

# Orbital Considerations in Sinonasal Malignancy

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Grand Rounds

June 8, 2016

# Outline

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- Anatomy
- Epidemiology
- Presentation
- Pathology
- Orbital Invasion
- Evaluation
- Management
- Sequela
- Disease-specific management
- Research

# Outline

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- **Anatomy**

- **Sinus/Orbit**

- Epidemiology
    - Presentation
    - Pathology
    - Orbital Invasion
    - Evaluation
    - Management
    - Sequela
    - Disease-specific management
    - Research

# Anatomy

{ Sinonasal }

Superior  
Turbinate

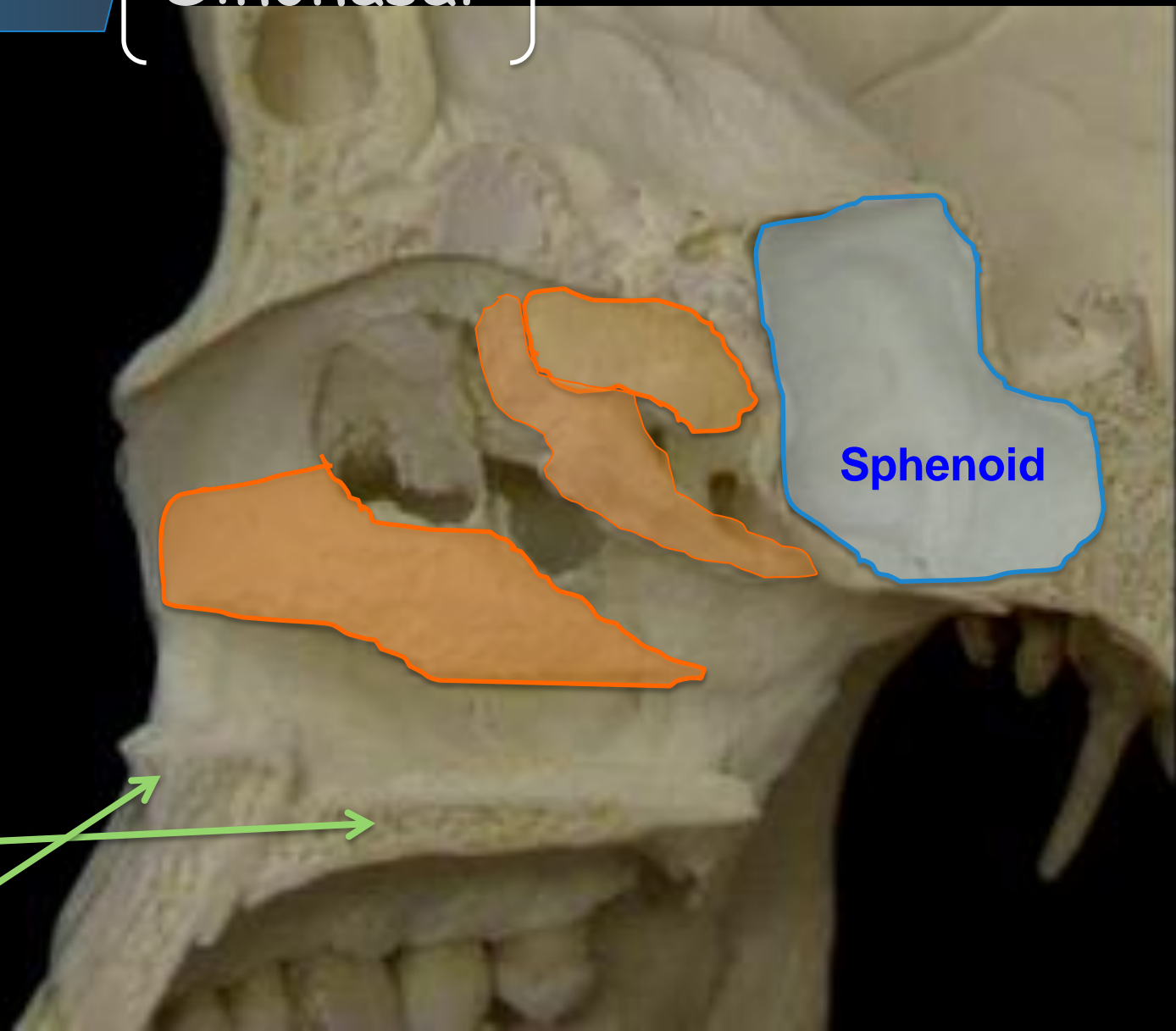
Middle  
Turbinate

Inferior  
Turbinate

Hard Palate

Nasal Spine

Sphenoid



# Anatomy

{ Sinonasal }

Lateral Nasal  
Sidewall



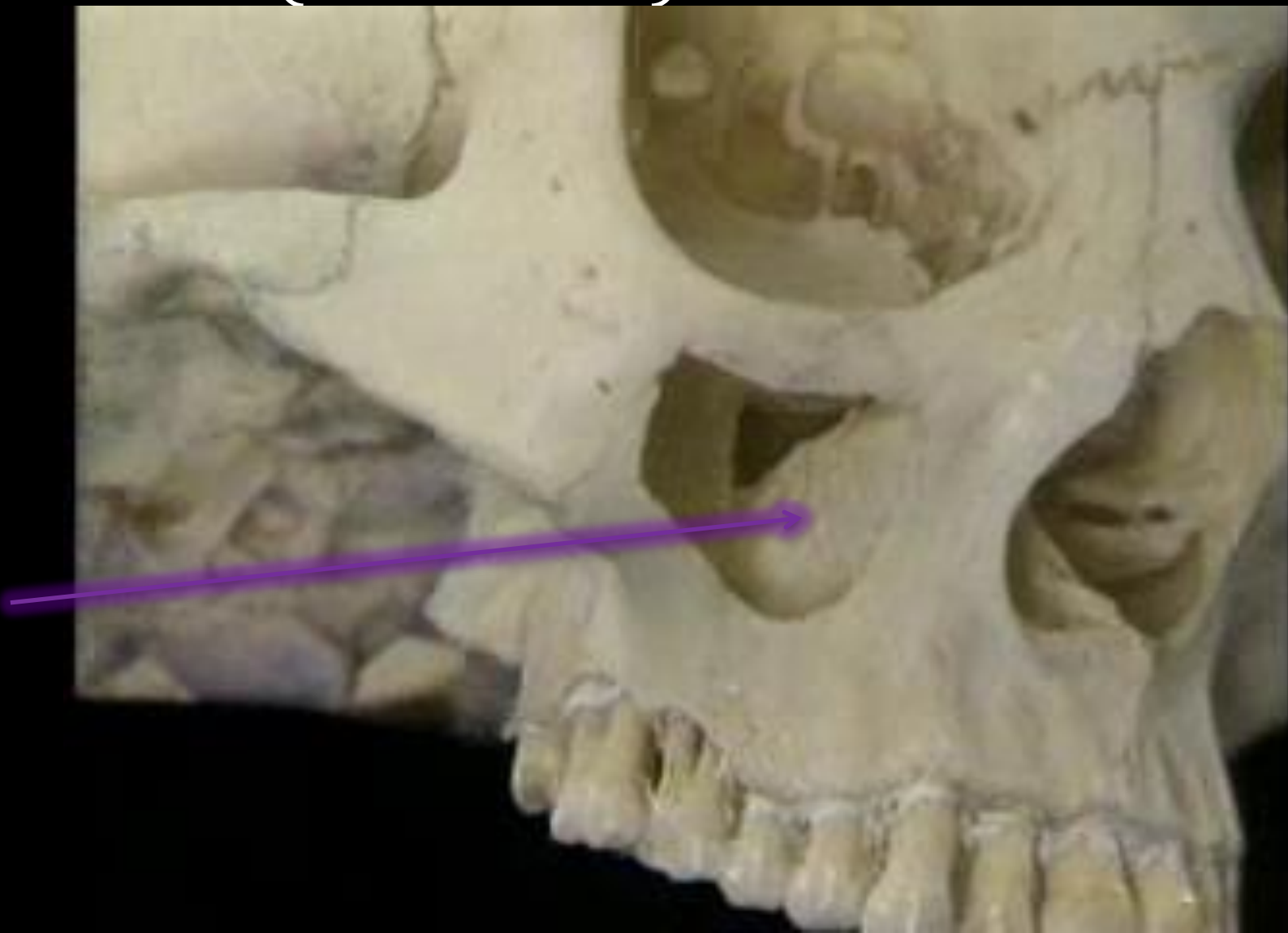
# Anatomy

{ Sinonasal }

Lateral  
Nasal  
Sidewall



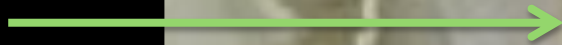
Medial  
Wall of  
Maxillary  
Sinus



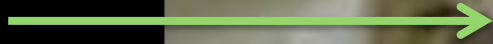
# Anatomy

{ Sinonasal }

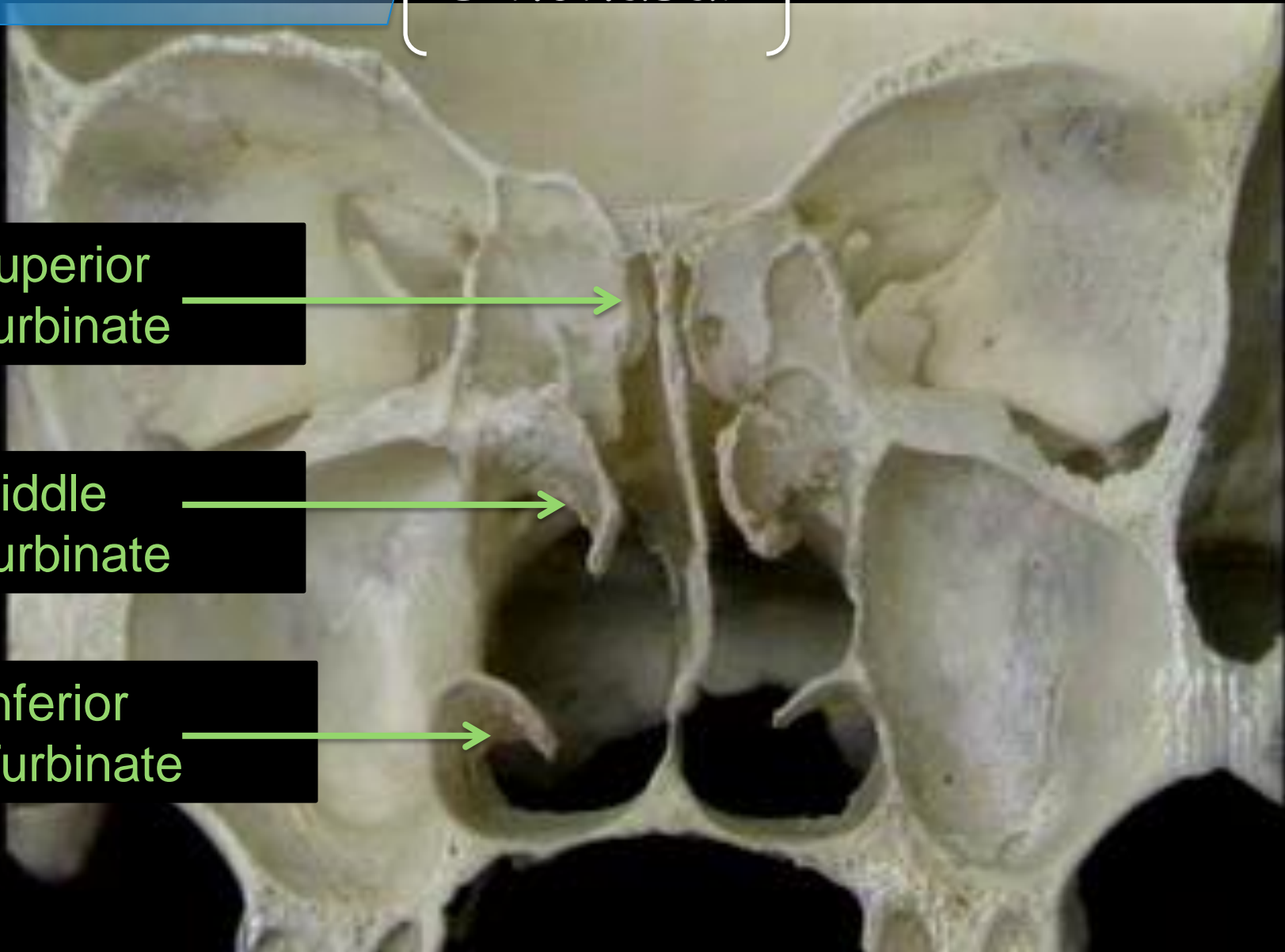
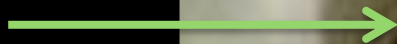
Superior  
Turbinates



Middle  
Turbinates



Inferior  
Turbinates

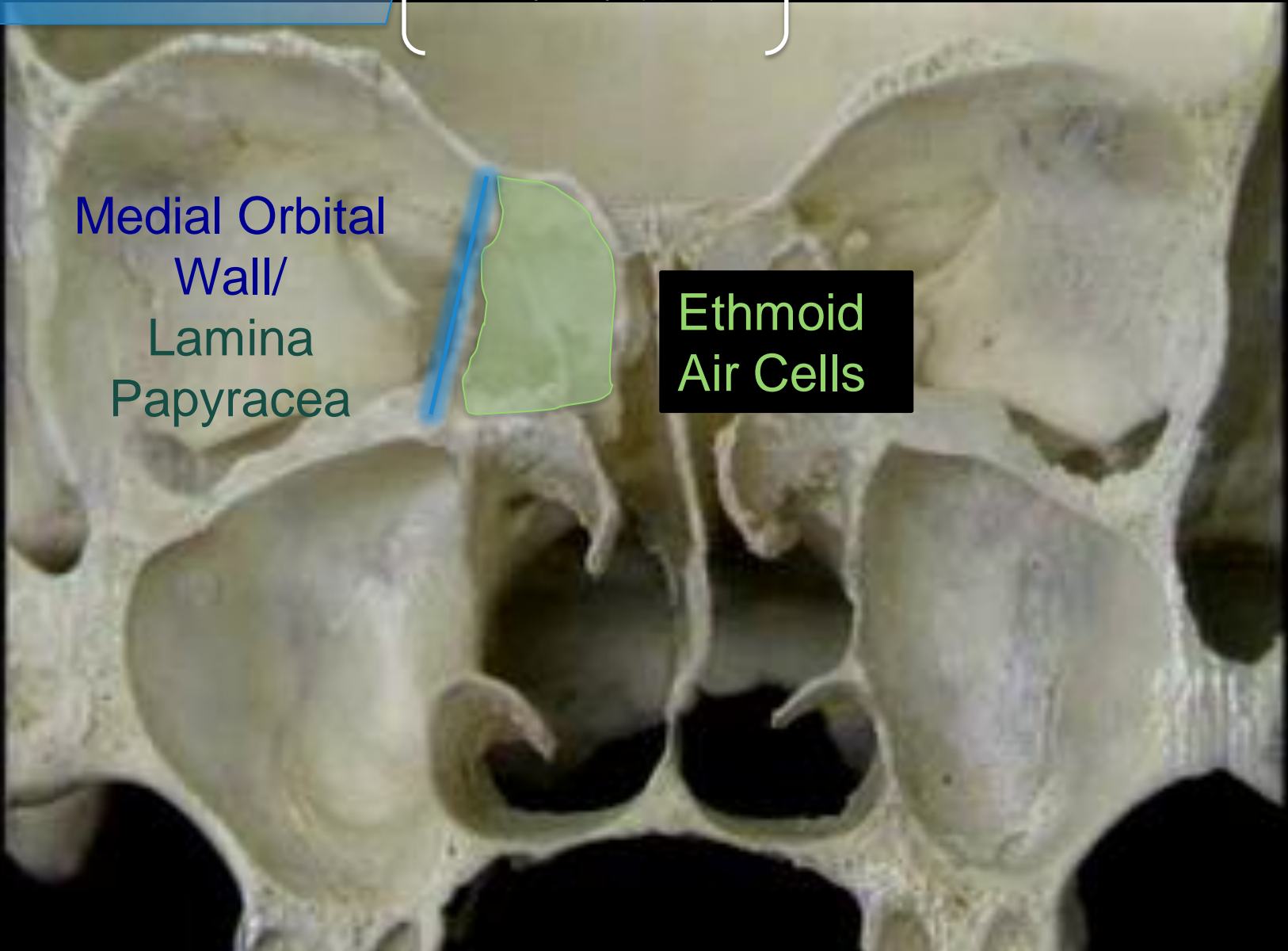


# Anatomy

## { Sinonasal }

Medial Orbital  
Wall/  
Lamina  
Papyracea

Ethmoid  
Air Cells





# Anatomy

## Sinonasal

Lamina  
Papyracea  
a



# Anatomy

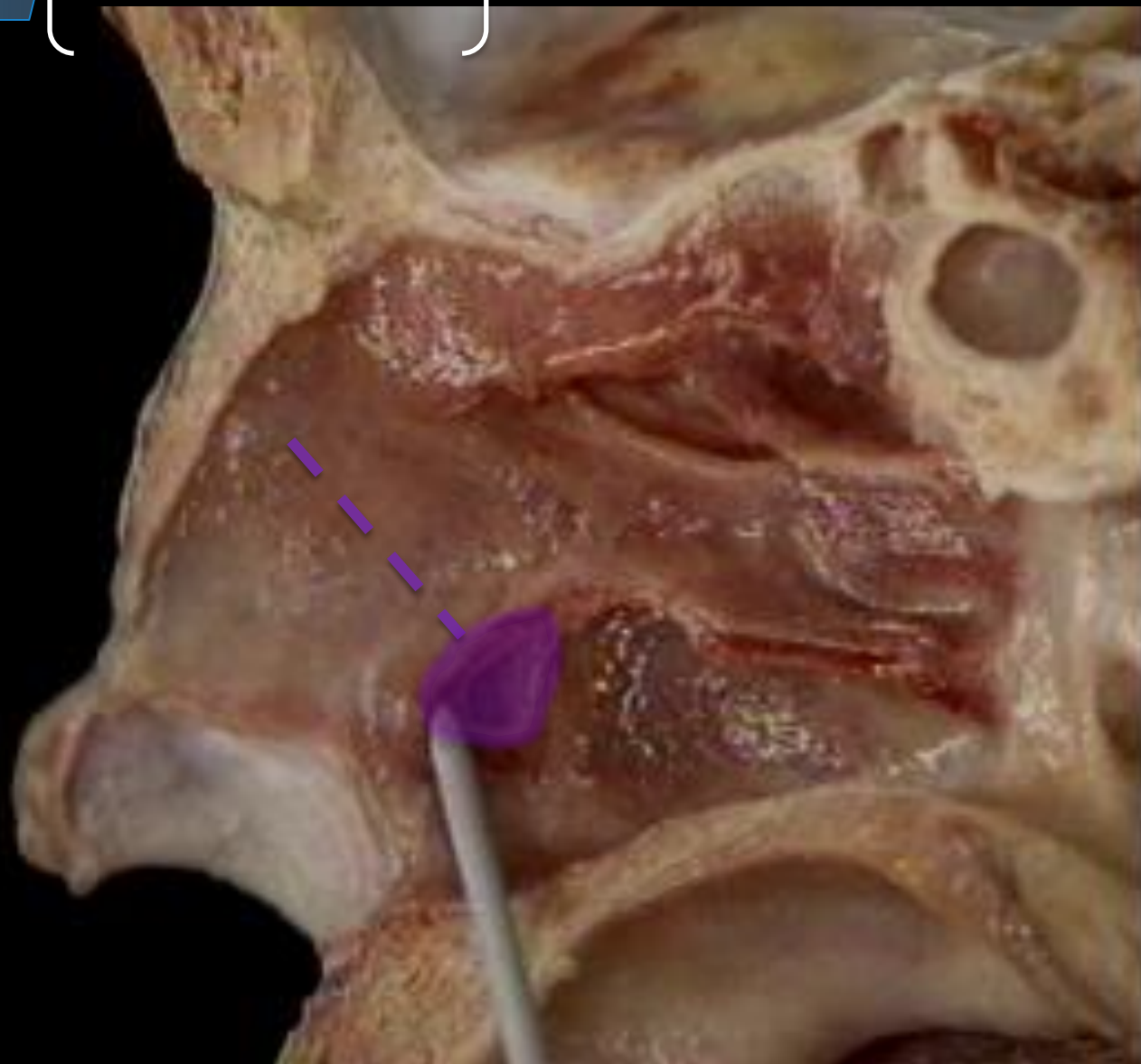
## Orbit

Lacrimal  
Fossa



# Anatomy

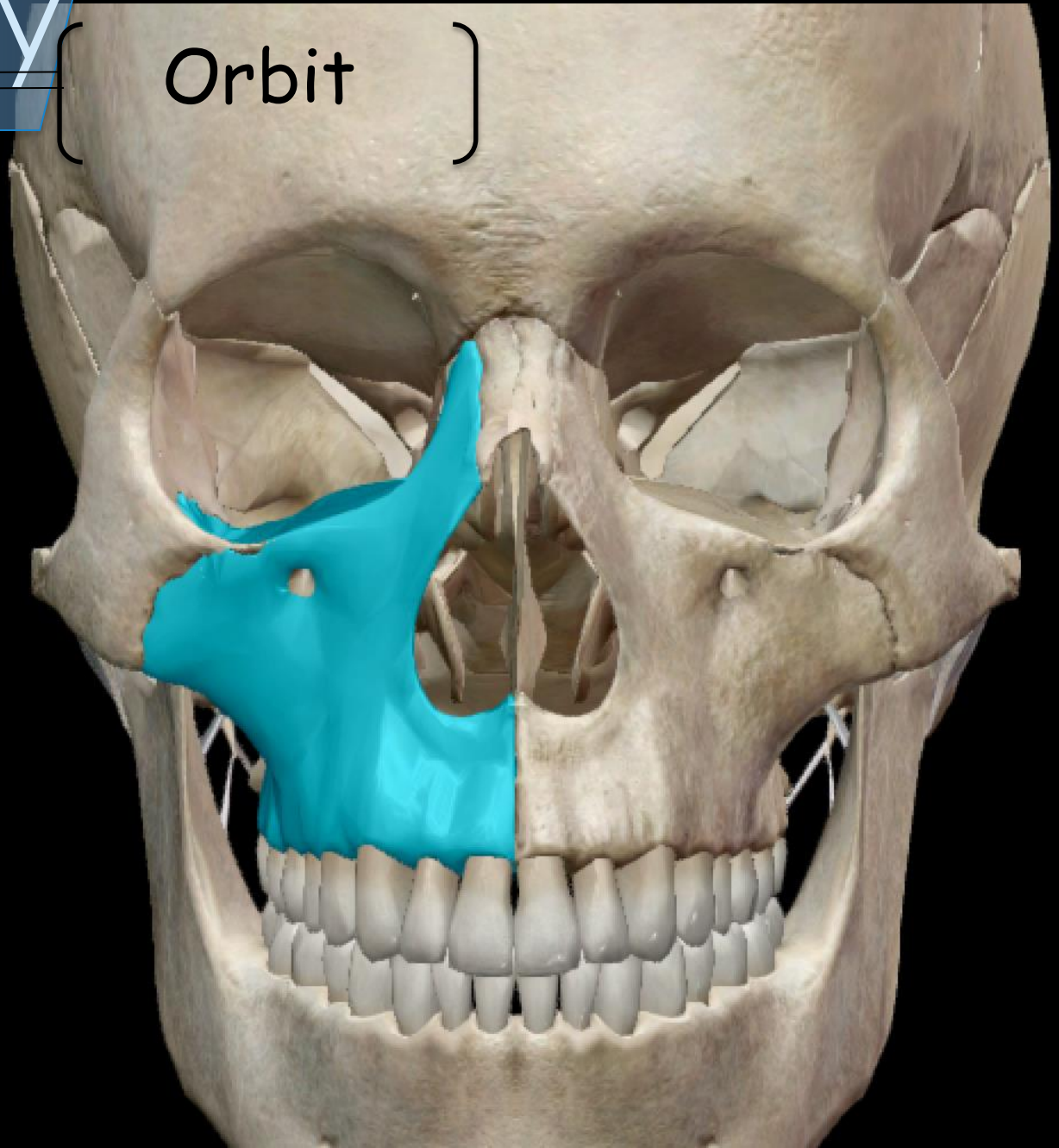
## Orbit



# Anatomy

[ Orbit ]

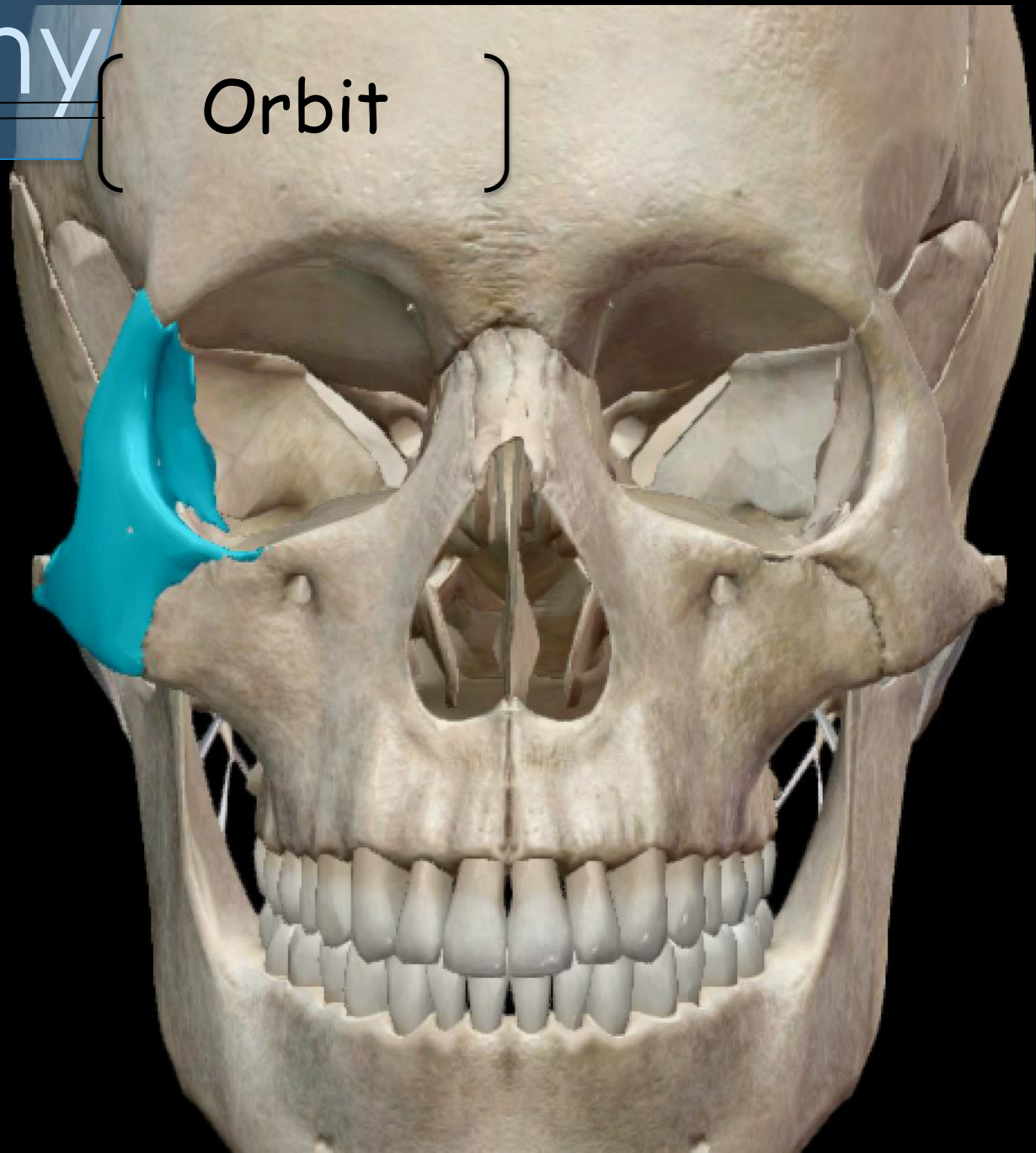
Maxillary



# Anatomy

[ Orbit ]

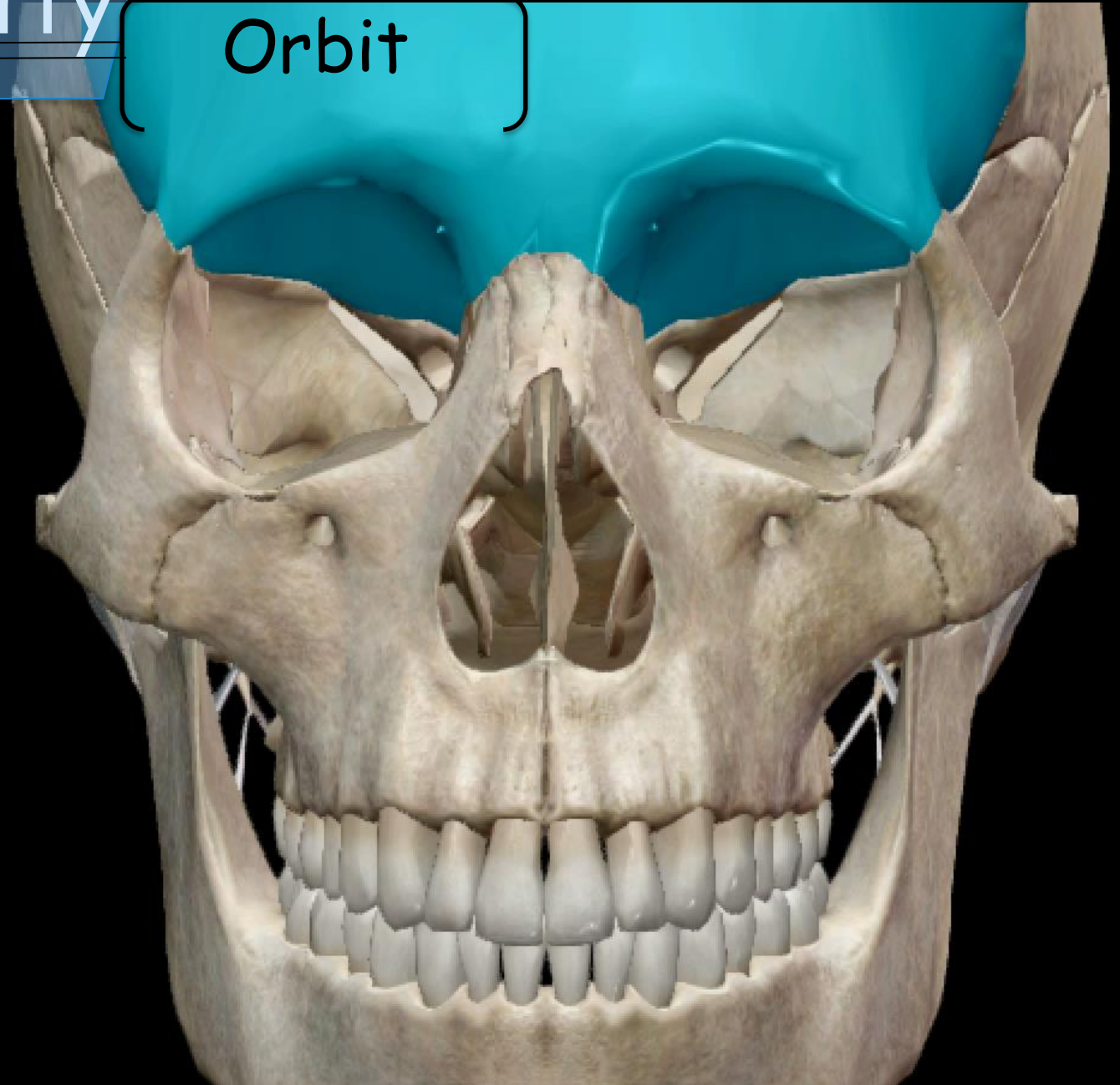
Zygomamatic



# Anatomy

Orbit

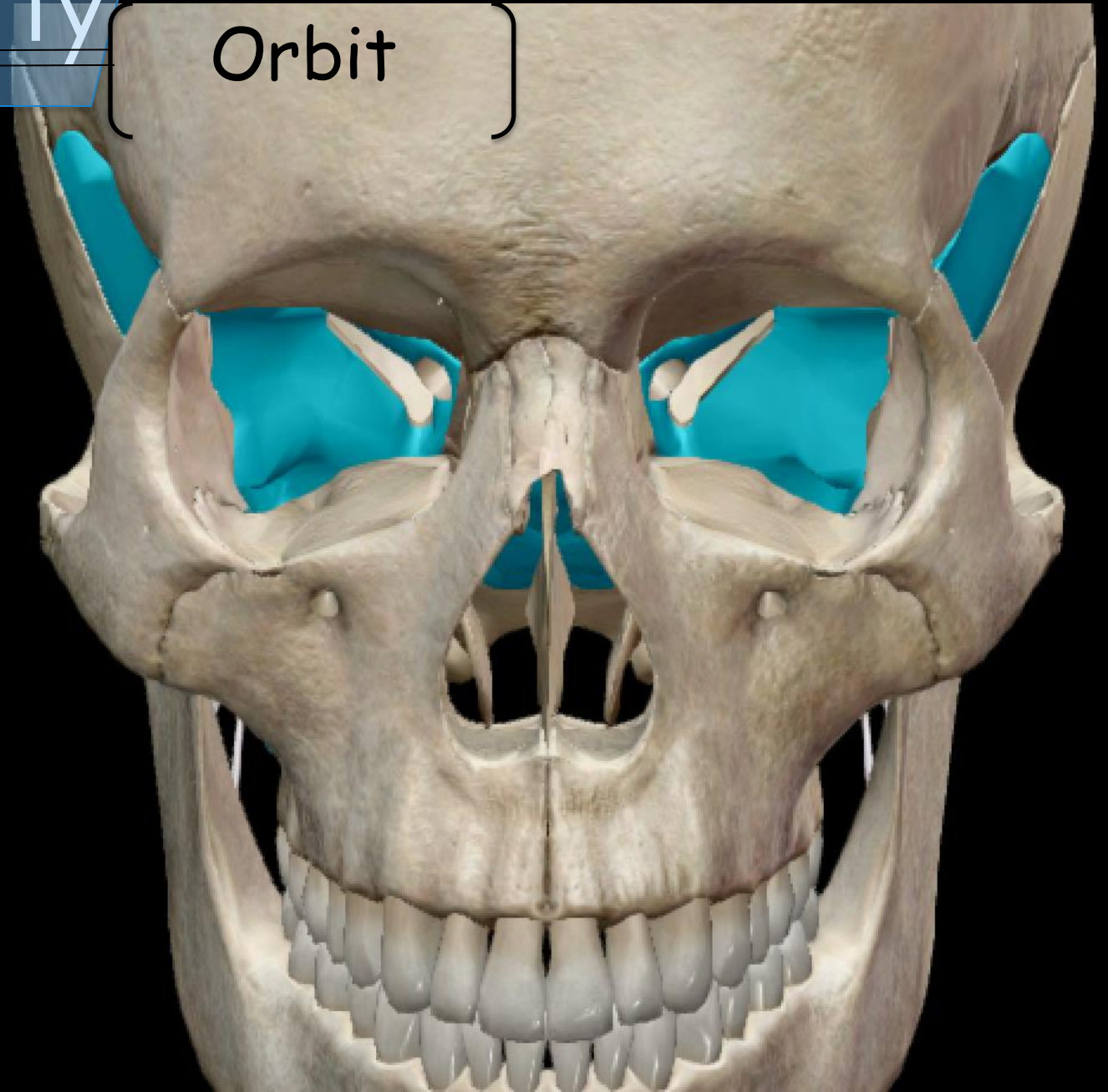
Frontal



# Anatomy

Orbit

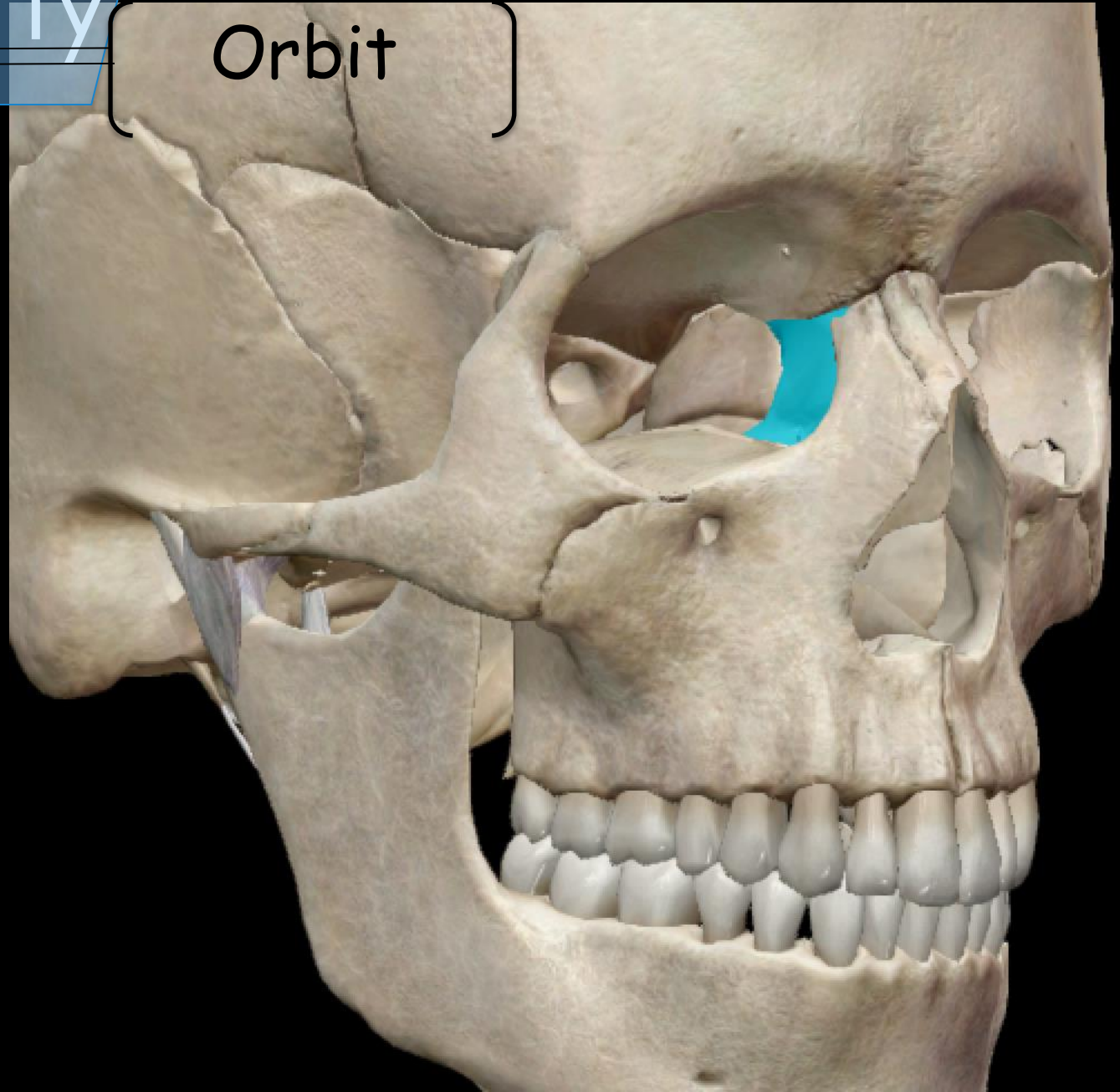
Sphenoid



# Anatomy

Orbit

Lacrimal

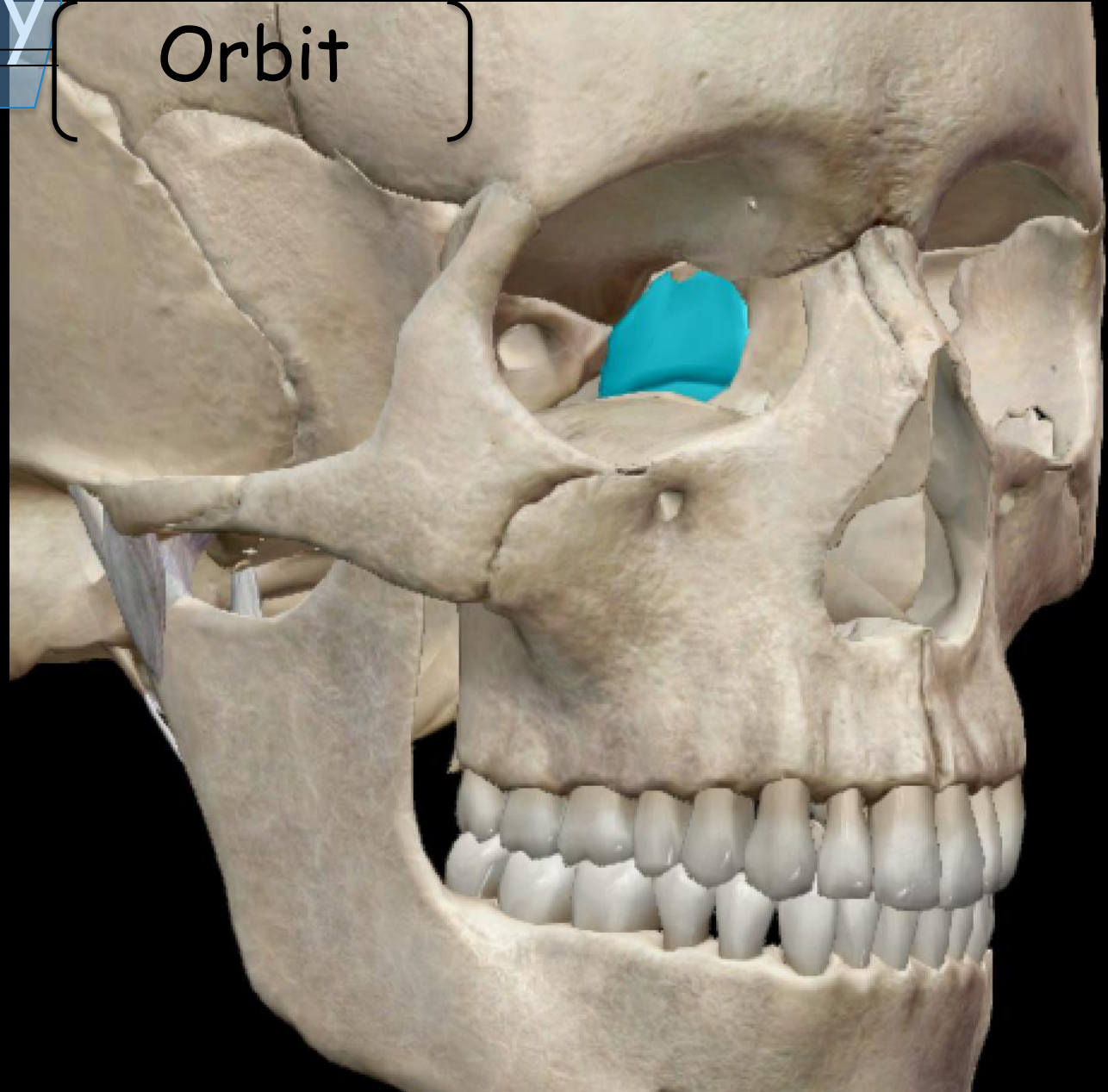




# Anatomy

Orbit

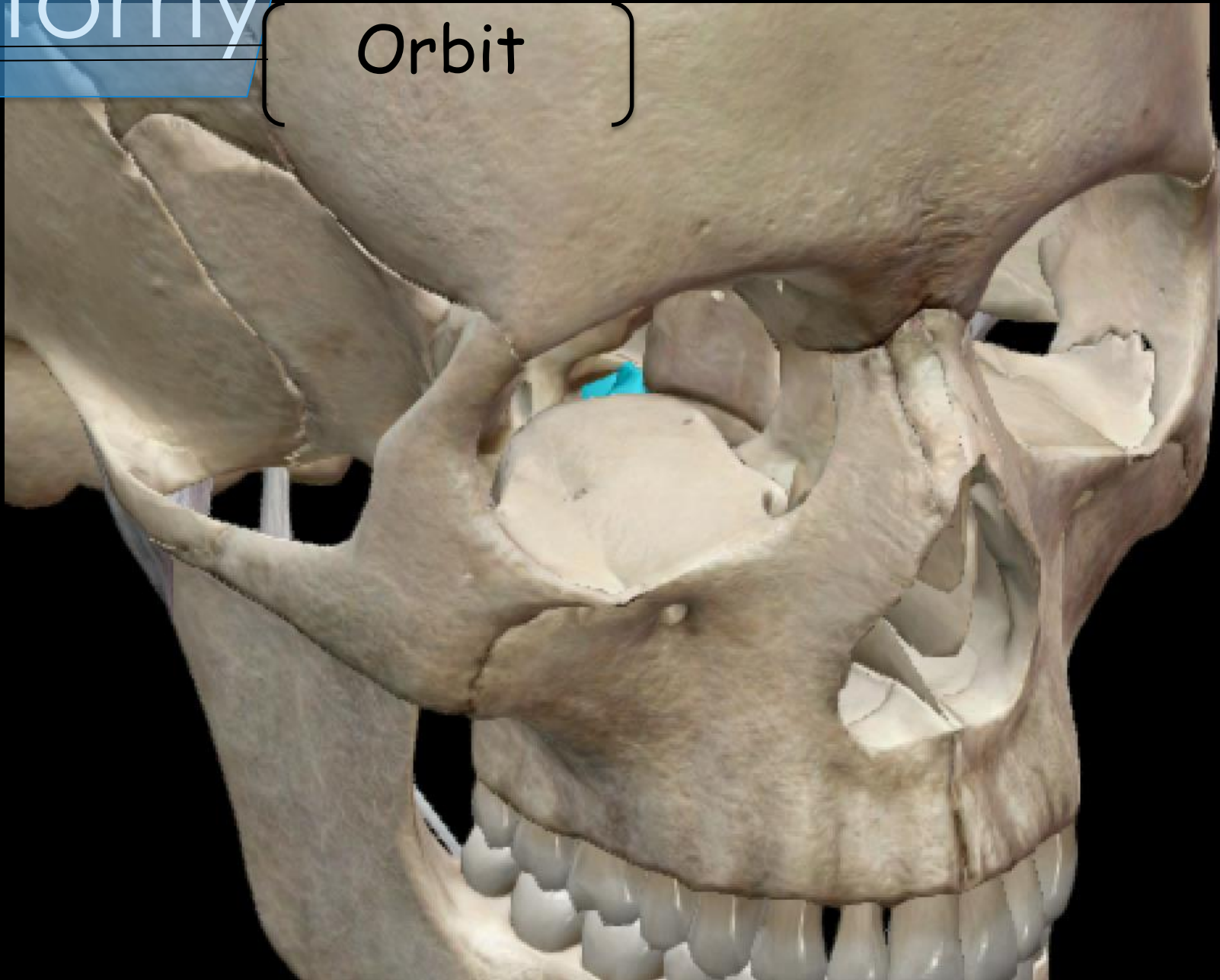
Ethmoid



# Anatomy

Orbit

Palatine



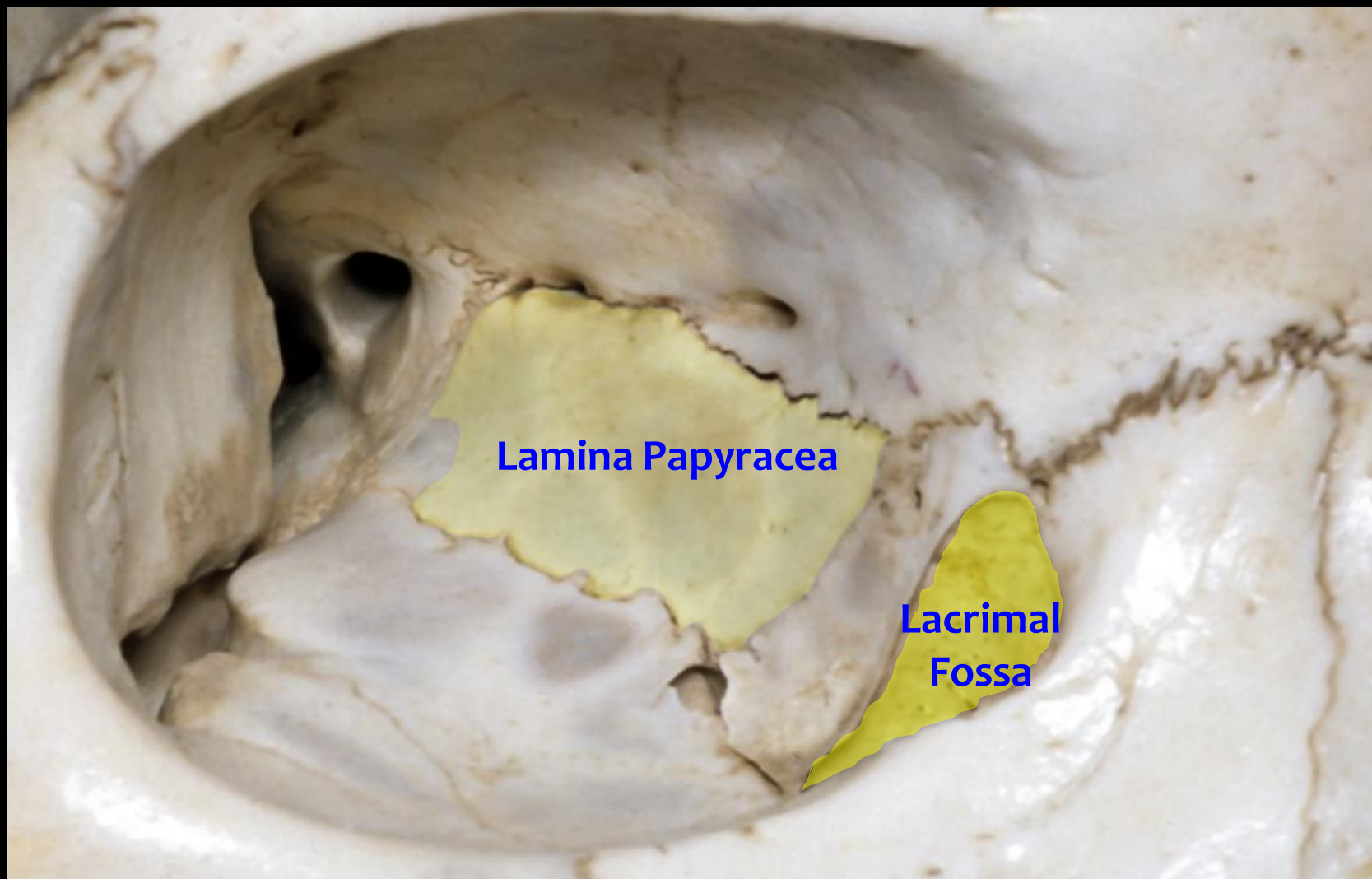
# Anatomy

## [ Orbit ]



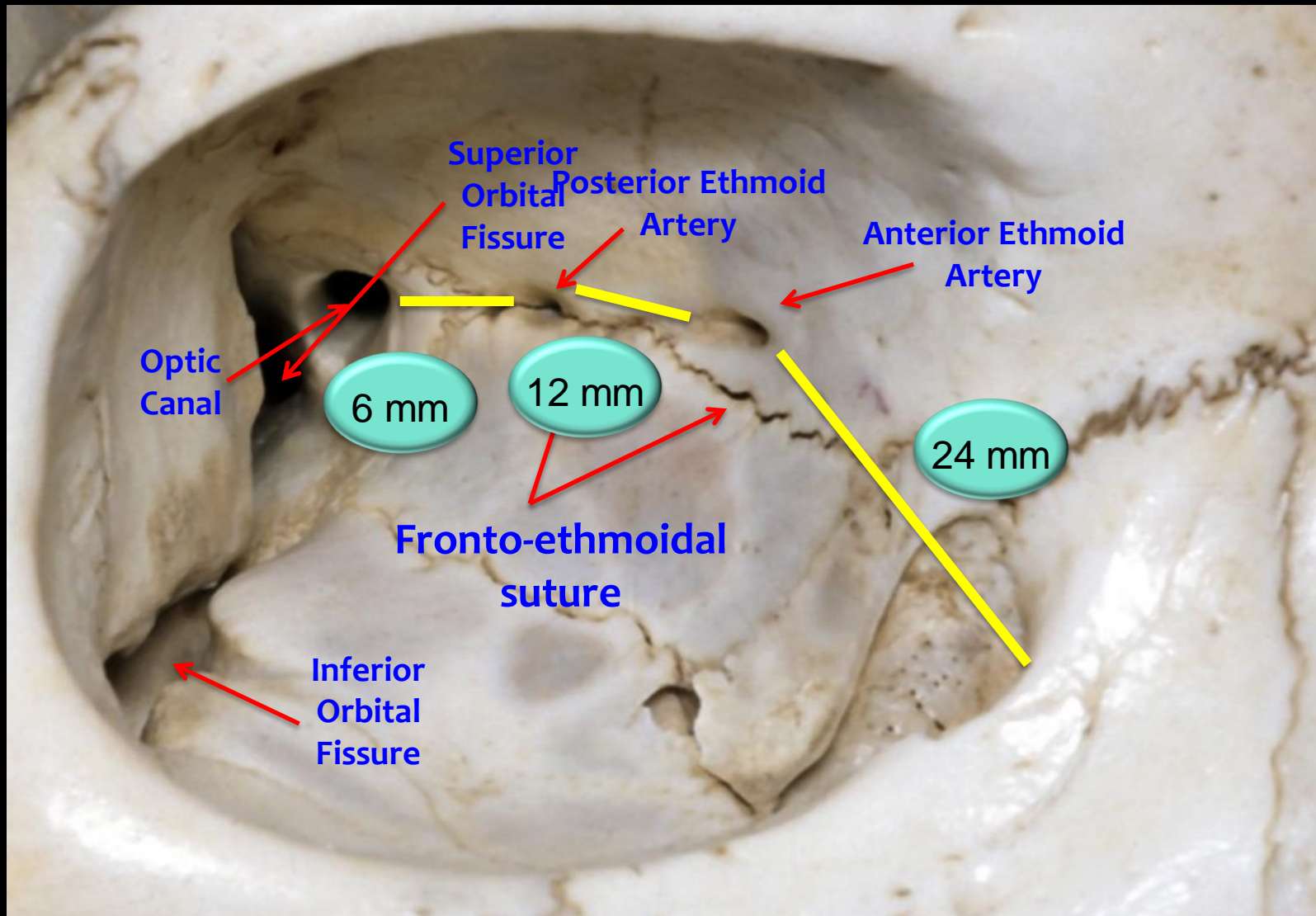
# Anatomy

## Orbit



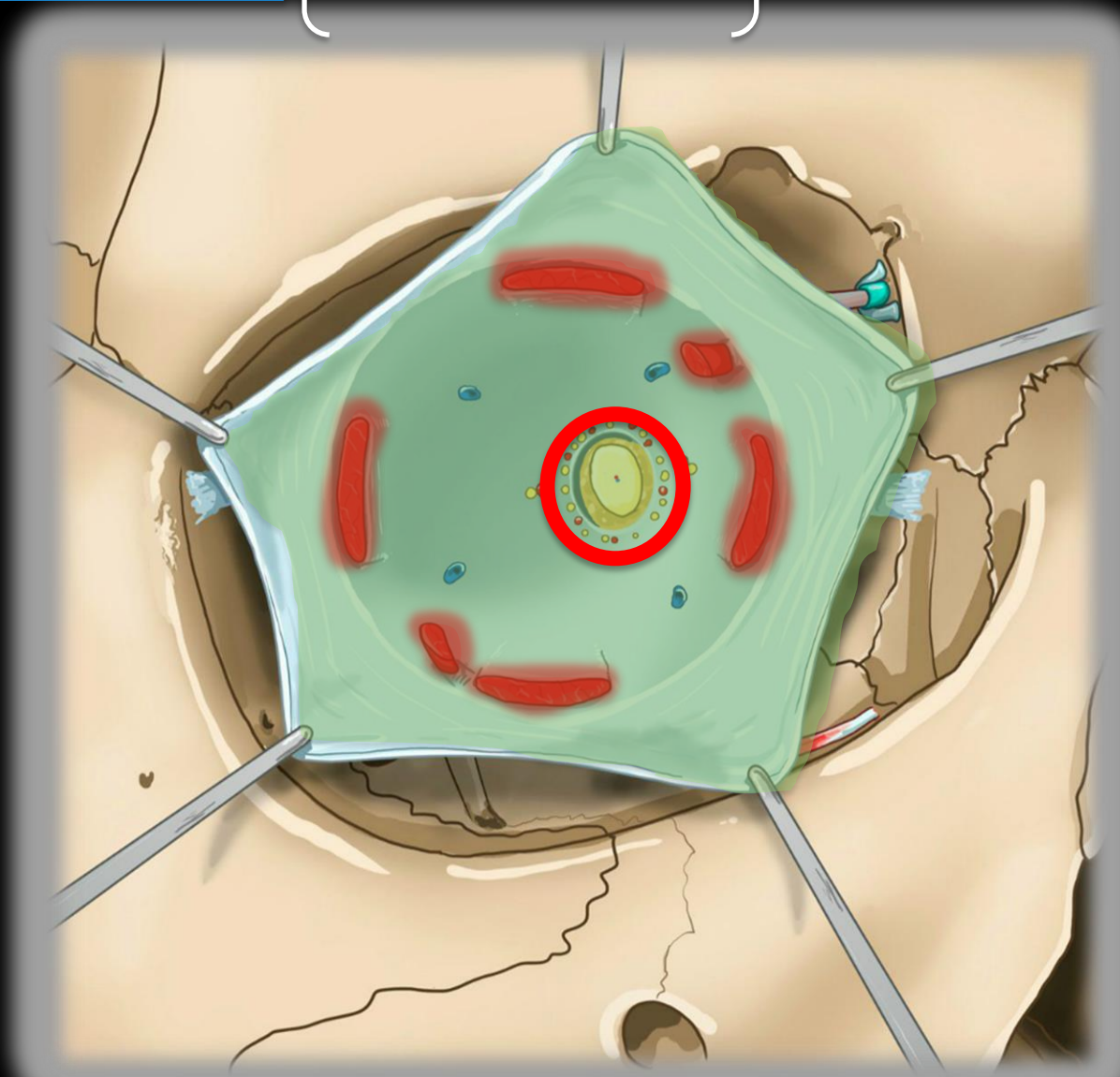
# Anatomy

## Orbit



# Anatomy

## Peri-orbita

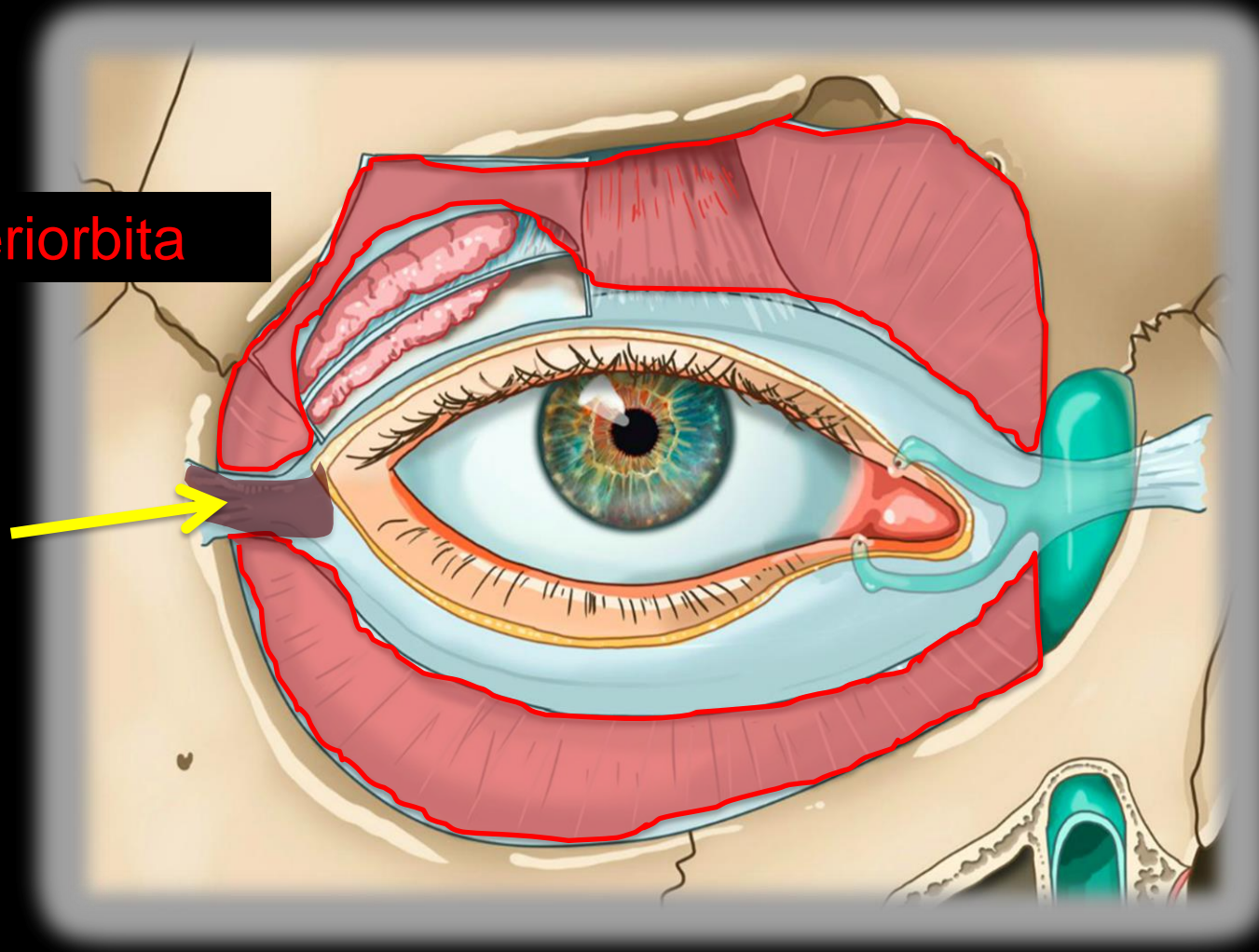


# Anatomy

## [ Orbit ]

Periorbita

Lateral  
canthal  
tendon

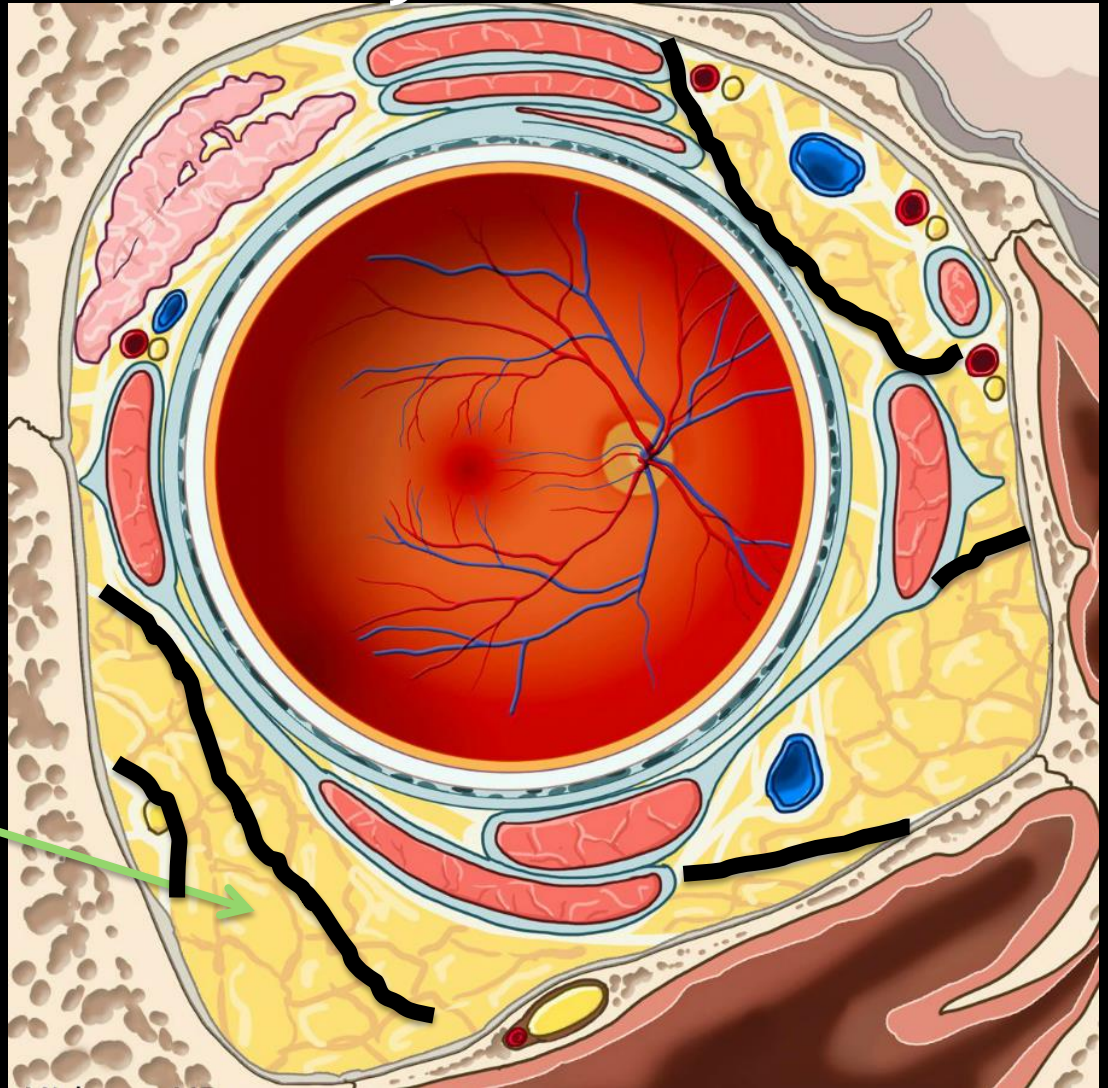


# Anatomy

## Orbit

Septations

Periorbital Fat

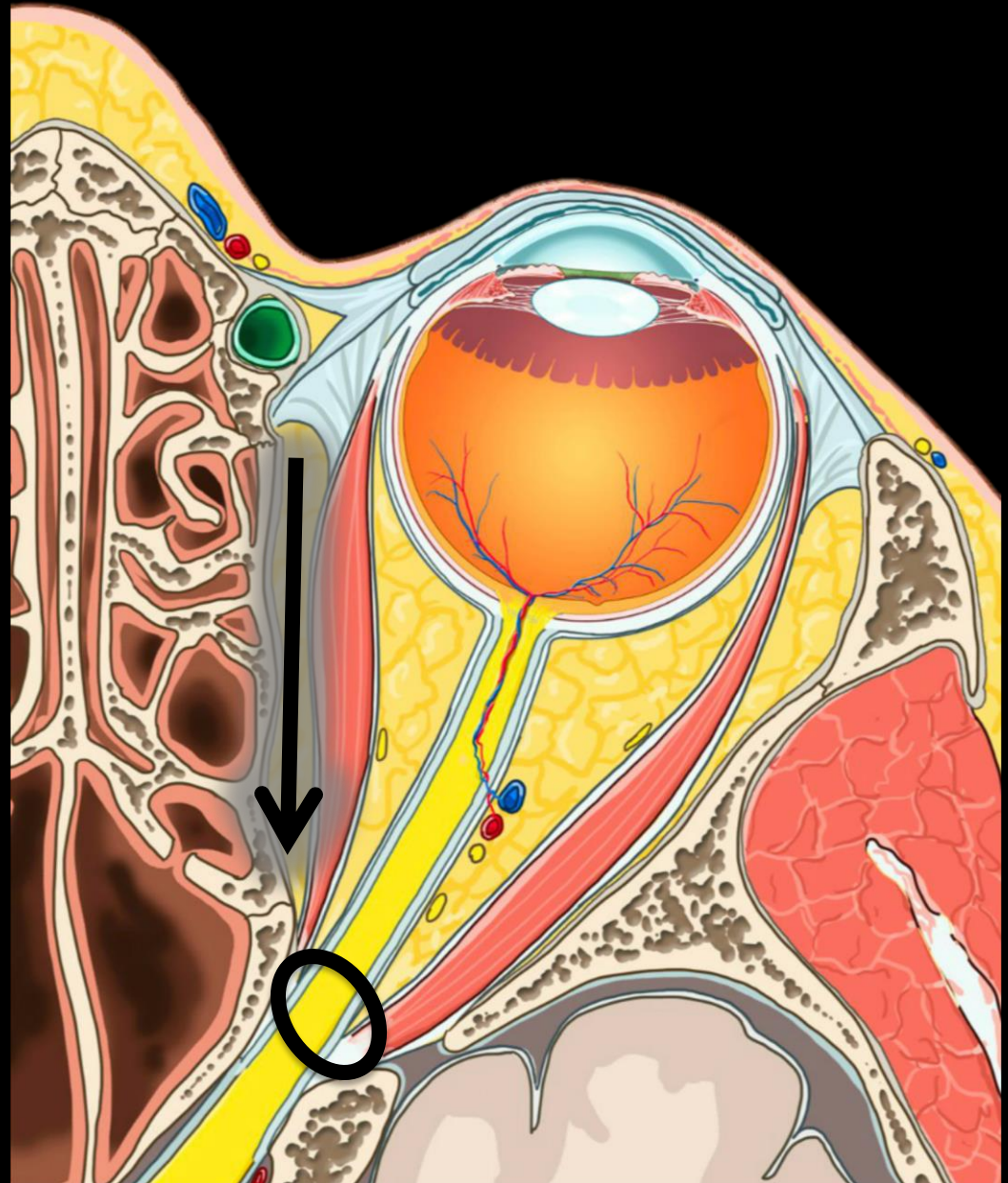




# Anatomy

## [ Orbit ]

Fat tracks  
back to  
orbital apex



# Outline

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- Anatomy

- **Epidemiology**

- Presentation

- Pathology

- Orbital Invasion

- Evaluation

- Management

- Sequela

- Disease-specific management

- Research

# Epidemiology

Prevalence

- 1% of all malignancies
- ~5% of H&N malignancies

Incidence

- Europeans: 1: 100,000
- Asians: 3: 100,000

SEER Data

- 6730 Non-lymphoreticular malignancies
- 1973-2006

Age

6<sup>th</sup> decade

Gender

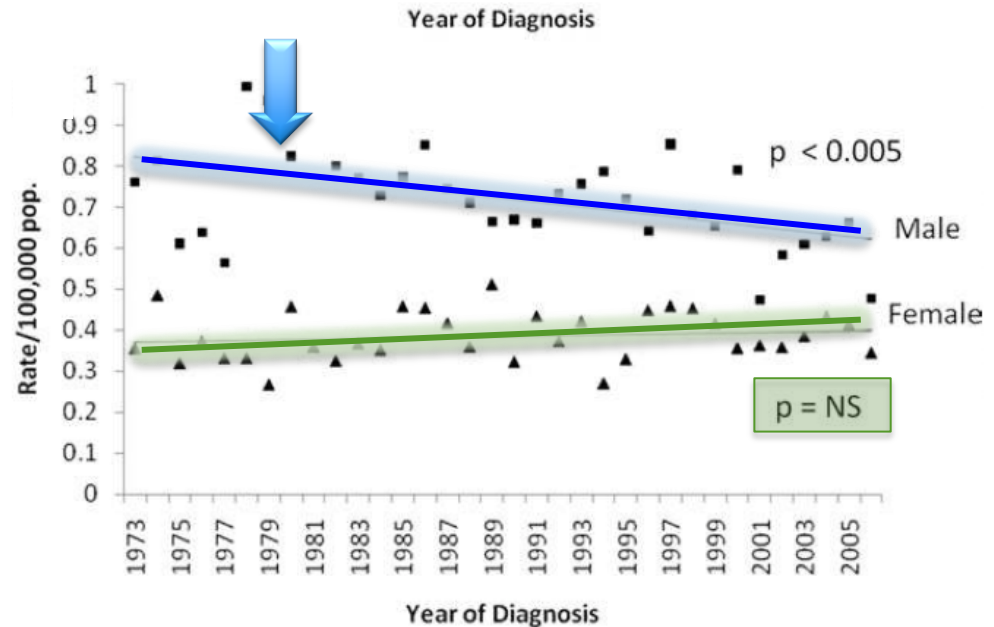
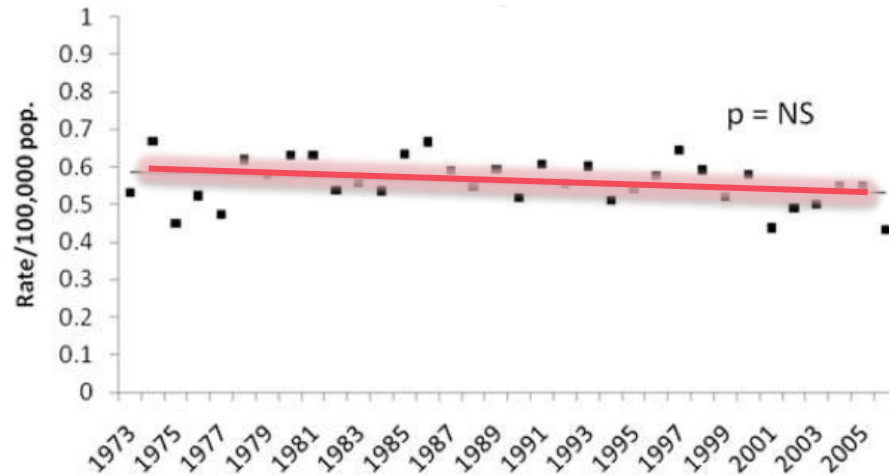
Male (58%)

Race

White (82%) > Black > "Other"

# Epidemiology

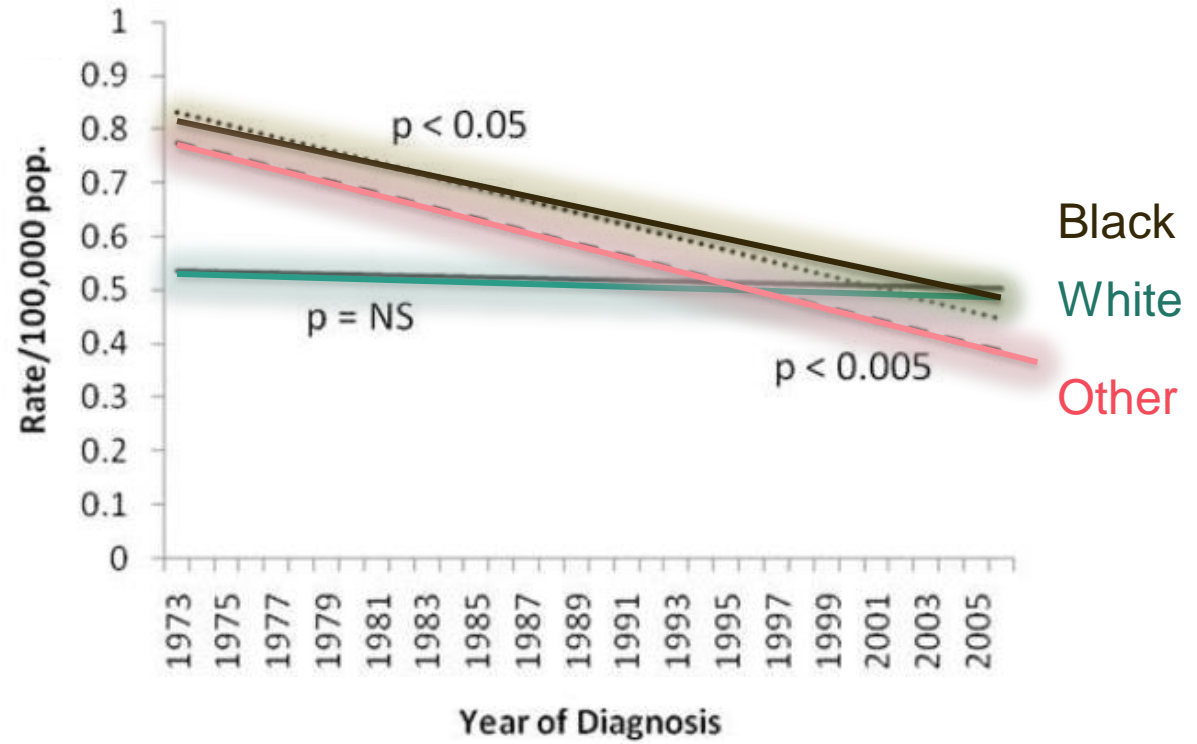
Rate of  
Sinonasal



Gender

# Epidemiology

Race



# Outline

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- Anatomy
- Epidemiology

- **Presentation**

- Pathology
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# Presentation

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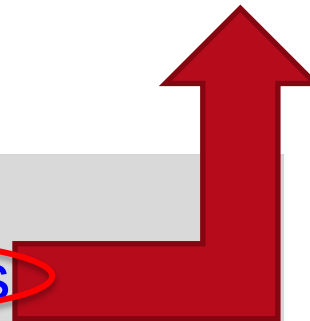
## Local

- Nasal Obstruction
- Bleeding
- Discharge
- Hyposmia
- Unilateral ETD
- Epistaxis

## Regional

- LAD
- **Orbital Changes**
- Diplopia
- Epiphora
- CN Dysfunction

- Exophthalmos
- Headache
- Facial Swelling
- Numbness



# Outline

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- Anatomy
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# Sinonasal Malignancies

## Epithelial Epidermoid

- Squamous cell ca
- Lymphoepithelial ca
- Carcinomas of lacrimal sac

## Mesenchymal

- Solitary Fibrous Tumors
- Liposarcoma
- Fibrosarcoma
- Malignant Fibrous Histiocytoma
- Synovial Sarcoma
- Alveolar Soft Part Sarcoma

## Bone

- Osteosarcoma

## Lymphoreticular

- Lymphoma
- Extramedullary Plasmacytoma

## Cartilage

- Chondrosarcoma

## Salivary

- Adenocarcinoma
- Adenoid Cystic Ca
- Mucoepidermoid Ca
- Acinic cell ca
- Carcinoma ex-pleomorphic adenoma

## Vasoform

- Angiosarcoma

## Muscle

- Rhabdomyosarcoma
- Leiomyosarcoma

## Neuroectodermal

- Malignant Peripheral Nerve Sheath Tumor
- Meningioma
- Neuroendocrine Carcinoma
- SNUC
- Ewings
- Olfactory Neuroblastoma
- Mucosal Melanoma

## Metastases

# Sinonasal Malignancies

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- **Squamous cell ca**
- Lymphoepithelial ca
- Carcinomas of lacrimal sac

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## Bone

- Osteosarcoma

## Lymphoreticular

- Lymphoma
- Extramedullary Plasmacytoma

## Cartilage

- Chondrosarcoma

## Salivary

- **Adenocarcinoma**
- **Adenoid Cystic Ca**
- Mucoepidermoid Ca
- Acinic cell ca
- Carcinoma ex-pleomorphic adenoma

## Vasoform

- Angiosarcoma

## Muscle

- **Rhabdomyosarcoma**
- Leiomyosarcoma

## Neuroectodermal

- Malignant Peripheral Nerve Sheath Tumor
- Meningioma
- Neuroendocrine Carcinoma
- **SNUC**
- **Olfactory Neuroblastoma**
- **Mucosal Melanoma**

## Metastases

# Sinonasal Malignancies

Epithelial Epidermoid

- Squamous cell ca

Salivary

# Squamous Cell Carcinoma

Lymphoproliferative

- Lymphoma
- Extramedullary Plasmacytoma

Cartilage

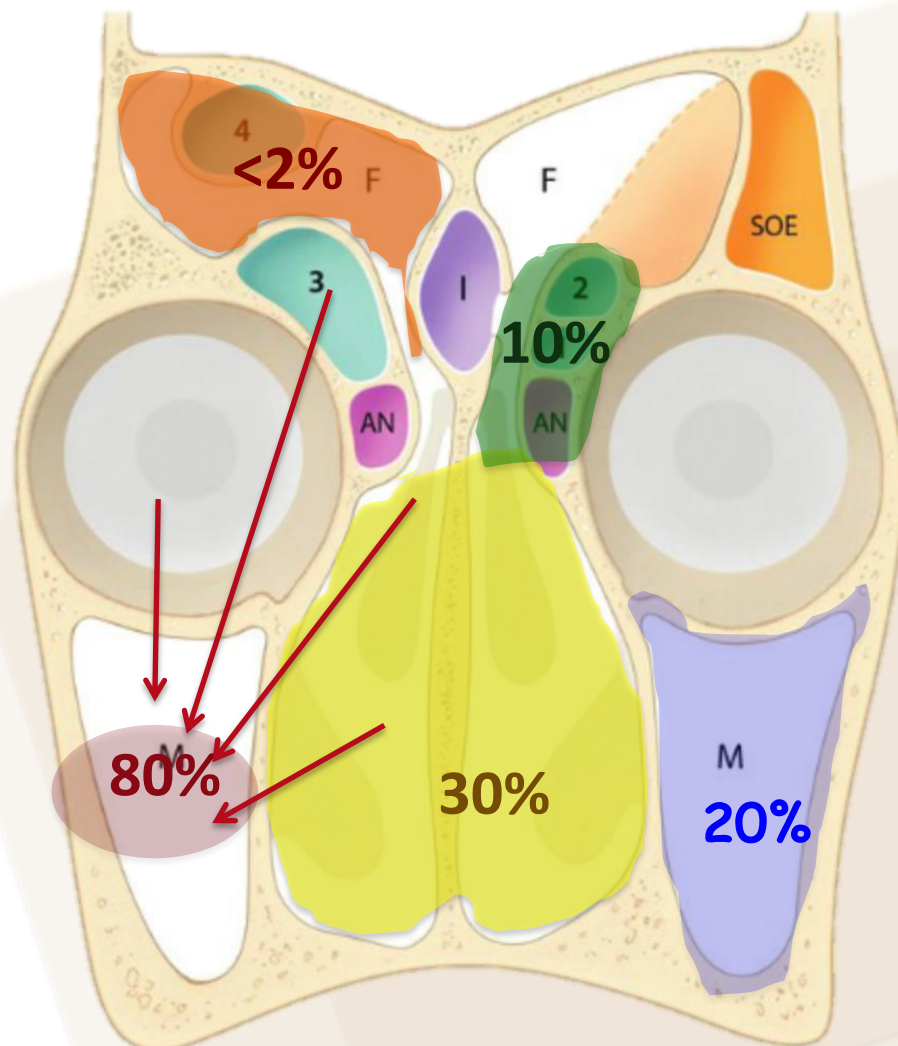
- Chondrosarcoma

- Neuroendocrine Carcinoma
- SNUC
- Ewings
- Olfactory Neuroblastoma
- Mucosal Melanoma

Metastases

# Sinonasal Malignancies

SQUAMOUS CELL  
CARCINOMA



80% Sinonasal Malignancies

60-70 years of age

M > F

Risk Factors....

- Nickel
- Chromium
- Bantu snuff
- Hydrocarbons
- Radium
- XRT
- IP
- Thorotrast
- Mustard Gas
- Cigarettes
- Wood
- EtOH
- Immunosup

5 year survival: 60%

Surgery, Chemo, XRT

# Sinonasal Malignancies

## Epithelial Epidermoid

- Squamous cell ca

## Salivary

# Adenocarcinoma

## Lymphoproliferative

- Lymphoma
- Extramedullary Plasmacytoma

## Cartilage

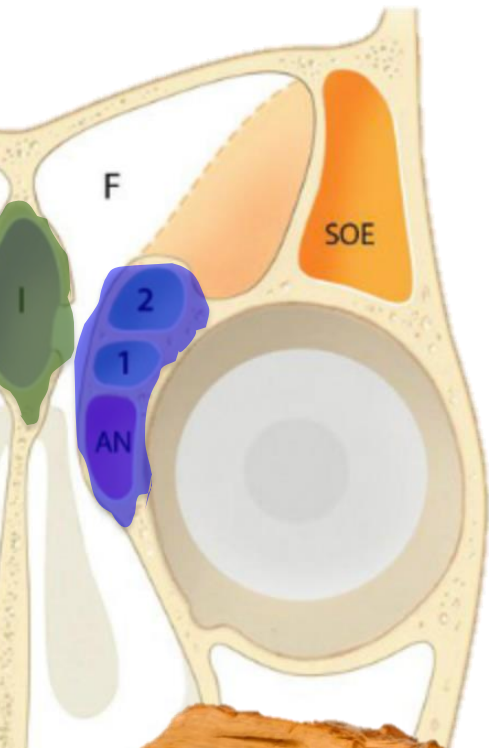
- Chondrosarcoma

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## Metastases

# Sinonasal Malignancies

ADENOCARCINOMA



Ethmoid Sinuses

Leather & Wood Workers

Advanced at Presentation:  
50% cribriform erosion

Tx: Surgery → XRT



# Sinonasal Malignancies

Epithelial Epidermoid

- Squamous cell ca

Salivary

## Adenoid Cystic Carcinoma

Lymphoproliferative

- Lymphoma
- Extramedullary Plasmacytoma

Cartilage

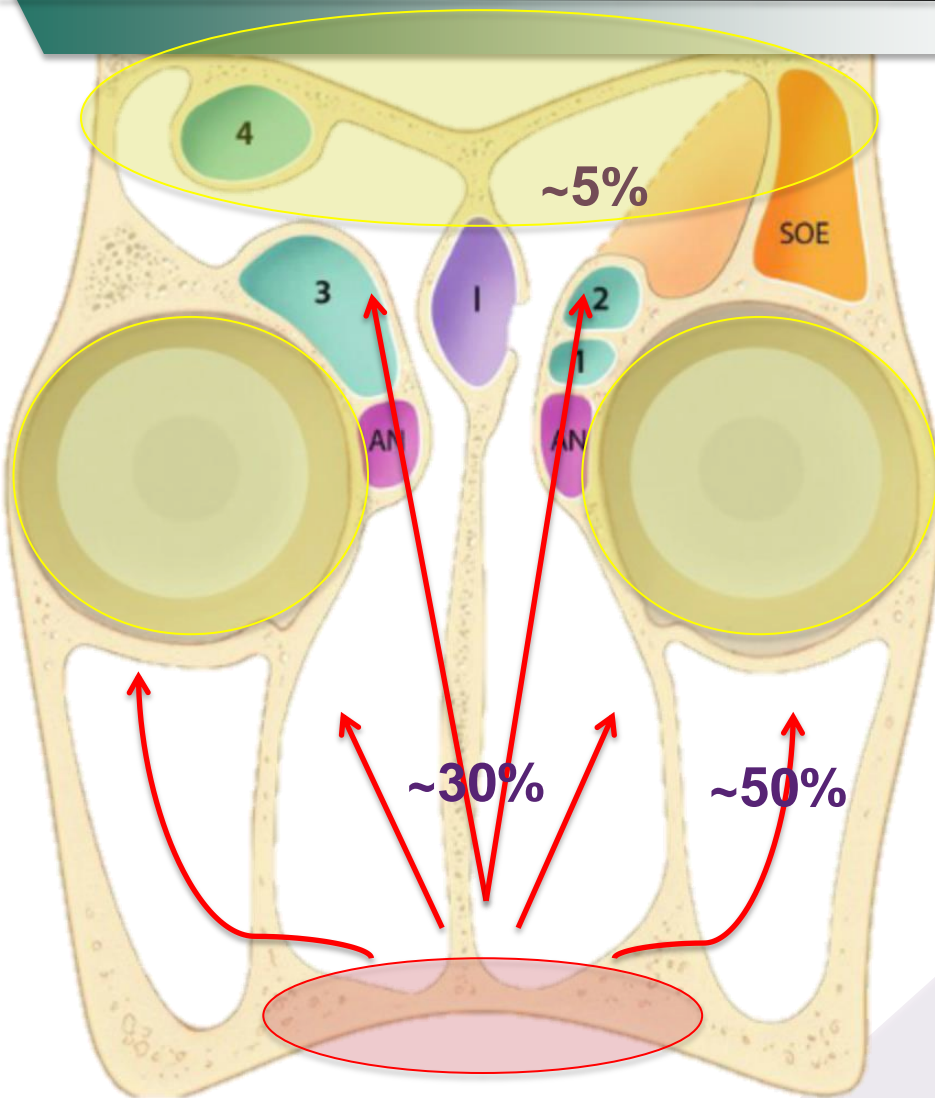
- Chondrosarcoma

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Metastases

# Sinonasal Malignancies

## ADENOID CYSTIC CARCINOMA



- Most common salivary neoplasm
- Location:
  - Maxillary > N.C. > Sphenoid/Frontal
- Peri-neural spread
  - Extension → orbit & intracranial
  - Difficult to clear
- Treatment:
  - Surgical rxn
  - Adjuvant XRT
- 50% Distant Mets → **Lung, Brain, Bones**



# Sinonasal Malignancies

## Epithelial Epidermoid

- Squamous cell ca

## Salivary

# Rhabdomyosarcoma

## Lymphoproliferative

- Lymphoma
- Extramedullary Plasmacytoma

## Cartilage

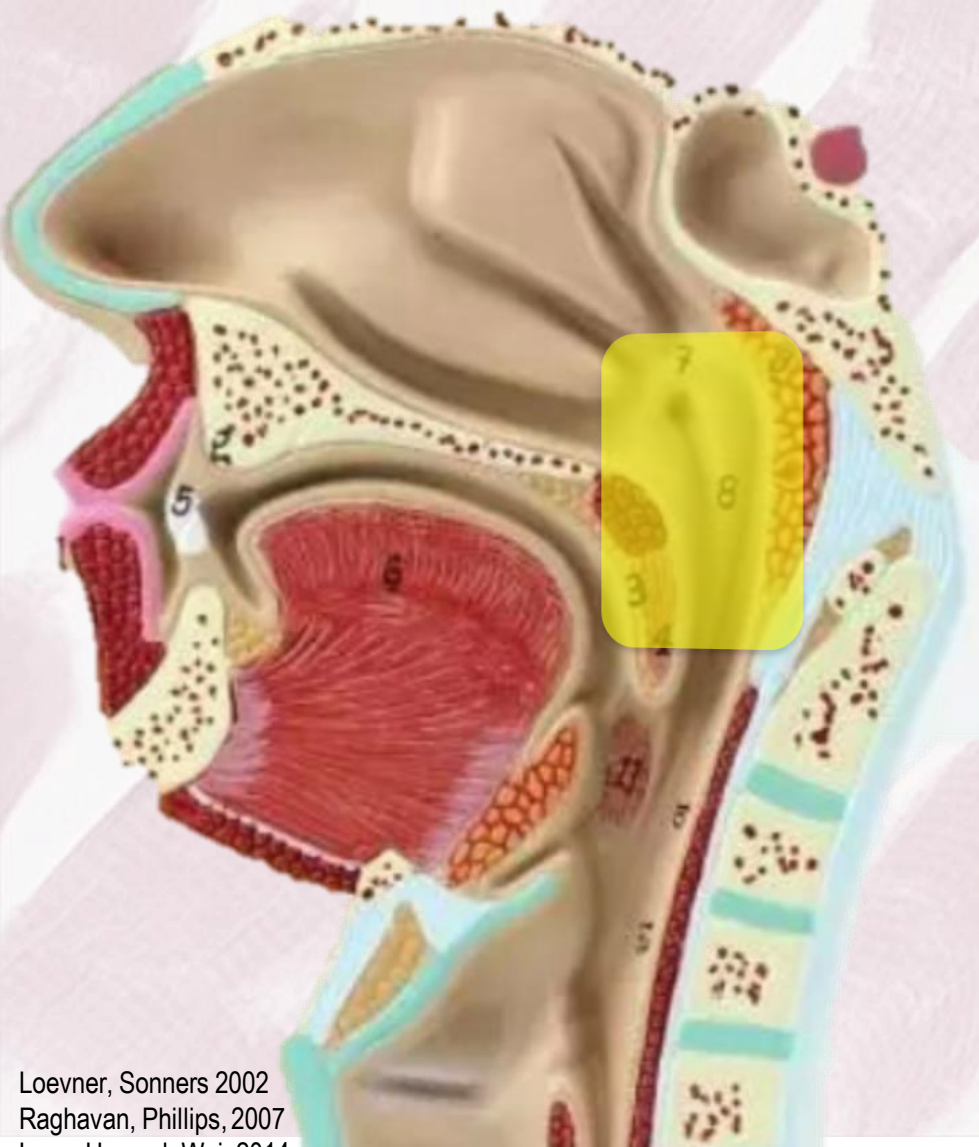
- Chondrosarcoma

- Neuroendocrine Carcinoma
- SNUC
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## Metastases

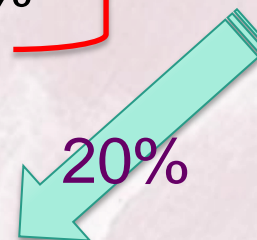
# Sinonasal Malignancies

## RHABDOMYOSARCOMA



Embryonal, → Children  
Alveolar, → Adolescence  
→ Adults

Pleomorphic  
Adults: 2-5%  
Children: 60% } 35% Head and Neck



Nasal Cavity, Nasopharynx, Sinuses

Adults: Ethmoids

Treatment: Surgery, Chemo/  
XRT

# Sinonasal Malignancies

## Epithelial Epidermoid

- Squamous cell ca

## Salivary

# Sinonasal Undifferentiated Carcinoma (SNUC)

## Lymphoproliferative

- Lymphoma
- Extramedullary Plasmacytoma

## Cartilage

- Chondrosarcoma

- Neuroendocrine Carcinoma
- SNUC
- Ewings
- Olfactory Neuroblastoma
- Mucosal Melanoma

## Metastases

# Sinonasal Malignancies

## SINONASAL UNDIFFERENTIATED CARCINOMA

Derived from Schneiderian epithelium

Mean age of dx: 6<sup>th</sup> decade

Aggressive neoplasms

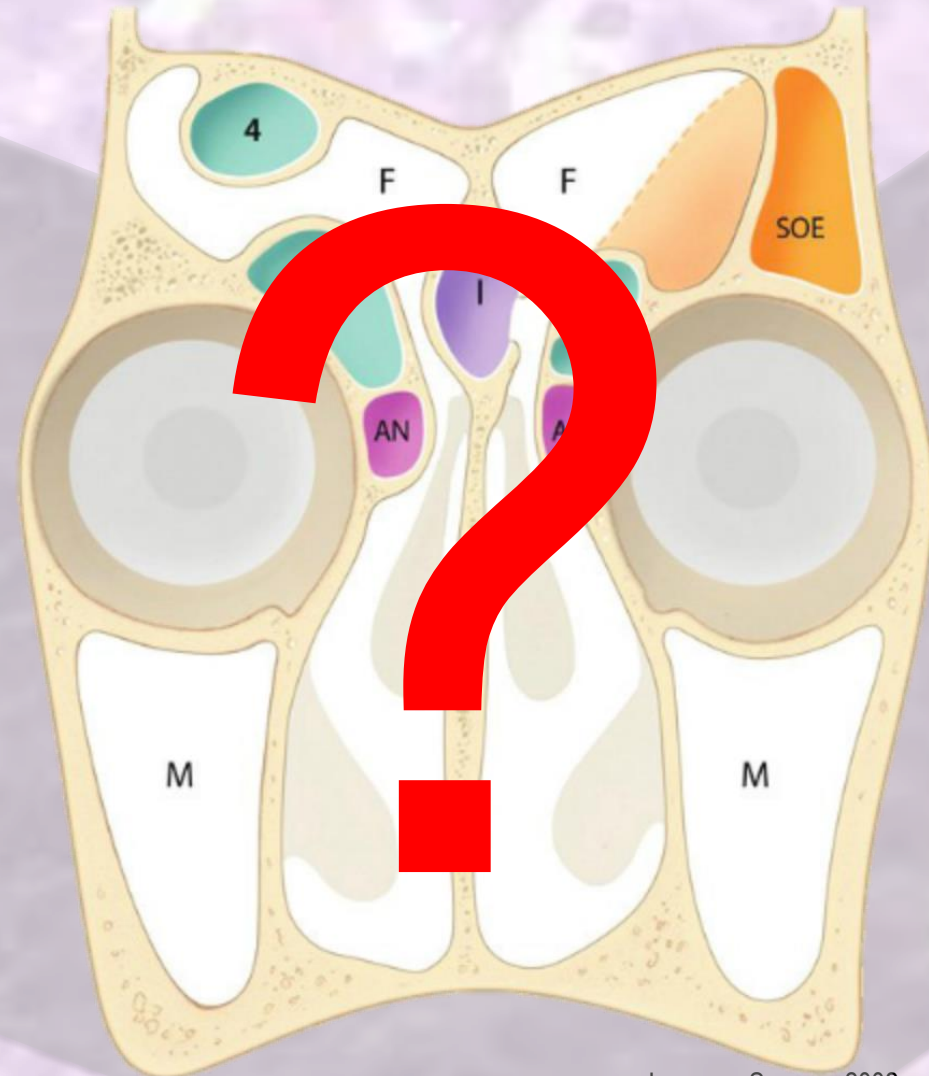
- Advanced presentation
  - 20-30% Cervical LAD
- Metastatic disease

Rapid growth

- Site of origin?

Treatment Controversial:

- Chemo/XRT w/ surgical salvage
- Surgery → Chemo/XRT



# Sinonasal Malignancies

Epithelial Epidermoid

- Squamous cell ca

Salivary

## Olfactory Neuroblastoma

Lymphoproliferative

- Lymphoma
- Extramedullary Plasmacytoma

Cartilage

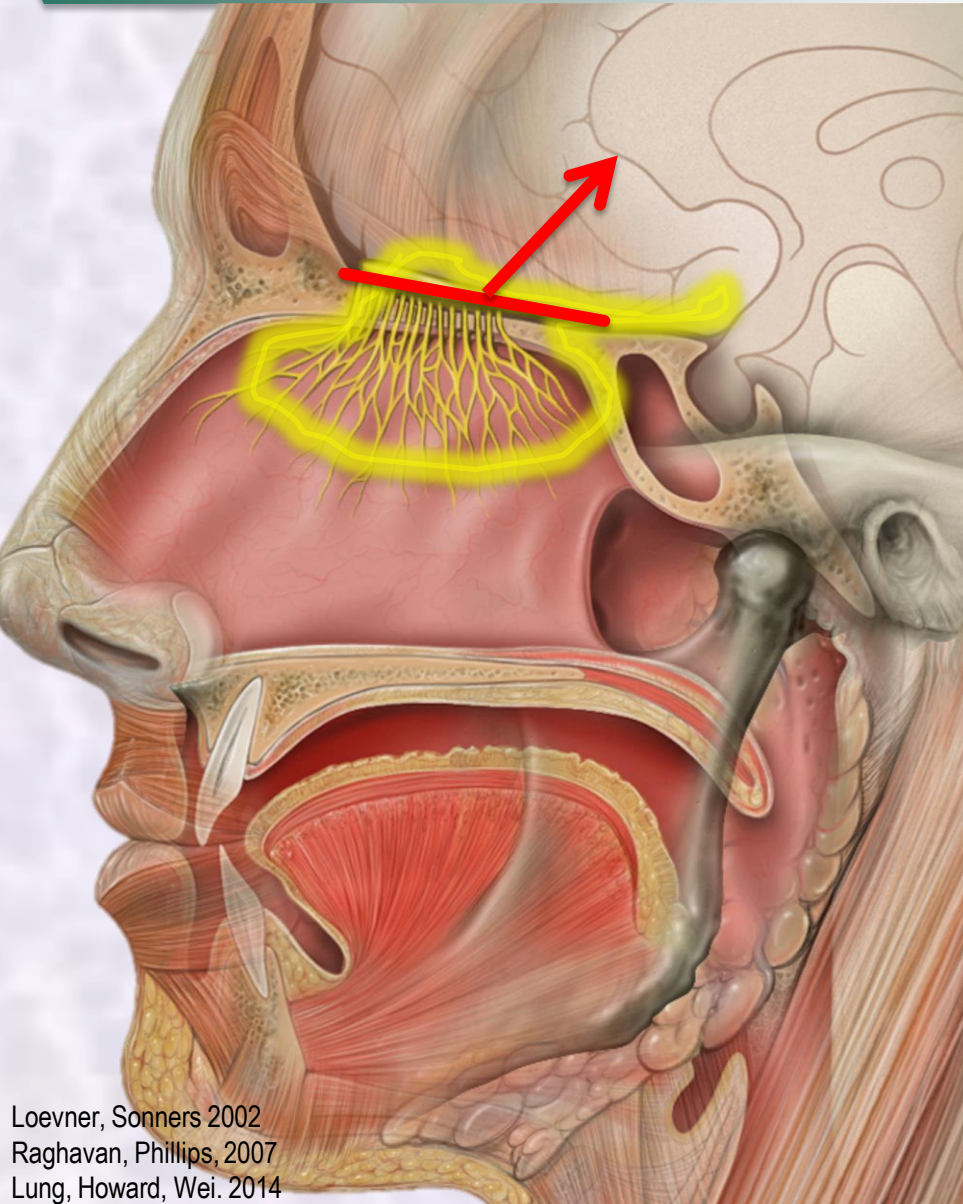
- Chondrosarcoma

- Neuroendocrine Carcinoma
- SNUC
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- Olfactory Neuroblastoma
- Mucosal Melanoma

Metastases

# Sinonasal Malignancies

## OLFACTORY NEUROBLASTOMA



- Arise from olfactory neuroepithelium
- Bimodal
  - 2<sup>nd</sup>-3<sup>rd</sup> decade
  - 6-7<sup>th</sup> decade
- Cross cribriform  
→ Intracranially
- Treatment:
  - Craniofacial rsxn ± XRT
- Long natural history
  - Locoregional recurrence
    - Up to 10 years
- Long term follow up necessary

# Sinonasal Malignancies

## Epithelial Epidermoid

- Squamous cell ca

## Salivary

# Mucosal Melanoma

## Lymphoproliferative

- Lymphoma
- Extramedullary Plasmacytoma

## Cartilage

- Chondrosarcoma

- Neuroendocrine Carcinoma
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## Metastases

# Sinonasal Malignancies

MUCOSAL  
MELANOMA

~20% Head & Neck

~2-5% Sinonasal Cavity

Nasal Septum\*

Turbinate → 80% Maxillary Sinus

Male > Female

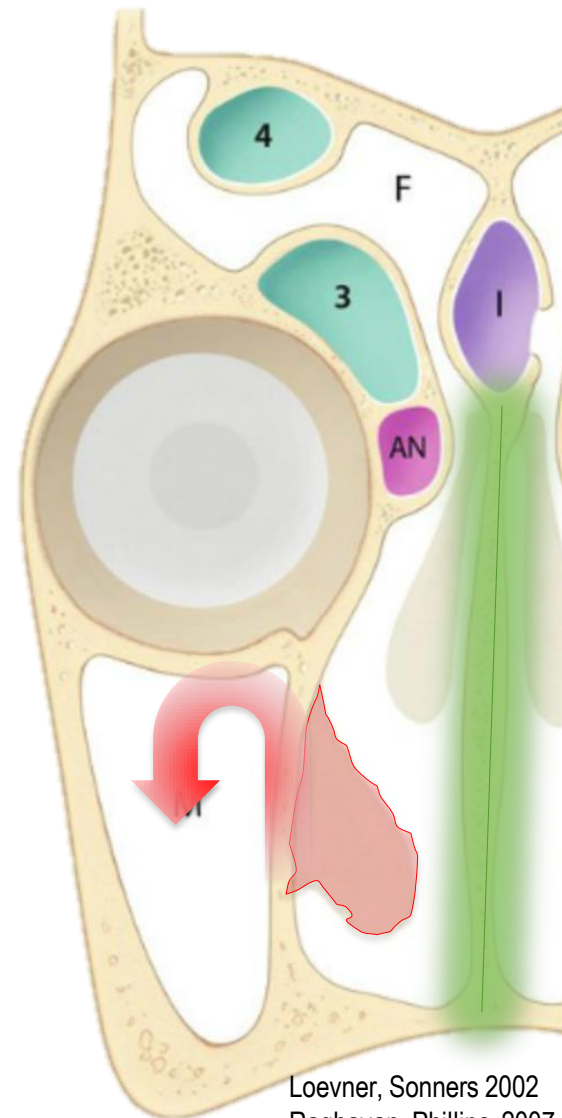
5-7<sup>th</sup> Decade

Spread by local invasion

LN Metastasis → 6% of cases

## Treatment:

- Surgery ± XRT
- Local Failure: 50%
- Mean Survival: ~2 years



Loevner, Sonners 2002  
Raghavan, Phillips, 2007  
Lung, Howard, Wei. 2014



# Outline

- Anatomy
- Epidemiology
- Presentation
- Pathology

## • Orbital Invasion

- Evaluation
- Management
- Sequela
- Disease-specific management
- Research

- Epidemiology
- Presentation
- Mechanism of Action
- Definition
- Prognosis

## Orbital invasion by malignancies

Varies with:

- Site of origin
- Histology
- Tumor Aggressiveness

Diagnosed at advanced stage

Orbital Involvement:

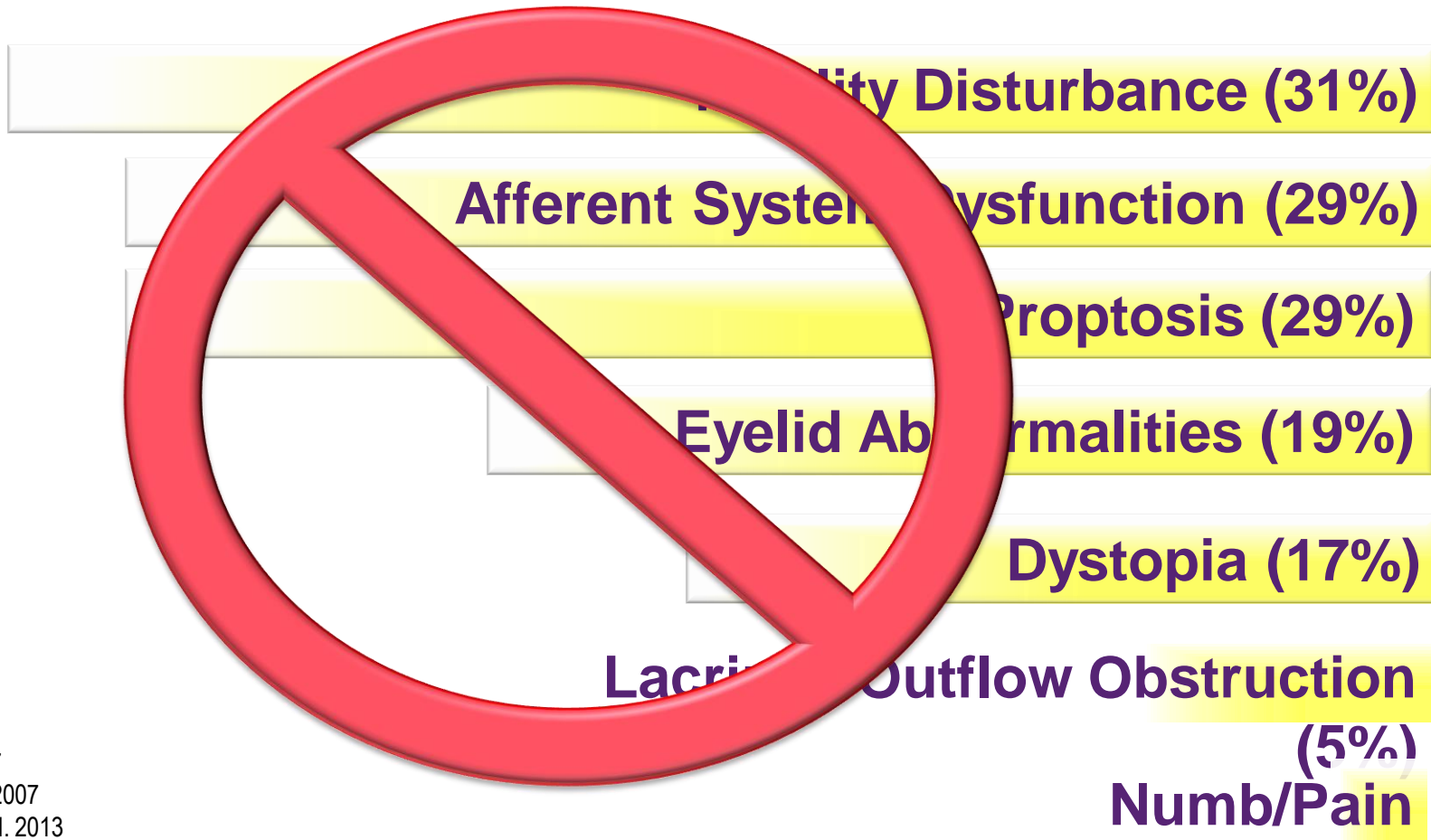
- 60-80%: Maxillary & Ethmoid
- 30-50% Periorbital Involvement

# Presentation

## Ocular Symptoms

62% Ethmoidal Tumors

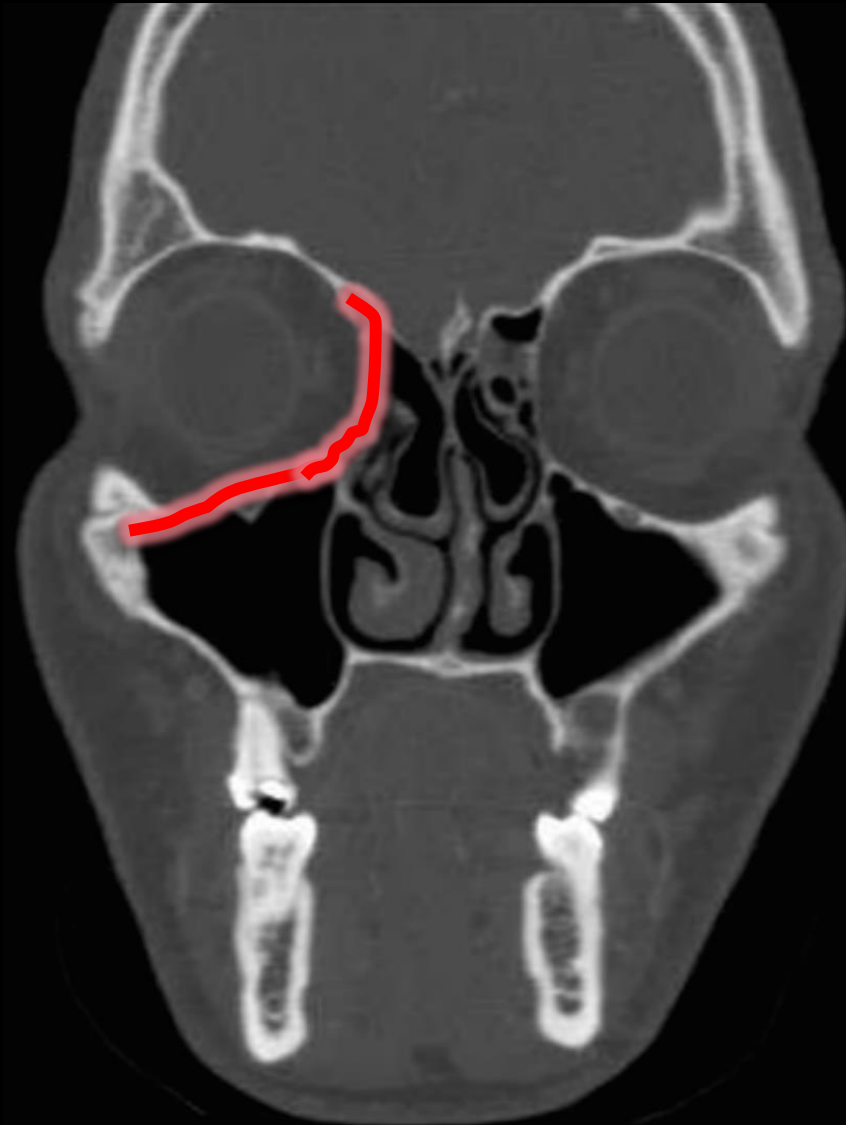
46% Nasal Cavity Tumors



Bleier, Lin. 2012  
Loevner, Sonners. 2002  
Essig, Newman, Levine. 2007  
Suarez, Ferlito, Dpath et. al. 2007  
Singh, Eskander, Huang, et.al. 2013

# Mechanism of Action

All 4 sinuses surround the orbit...



# Mechanism of Action

All 4 sinuses surround the orbit...



# Mechanism of Action

All 4 sinuses surround the orbit...



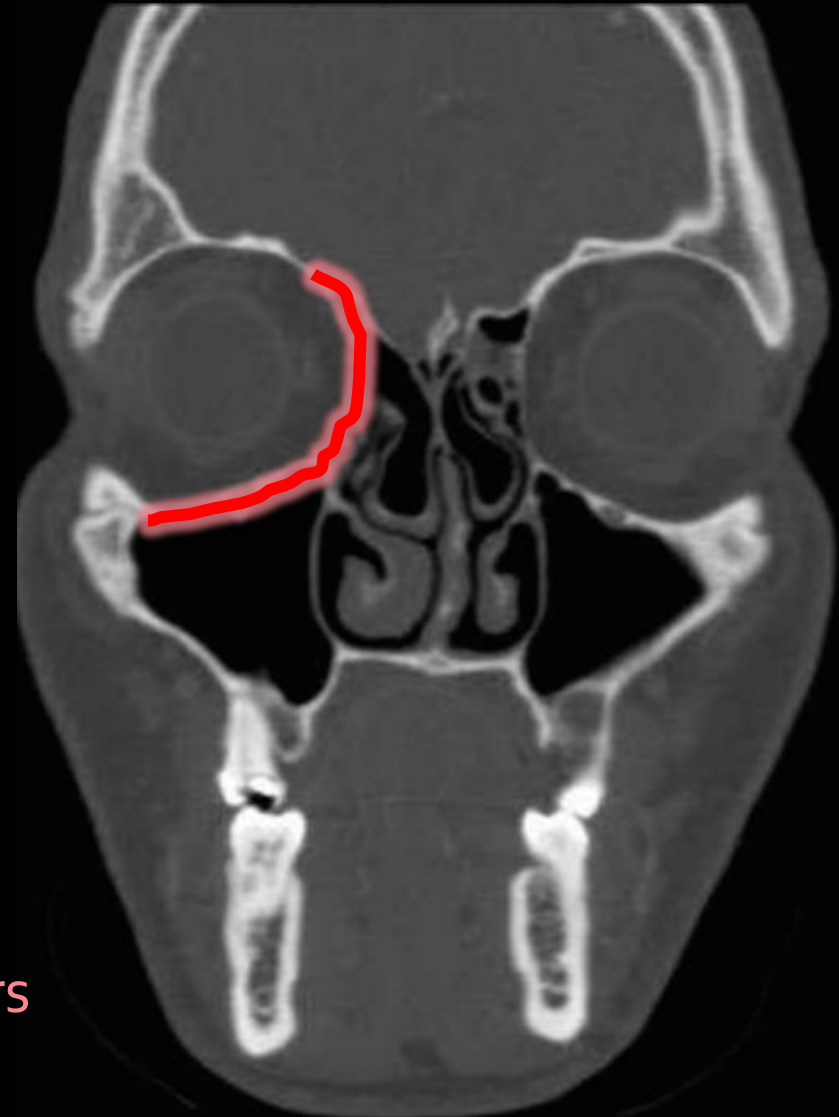
# Mechanism of Action

## Opportunities for orbital extension

- Multiple foramina
- Perforating nerves/ vessels
- Thin bones
  - Lacrimal fossa
  - Lamina papyracea
- Periorbita



No natural  
intra/extra-conal barriers

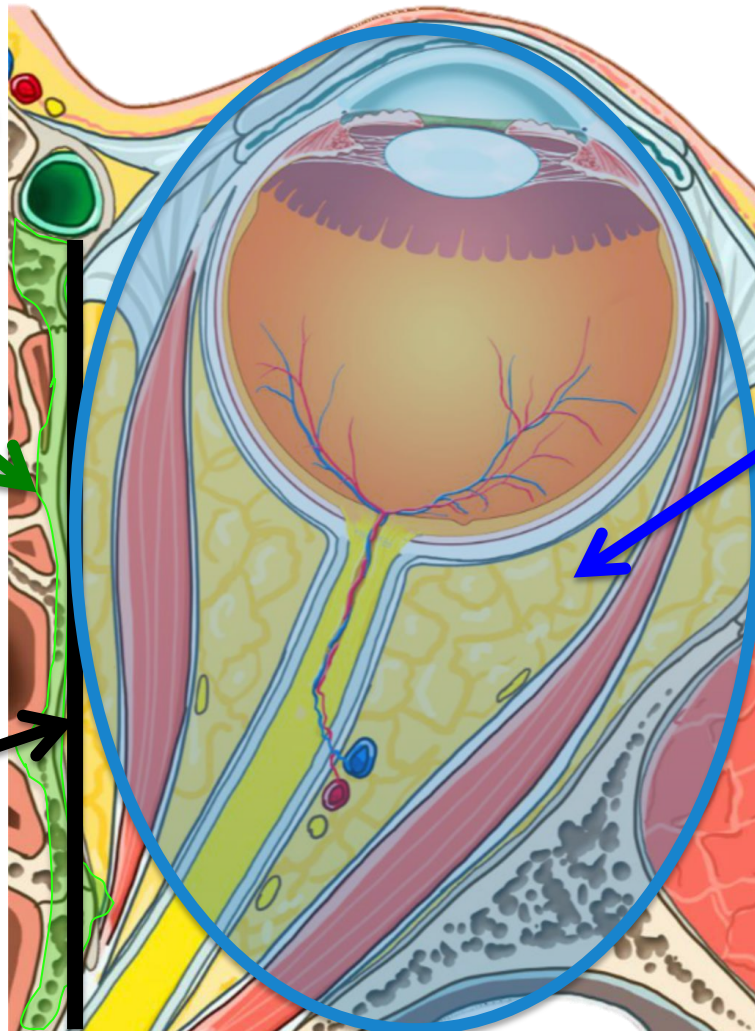


# “Orbital Invasion”

Orbital wall erosion?

Periorbital Involvement?

Orbital Soft Tissues?

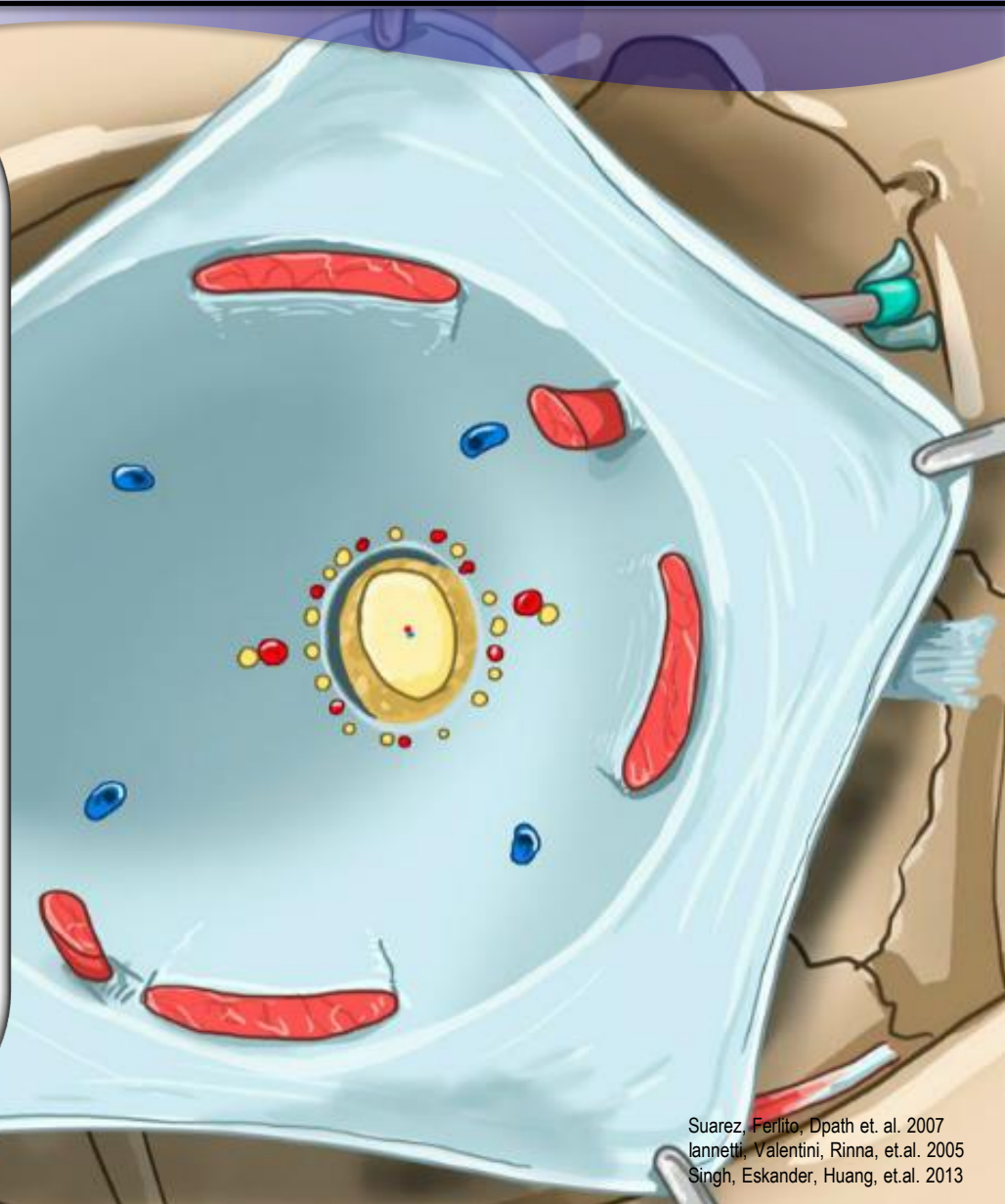




# “Orbital Invasion”

## Periorbita

- “True protector” of orbit
- Intact despite bone erosion
- Defines orbital invasion?
- Degree of invasion
  - Partial vs. Full thickness?



# “Orbital Invasion”

Orbital Invasion- 35-75% of cases

Discordant definitions

## McCary et al

- A: Adj to orbit, no wall
- B: Wall erosion, no globe displacement
- C: Wall erosion & infiltration, no periorbita
- D: Invades orbit & periorbita

## Ianetti et al

- I: Wall erosion
- II: Orbital fat
- III: MR, globe, ON, palpebral skin

No Agreement

## Poor Prognosis

Ganly et al 2005

334 pts CFR for ethmoid tumors

LACK of orbital invasion...

- Predict recurrence free, disease specific and overall survival
- DSS:
  - + Orbit: 41%
  - - Orbit: 75%

### ORBITAL SOFT TISSUE INVOLVEMENT

- Independent factor influencing survival

### INVASION LIMITED TO PERIORBITA

- Survival unchanged

# Outline

- Anatomy
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- Orbital Invasion

## • Evaluation

- Management
  - Sequela
  - Disease-specific management
  - Research
- Imaging
  - Definitive

# Imaging

- No symptoms  $\neq$  No invasion
- CT & MRI important!

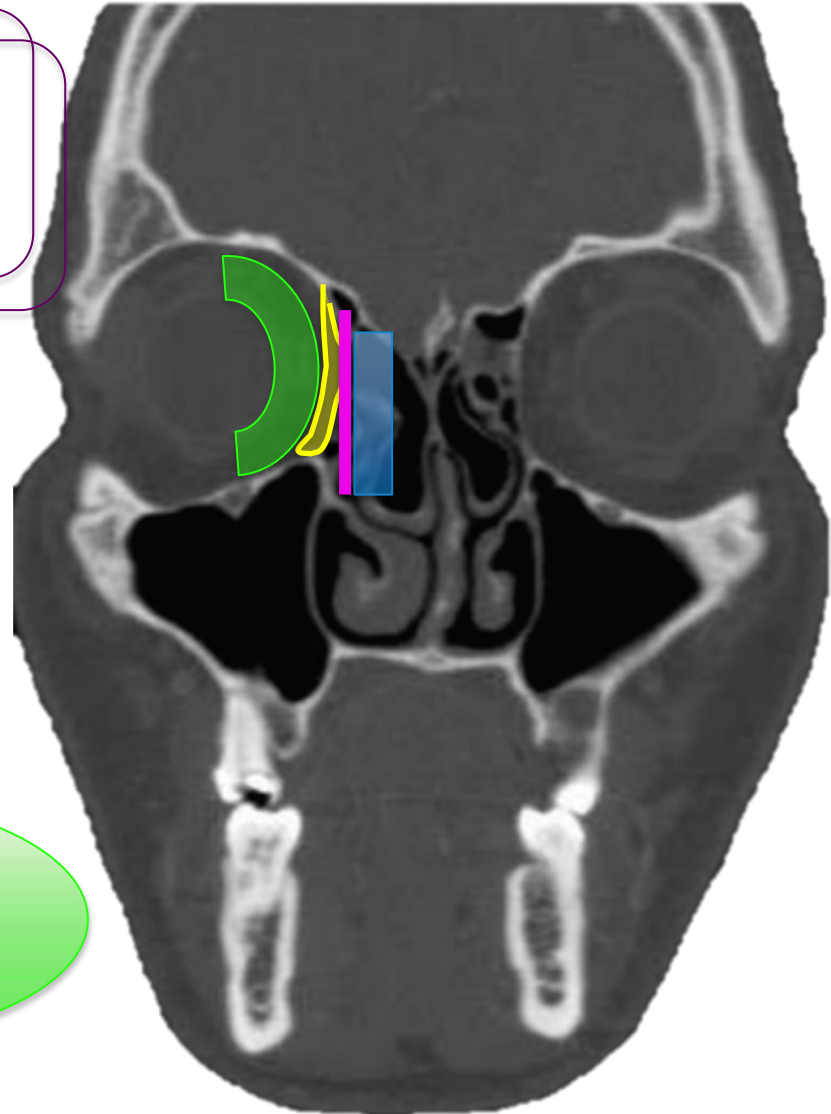
Penetrate bony orbit; possibly periorbita

Erode bone only

*Useful for distinguishing...*

Directly abut the orbit w/o bone invasion

Orbital soft tissues



# Imaging

## CRITERIA

Eisen et.al. 2000

*Predict  
Periorbital  
Invasion*

### Relationship to Periorbita

- Abutting
- Displacing
- Bowing

### Interface: Tumor & Periorbita

- “nodular”
- “smooth”

### Orbital Fat Invasion

- Stranding in extraconal fat

### Extraocular Muscles

- Displaced
- Enlarged
- Abnl

intensity

### Orbital Bone Integrity

### Nasolacrimal Invasion

- Tumor in duct or sac

Conclusions

- No one criterion had accuracy >79%
- $\geq 6$  criteria predicted orbital invasion w/ accuracy 72%.
- Adjacent to periorbita: most sensitive (90%), low specificity (29-44%)
- EOM enlargement: most specific (94%)
- Orbital Fat Involvement: specific, high PPV, but less sensitive

# Imaging

CT

CT more accurate than  
MRI

## Strength of CT

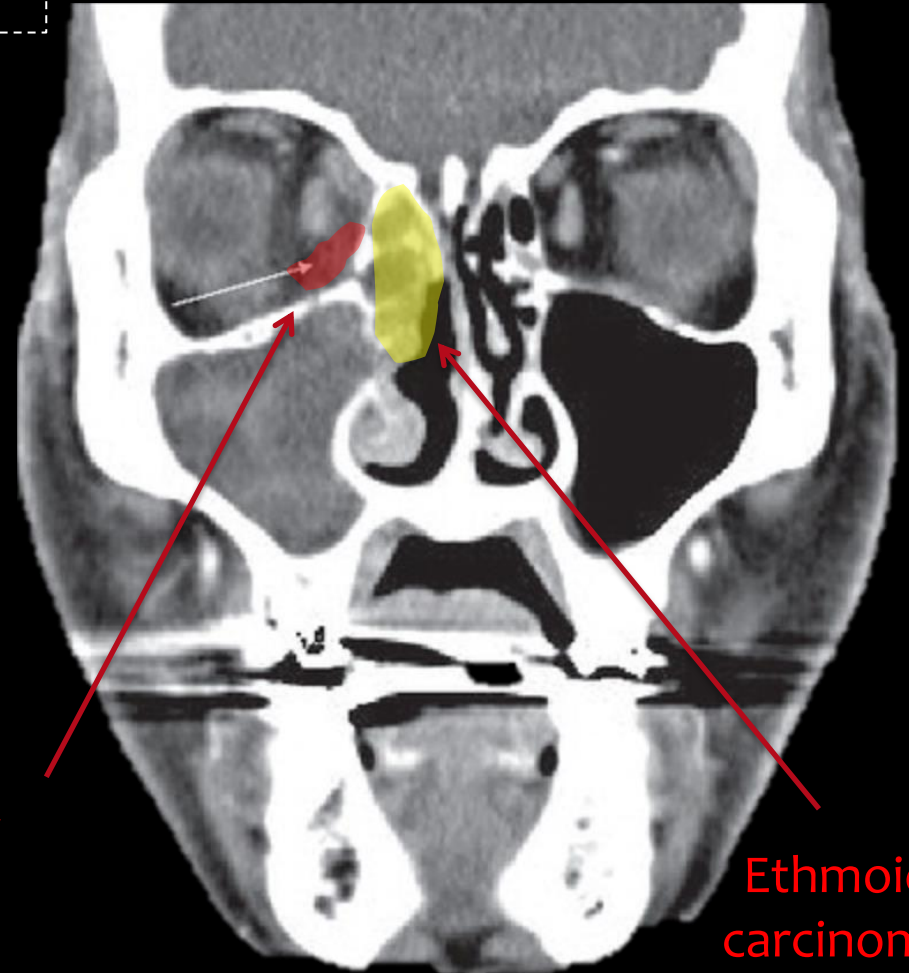
- Evaluate bone, fat interface

## Difficulty distinguishing tumor...

- Compresses vs. invades  
periorbital

Ill defined hazy  
density

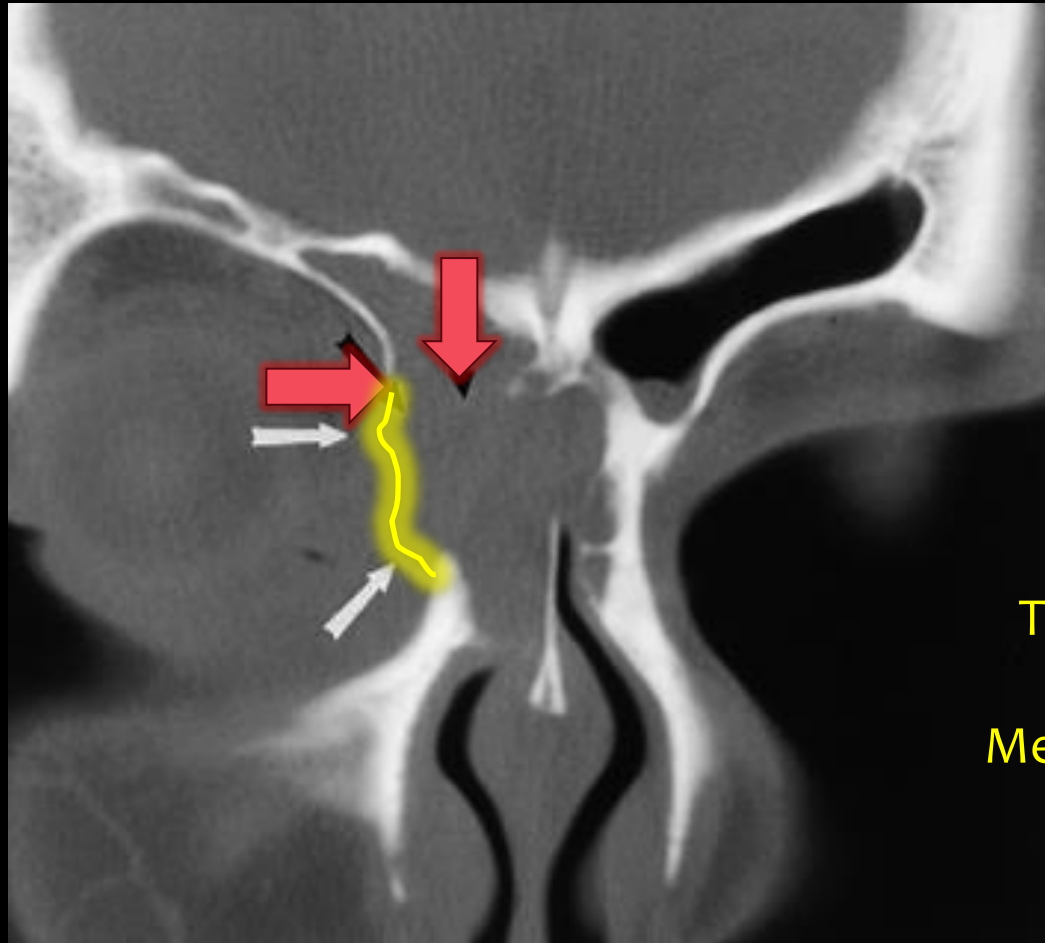
Ethmoid  
carcinoma



# Imaging

CT

Erosion of  
lateral nasal wall  
and frontal sinus  
floor



Thinning &  
bowing  
Medial orbital  
wall

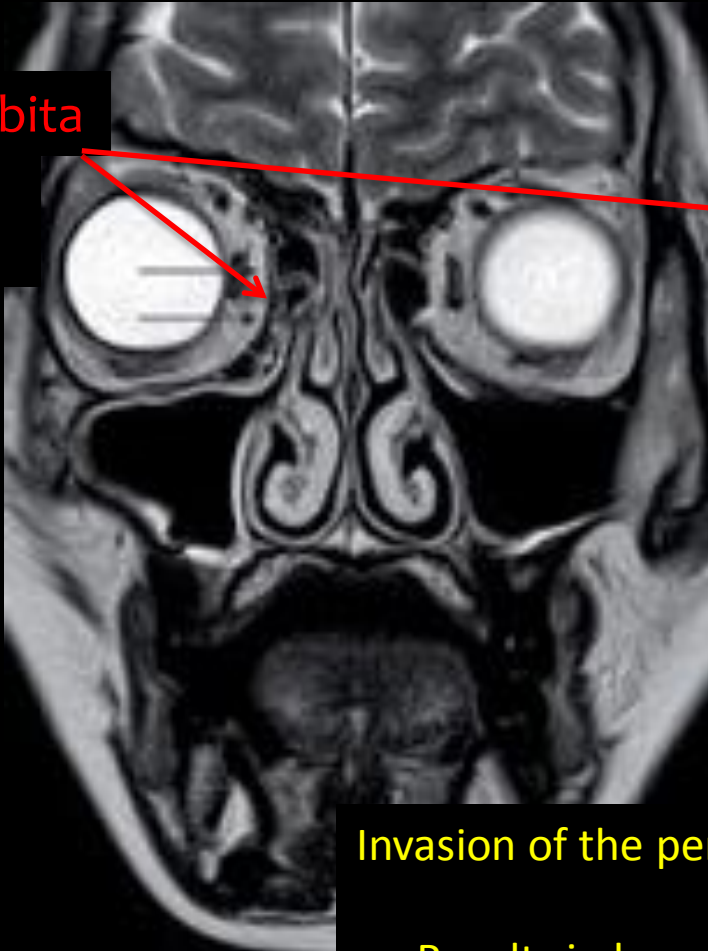


# Imaging

**MRI**

Periorbita

Hypo  
T1, T2



**Invasion of the periorbita:**

- Results in loss of signal

# Imaging

## MRI

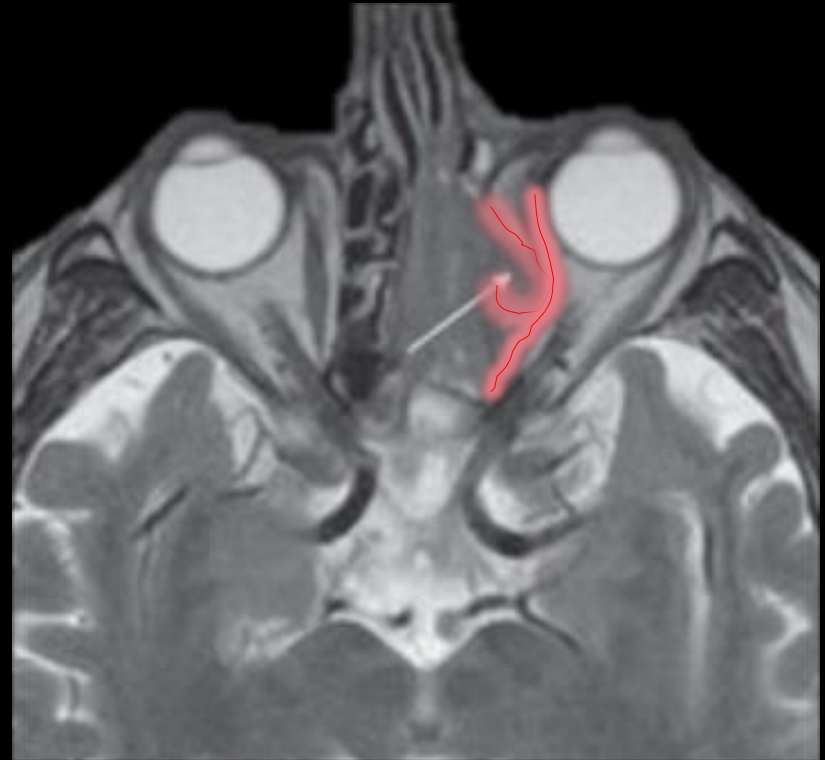
Loss of fat signal

Abnormal  
signal in fat

Normal  
bright fat  
on T1



Tumor Nodularity

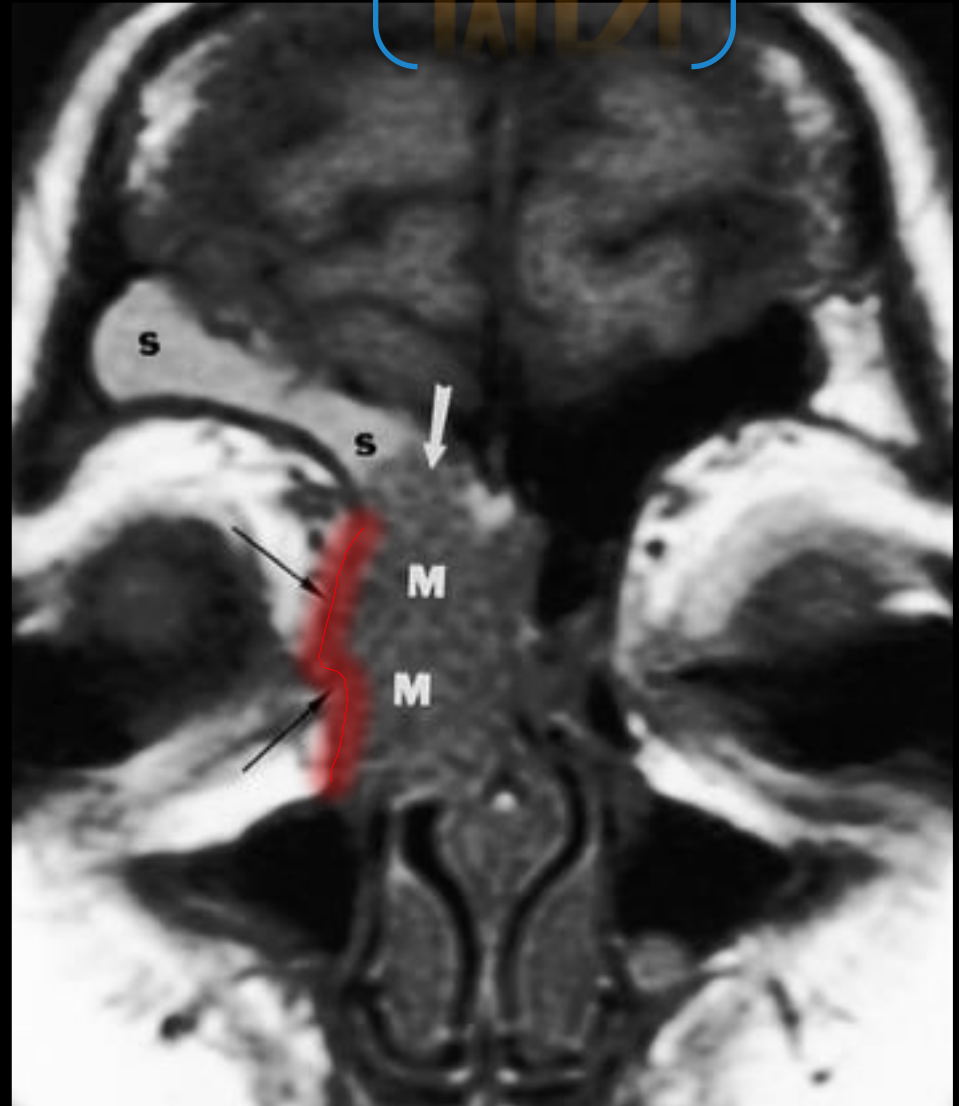


Mass Effect of  
Medial Rectus

# Imaging

MRI

Tumor  
Nodularity



# Definitive Evaluation

The background of the slide features a glass of water with several ice cubes. A large, semi-transparent blue oval is centered over the image, containing the text 'Intra-operative frozen section'.

**Intra-operative frozen  
section**

# Outline

---

- Anatomy
- Epidemiology
- Presentation
- Pathology
- Orbital Invasion
- Evaluation

## • Management

- Sequela
- Disease-specific management
- Research

- Controversy
- Surgery
- Radiation/Chemo

# Management



**Surgery**

**XRT**

**Chemo**

# Management

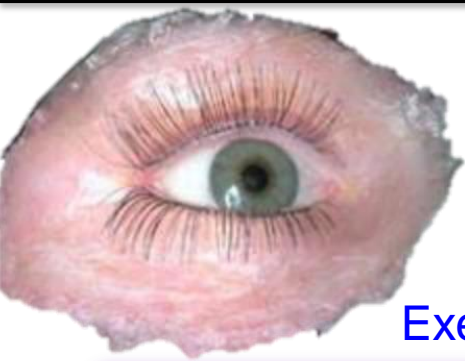
## Surgery

- Exenteration
- Debulk

XRT

Chemo

# Controversies



Orbital  
Exenteration

1970

Orbital Preservation

2016

Points of  
Contention

1. Oncological Safety of Orbital Preservation
2. Functional Outcome in Preserved Eyes.



# Orbital Exenteration

Support for

## Imola 2002

1. Involvement of the orbital apex
2. Non-resectable full-thickness invasion through periorbita into retrobulbar fat
3. Extension into the EOM
4. Invasion of the bulbar conjunctiva
5. Lid involvement beyond reasonable hope for reconstruction

- Study over 200 pts
- Local control rate:
  - 79% **with** exenteration
  - 14% **without** exenteration

Probably unwise to conclude  
that the orbit can be spared in  
all patients

# Orbital Exenteration

Support for

Anderson (1996)

- 32% incidence of non-functional eye
- 58 patients- anterior CFR, orbit preservation, adjuvant XRT

**“Strong consideration for orbital exent based on anticipated poor functional outcomes”**

Rajapurkar (2013)

- 19 total/radical maxillectomy
- 4/19- orbital floor + periorbita + Fat (orbit preserved)
  - $\frac{3}{4}$ - orbital + margins (despite XRT)
  - Recurred

**If cant ensure complete negative orbital margins, exent may be safer oncologically**

# Orbital Exenteration

Support  
Against

## Contraindications

- Brain?
- Cavernous Sinus
- Carotid Artery
- Bilateral Optic n.
- Optic Chiasm

## Psychosocial

- 27 patients → Orbital Preservation
  - All were glad eye was spared

The cosmetic, functional, and psychologic consequences of loss of an eye mandate that every effort should be made to preserve the eye as long as **oncologic safety is not compromised.**”

# Orbital Exenteration

Support  
Against

Reyes, mason, Solares, Bush, Carrau. 2015

Source	Indication for evisceration	5-year survival evisceration, %	5-year survival preservation, %
Wu et al <sup>17</sup>	Invasion medial orbital wall <sup>a</sup>	27.3	34.8
Lund et al <sup>19</sup>	Transgression of the periosteum <sup>b</sup>	29	26
Imola et al <sup>20</sup>	Orbital fat involvement, extraocular muscle invasion, orbital apex, or eyelid invasion <sup>c</sup>	46	53
Iannetti et al <sup>18</sup>	Invasion of the medial rectus muscle, optic nerve, ocular bulb, or the skin overlying the eyelid <sup>c</sup>	62.2	63.5

No strong evidence favoring preservation vs. exenteration

## Criticisms:

- Tumor histology not taken into account.
  - Effect may be limited to SCC, Adenoca
- Different indications for exenteration
- Preserved: not description of what resected

# Orbital Exenteration

Bartisch

- “Starved” the day of the operation
- Held down by 2 assistants
- No anesthesia
- Pass needle & silk thread through globe
  - Exerting forward traction
- Cut attachments to eye with curved knife
- Bandage placed
  - Enriched with sulfured spelter and brandy



1583

# Orbital Exenteration

Involves removal of the soft tissue contents of the orbit, including the globe.

## Total:

- globe, eyelid, conjunctiva, orbital contents, periorbita

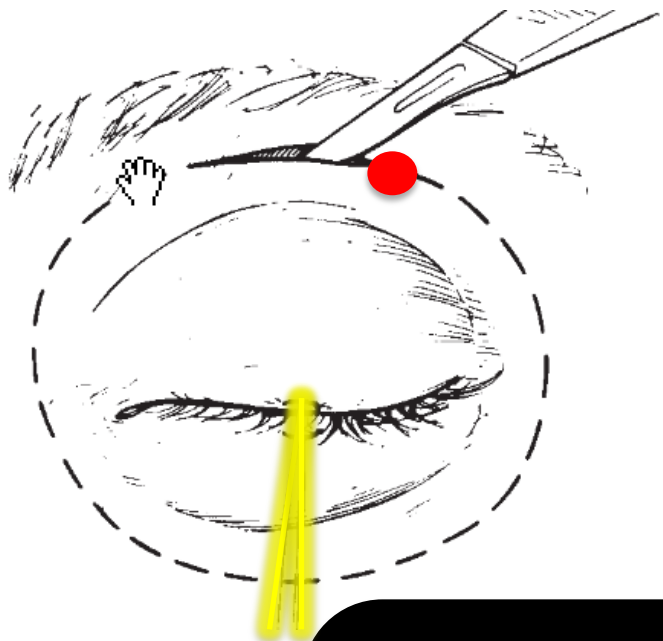
## Extended:

- bony orbital walls, paranasal sinuses,  $\pm$  intracranial tissue

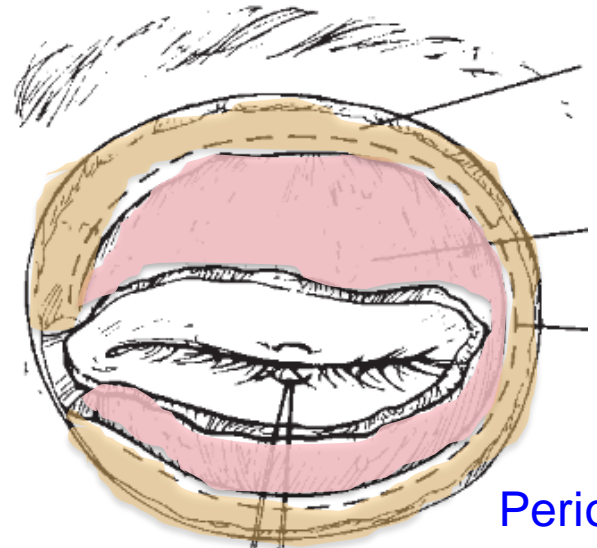
## Subtotal:

- globe, conjunctiva, EOM

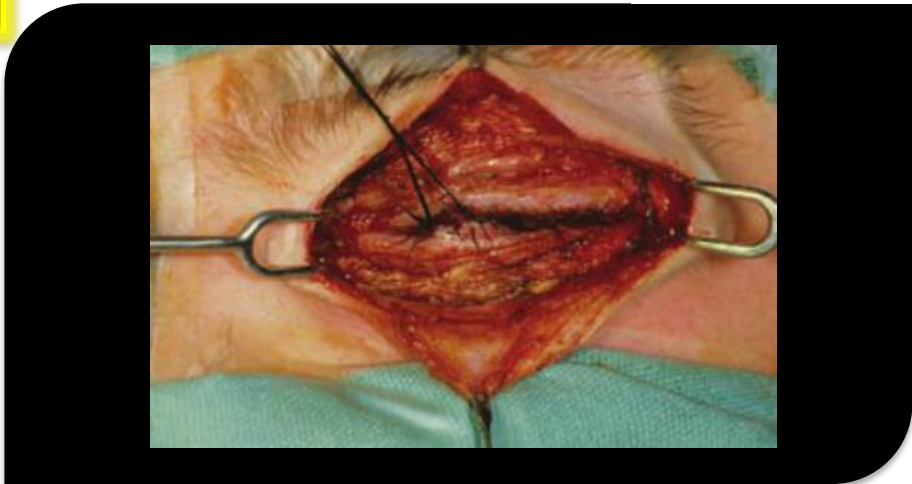
# Orbital Exenteration



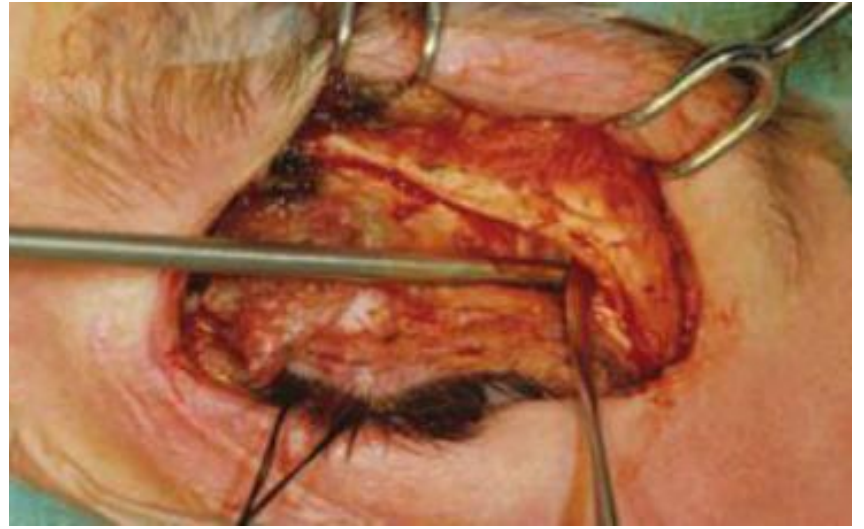
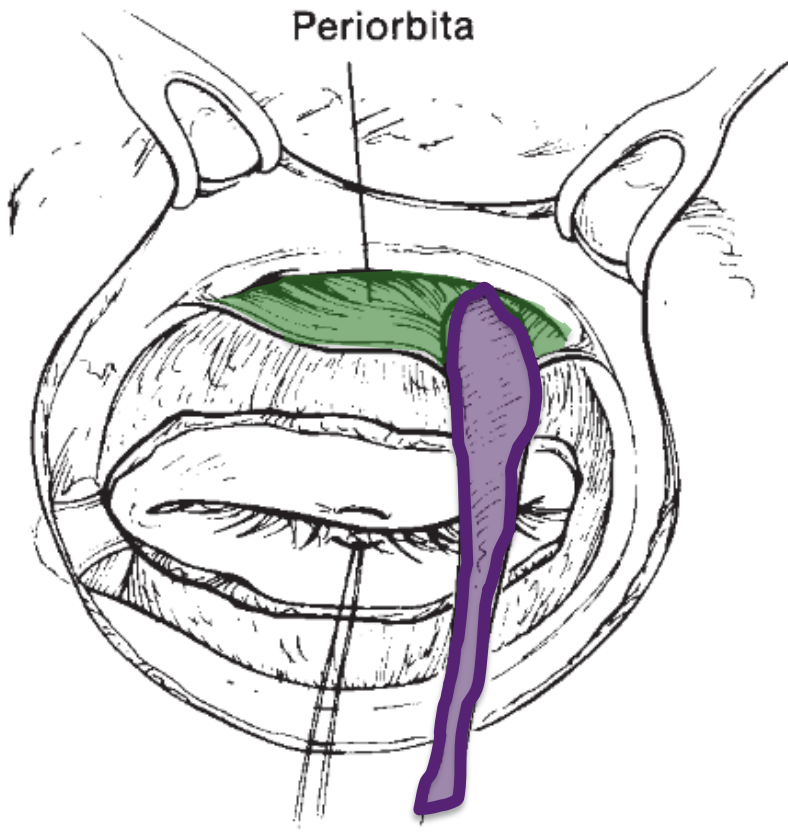
Orbicularis



Periosteum

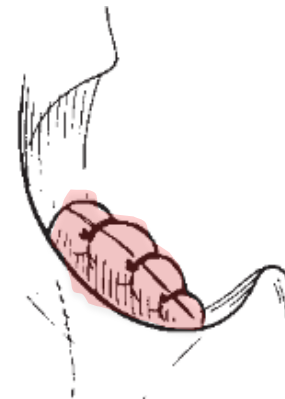
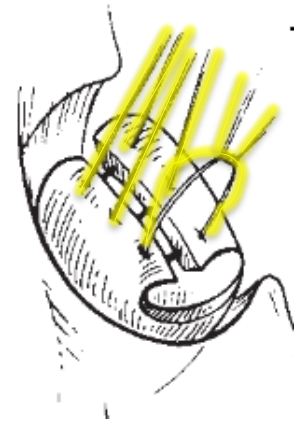
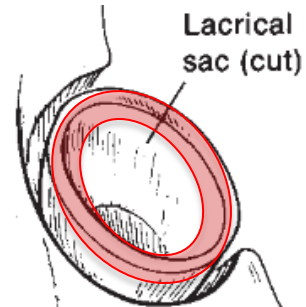
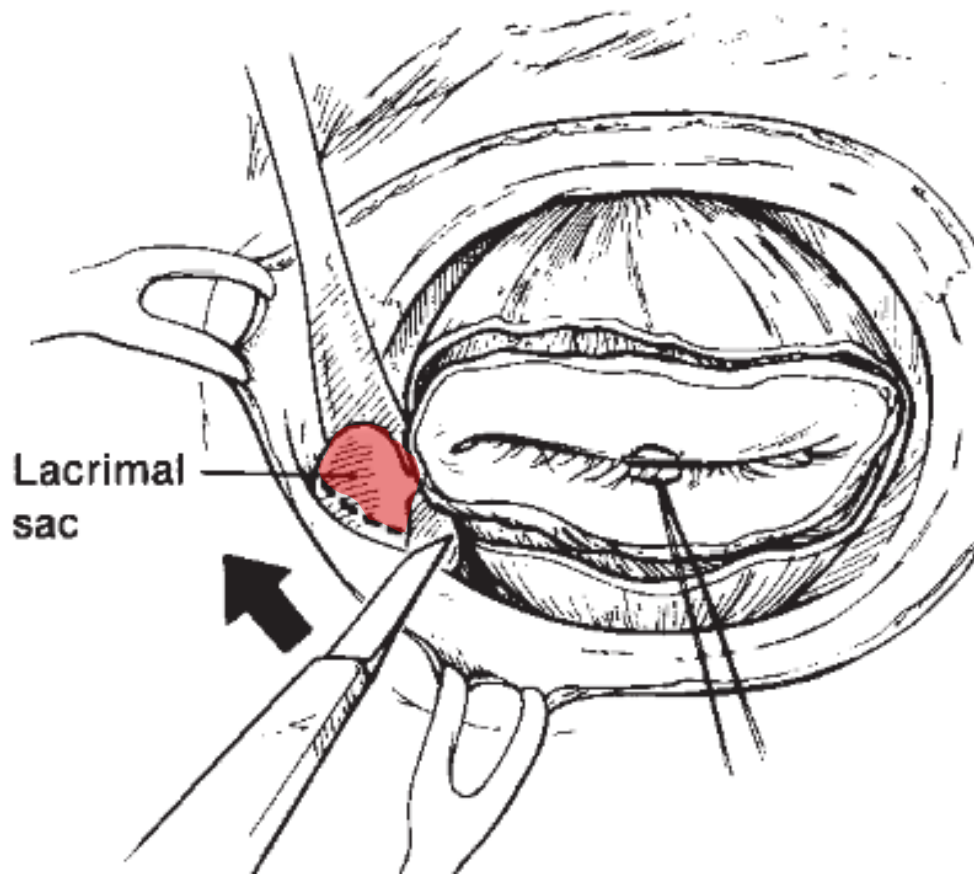


# Orbital Exenteration

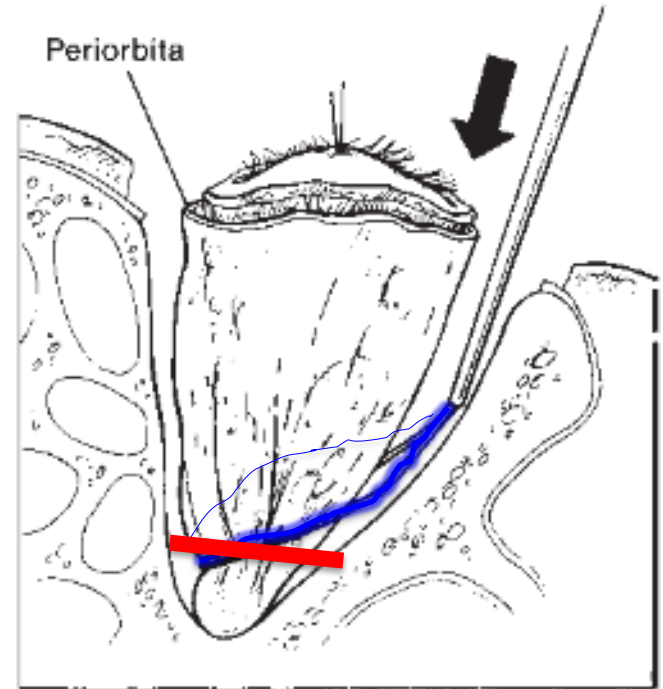
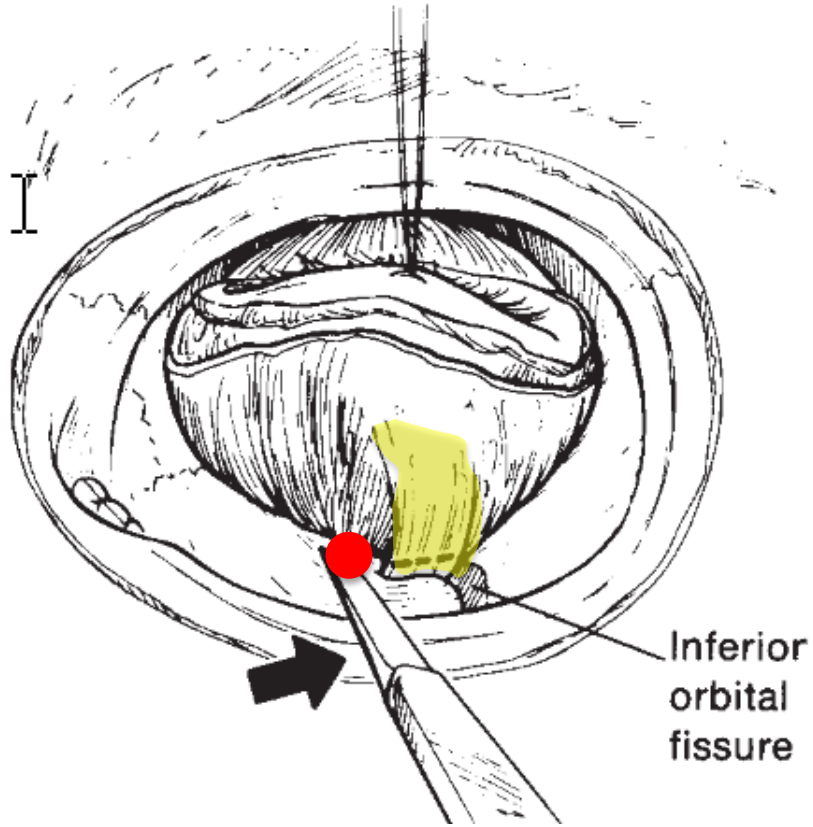




# Orbital Exenteration



# Orbital Exenteration

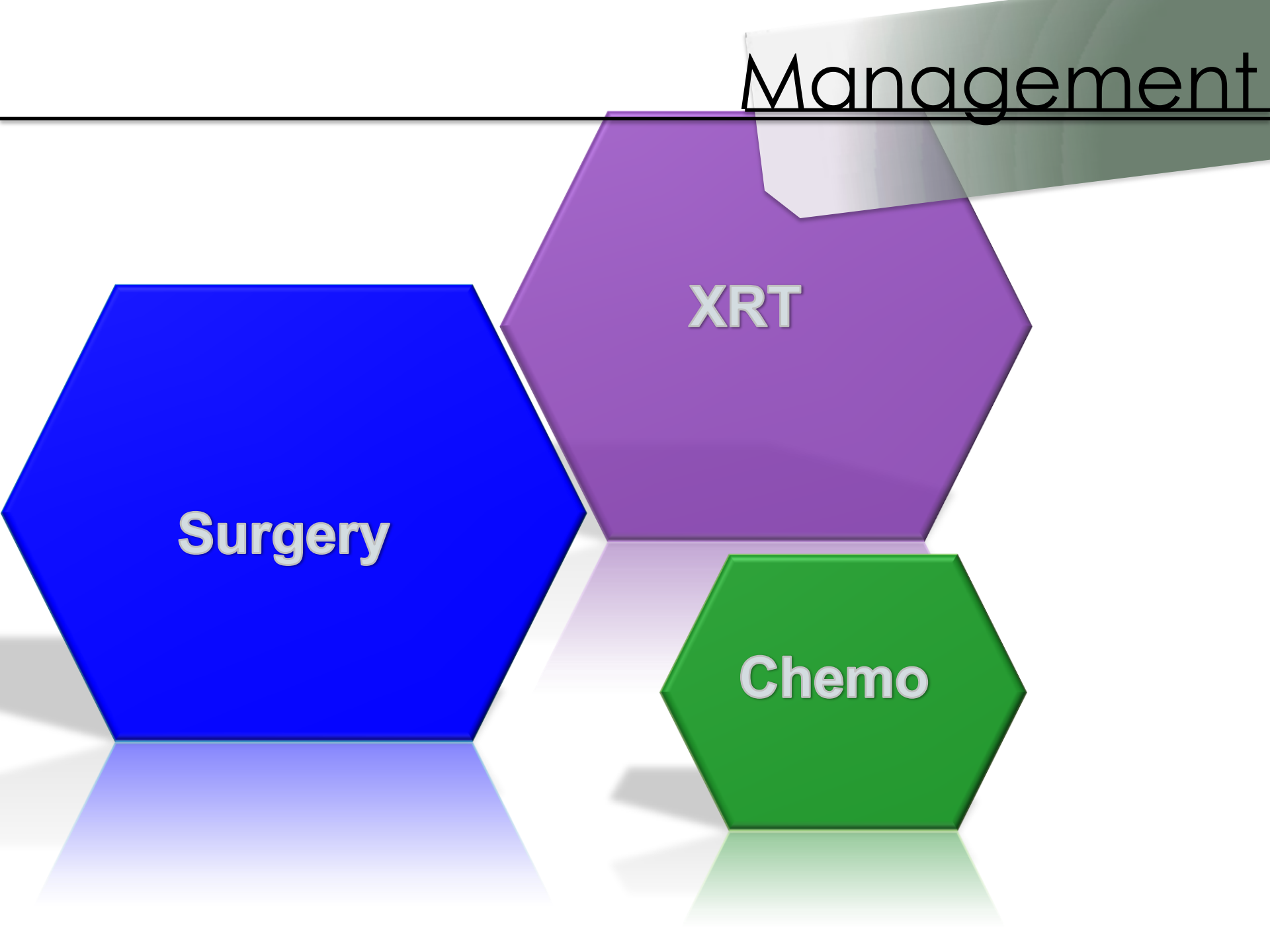


# Management

**Surgery**

**XRT**

**Chemo**



# Management

## Surgery

- Exenteration
- Debulking

XRT

Chemo

# Orbital Preservation/ XRT

TABLE IV.  
Patterns of Local Recurrence According to Primary Tumor Site in Patients Treated With Orbital Preservation versus Orbital Exenteration.

Histologic Subtype	Orbital Preservation (54)				Orbital Exenteration (12)	
	No.	Local Sinonasal Recurrence			No.	Local Recurrence
		-Orbital Disease	+Orbital Disease	Total		
SCCa	18	4	2	6 (11.1)*	6	2 (16.7)
SNUC	6	1	1	2 (3.7)	2	1 (8.3)
Adenomatous	10	2	1	3 (5.6)	3	1 (8.3)
Sarcoma	11	3	—	3 (5.6)	1	—
Other	9	2	—	2 (3.7)	—	—
TOTAL	54	12	4	16 (29.6)	12	4 (33.3)

-Orbital disease = local recurrence in the sinonasal cavity remote from the original site of orbital involvement.

+Orbital disease = local recurrence in the sinonasal cavity with involvement of the original orbital site.

\*Values in parentheses are percentages.

Eye preservation could be attempted in any malignancy that invaded the orbital soft tissues with penetration through the periorbital fat provided that it could be easily and completely dissected away from the orbital fat.

No statistically significant difference in recurrence rates

# Orbital Preservation/ XRT

## Disease-free survival in patients with orbital invasion

	Orbital Preservation†	Exenteration‡	Significance (P)
Som et al. (1974)	—	3/27 (11%)	>.05
Perry et al. (1988)	1/2 (50%)	2/4 (50%)	
Xuexi et al. (1995)	8/23 (35%)	24/88 (27%)	
Carrau et al. (current study)	5/9 (56%)	6/12 (50%)	
Total	14/34 (41%)	35/131 (37%)	

No  
difference in  
survival

## Local recurrence in patients with orbital invasion

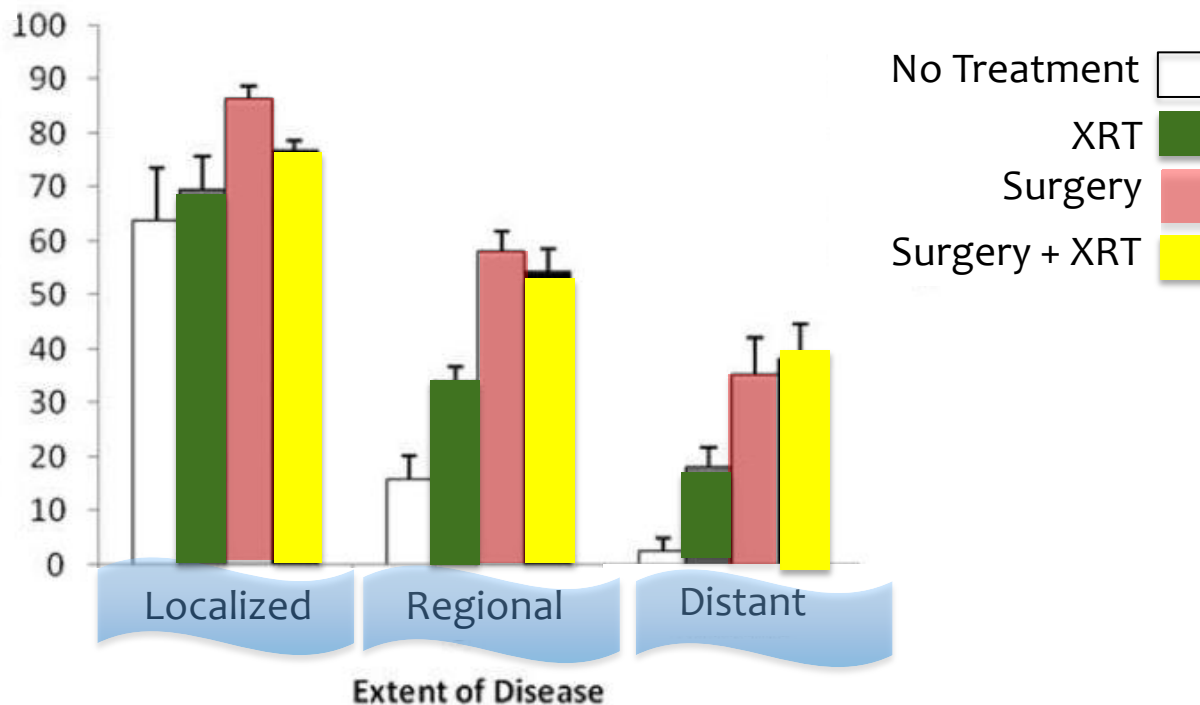
	Orbital Preservation†	Exenteration‡	Significance (P)
Som et al. (1974)	—	22/27 (81%)	>.05
Perry et al. (1988)	1/2 (50%)	1/4 (25%)	
Xuexi et al. (1995)	2/23 (9%)	11/88 (13%)	
McCary et al. (1996)	1/5 (20%)	—	
Carrau et al. (current study)	0/11 (0%)	0/11 (0%)	
Total	4/58 (7%)	34/131 (26%)	

No difference  
in local  
recurrence

Preservation of the orbit, when the full thickness of periorbita is not invaded, does not downgrade outcome and therefore supports a trend toward orbital preservation.

# Survival: Sinonasal Malignancy

5- Year Survival: Sinonasal Malignancy



Not specific to orbital invasion

# Orbital Preservation/ XRT

## University of Virginia Protocol (SNUC, Esthesio)

- Preop XRT
  - Effort to spare globe, lacrimal gland
- Chemo?
- Salvage surgery

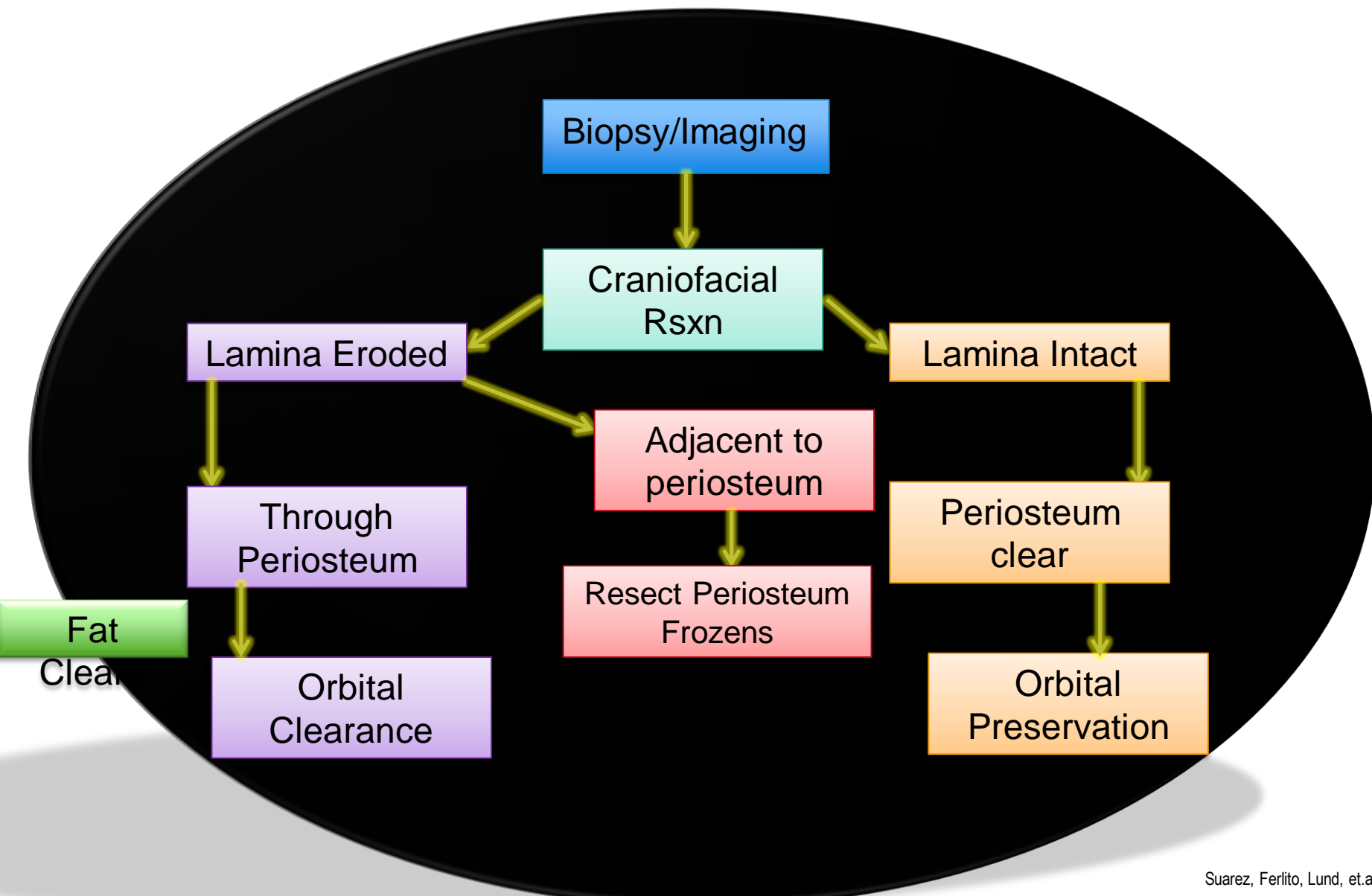
- **33 patients: Orbital invasion**
  - Invaded bone & displaced periorbita
  - Grossly invaded the orbit & periorbita
- No eyes removed
- 5/33: Local recurrence
  - 1/5: in orbit

### Pre-op XRT

- Reduce tumor size
- Tumor in orbit replaced by scar
  - Easily dissected from fat



# Algorithm for Managing Orbit



# Outline

---

- Anatomy
- Epidemiology
- Presentation
- Pathology
- Orbital Invasion
- Evaluation
- Management
- **Sequela**
  - Disease-specific management
  - Research

# Sequela of Function

## Points of Contention

Oncological Safety of Orbital Preservation

Functional Outcome in Preserved Eyes

# Sequela of Function

---

A Venn diagram with three overlapping circles. The top-left circle is light blue and labeled 'Surgery alone'. The top-right circle is light purple and labeled 'radiation alone'. The bottom circle is light red and labeled 'Surgery & radiation'. The circles overlap in the center and at the intersections.

Surgery  
alone

radiation alone

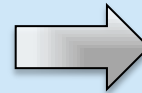
Surgery &  
radiation

# Sequela of Function

## Surgery alone

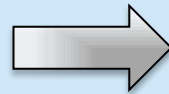
Imola, Schramm 2002

Functional **without** impairment



54%

Functional **with** impairment



37%

Non-Functional



9%

“Functional”  
day-to-day use of the eye (VA, globe position, lacrimal integrity, etc..)

### Most Common:

- Lack of adequate reconstruction
- Diplopia

# Sequela of Function

radiation alone

Loss of Ocular  
Function

- Ipsilateral Orbit: 79%
- Contralateral Orbit: 5%

# Loss of Ocular Function

# Sequela of Function

radiation alone

Overall Incidence of Functional Ocular Sequelae and the Influence of Radiation Therapy in the Group of Patients Treated With Orbital Preservation.

Ocular Sequelae	Occurrence in Orbital Preservation Group		
	Overall (54)	Radiation Therapy (39)	No Radiation Therapy (15)
Ectropion	11 (20)*	9 (23)	2 (13)
Blepharitis/conjunctivitis	18 (33)	15 (38)	3 (20)
Corneal exposure keratopathy	6 (11)	5 (13)	1 (7)
Epiphora	7 (13)	2 (5)	5 (33)
Dryness	5 (9)	5 (12.8)	
Optic atrophy	2 (4)	2 (5)	
Cataract formation	4 (8)	4 (10)	

\*Values in parentheses are percentages.

# Sequela of Function

## Surgery & radiation

### McCary 1996

- 29/ 33-
  - Pre-op XRT
  - Rrxn of periorbita
- 55%: No ophthalmic problems
- 45%:
  - Exposure Keratitis (6 pts)
  - Motility Disturbance (6 pts)
    - 5 pts: transient or asymptomatic
  - Cataracts
  - Ectropion
  - Dsytopia
  - Enophthalmos

### Bleier 2012, Suarez 2008

- Increased risk of:
  - Otpic atrophy
  - Cataracts
  - Excessive dryness
  - Ectropion



# Outline

---

- Anatomy
- Epidemiology
- Presentation
- Pathology
- Orbital Invasion
- Evaluation
- Management
- Sequela
- **Disease-specific management**
- Research

# Outcomes...

---

Sparing the soft tissues of the orbit when the periorbita have not been deeply transgressed by tumor generally does not appear to adversely affect local control.

# Outcomes...

---

## Confounding factors...

### Selection Bias

- More advanced tumors → Exenteration
- More favorable tumors → Preservation

### Tumor Histology

- Plays significant role in outcome

# Local Recurrence

## Histologic Subtype

Histologic Subtype	Orbital Preservation (54)				Orbital Exenteration (12)	
	No.	Local Sinonasal Recurrence			No.	Local Recurrence
		-Orbital Disease	+Orbital Disease	Total		
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Adenomatous	10	2	1	3 (5.6)	3	1 (3.3)
Sarcoma	11	3	—	3 (5.6)	—	—
Other	9	2	—	2 (3.7)	—	—
<b>TOTAL</b>	<b>54</b>	<b>12</b>	<b>4</b>	<b>16 (29.6)</b>	<b>12</b>	<b>4 (33.3)</b>

Not Statistically Significant

-Orbital disease = local recurrence in the sinonasal cavity remote from the original site of orbital involvement.

+Orbital disease = local recurrence in the sinonasal cavity with involvement of the original orbital site.

\*Values in parentheses are percentages.

Low numbers of each histology

# Conclusions...

---

Periorbita not deeply transgressed

✧ Does not affect local control/survival

✧ Preserve orbit

Outcomes less clear when fat is invaded

Surgery/XRT- Preserved eye with variable level of function

Tumor histology/behavior matters

# Outline

---

- Anatomy
- Epidemiology
- Presentation
- Pathology
- Orbital Invasion
- Evaluation
- Management
- Sequela
- Disease-specific management

• **Research**

# Jefferson Data

## Goals

...

1. Evaluate recurrence and survival rates based on tumor histology for orbital preservation vs. exenteration
2. Stratify based on extent of tumor resection & degree of invasion
  - Attention to orbital fat

# Jefferson Data

Data

Inv pap w/ SCC	6
SCC	15
BCC	2
Melanoma	3
Esthesio	5
Poorly diff/undiff	13
Spindle Cell	2
SNUC	2
ACC	2

MucoEp	1
Hemangioperi	1
AdenoCA	5
Sarcoma	1
Alveolar Rhabdo	2
Sebaceous CA	1
Leiomyosarcoma	1
Myoepithelioma	1
Plasmacytoma	1



# Acknowledgements

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# Outline

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- References

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Questions?