PREVENTION (MINIMIZING) COMPLICATIONS IN ENDOSCOPIC SINUS SURGERY

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SINUS SURGERY COMPLICATIONS

- 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
**SINUS SURGERY COMPLICATIONS**

**PROBLEM**

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

- 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
**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°>30°)

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**SINUS SURGERY COMPLICATIONS**

**RECOMMENDATIONS**

- **Loss of Orientation**
- **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
**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

**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
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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- 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.
**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

**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*
**SINUS SURGERY COMPLICATIONS**

**RECOMMENDATIONS**

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

**PROBLEM**

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

**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
**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**
  - **Orbital Hemorrhage without Penetration**
  - **Forced Duction Test**
  - **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

Orbital/Optic Nerve Injury
Orbital Injury
- Treatment of Hemorrhage with Increased Intraocular pressure
  > 20 ml Hg =
  \[ \text{\uparrow venous pressure} \]
  - Medial Decompression
  - Lateral Canthotomy
  - Lynch Orbitomy
  - Diamox, Manitol, Orbital Message

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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

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

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