

Head and Neck Infections



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ACR Education Center 2025

Learning Objectives

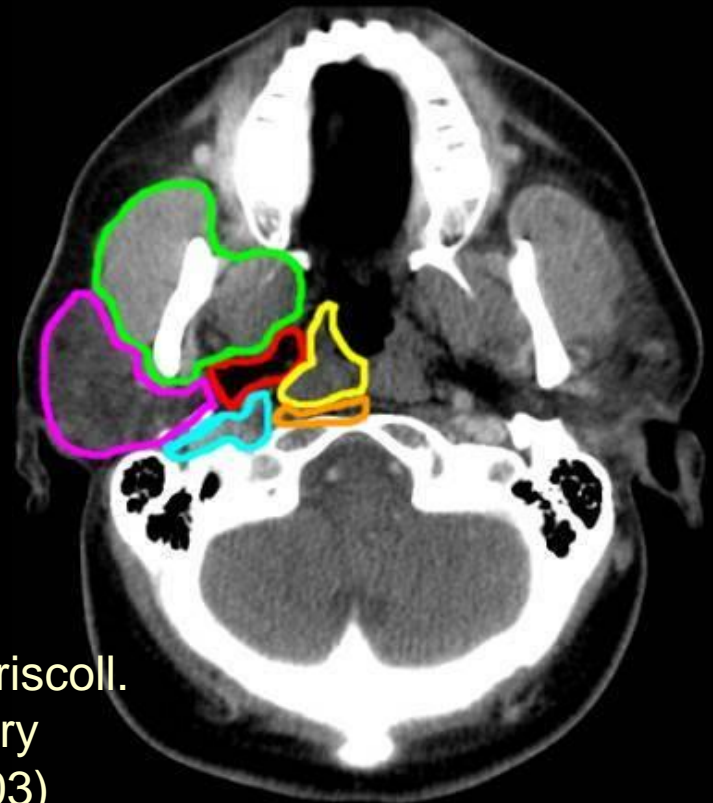


- To diagnose H & N infection on CT.
- To characterize the nature and the location of the infection.
- To appreciate the complications that may result from the infection.

Anatomy

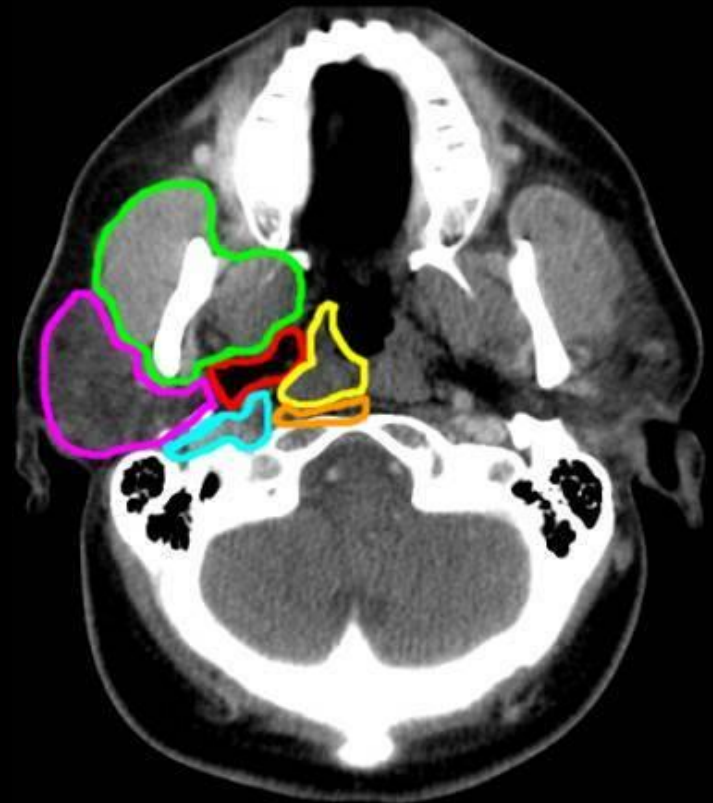
“The presentation, spread, and management of neck infection are based on the anatomic configurations of the cervical fascia and the spaces they define.”

Scott, Stiernberg, Driscoll.
Head & Neck Surgery
Otolaryngology (2003)



Anatomy

Learn the anatomy
based on the
contents of each
space rather than
based on the fascial
planes



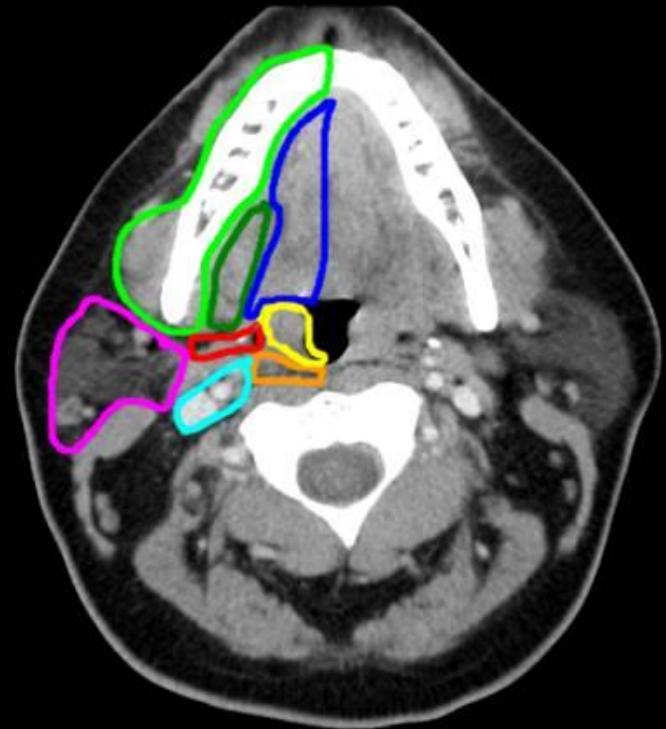
Pharyngeal Mucosal Space

- Say Ahhh!
- Mucosa
- Lymphoid tissue
 - Tonsils
 - Adenoids



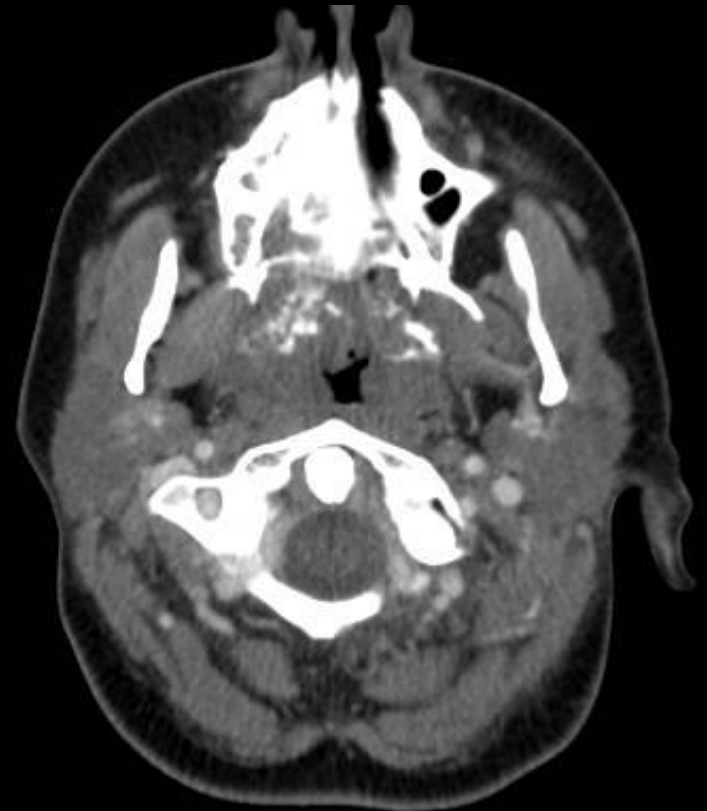
PMS Infections

- Pharyngitis
- Tonsillitis
- Suppuration
- Tonsillar abscess
- Spread to other spaces



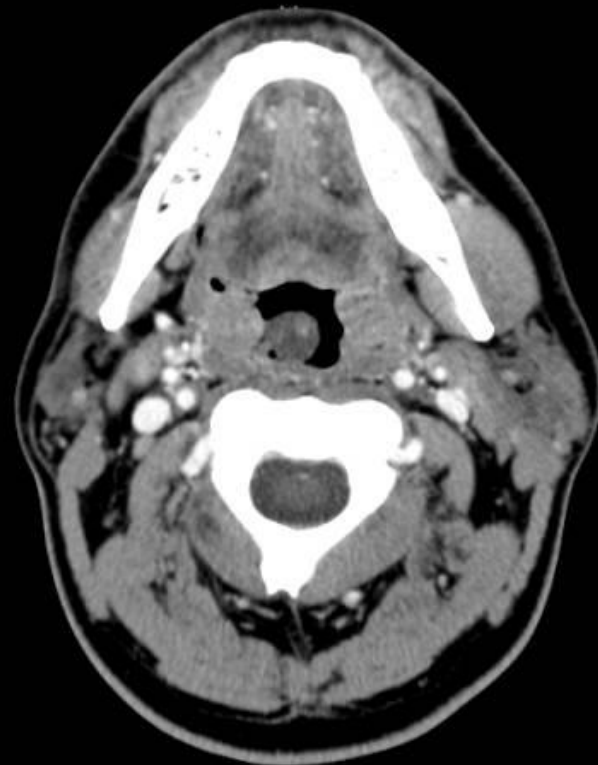
Chronic Tonsillitis

- Remote tonsillar infection
- Bilateral calcifications



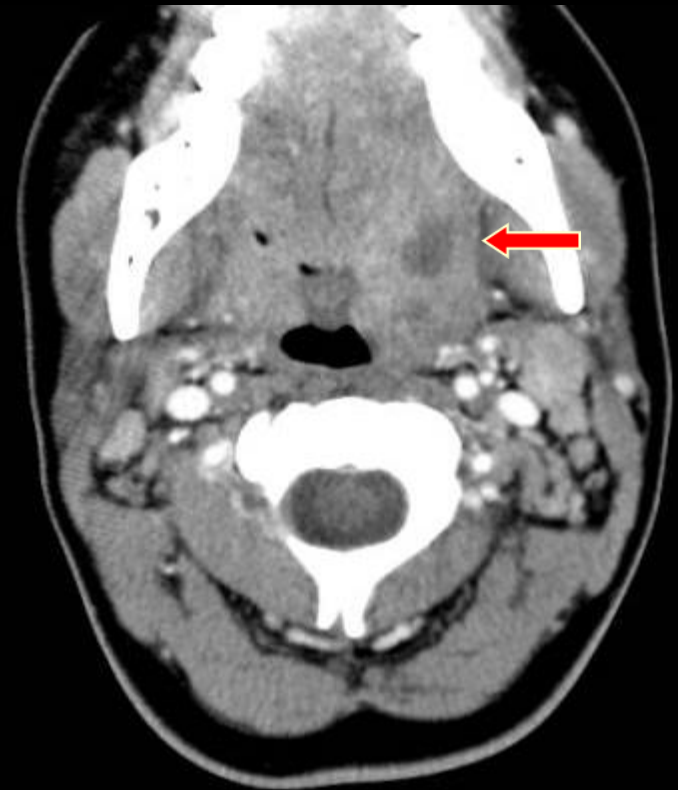
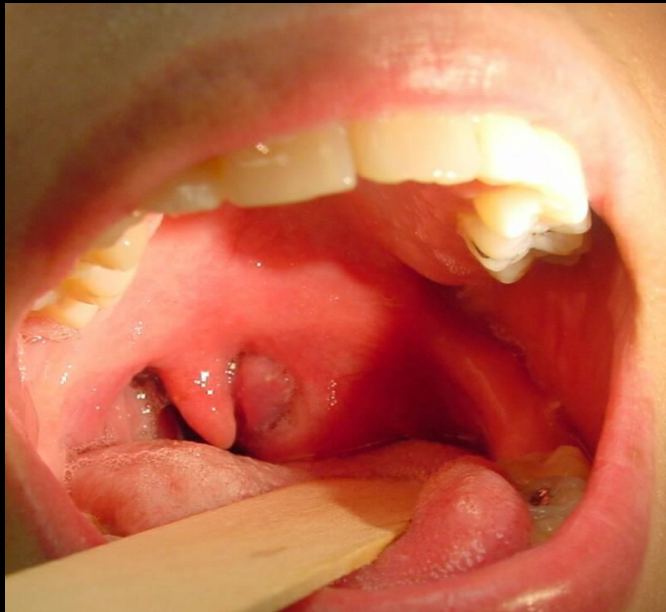
Acute Tonsillitis

- Enlarged uvula
- Enlarged and enhancing tonsils
- No suppuration



Cellulitis and Edema

- Poorly defined, low-density focus



Peritonsillar Abscess

- Well-defined, fluid density collection



Lin M. ALiEM (September 2009)

Later Stage Abscess

- Poorly defined, low-density collection
- Enhancing, crenulated wall



Kirse DJ & Robertson DW,
Laryngoscope; 111:1413-1422 (2001)

Cellulitis vs Abscess



- Low density = cellulitis/edema
- Fluid density + enhancing wall = abscess
- CT accuracy 63-77%
- Clinical exam low sensitivity for abscess
- This distinction is important because the therapy is different

Miller et. al. Laryngoscope 109:1873-1879
(1999) Vural, Gungor, Comerci S. American
Journal of Otolaryngology; 24:143-148 (2003)

Epiglottitis

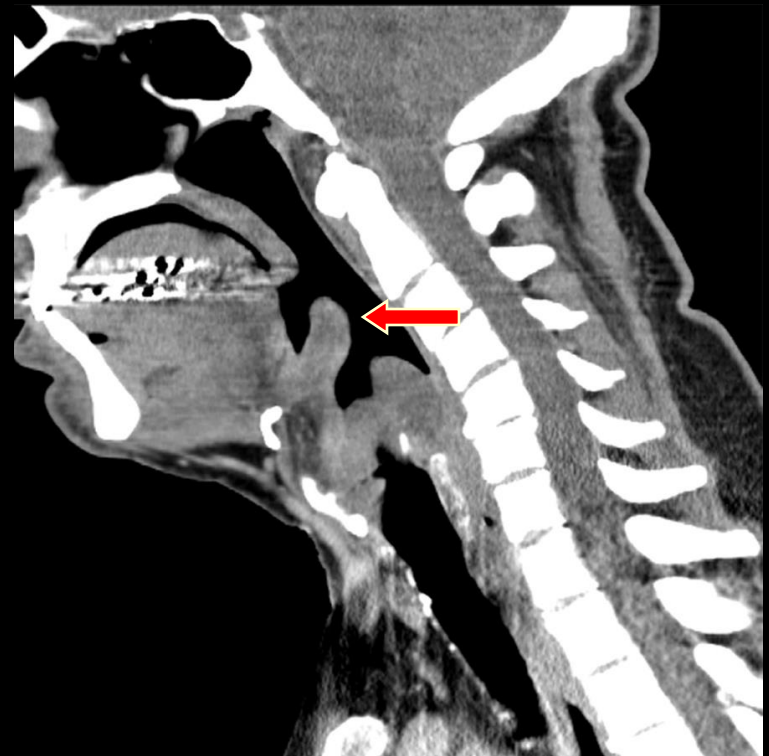


- Inflammation of epiglottis & supraglottis
- Historically, frequent in pediatric patients
 - Infection with *Haemophilus influenzae* type b
- Currently, more frequent in adults
 - Widespread childhood vaccination
 - Infection with *Strep.* & *Staph.*

Mayo-Smith MF, Spinale JW, Schiffman FJ,
et. al. Chest. 108(6):1640-47 (1995)

Epiglottitis

- Thickening of the epiglottis on plain film or CT
 - “Thumb sign”
- Swelling of the supraglottic larynx



Epiglottitis

- Swelling of supraglottic larynx
 - Edema of the false cords
 - Airway compromise
 - Stranding of the preepiglottic fat
- CT differentiates epiglottitis from other causes of fever and sore throat i.e., abscess



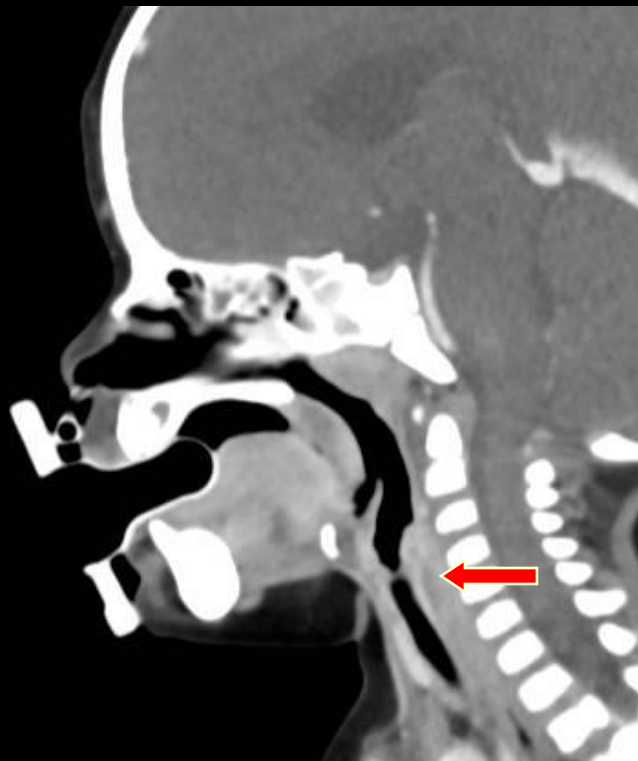
Croup



- Inflammation of subglottic airway
- Most frequent in pediatric patients
 - Acute viral infection
 - Present with inspiratory stridor
- The subglottic narrowing causes an inverted V appearance known as the “Steeple Sign”

Croup

- Subglottic narrowing
– “Steeple Sign”

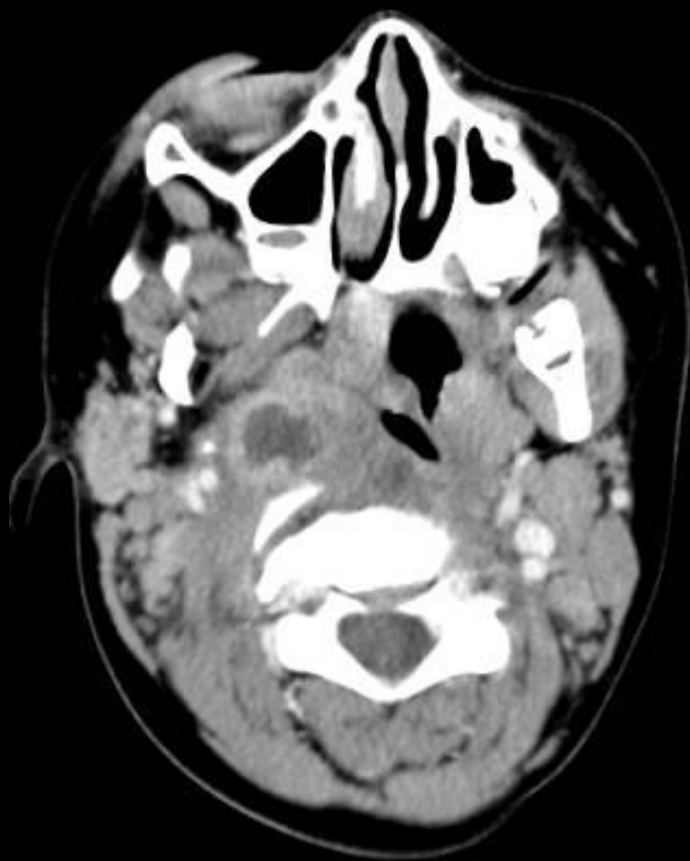


Retropharyngeal Space

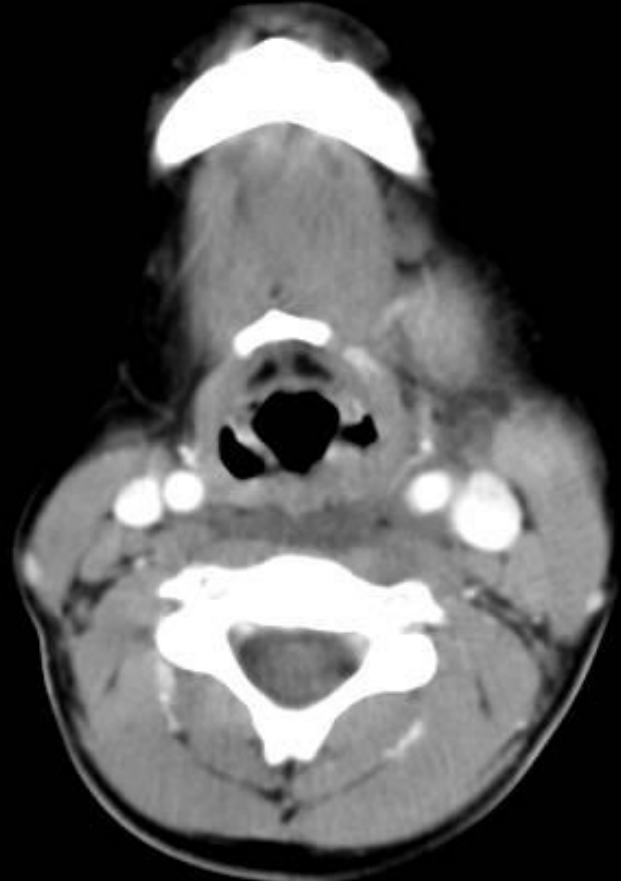
- Fat
- Retropharyngeal nodes (0-5 yrs)
- Divided by median raphe
- “Bow Tie” shape
- Extends to mediastinum



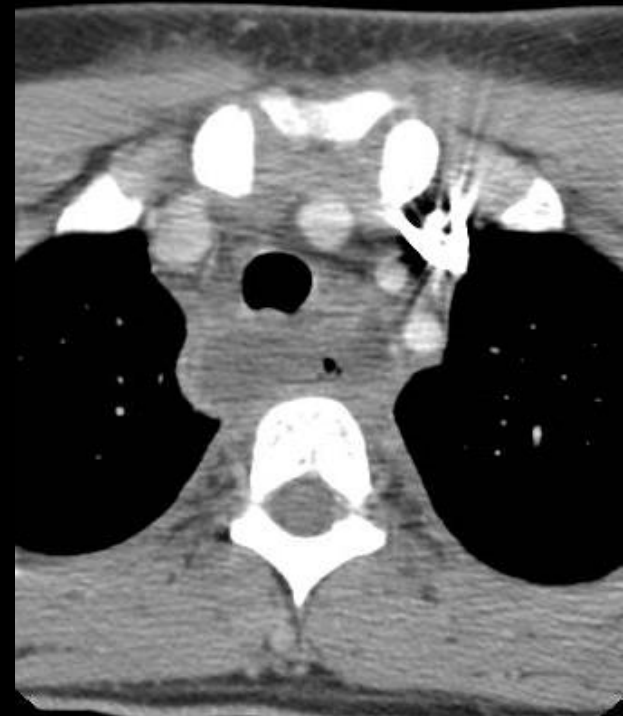
PMS to RPS



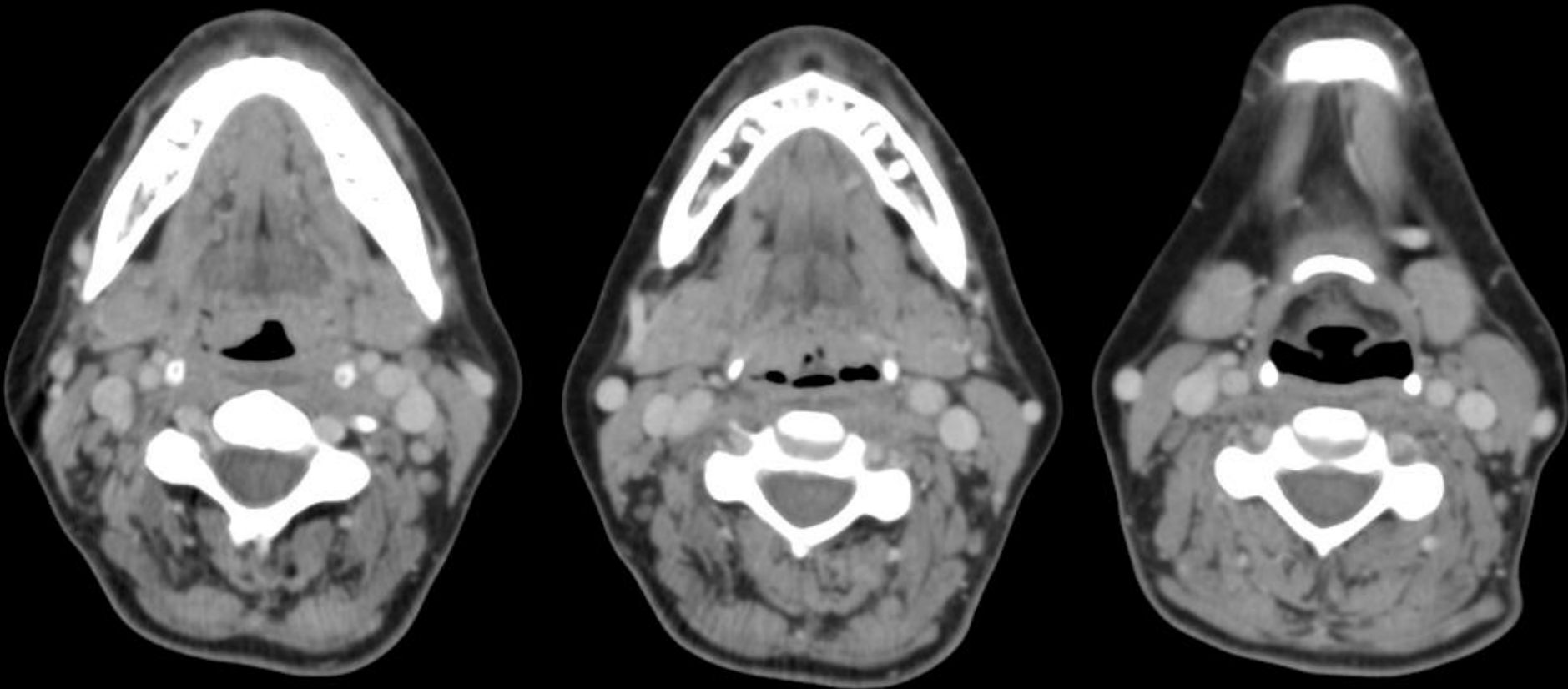
PMS to RPS



PMS to RPS to Mediastinum

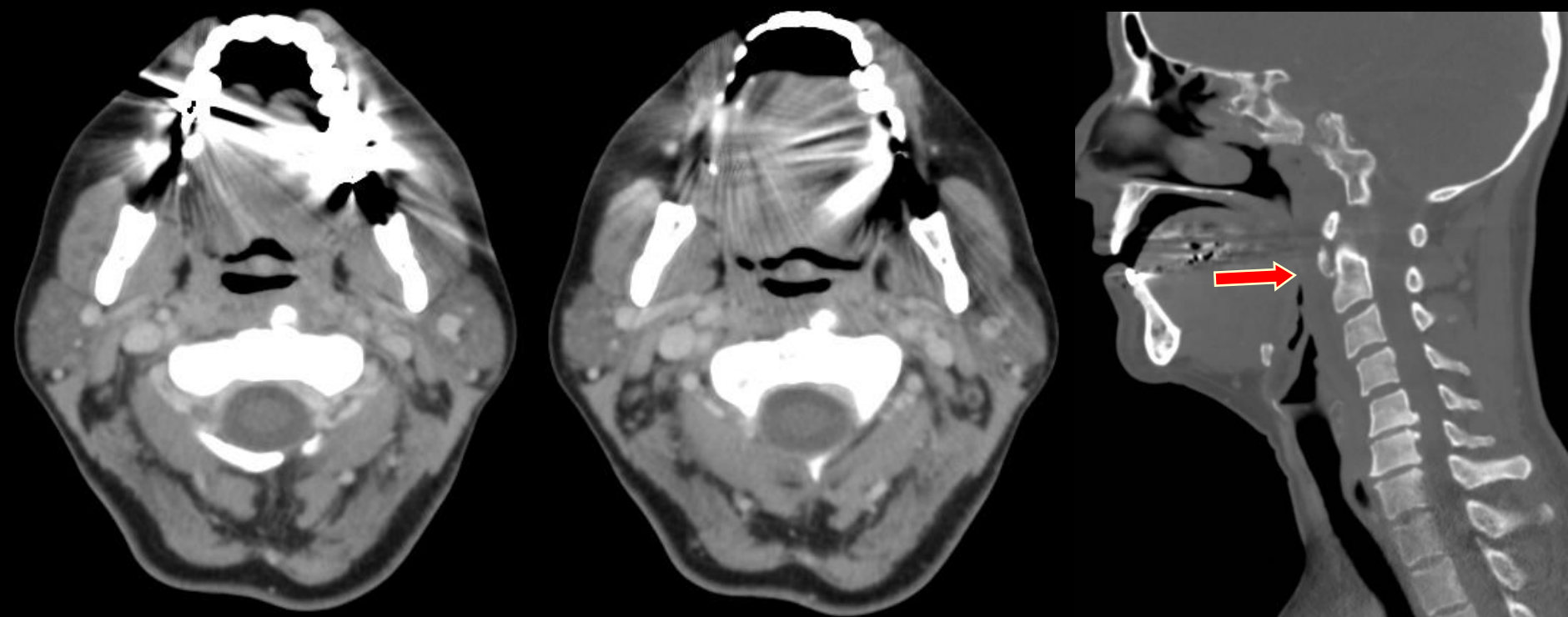


RPS Infection?



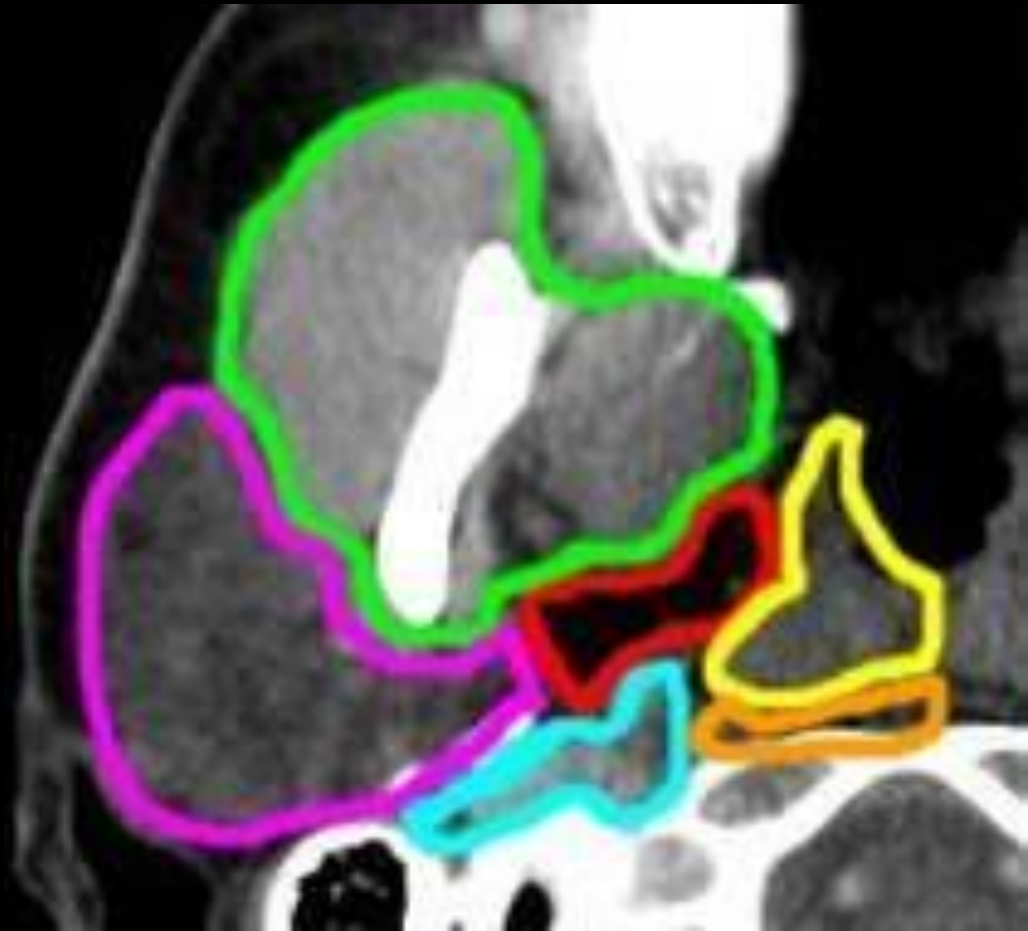
RPS Infection?

No! Calcific Tendonitis



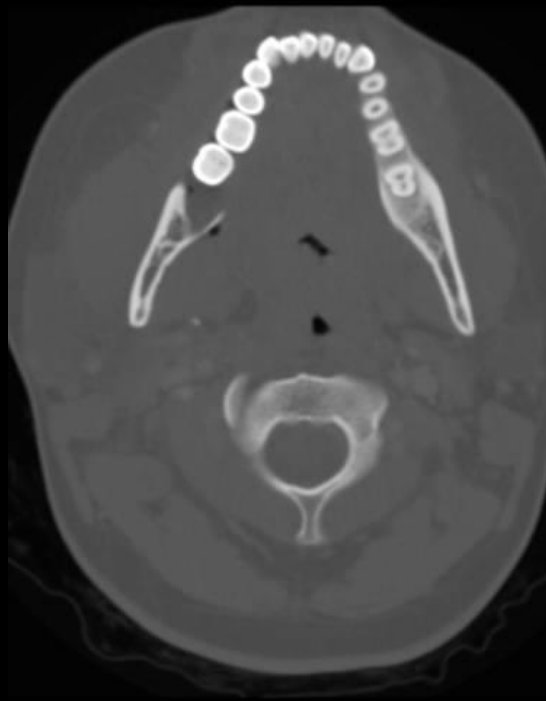
Masticator Space

- Muscles of Mastication
- Mandible
- Infections are most often odontogenic in origin, often following a dental procedure



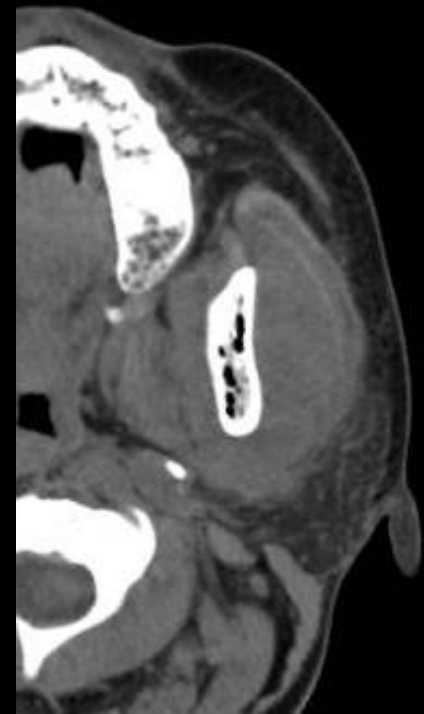
Masticator Space Infection

- Recent extraction
- Enlarged masseter
- Superficial fat stranding

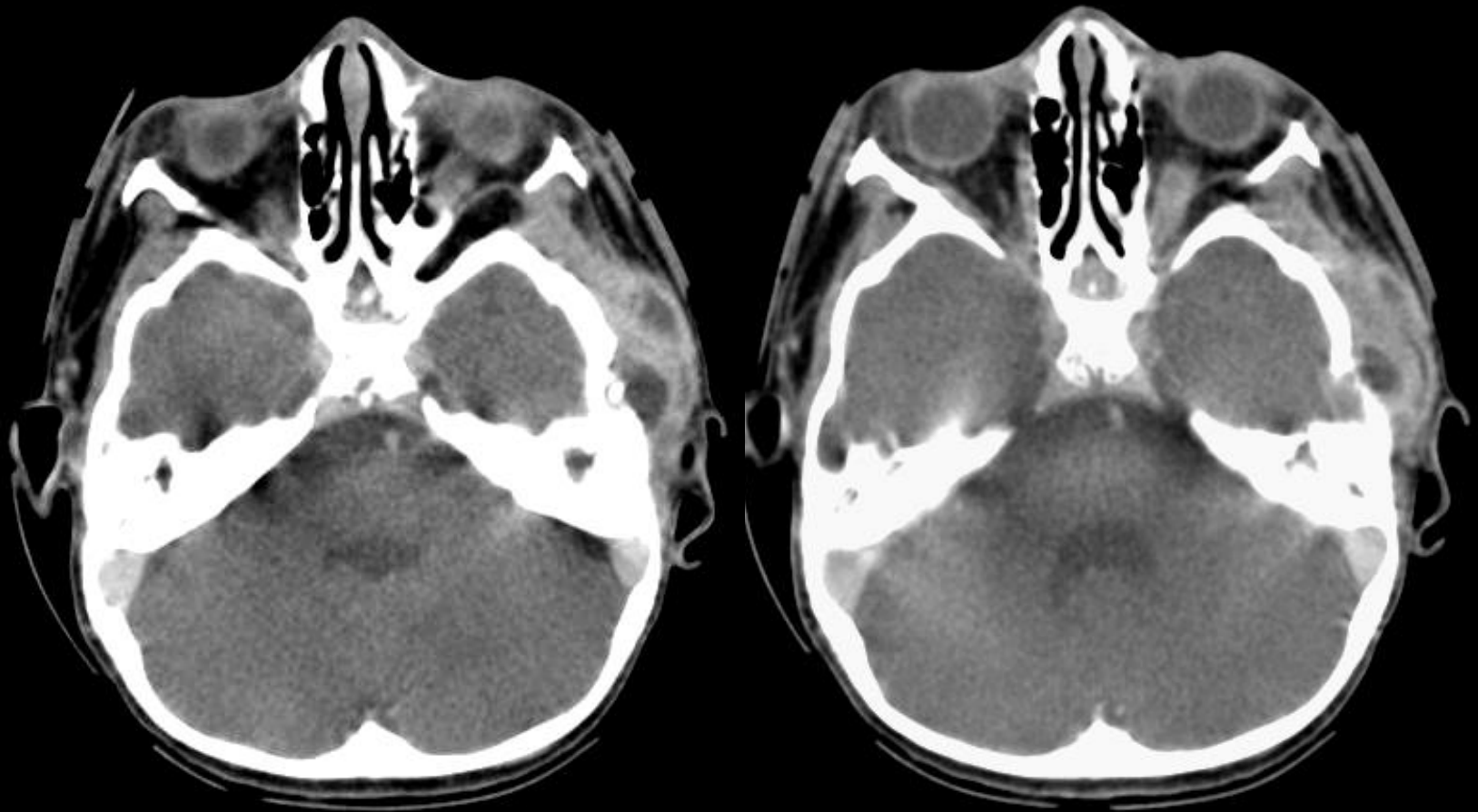


Masticator Space Infection

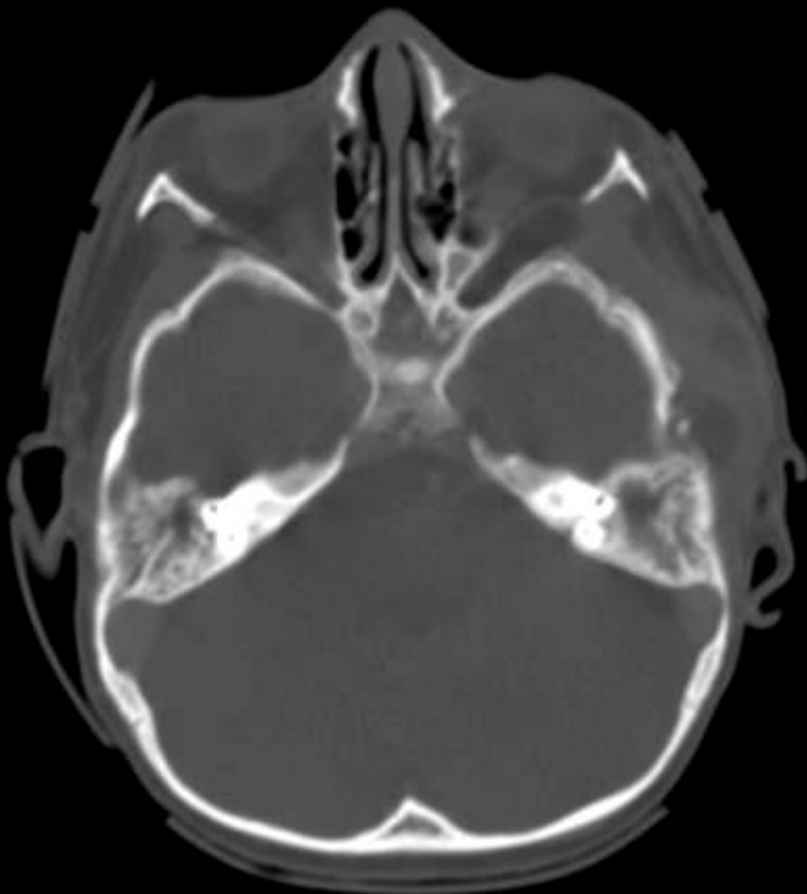
- L facial tenderness
- Enlarged L masseter with fat stranding
- Wide window
 - Gas within the mandible
 - Osteomyelitis



Masticator Space Infection

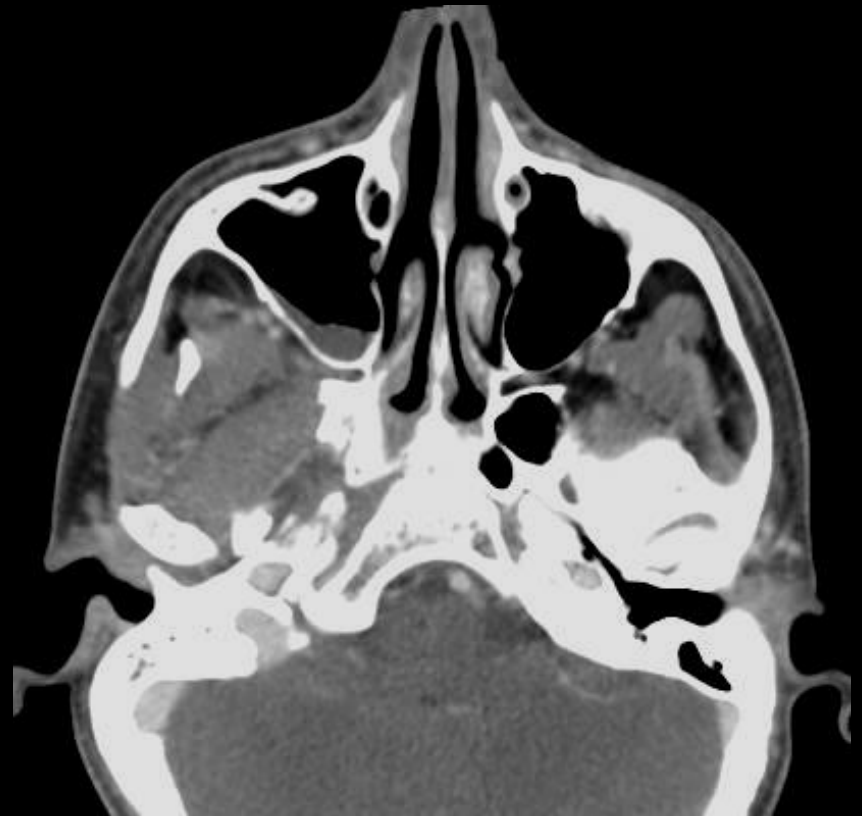


Masticator Space Infection



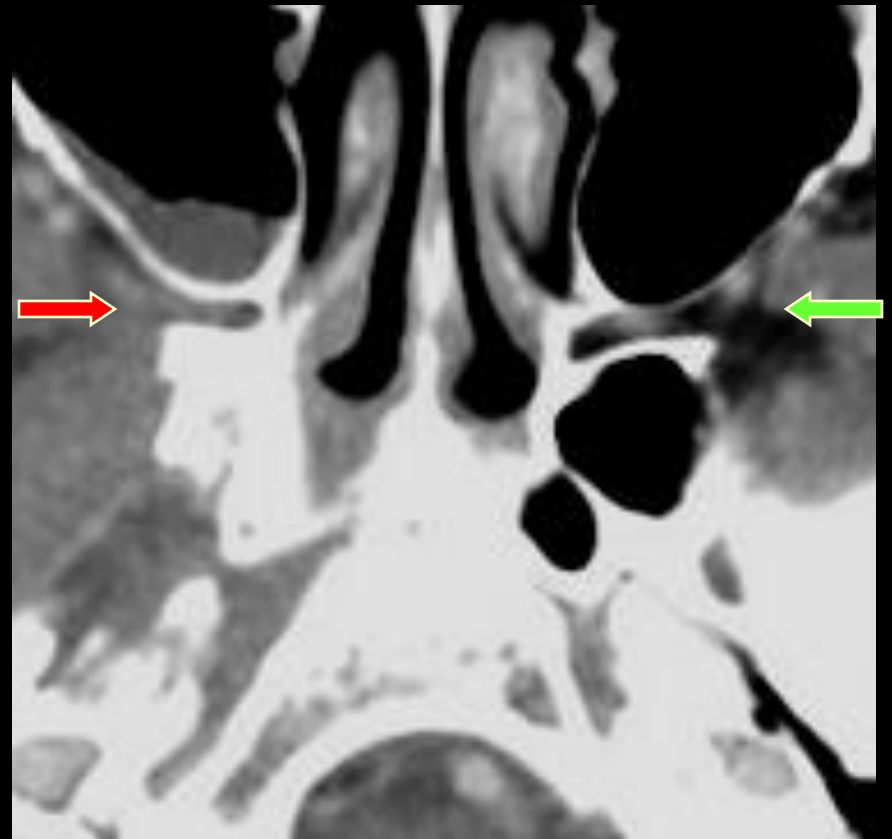
Masticator Space Infection

- Presents with right facial pain
- CT “normal” ?!
- Patient sent home, but returns several weeks later

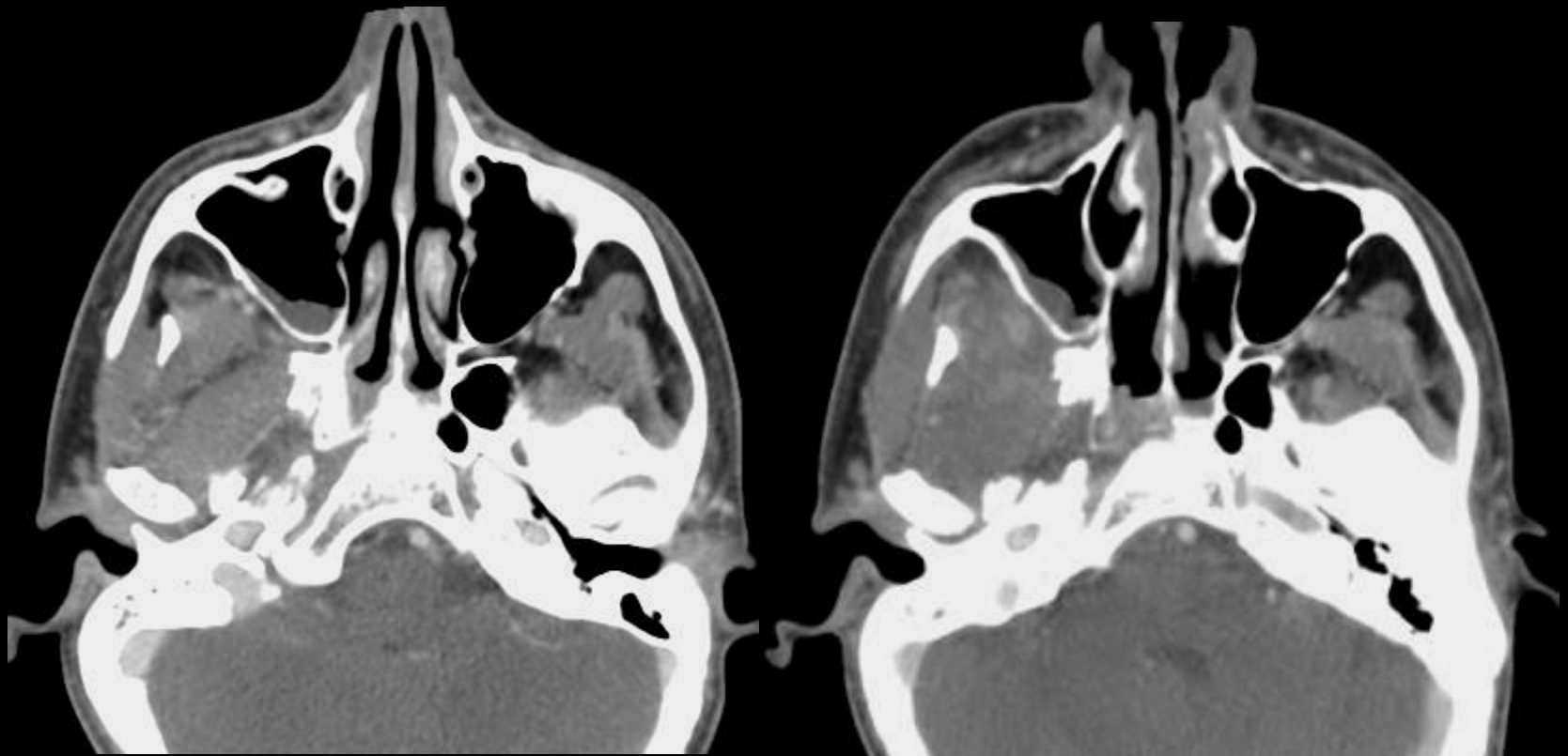


Masticator Space Infection

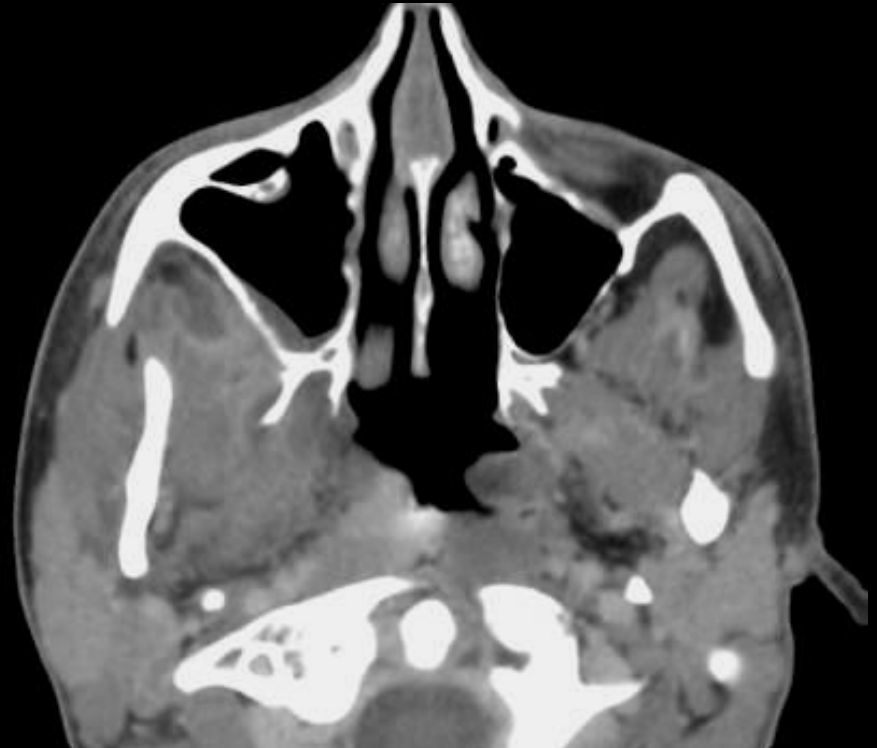
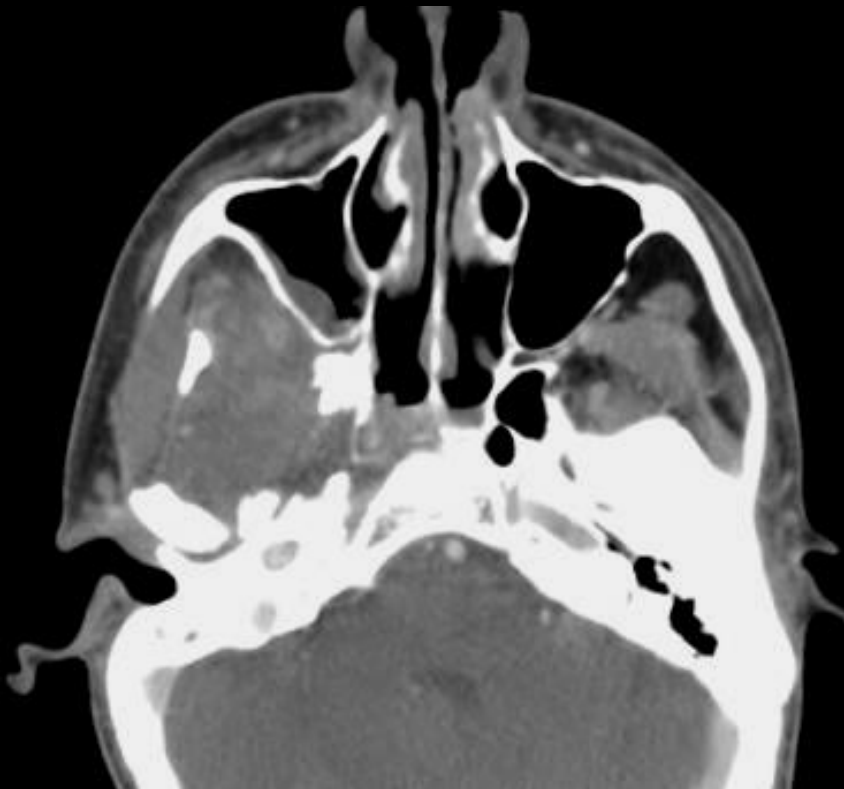
- Pterygopalatine fossa should contain at least some fat



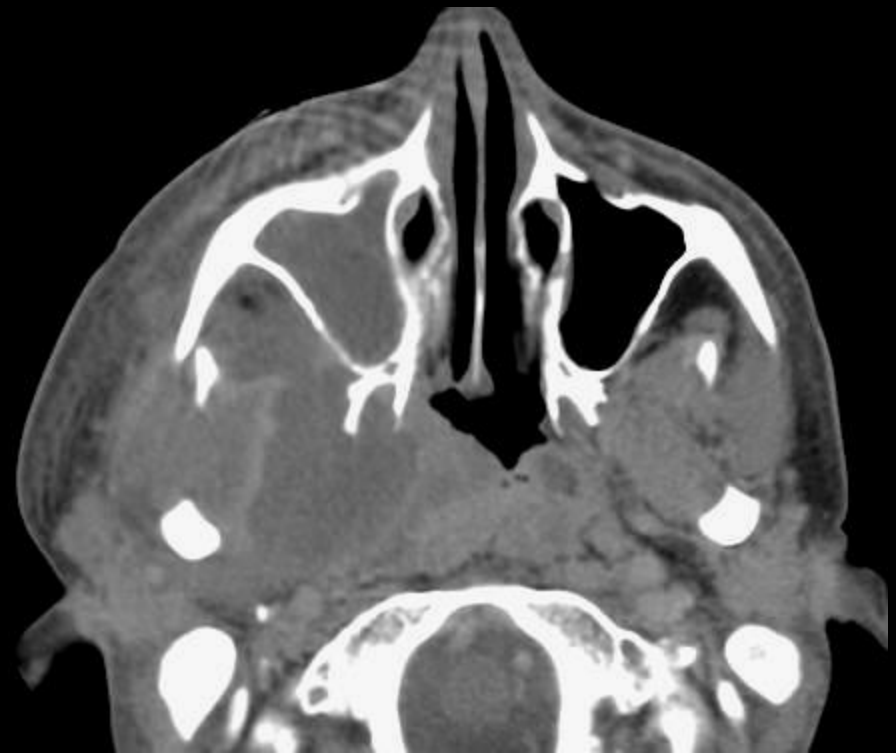
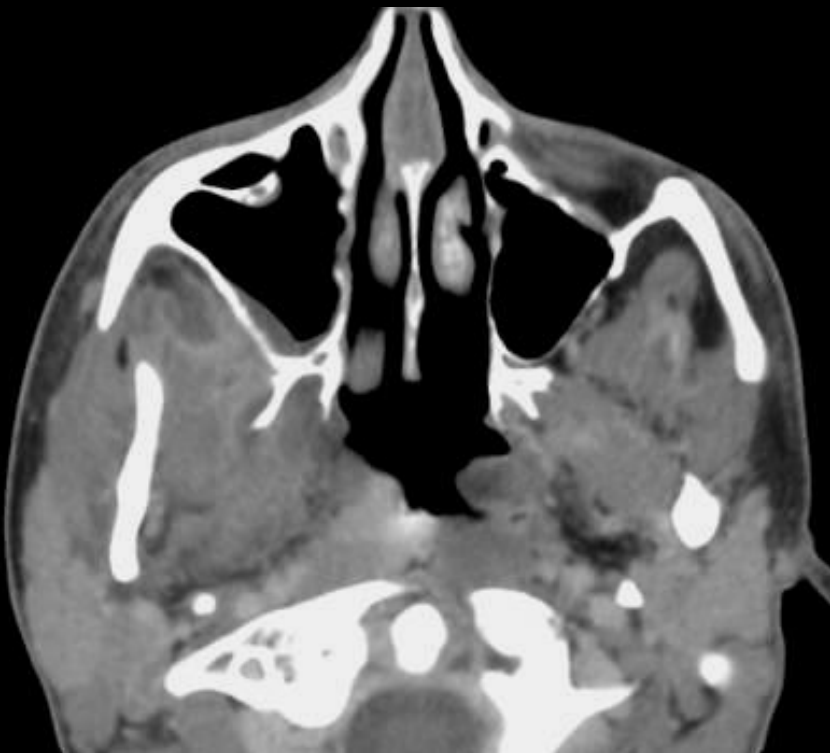
Masticator Space Infection



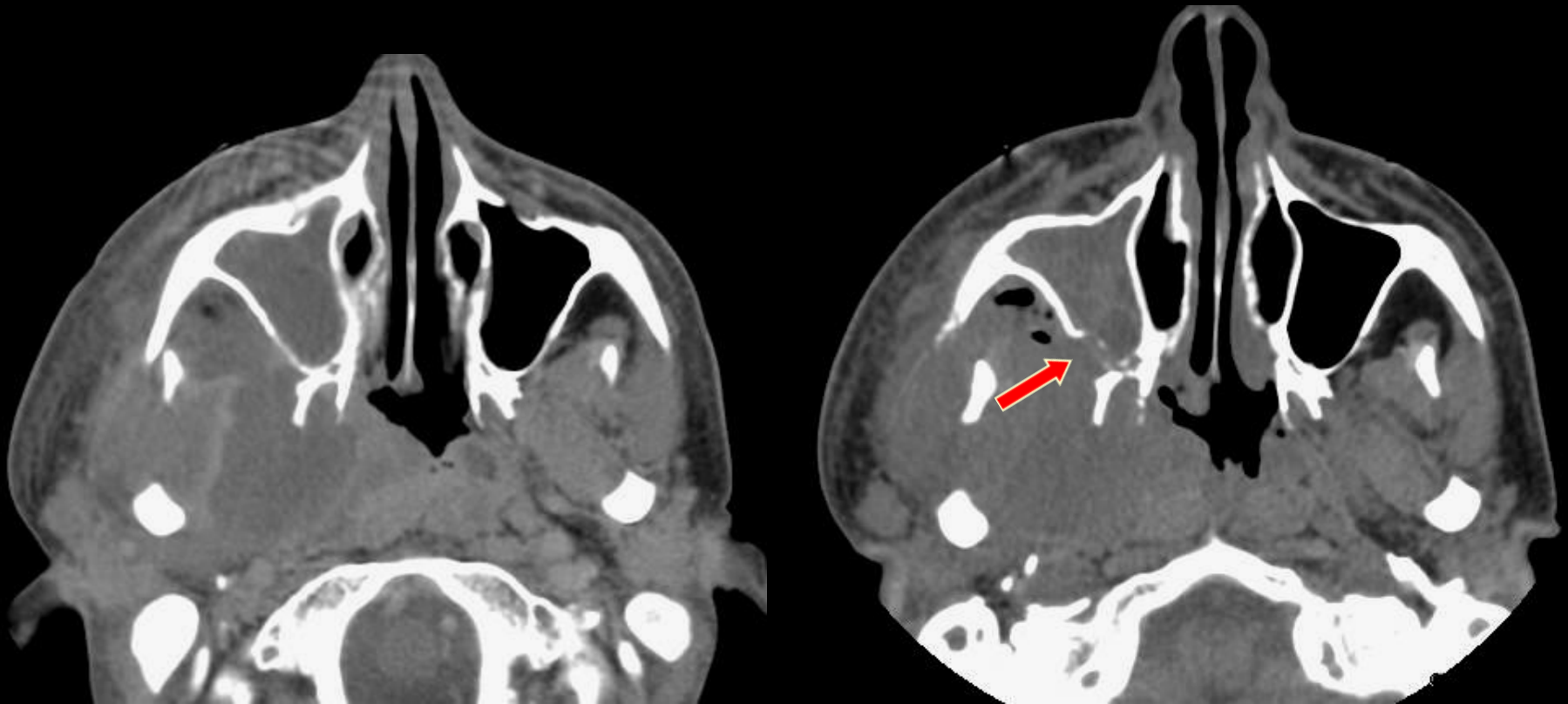
Masticator Space Infection



Masticator Space Infection



Masticator Space Infection

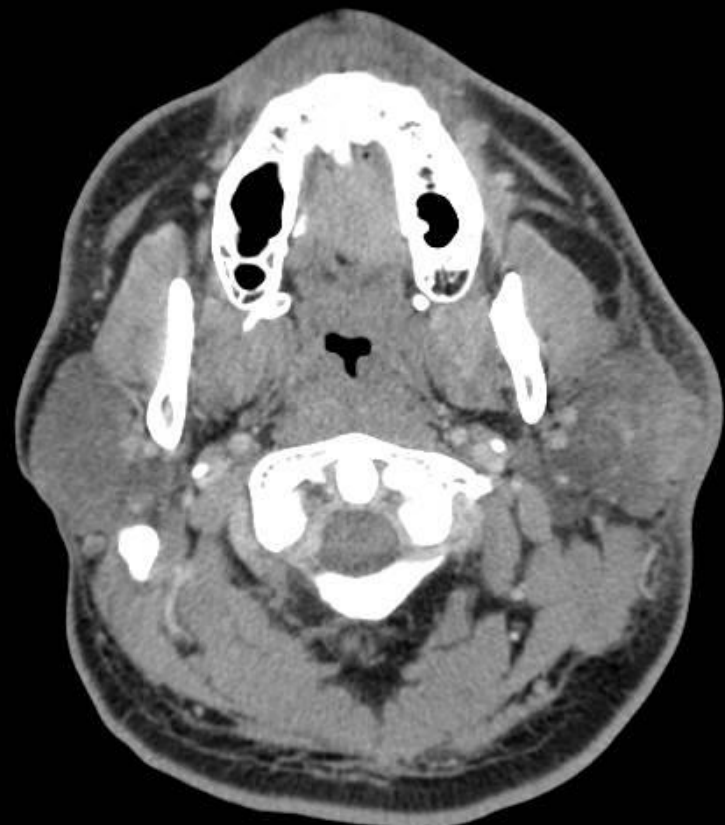


Parotid Space

- Parotid gland (low density c/w muscle)
- Bacterial infection due to stasis or obstruction to flow
- Viral parotitis, ie mumps



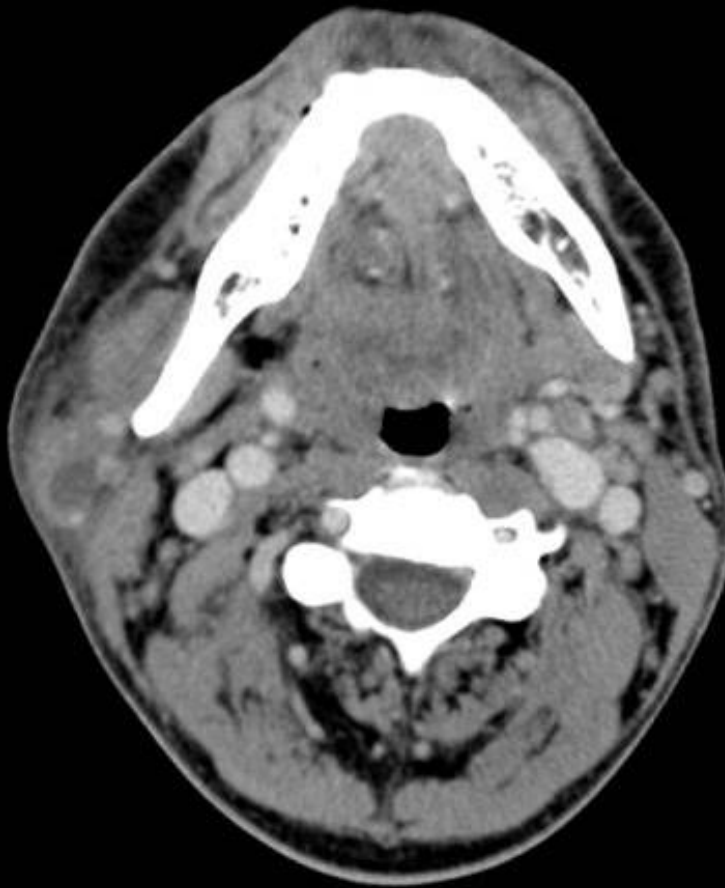
Left Parotitis



Bilateral Parotitis



Parotid Space Abscess



Parotid Sialolithiasis



Carotid Space

- Carotid artery
- Internal jugular vein
- Vessels easy to see with IV contrast
- Cranial nerves IX-XII, nodes

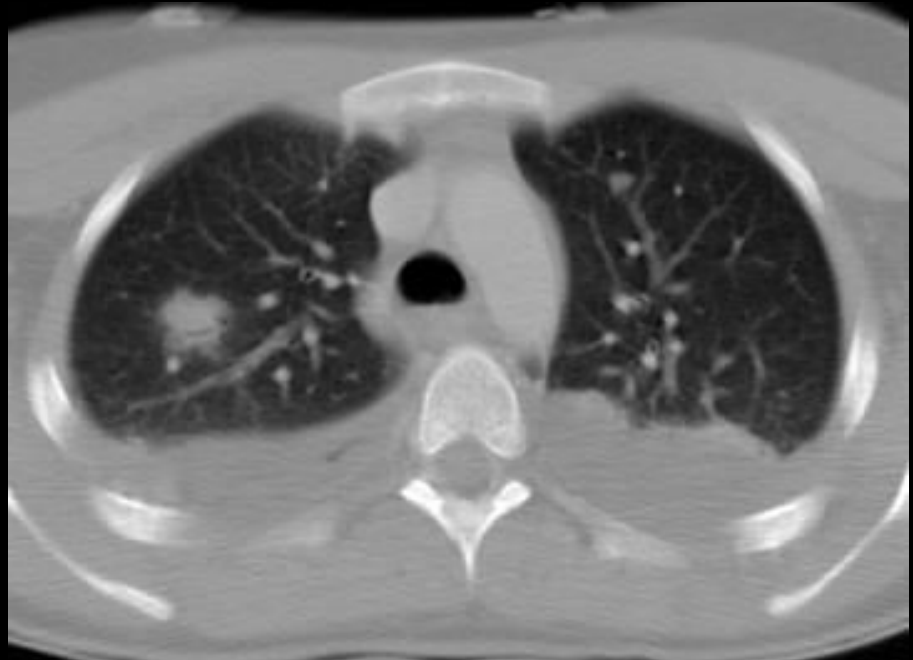


Lemiere Syndrome

- Left carotid space infection
- Jugular septic thrombophlebitis
- Septic embolism to the lungs



Lemiere Syndrome

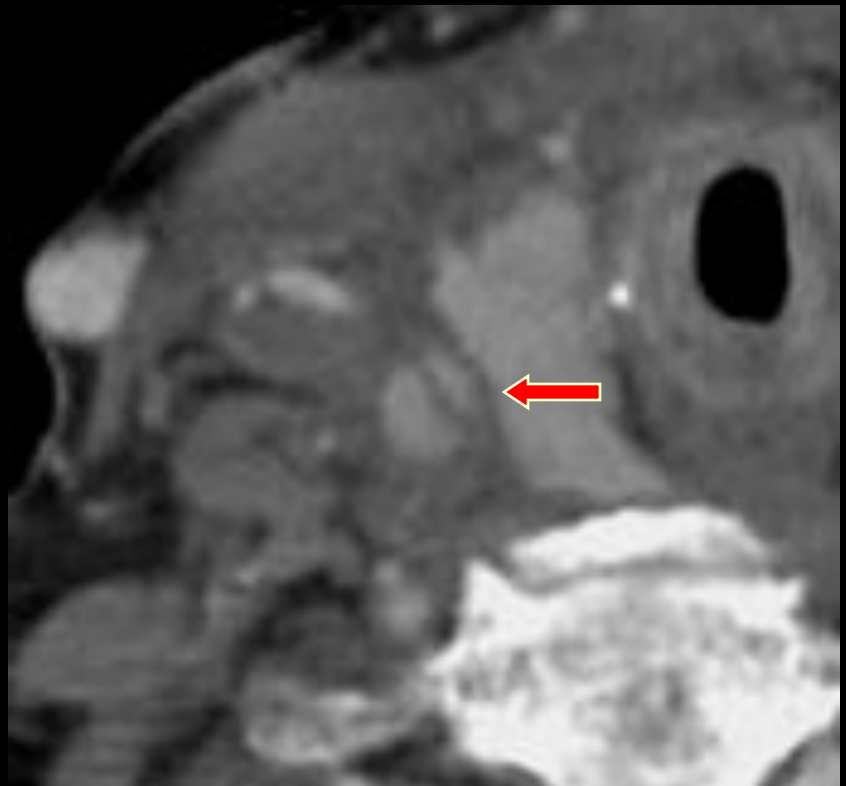
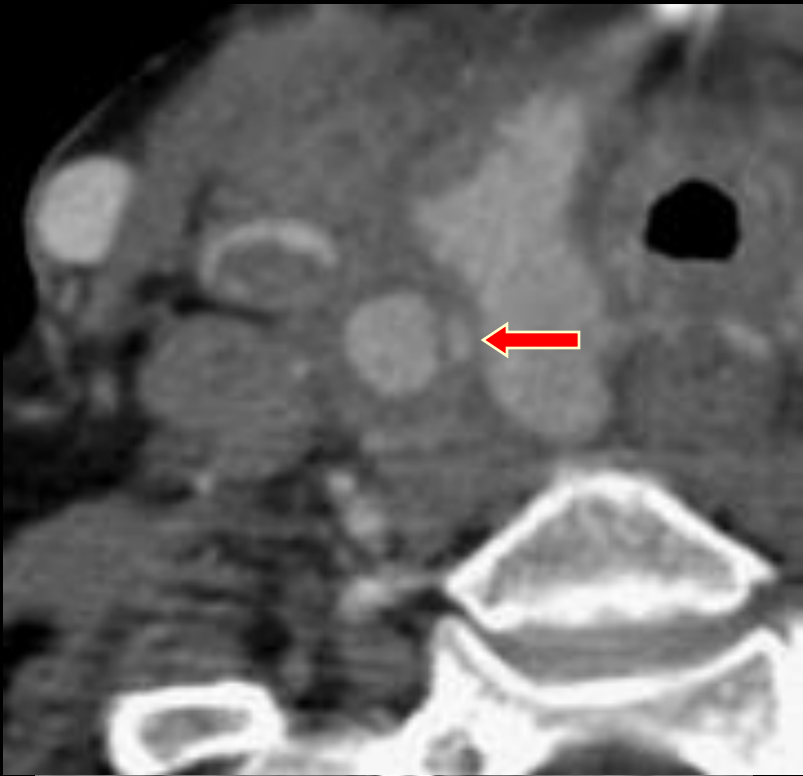


Carotid Pseudoaneurysm

- Proteolytic enzymes in the abscess weaken the vessel wall
- Pseudoaneurysm
- Carotid rupture

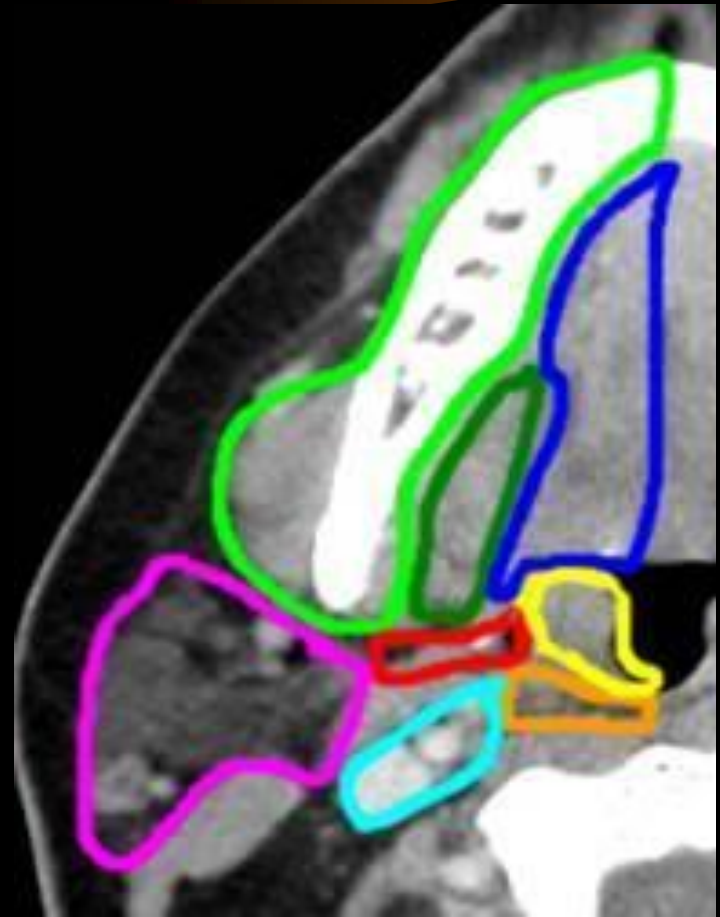


Carotid Pseudoaneurysm

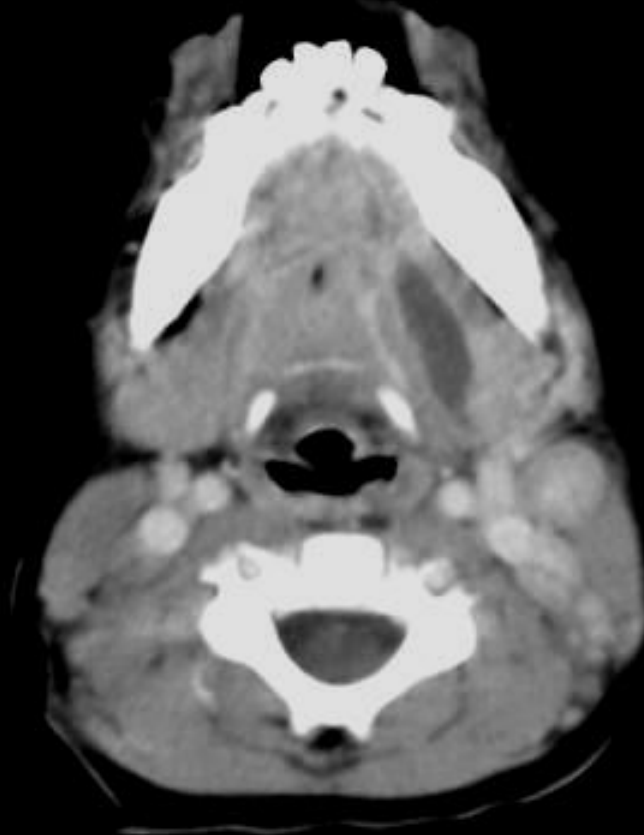


Sublingual Space

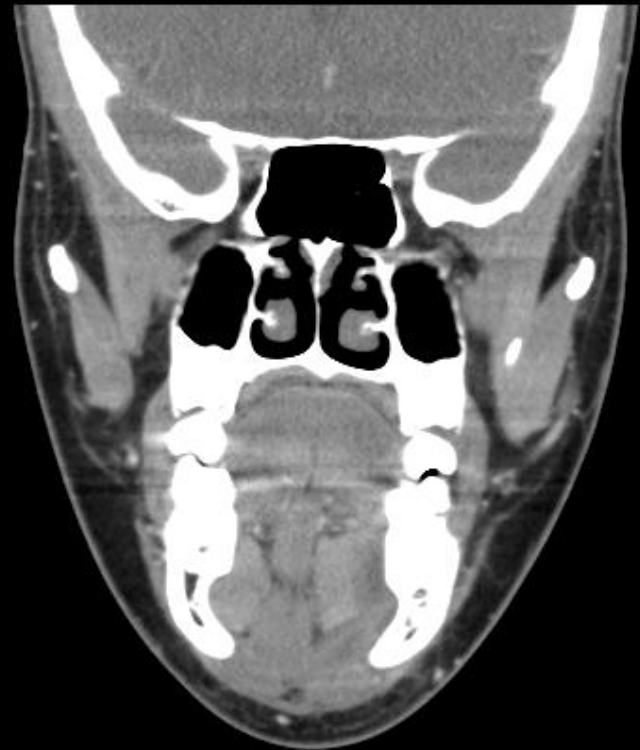
- Superior and medial to the mylohyoid muscle
- Submandibular gland (portion)
- Sublingual gland
- Infections often odontogenic



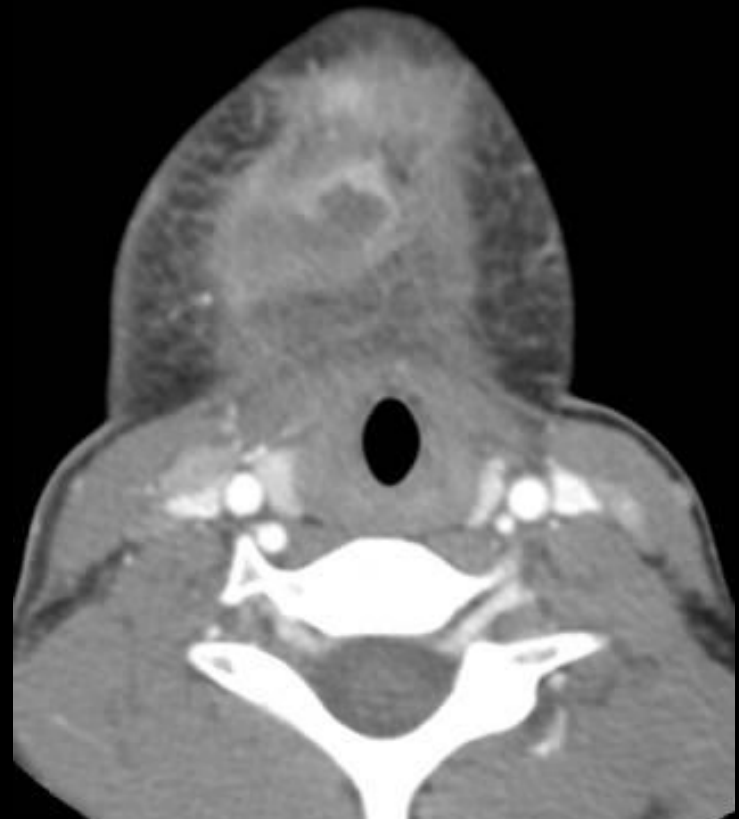
Sublingual Space Fluid



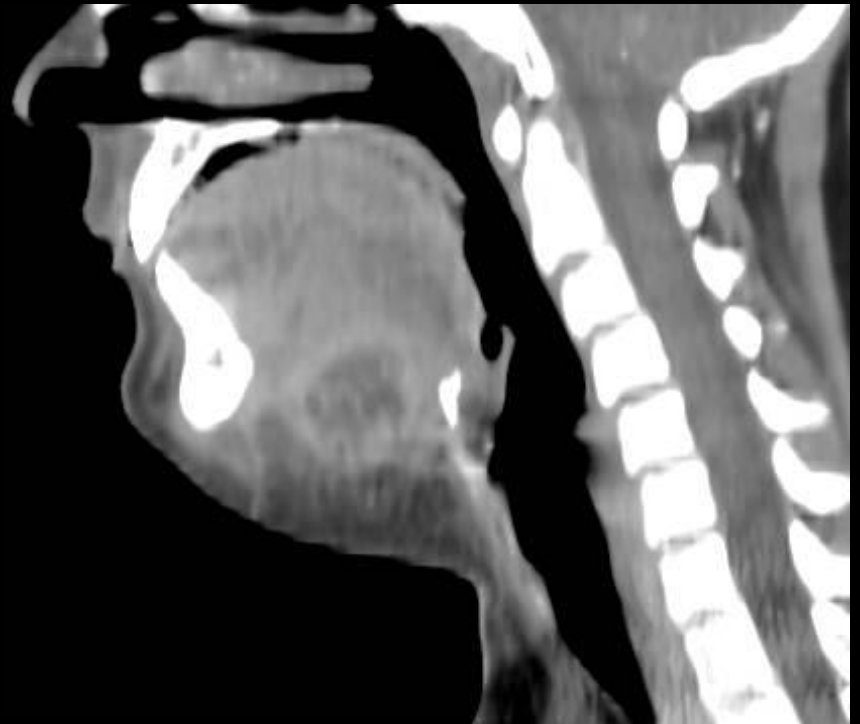
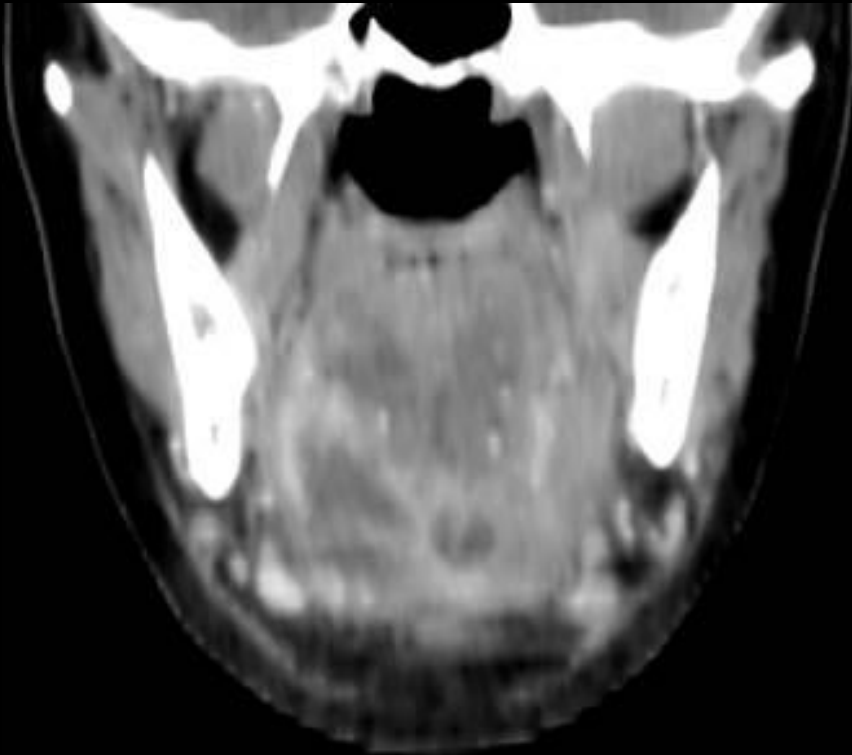
Sublingual Gland Infection



Sublingual Abscesses

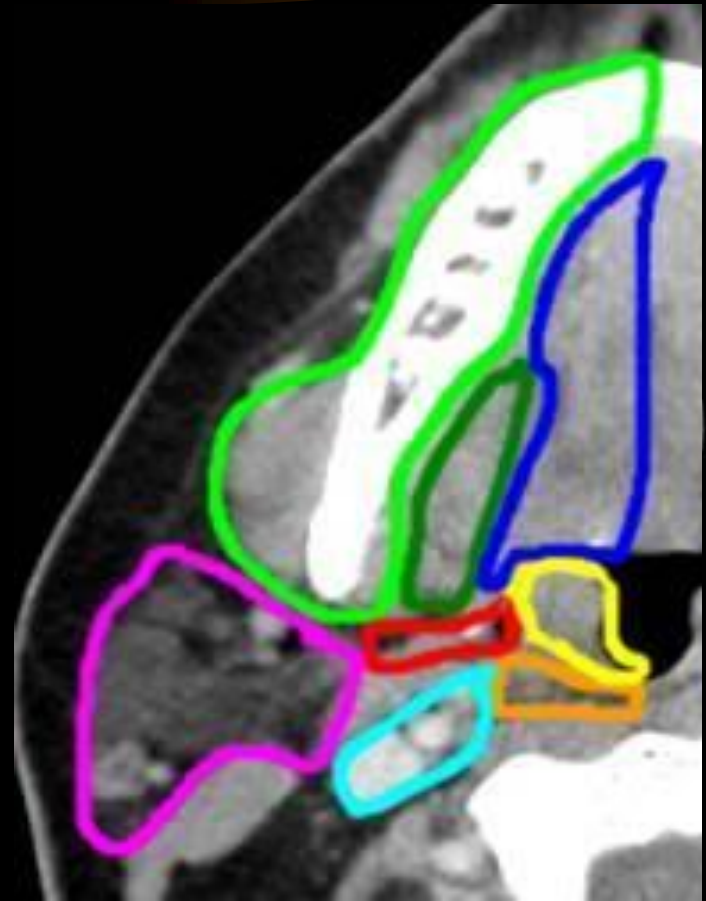


Sublingual Abscess

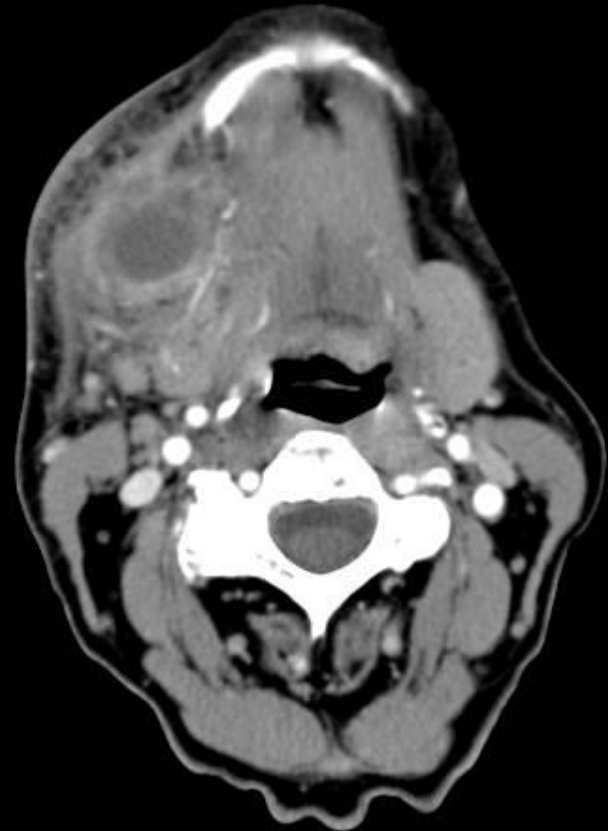
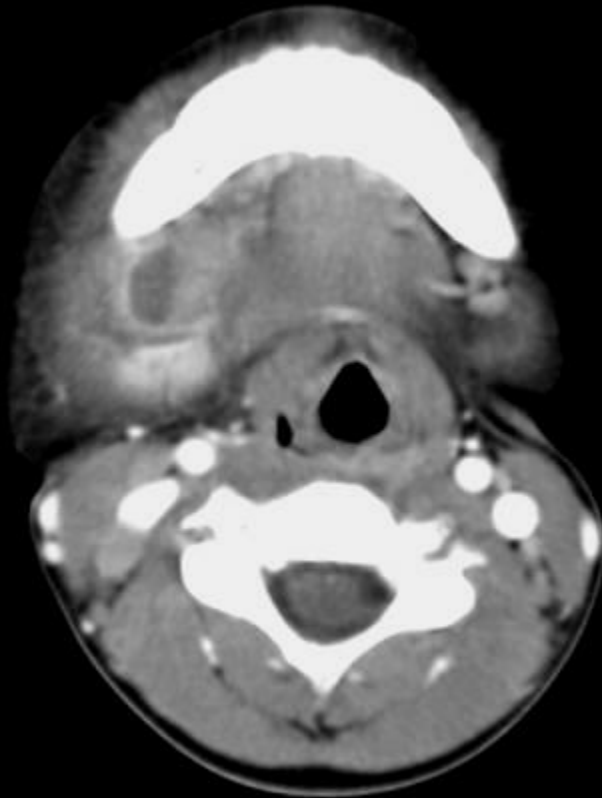


Submandibular Space

- Inferior and lateral to the mylohyoid muscle
- Submandibular gland
- Nodes
- Second branchial cleft cyst



Submandibular Abscesses

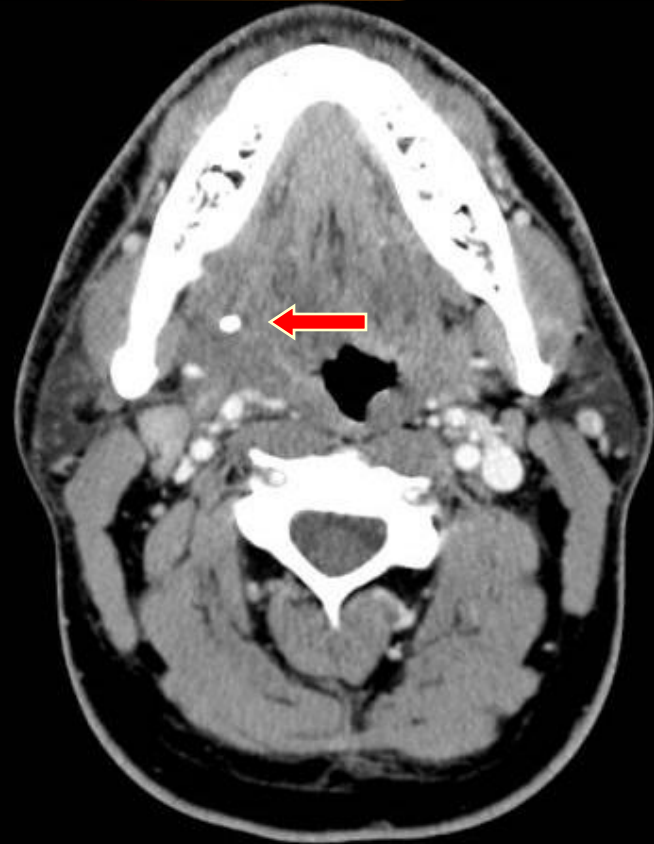


Ludwig's Angina

- Wilhelm Friedrich von Ludwig in 1836 described 5 patients with swelling of the neck that progressed rapidly to involve tissues between the larynx and the floor of the mouth.



Wharton's Duct Stone



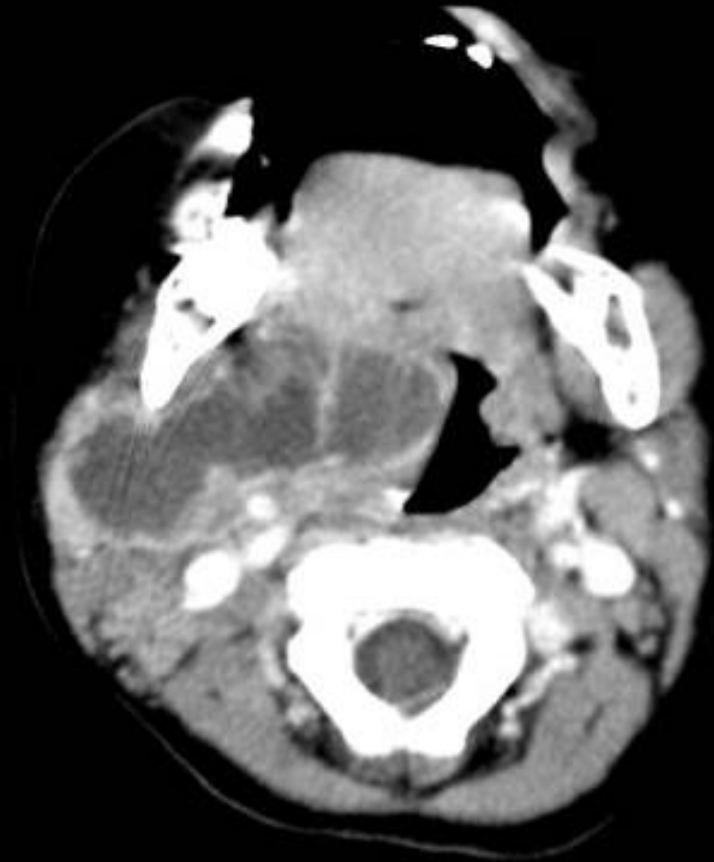
Infected Second BC Cyst

- Congenital lesion may be unnoticed until infected
- Characteristic location at the anterior and deep to the SCM muscle



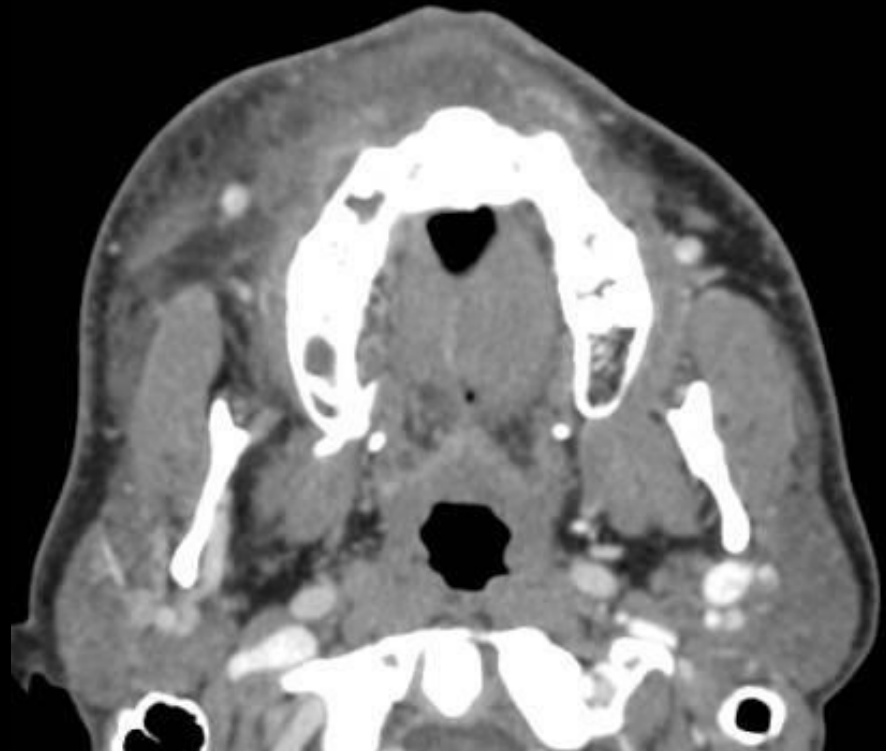
Infected Cystic Hygroma

- Transpatial, congenital, cystic malformation of lymphatics
- May present when secondarily infected



Case

- Right facial swelling
- Infiltration and stranding of the fat c/w facial Infection
- What is the source?



Endodontal Disease: CT

- Bacteria attack the tooth (dental caries) and may reach the pulp chamber
- Infection spreads to the roots exiting at the root apex



Endodontal Disease: CT

- Bacteria attack the tooth (dental caries) and may reach the pulp chamber
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Endodontal Disease: CT

- Bacteria attack the tooth (dental caries) and may reach the pulp chamber
- Infection spreads to the roots exiting at the root apex



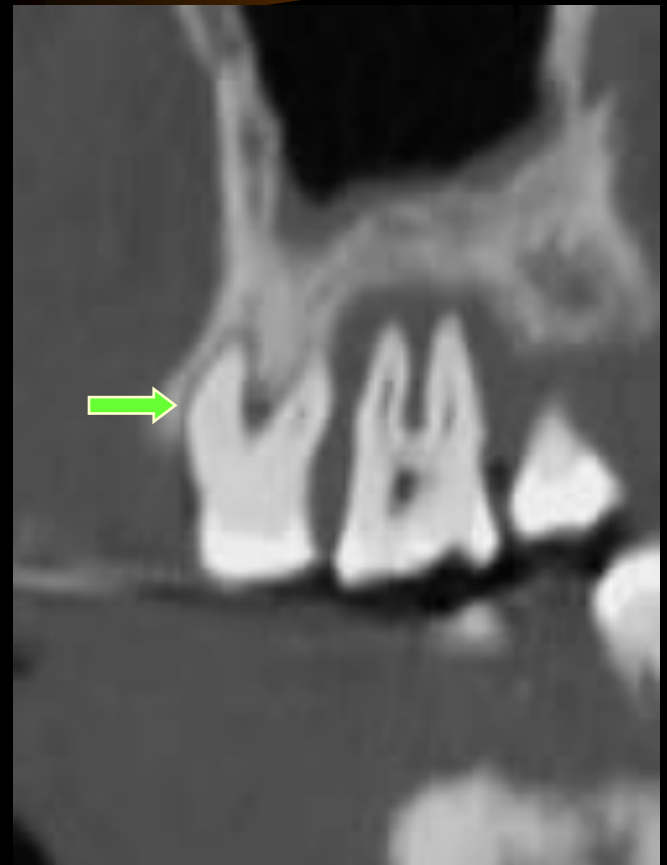
Endodontal Disease: CT

- Bacteria attack the tooth (dental caries) and may reach the pulp chamber
- Infection spreads to the roots exiting at the root apex



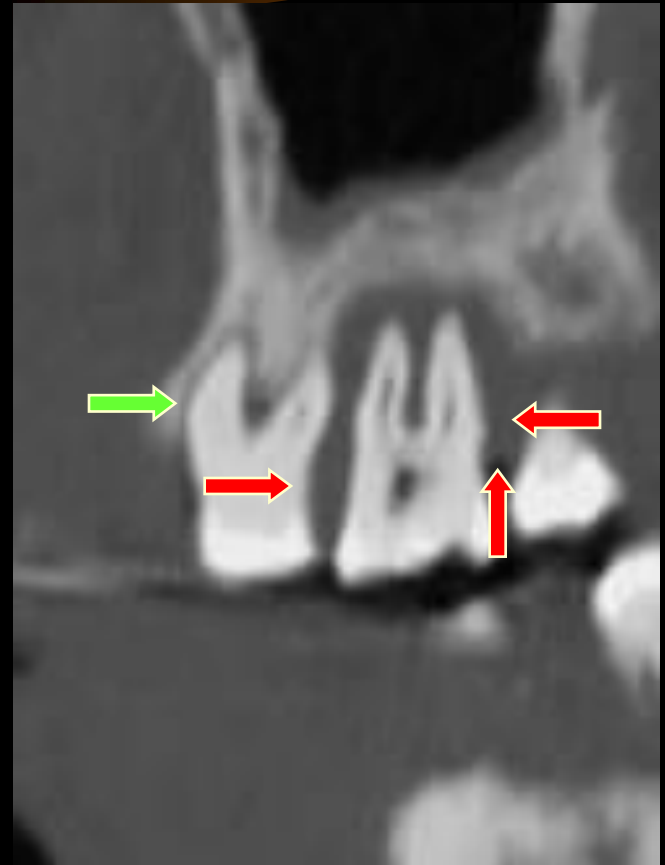
Periodontal Disease: CT

- There is a normal thin lucency along the root of the tooth; the periodontal ligament



Periodontal Disease: CT

- There is a normal thin lucency along the root of the tooth; the periodontal ligament
- Bacteria attack the gum and may spread along the periodontal ligament

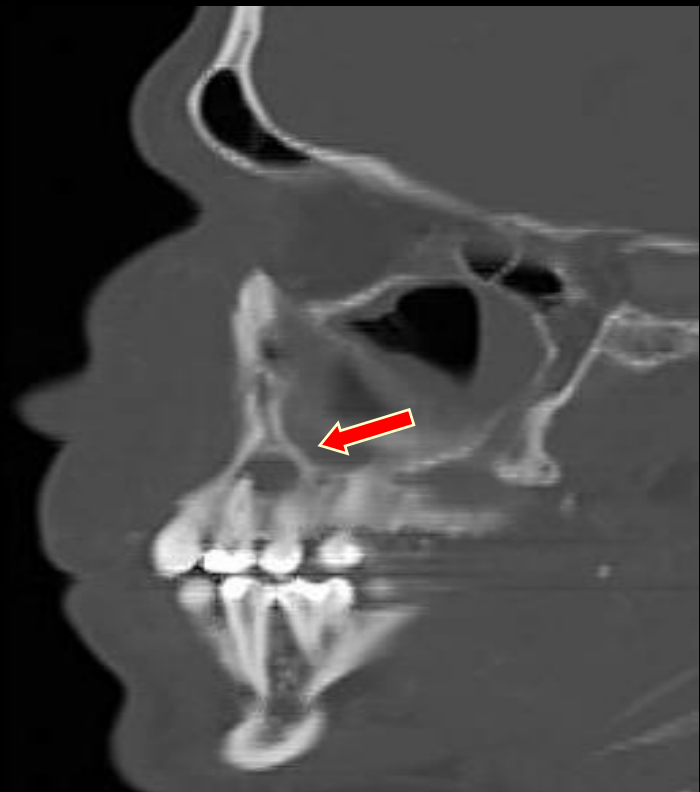
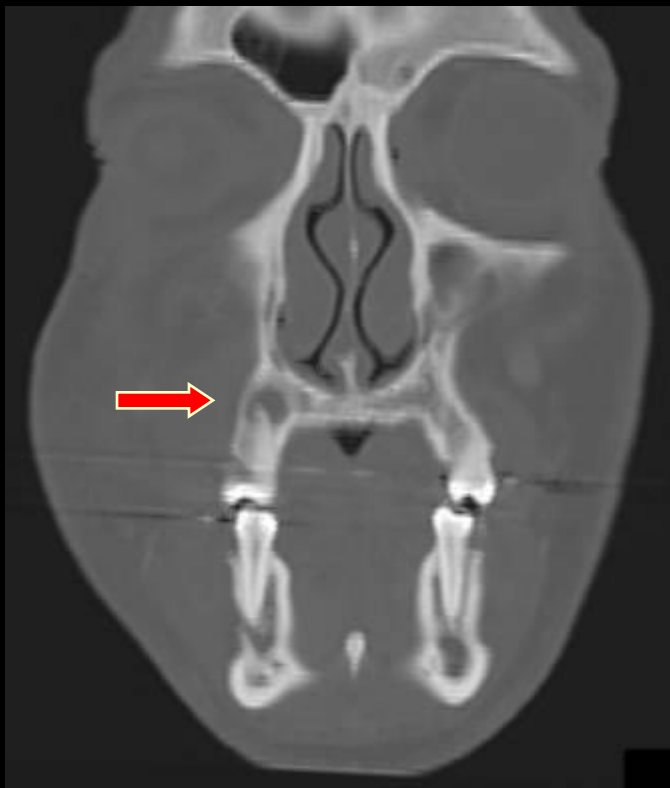


Endodontal Disease: CT

- Lucency at the tooth apices (dental roots) appears as “floating roots”



Endodontal Disease: CT



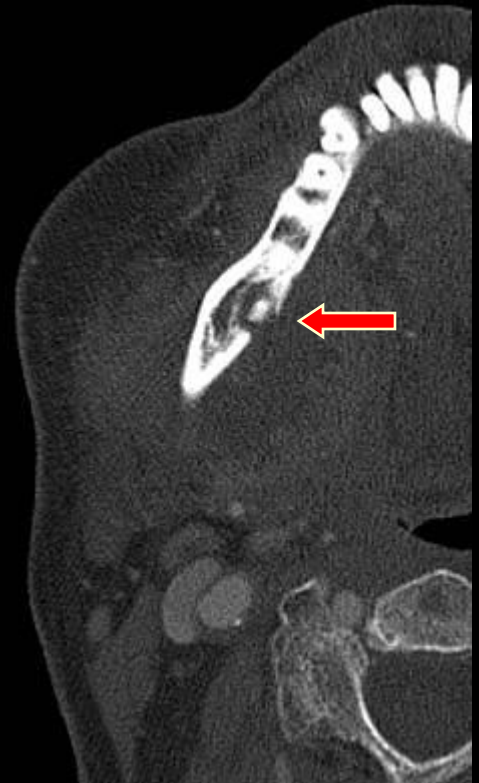
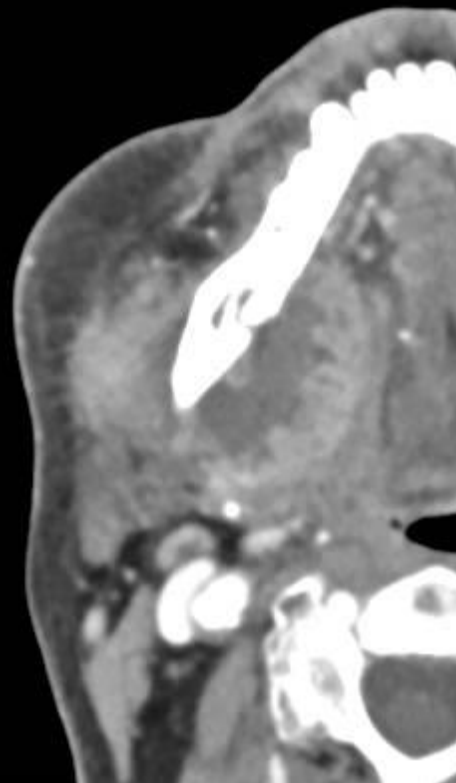
Case

- Right facial swelling
- Submandibular space abscess
 - Note the medial displacement of the mylohyoid muscle
- What is the source?



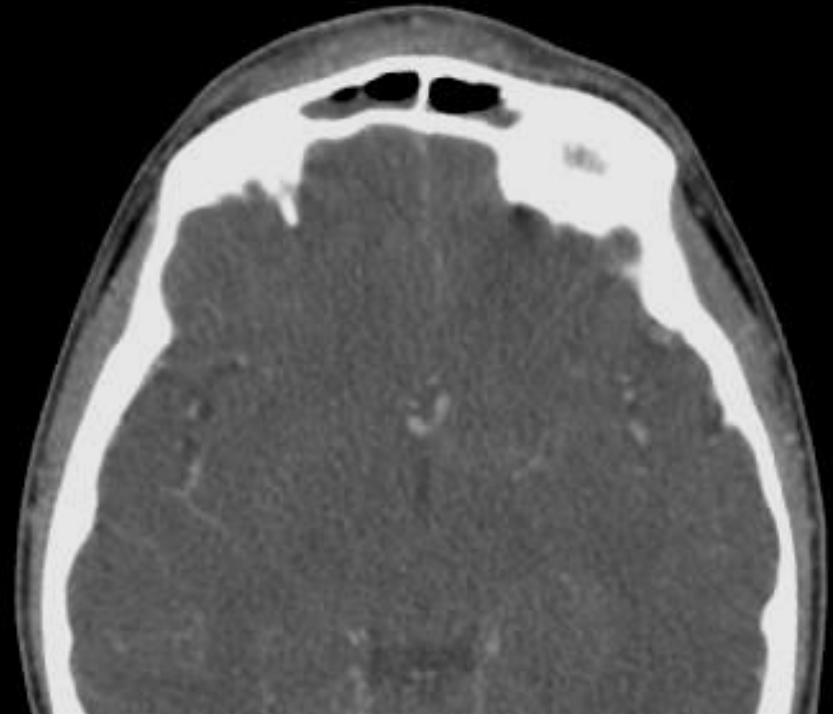
Case: Submandibular Abscess

- What's the source?
- Check the bone windows
- Note lucency at the lingual surface of the mandible
 - Dehiscence of the lingual cortex



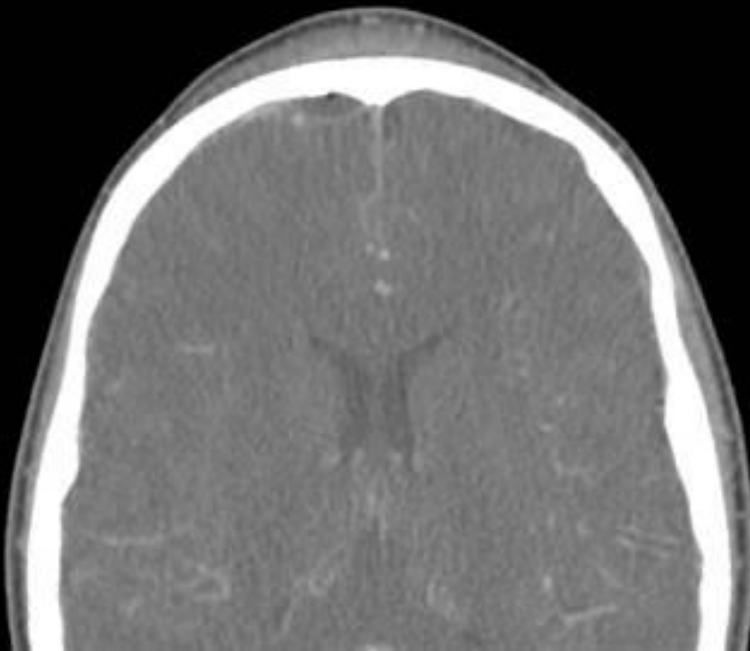
Case: STS of Forehead

- What is the source?
- Notice the frontal sinusitis
- “Pott’s puffy tumor”



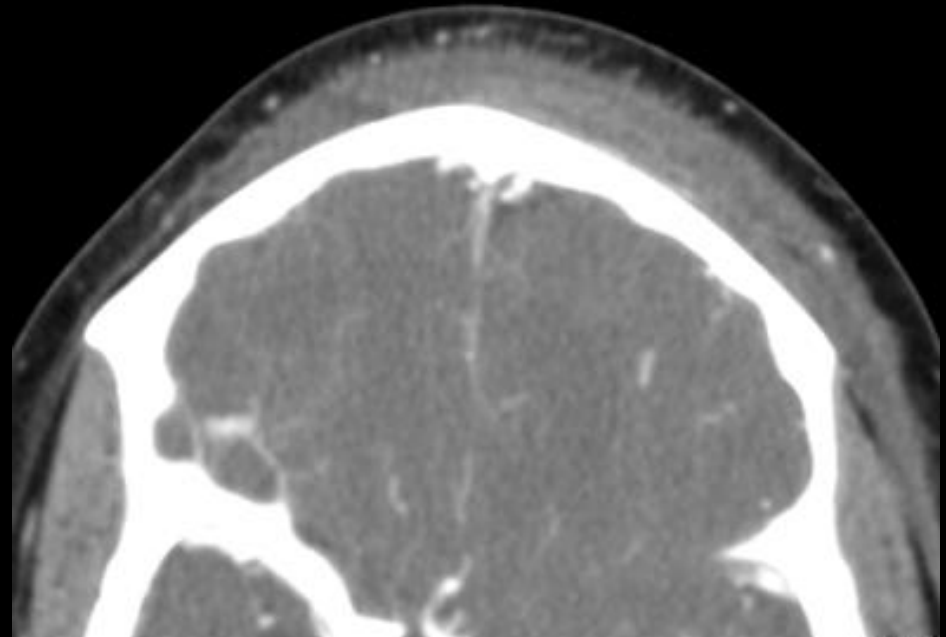
Case: STS of Forehead

- Small subdural empyema

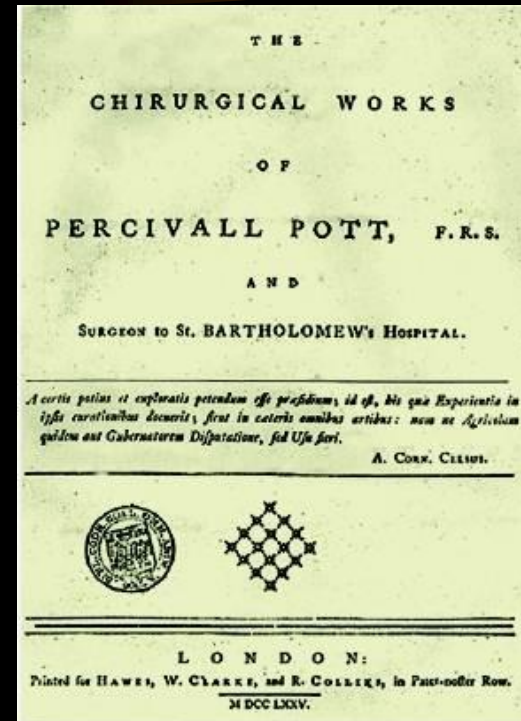


Frontal Soft Tissue “Mass”

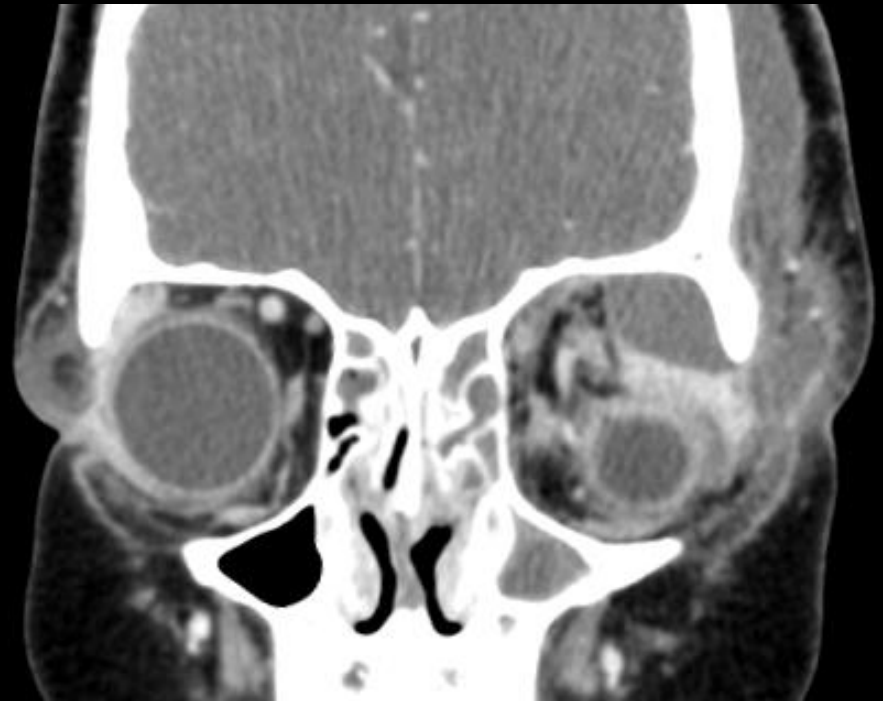
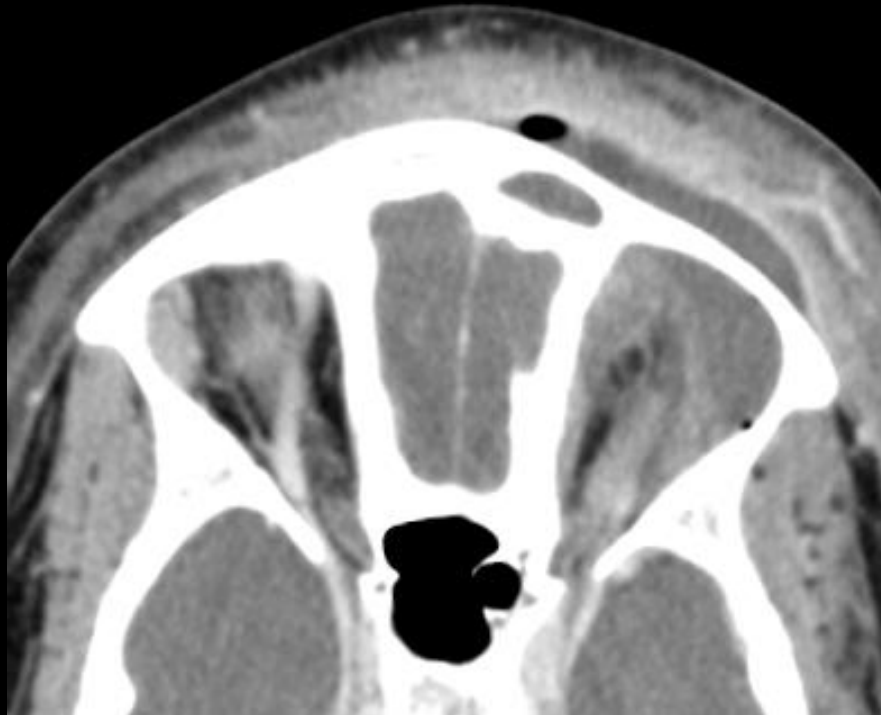
- What is the source?
- What is the extent of disease?
- Pott's Puffy Tumor



Pott's Puffy Tumor (1760)

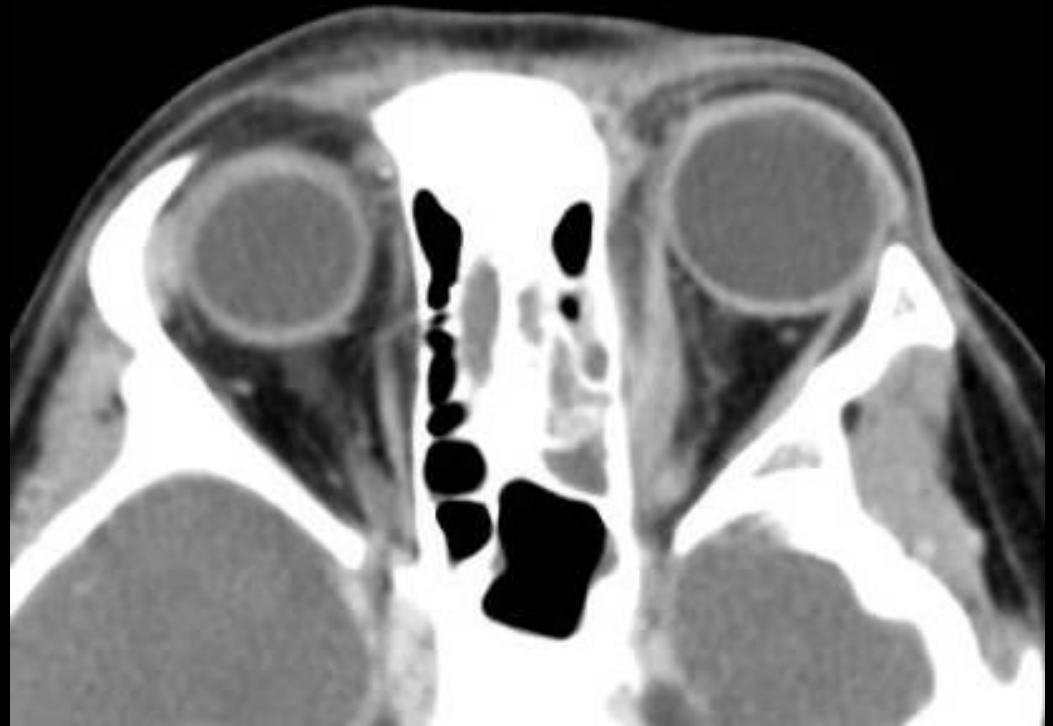


Sinus & Orbit Disease



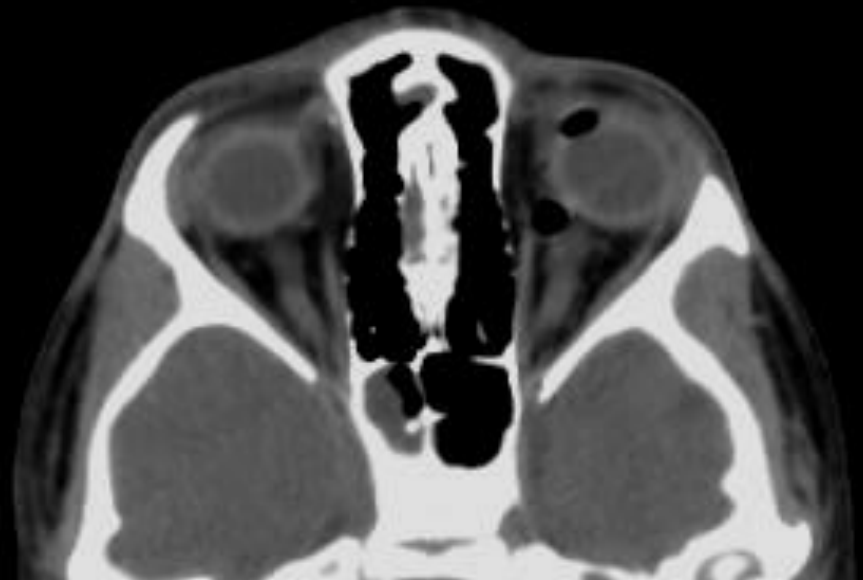
Orbit: Subperiosteal Abscess

- Infection spreads from the ethmoid sinus via valveless veins



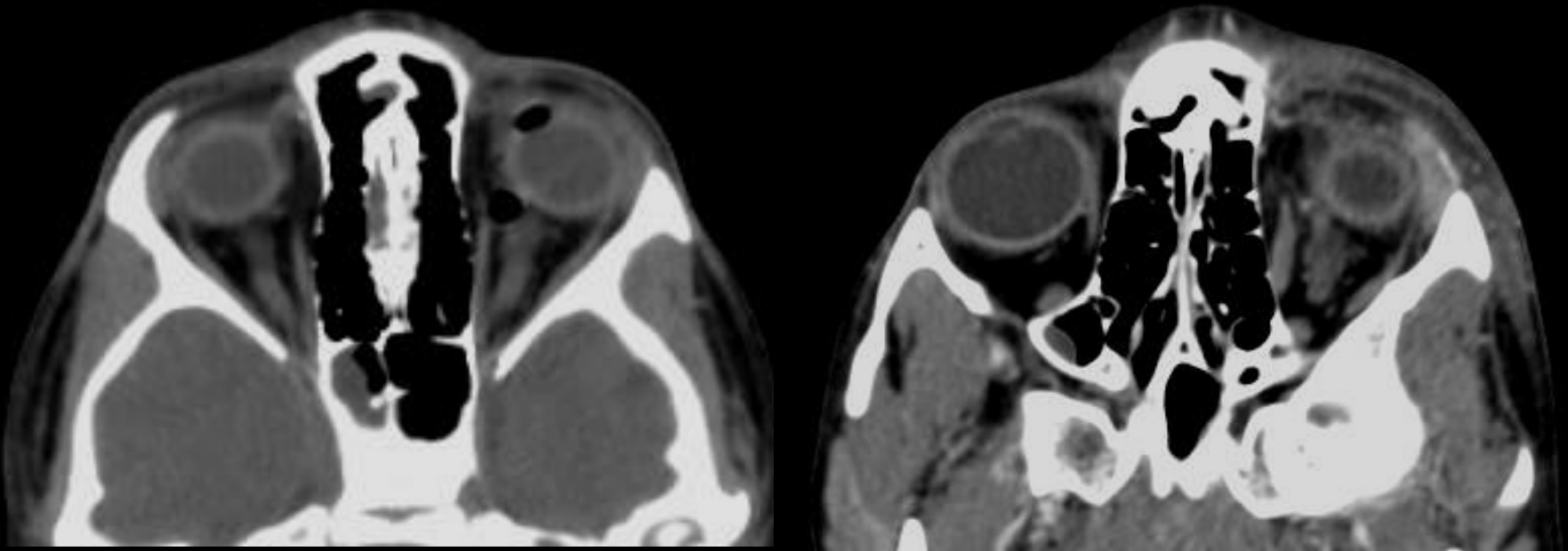
Penetrating Trauma: Orbit

- Non-contrast CT shows no obvious foreign body
- Wood i.e., tree branch, may be difficult to see on CT



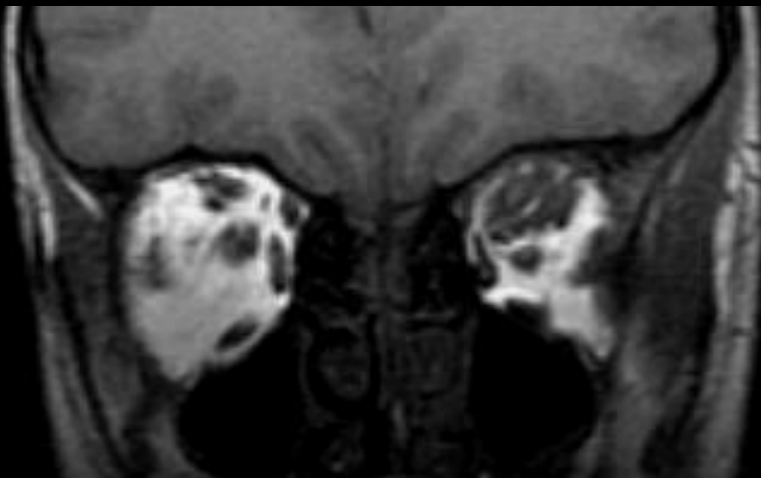
Penetrating Trauma: Orbit

- 3 days later the eye is infected
- Possible abscess. ? Foreign body



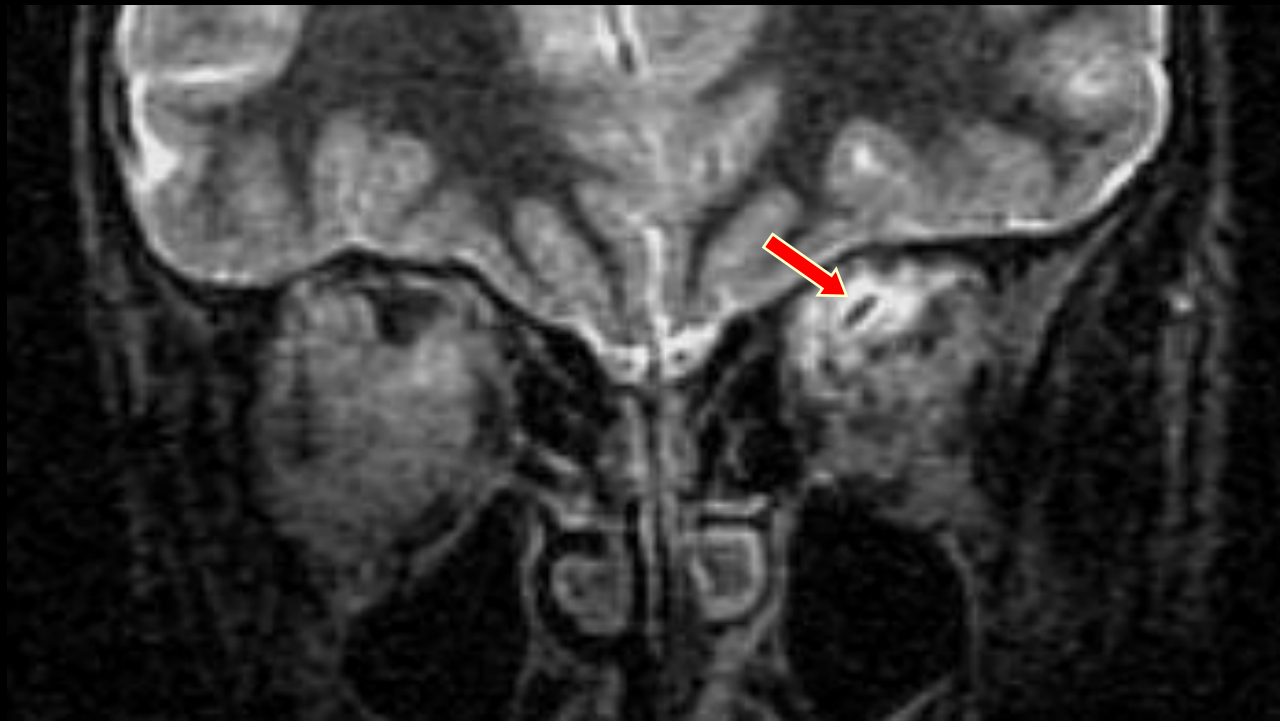
Penetrating Trauma: Orbit

- 3 days later the eye is infected
- MR shows orbital abscess



Penetrating Trauma: Orbit

- T2 MR shows the wooden fragment



Summary



- Identify infection
 - Anatomy i.e., pterygopalatine fossa
- Characterize infection
 - Abscess vs. cellulitis
- Localize infection
 - Space of origin
 - Spread to other spaces
 - i.e., mediastinum, orbit, brain

Summary



- Appreciate complications
 - Osteomyelitis
 - Arterial (pseudoaneurysm / blowout)
 - Venous (thrombosis / Lemierre Syn.)
 - Spread to mediastinum
- Recognize underlying abnormalities
 - Obstructing calculus
 - Dental procedure / endodontal disease
 - BC cyst / cystic hygroma

Thanks, and Good Luck!

