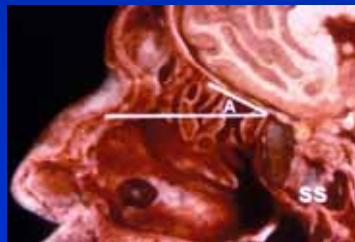
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# SINUS SURGERY COMPLICATIONS

## RECOMMENDATIONS

- **Loss of Orientation**
  - **Confusion of Landmarks/Intranasal Distances**
    - Middle Turbinate, Maxillary Ostium and Sphenoid Sinus are Critical Landmarks
    - Inferior Rotation of Instruments in A>P Approach, not Simply Advancement( $60^{\circ}>30^{\circ}$ )



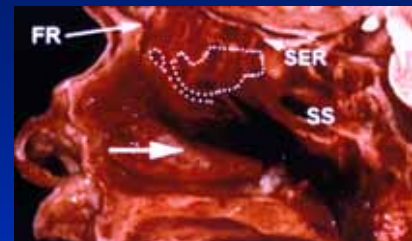
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# SINUS SURGERY COMPLICATIONS

## RECOMMENDATIONS

- **Loss of Orientation**
  - **Confusion of Landmarks/Intranasal Distances**
    - Utilize  $0^{\circ}$  Endoscope in A>P Approach for Inferior Ethmoidectomy,  $30^{\circ}$ ,  $45^{\circ}$  Endoscope in P>A Approach for Superior Ethmoidectomy
    - Practice, Practice, Practice



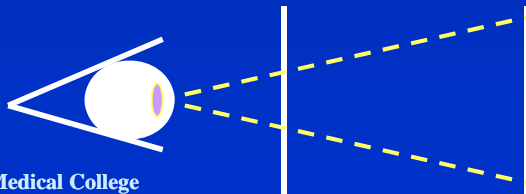
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# SINUS SURGERY COMPLICATIONS

## RECOMMENDATIONS

- **Loss of Orientation**
  - Myopic Surgery
    - Avoid Placing Endoscope too Close to Surgical Field
    - Change Position of Endoscope Relative to Surgical Field to Establish Depth of Field



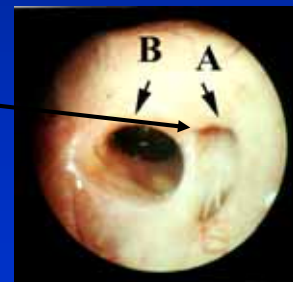
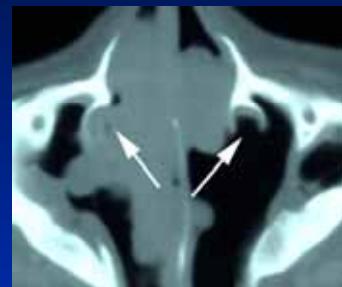
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# SINUS SURGERY COMPLICATIONS

## PROBLEM

- **Inability to Identify/Preserve Maxillary Ostium**
  - Inferior Uncinate Process Covers Ostium
  - Ostium not Visible After Removal of Uncinate
  - Transection of Nasolacrimal Duct
  - Postoperative Stenosis of Ostium
  - Circus Movement of Maxillary Secretions



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# SINUS SURGERY COMPLICATIONS

## RECOMMENDATIONS

- **Inability to Identify/Preserve Maxillary Ostium**
  - Remove Uncinate Posterior to Maxillary Line  
(consider fracturing anteriorly to establish insertion with seeker)
  - Use Air Bubbles or Probe to Find Ostium
  - Enlarge Ostium Posteriorly or Inferiorly
  - Connect Antrostomy Site to Natural Ostium to Prevent Circus Movement of Secretions

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# SINUS SURGERY COMPLICATIONS

## RECOMMENDATIONS

- **Inability to Identify/Preserve Sphenoid Ostium**
  - Remove all Mucosal Disease/Cells Obliterating Sphenoid Ostium
  - Utilize Critical Angles and Relationships to Identify Sphenoid Ostium (nasopharyngeal control, superior turbinate, nasal septum)
  - *PS, know where the location of the carotid artery and optic nerve prior to surgery.*

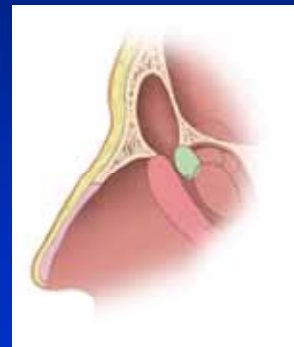
Mosher, 1902



# SINUS SURGERY COMPLICATIONS

## PROBLEM

- **Inability to Identify/Preserve Frontal Ostium**
  - Obstruction of Frontal Recess by Uncinate Process
  - Obstruction of Ostium by Agger Nasi and Frontal Recess Cells
  - Confusion of Supraorbital Ethmoid Ostium with Frontal Sinus Ostium
  - Penetration of Anterior Cranial Fossa



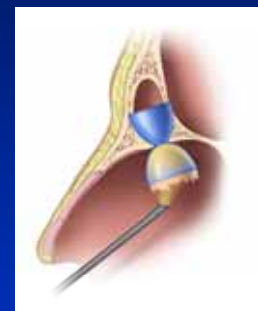
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# SINUS SURGERY COMPLICATIONS

## RECOMMENDATIONS

- **Inability to Identify/Preserve Frontal Ostium**
  - Complete Removal of Uncinate Process (medial to lateral, egg cap analogy)
  - Sequential Removal of Frontal Recess, Agger Nasi, Infundibular Cells (inferior to superior and posterior to anterior approach, ostial seeker)
  - Real Time Computer Guide Surgery
  - Minimal Surgery of the Frontal Ostium = *less is best*



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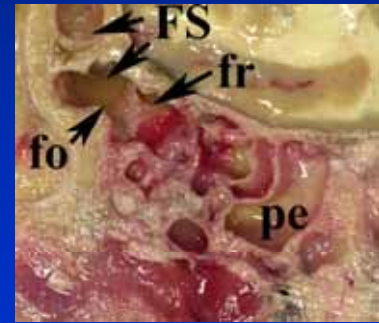
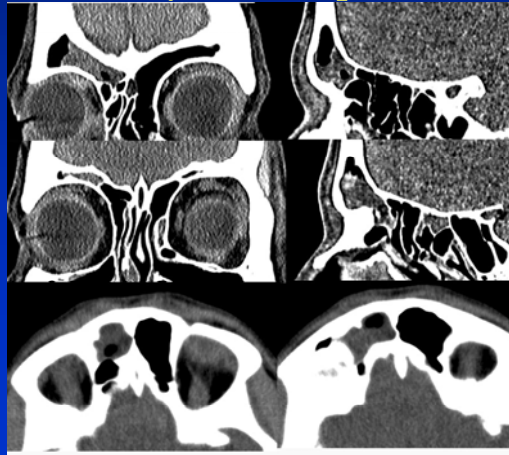




# SINUS SURGERY COMPLICATIONS

## RECOMMENDATIONS

- **Inability to Identify/Preserve Frontal Ostium**
  - Understand the Anatomy and Preoperative Planning



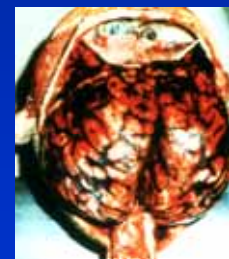
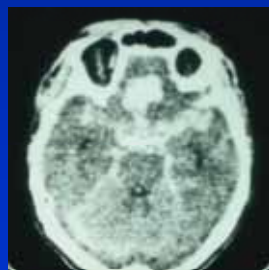
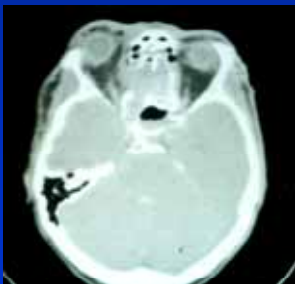
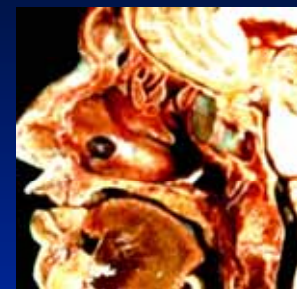
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# SINUS SURGERY COMPLICATIONS

## PROBLEM

- **Penetration of Roof of Ethmoid Sinus**
  - Penetration of Lateral Lamella of Cribriform Plate
  - Penetration of Frontal Bone



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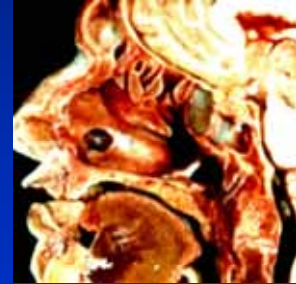




# SINUS SURGERY COMPLICATIONS

PREVENTION = apply the entire skill set

- **Penetration of Roof of Ethmoid Sinus**
  - Prevention of Intraoperative Hemorrhage
  - Avoid Confusion of Landmarks/Intranasal Distances
    - Utilize 0° Endoscope in A>P Approach for Inferior Ethmoidectomy, 30°, 45° Endoscope in P>A Approach for Superior Ethmoidectomy
    - Practice, Practice, Practice
  - Avoid Loss of Orientation
    - Middle Turbinate, Maxillary Ostium and Sphenoid Sinus are Critical Landmarks
    - Inferior Rotation of Instruments in A>P Approach, not Simply Advancement(60°>30°)
  - Avoid Myopic Surgery



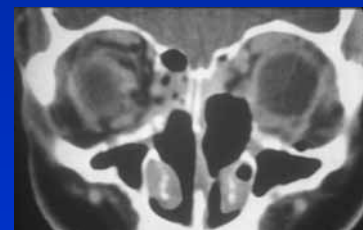
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# SINUS SURGERY COMPLICATIONS

PROBLEM

- **Orbital/Optic Nerve Injury**
  - **Orbital Penetration**
    - At Uncinate Process = Preseptal Injury
    - At Mid-ethmoid = Orbital Fat/Muscle Injury
    - Posterior Orbit = Optic Nerve/Muscle Injury



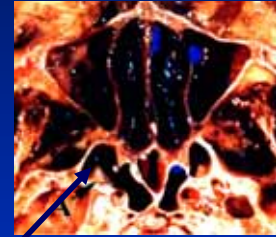
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# SINUS SURGERY COMPLICATIONS

## PROBLEM AND PREVENTION

- **Orbital/Optic Nerve Injury**
  - **Orbital Penetration**
    - At Uncinate Process = Beware of Narrowness of Anterior Ethmoid
    - At Mid-ethmoid = Use Lamina Papyracea as Landmark
    - Posterior Orbit = Use CT scan to Identify Onodi Cells/Variations in Ethmoid Pneumatization



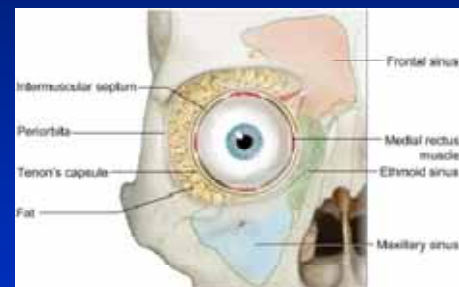
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# SINUS SURGERY COMPLICATIONS

## MECHANISM OF INJURY AND TREATMENT

- **Orbital/Optic Nerve Injury**
  - **Orbital Penetration**
    - **At Uncinate Process**
      - Preseptal Hemorrhage = Observation and ice to eye, Eye consult *prn*
    - At Mid-ethmoid through lamina papyracea



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# SINUS SURGERY COMPLICATIONS

## MECHANISM OF INJURY AND TREATMENT

- **Orbital/Optic Nerve Injury**
  - **Orbital Penetration**
    - **At Mid-ethmoid through lamina papyracea**
      - **Orbital Hemorrhage**
        - **Orbital Fat and Vessel Injury**
      - **EOM Injury**
      - **Orbital Hemorrhage without Penetration**
      - **Optic Nerve Injury**



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# SINUS SURGERY COMPLICATIONS

## MECHANISM OF INJURY AND TREATMENT

- **Orbital/Optic Nerve Injury**
  - **Orbital Penetration**
    - **At Mid-ethmoid through lamina papyracea**
      - **Orbital Hemorrhage**
        - **Orbital Fat and Vessel Injury**
      - **EOM Injury**
        - **Forced Duction Test**
      - **Orbital Hemorrhage without Penetration**
      - **Optic Nerve Injury**



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# SINUS SURGERY COMPLICATIONS

## MECHANISM OF INJURY AND TREATMENT

- **Orbital/Optic Nerve Injury**
  - **Orbital Penetration**
    - **At Mid-ethmoid through lamina papyracea**
      - **Orbital Hemorrhage**
        - **Orbital Fat and Vessel Injury**
      - **EOM Injury**
      - **Orbital Hemorrhage without Penetration**
        - **Transection Ethmoidal Arteries**
        - **Debrider Aspiration**
    - **Optic Nerve Injury**



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# SINUS SURGERY COMPLICATIONS

## MECHANISM OF INJURY AND TREATMENT

- **Orbital/Optic Nerve Injury**
  - **Orbital Injury**
    - **Treatment of Hemorrhage with Increased Intraocular pressure > 20 ml Hg =**
      - **↑ venous pressure**
      - **Medial Decompression**
      - **Lateral Canthotomy**
      - **Lynch Orbitomy**
      - **Diamox, Mannitol, Orbital Massage**



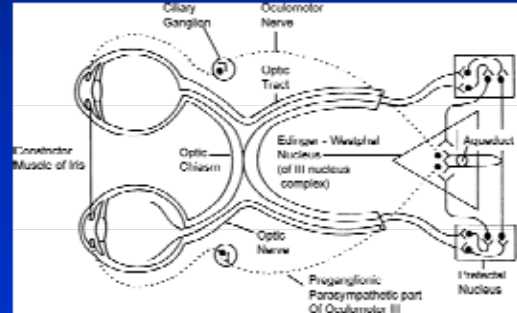
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# SINUS SURGERY COMPLICATIONS

## MECHANISM OF INJURY AND TREATMENT

- **Orbital/Optic Nerve Injury**
  - **Optic Nerve Injury**
    - **Intraoperative Evaluation**
      - Pupillary Size, anesthetic considerations
      - Pupillary Reflex, Marcus-Gunn pupil, Swinging-flashlight test, Afferent Pupillary defect



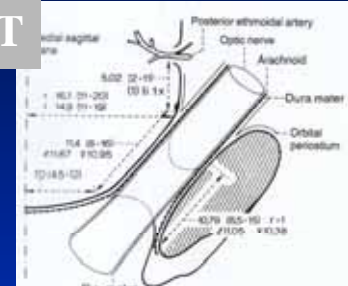
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# SINUS SURGERY COMPLICATIONS

## MECHANISM OF INJURY AND TREATMENT

- **Orbital/Optic Nerve Injury**
  - **Optic Nerve Injury**
    - **“Timing is Everything” for potential recovery of vision**



Sofferman, Warner, Kountakis, Guyer, Knox, Luxenberg	Multiple approaches and timing, variable results
Levin, Int. Optic Nerve Trauma Study Group, N=133, Multiple Variables	32% surgery, 57% untreated, 52% steroids ↑visual acuity, p=0.22 within 7 days of injury
Rajiniganth, N=44 when vision unchanged or ↓ after steroid, compression by CT	70% ↑visual acuity with surgery < 7 days, 24% with surgery > 7 days

# SINUS SURGERY COMPLICATIONS

## CONCLUSIONS

- **Intraoperative Hemorrhage**
- **Loss of Orientation**
- **Inability to Identify/Preserve Maxillary Ostium**
- **Inability to Identify/Preserve Sphenoid Ostium**
- **Inability to Identify/Preserve Frontal Ostium**
- **Penetration of Roof of Ethmoid**
- **Orbital Injury/Optic Nerve Injury**

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