

Anterior Skull Base and Sinonasal Tumors

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Introduction

- Endoscopic surgery redefined “resectability”
- Expanded endonasal approaches mainstay for resection of sinonasal tumors

Trans-ethmoidal Trans-cribriform Trans-maxillary



- Imaging paramount pre-op planning

Expanded Endonasal Approach (EEA)

- Endoscopic resectability determined by
 - Histology (differential diagnosis)
 - Location
 - Extent of tumor
 - Safe approach
 - » Structures encountered between endoscope and tumor
 - » Anatomic/surgical landmarks

Learning Objectives

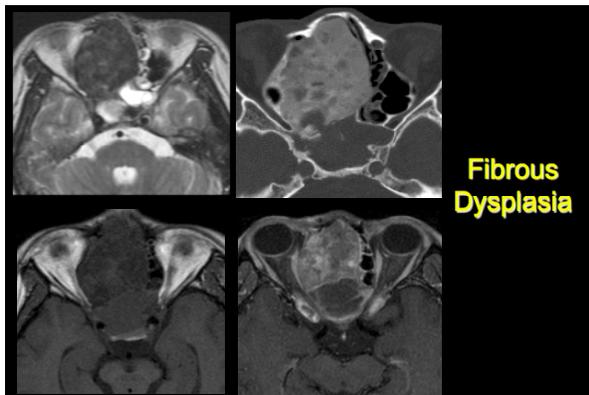
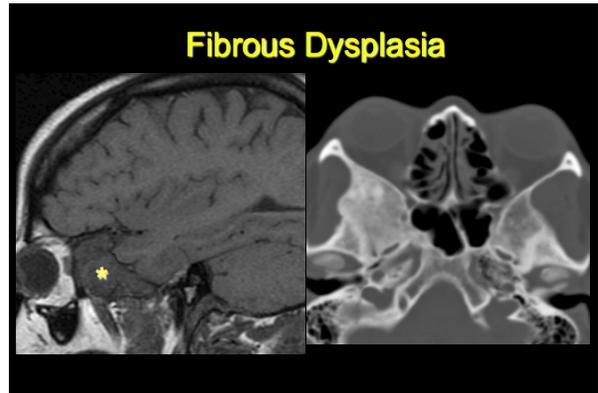
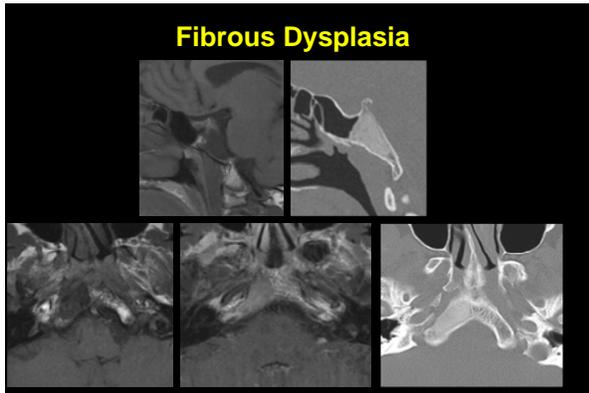
- Evaluate radiologic patterns of sinonasal neoplasia
- Discuss surgical landmarks
 - Endoscopic resection only
 - Endoscopic + open resection
 - Unresectable
- Illustrate complimentary roles CT & MRI
 - Determining surgical candidacy
 - Emphasis on necessary radiologic reporting

Value of CT

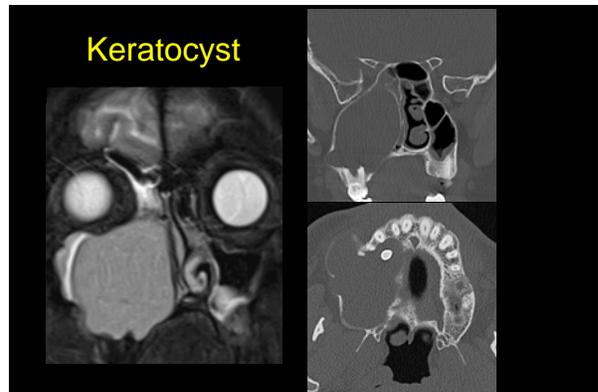
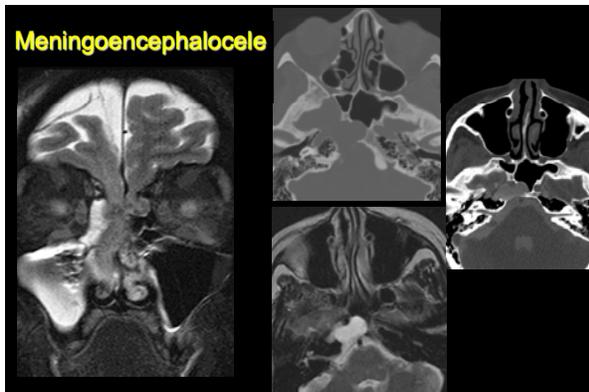
- Lesion characterization:
 - “Mimics” of sinonasal neoplasia
 - Bone destruction
 - Periosteal reaction
 - Identify matrix: bone, cartilage
- Integrity of osseous skull base
- Anatomy, anatomic variants

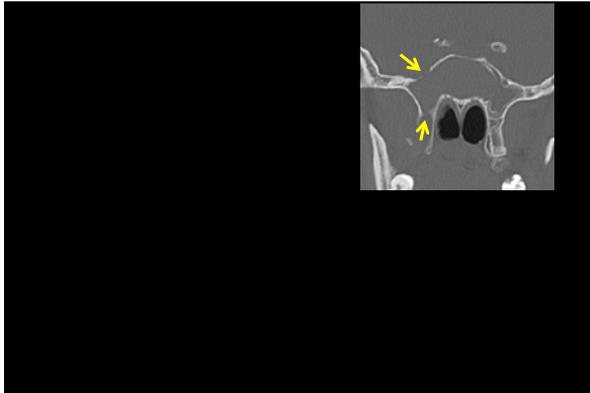
Mimics of Sinonasal Tumors

- Fibrous dysplasia
 - Common incidental finding on MRIs
 - Misinterpreted as tumor
 - CT diagnostic



- Mimics of Sinonasal Tumors**
- Meningoencephaloceles
 - Odontogenic lesions
 - Fungus

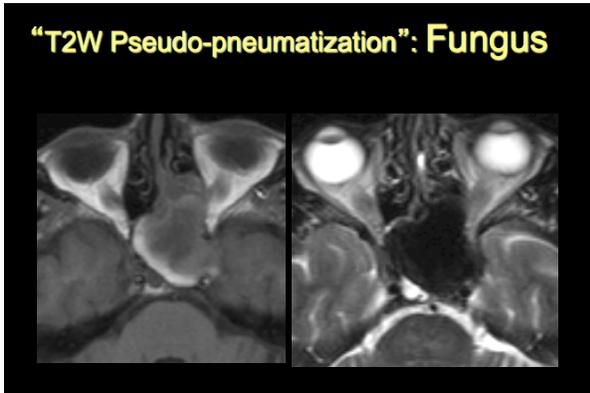




Fungus

- High [Protein]
- Hyphae
- Iron
 - Variable T1W signal
 - **Dark T2W**

Mimic aerated sinus
"Pseudo-pneumatization"

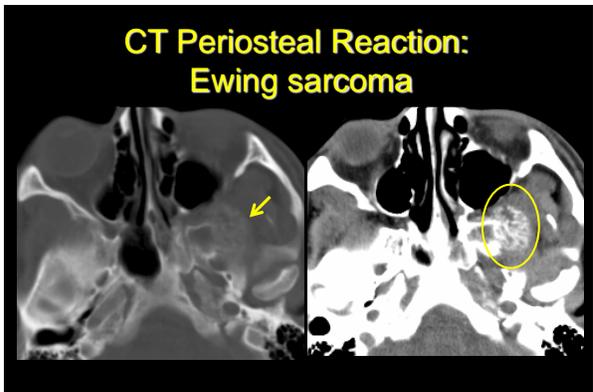
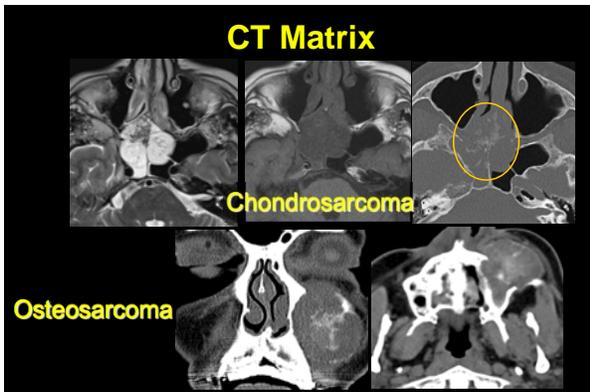


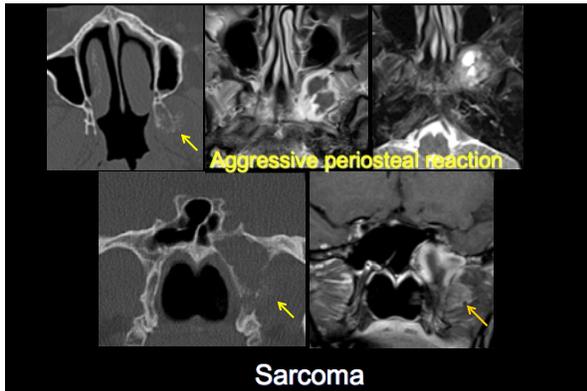
CT: Lesion Characterization

- Expansion
- Smooth remodeling
- Permeative
- Destructive

Schwannoma

Spindle cell carcinoma





Value of MRI

- Sinonasal secretions vs tumor
- Invasion skull base
 - Marrow
 - » T1-hypointensity, enhancement
 - Foraminal extension
 - » Direct, perineural
- Intracranial extension

MRI of Sinus Secretions

- Secretions - no solid enhancement
- Signal intensity multifactorial
 - [Protein]
 - Extent mobile water protons
 - Viscosity
 - Cross-linking of glycoproteins

MRI of Sinus Secretions

- Fluid low [protein] <10% & high H₂O
 - **Bright T2W, Dark T1W-C**
- Proteinaceous secretions [Protein] > 20%
 - **Bright or dark on T2W**
 - **Bright T1W-C**

Inverting Papilloma with SCCA



Enhanced T1W

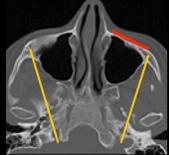
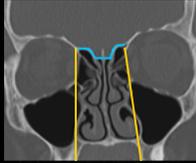
Unenhanced T1W

Sinonasal Tumors Surgeon's Decisions Neuroradiologist's Guidance

- Endoscopic resection only
- Endoscopic + open procedure
 - Anterior craniofacial
 - Maxillectomy
 - Orbital exenteration
- Unresectable
 - Radiation, chemoradiation
 - Then reassess surgical candidacy

Surgical Landmarks for EEA

- Frontal sinus - roof of orbits
- Facial soft tissues
- Orbit
- Intracranial compartment
- Neurovascular structures
- Lateral skull base
 - Foramen ovale
- **Skull base reconstruction**
 - Free grafts, Nasoseptal flaps
 - » Harvested before resection



Contraindications for EEA

- Intracranial invasion
 - Brain
 - Superior/lateral cavernous sinus
 - Optic canal
- Tumor extending lateral to foramen ovale
- Inability to reconstruct skull base defect

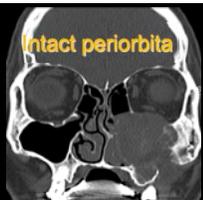
Relative contraindications

- Tumor frontal sinus extending over orbital roof
- Orbital invasion

Orbital Extension

Focal Orbitotomy

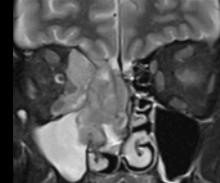
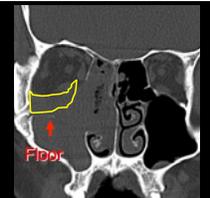
- Periorbita
 - Orbital bone
 - Periosteum
- Focal extra-conal



Orbital Invasion

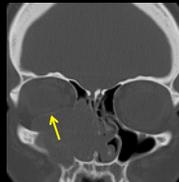
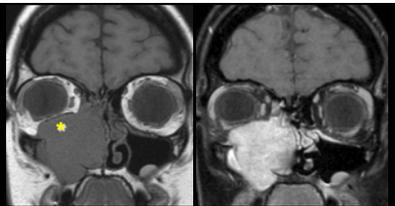
Orbital exenteration

- Extensive extra-conal
- Conal
- Intra-conal



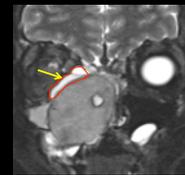
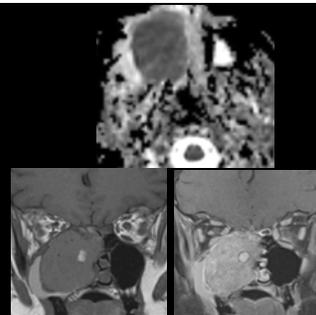
Carcinoma

Negative Orbit



Plasmacytoma

Negative orbit



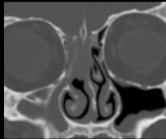
Intracranial Extension

- Integrity of the osseous skull base
- Focal dural invasion
 - Resection EEA
 - Histology
 - Esthesioneuroblastoma
 - Low grade sarcomas
 - EEA + anterior craniofacial resection
 - Histology
 - Squamous cell carcinoma
 - Endocrine carcinoma
 - Poorly differentiated carcinomas
 - Melanoma
- Brain invasion - Nonresectable

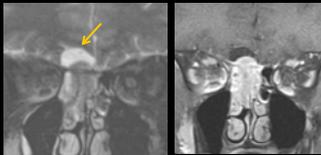
Integrity of the Osseous Skull Base



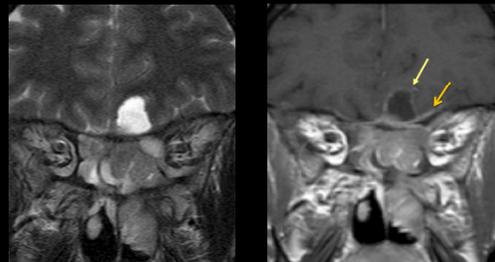
Esthesioneuroblastoma – focal dural tumor



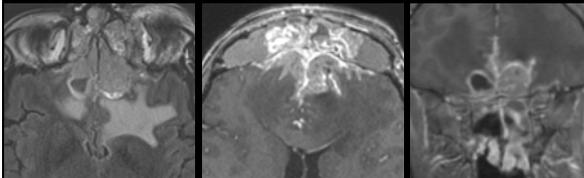
Characteristic intracranial cyst



Esthesio Intracranial dural and pial invasion

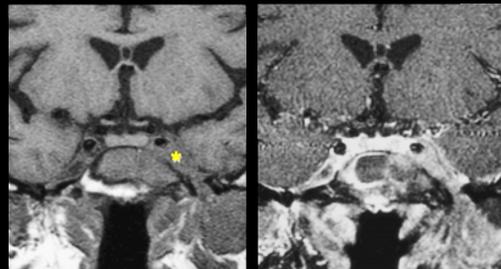


Esthesio – brain invasion



Unresectable

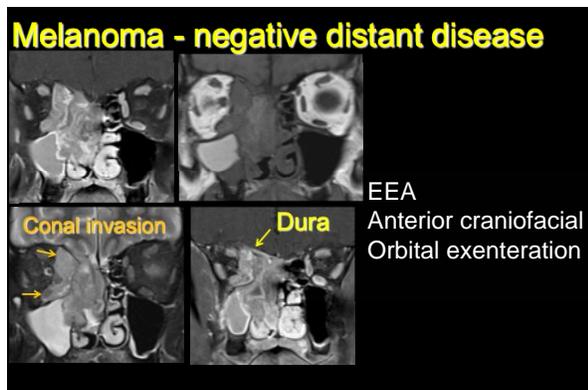
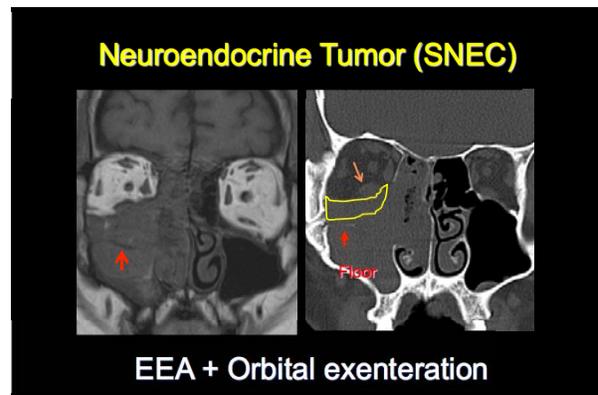
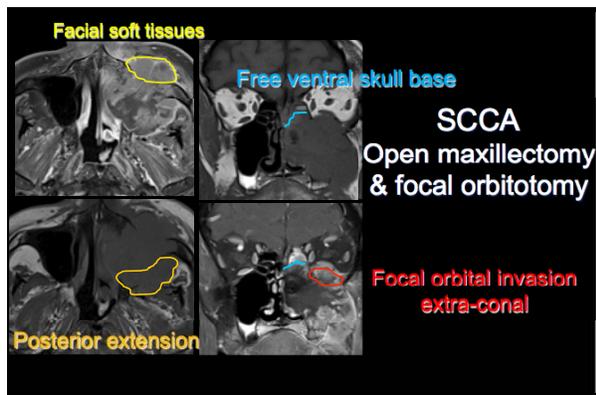
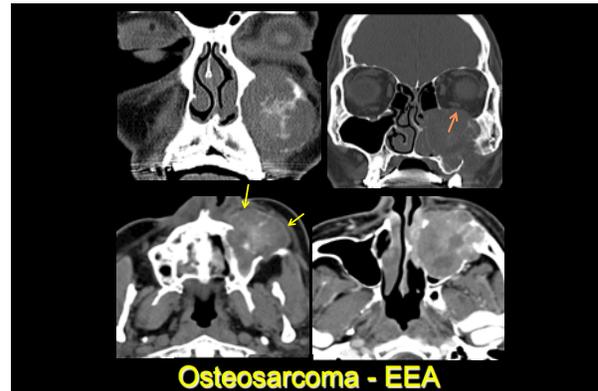
Cavernous Sinus Invasion



Unresectable

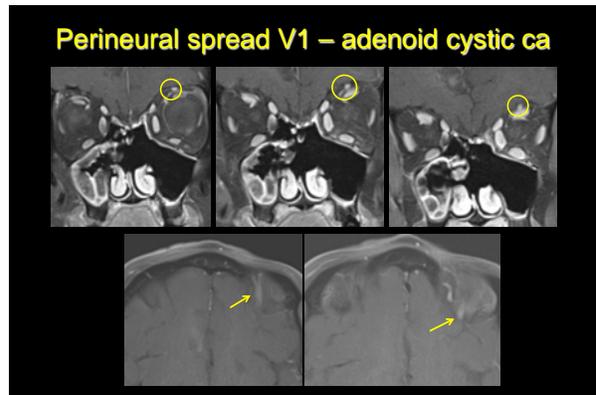
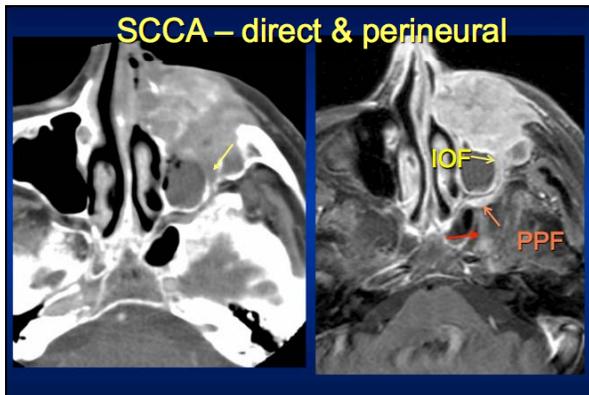
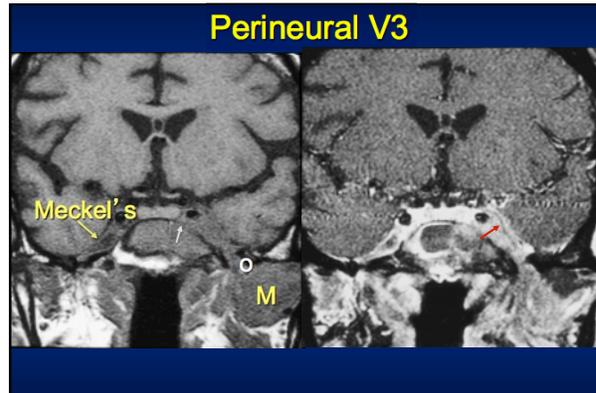
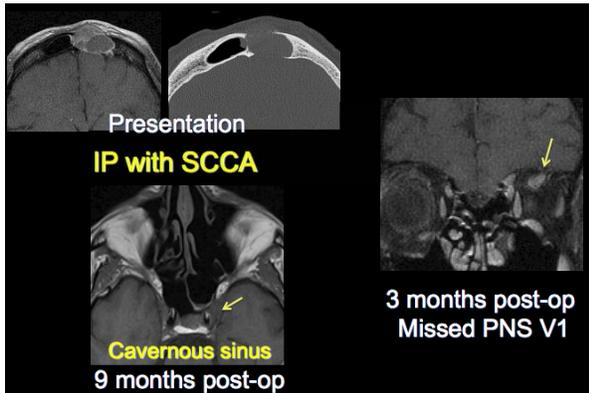
Endoscopic Resection Only

- Confined to sinonasal cavity
- No significant lateral extension in frontal sinus over orbital roof
- No or mild focal dural invasion
- No brain invasion
- No or minimal orbital invasion
 - Focal extra-conal fat



A Few Words on Trigeminal Perineural Spread

- Often not considered by neuroradiologist
- It is not uncommon
- Surgeon must know
 - If intracranial spread to cavernous sinus or Meckel's cave
 - » Not a surgical candidate
 - If perineural extra-cranial
 - » Drill down involved foramen to the skull base
 - » Post-op XRT



- Summary: Take Home Points**
- Expanded endonasal approach based on
 - Histology
 - Location
 - Anatomy and extent of disease
 - Radiology reporting: CT and MRI
 - Differential Diagnosis
 - Extra-sinus spread
 - Orbit
 - Intracranial
 - Anatomy to help determine approach