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head and neck radiology

# Emergencies in head and neck imaging

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# No disclosures

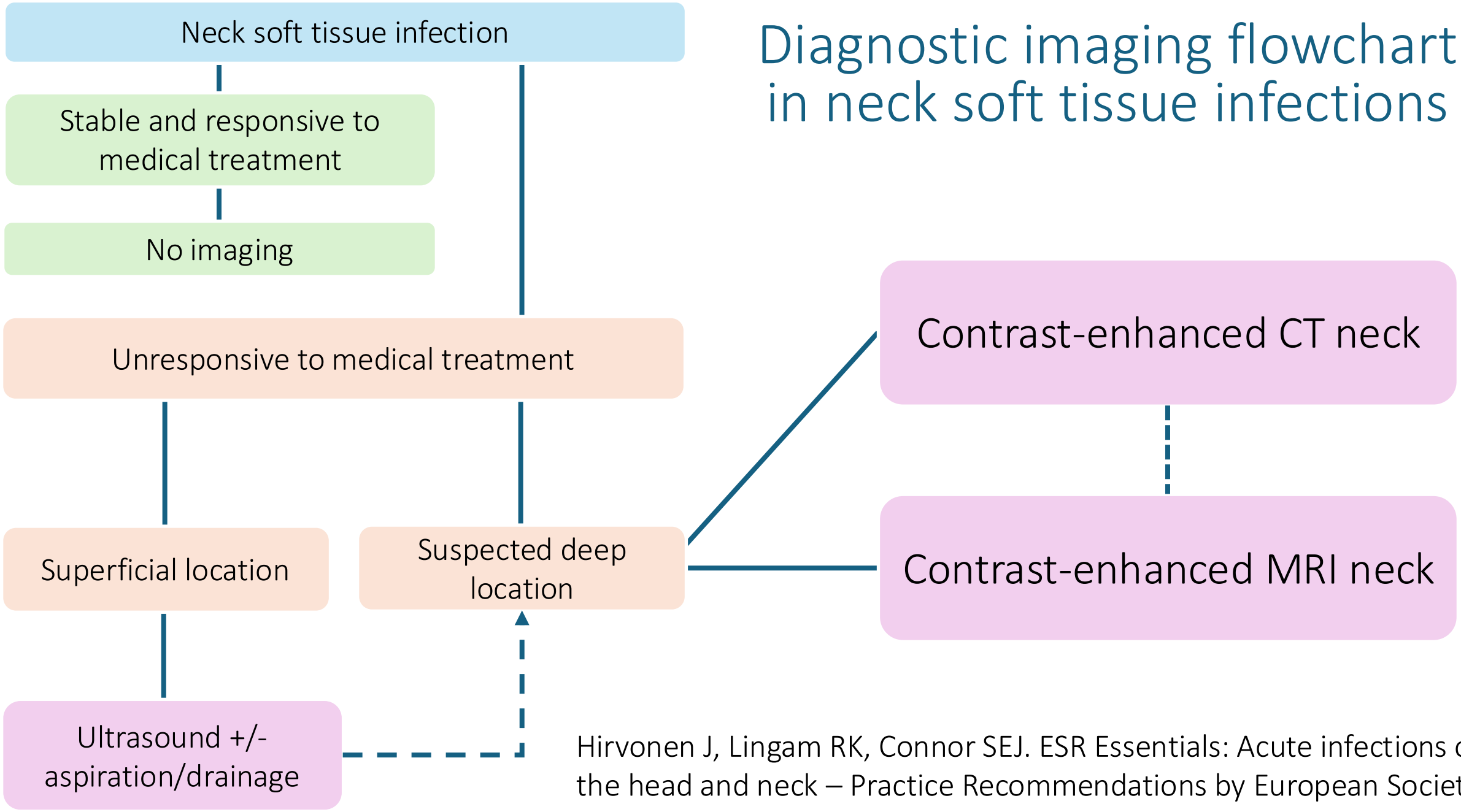
# Purpose

1. To identify critical conditions: deep neck infections, traumatic injuries, and airway obstructions
2. To describe a practical approach: what to report urgently and how to prioritise findings
3. To illustrate real-world case discussions with interactive audience participation

# Deep neck infections

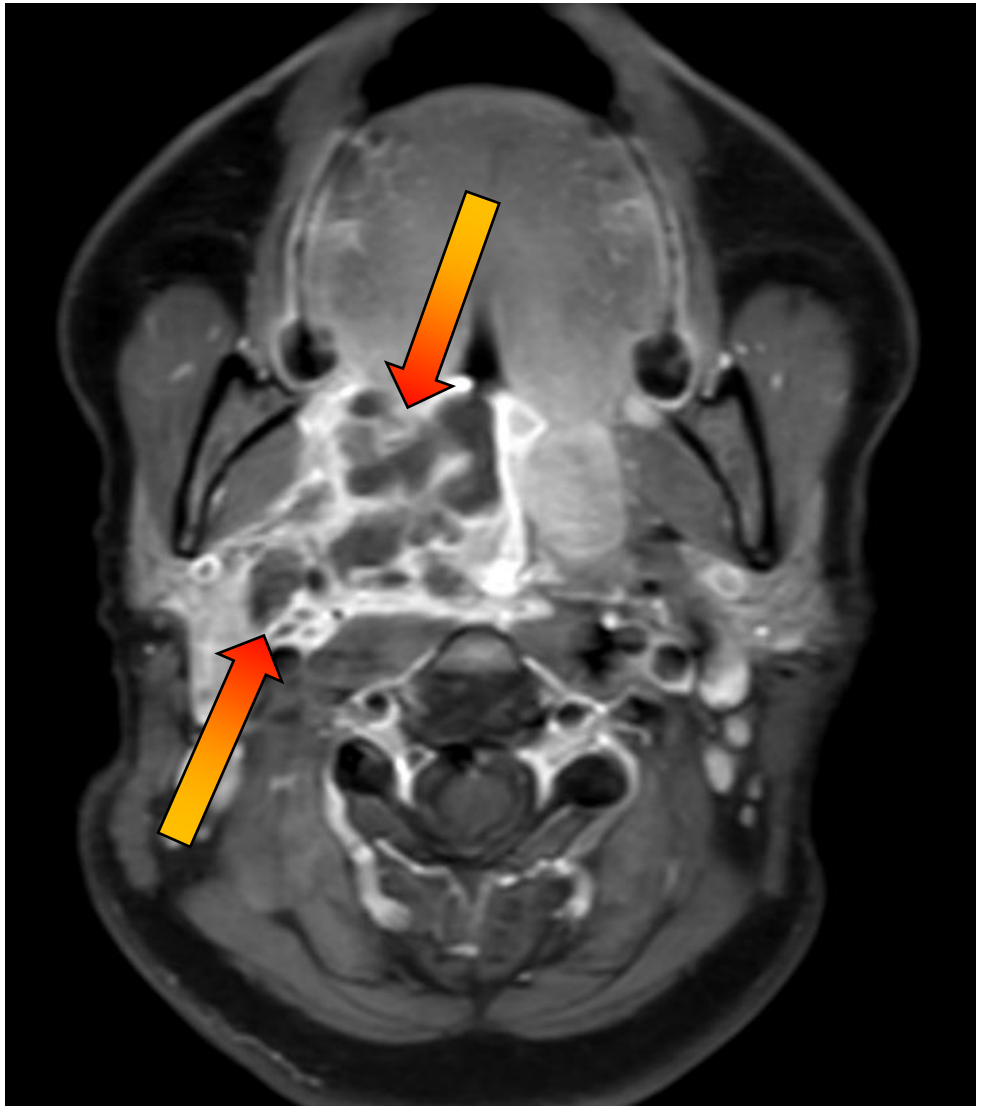
- **Mostly pharyngotonsillar (throat) or odontogenic (teeth)**
  - Multibacterial etiology
  - Look for extension into deep neck spaces
- **Look for surgically drainable abscesses**
  - CT: mass effect, low-density core, rim enhancement
  - MRI: high T2SI, no enhancement on T1C, low ADC on DWI
  - Irregular shape suggests poor prognosis
- **Rule out complications**
  - Vascular thrombosis
  - Airway compromise
  - Descending mediastinitis

# Diagnostic imaging flowchart in neck soft tissue infections

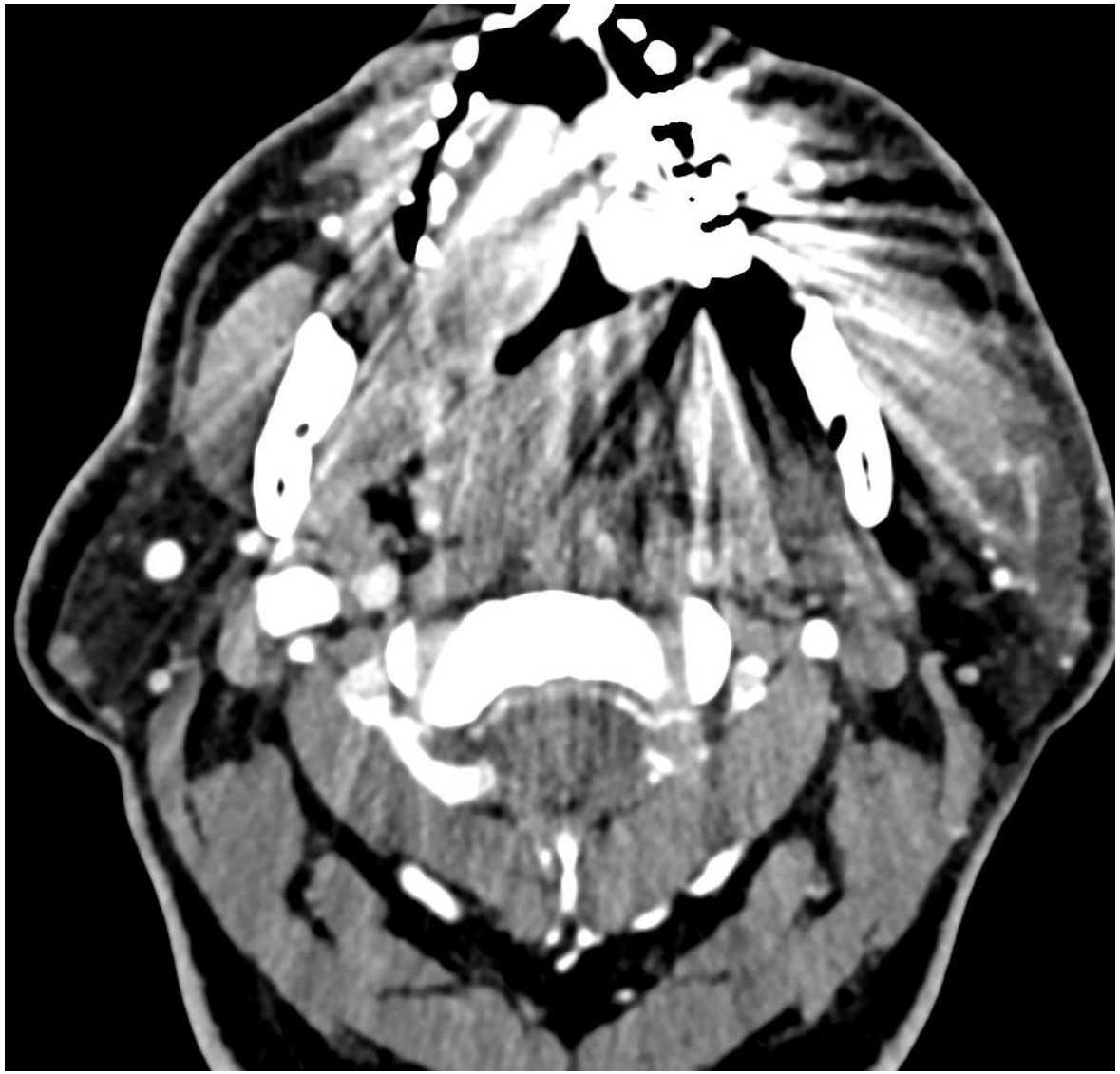



Hirvonen J, Lingam RK, Connor SEJ. ESR Essentials: Acute infections of the head and neck – Practice Recommendations by European Society of Head and Neck Radiology. *European Radiology* 2026;36:334-343

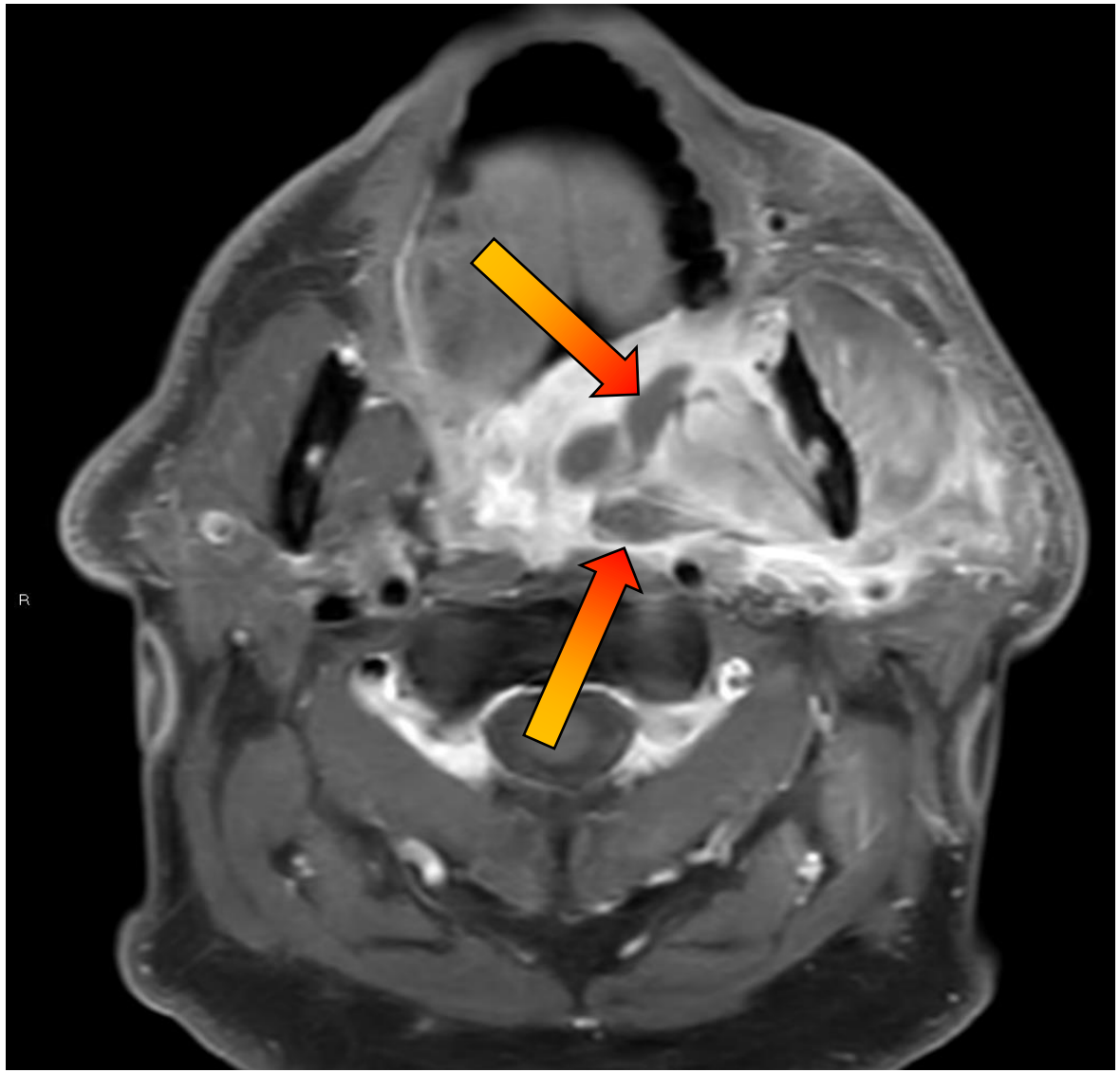
*Computed tomography*



*Magnetic resonance imaging*

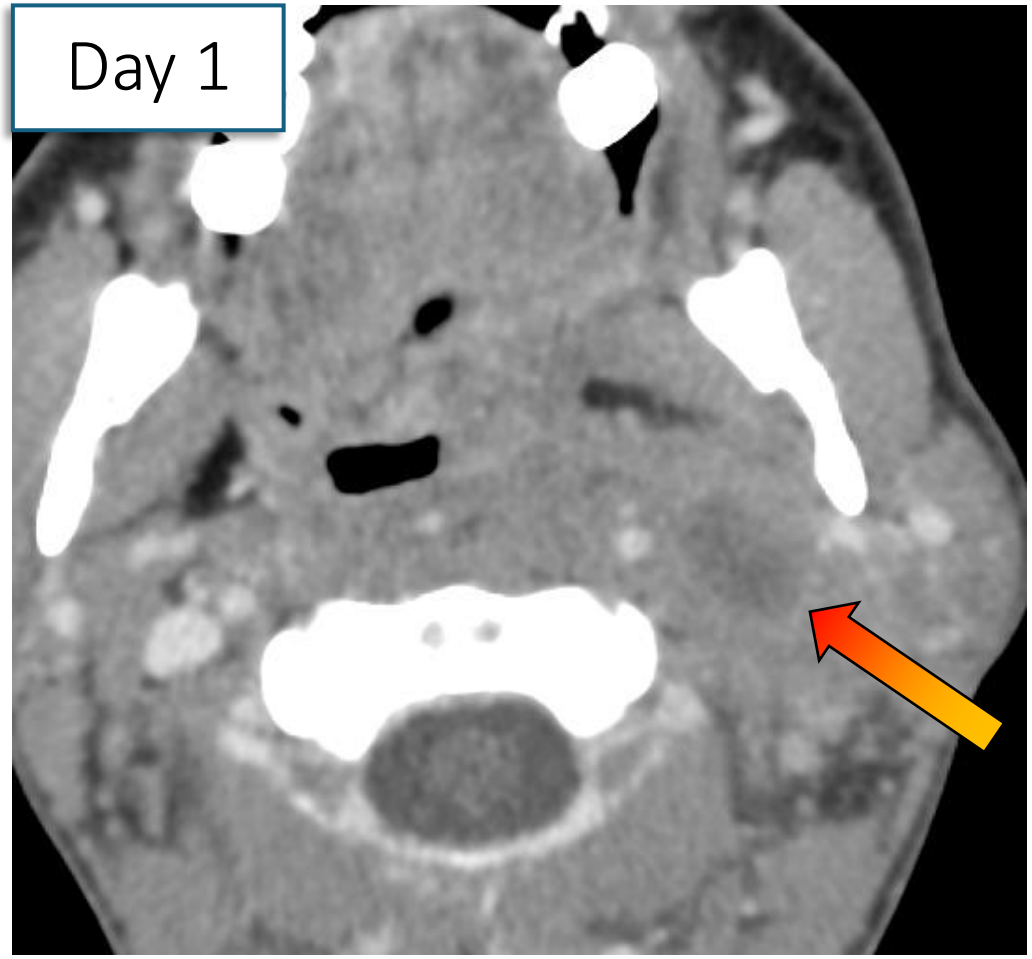


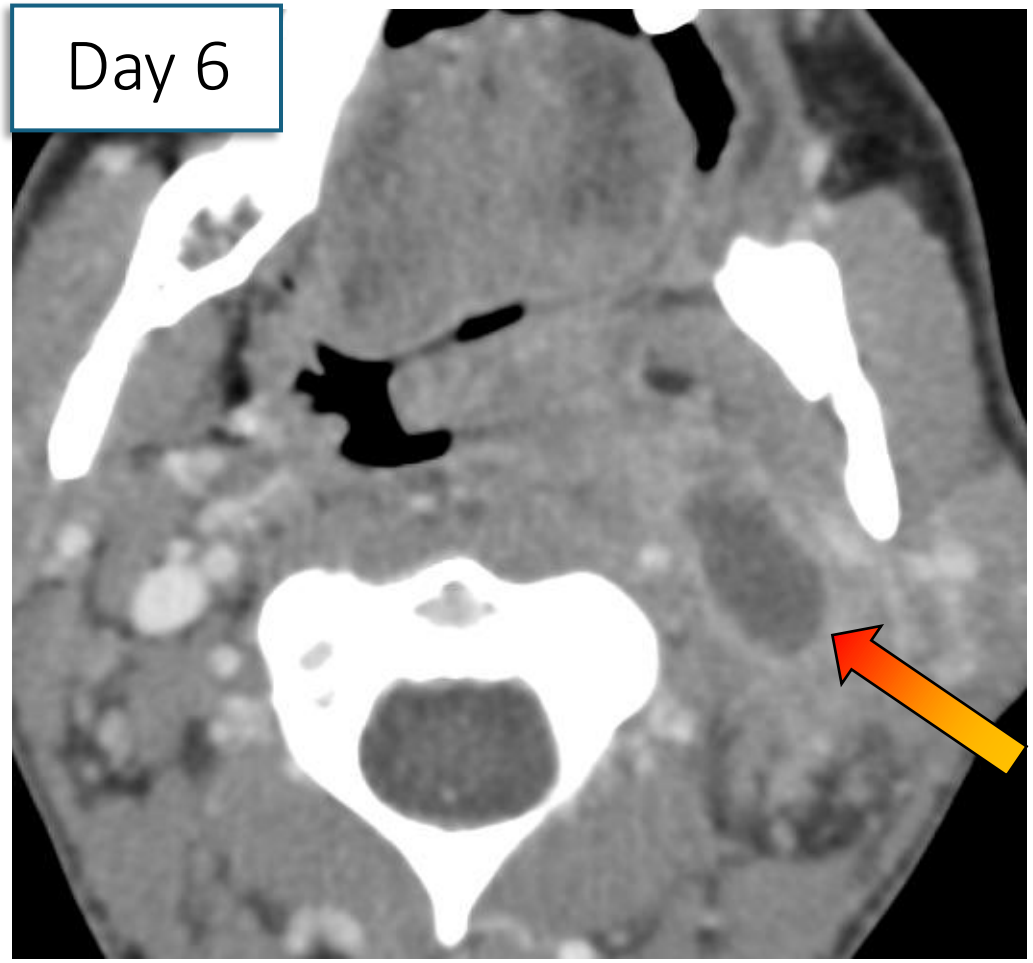
*Computed tomography*




*Magnetic resonance imaging*

# Abscess rim enhancement is a late feature on CT

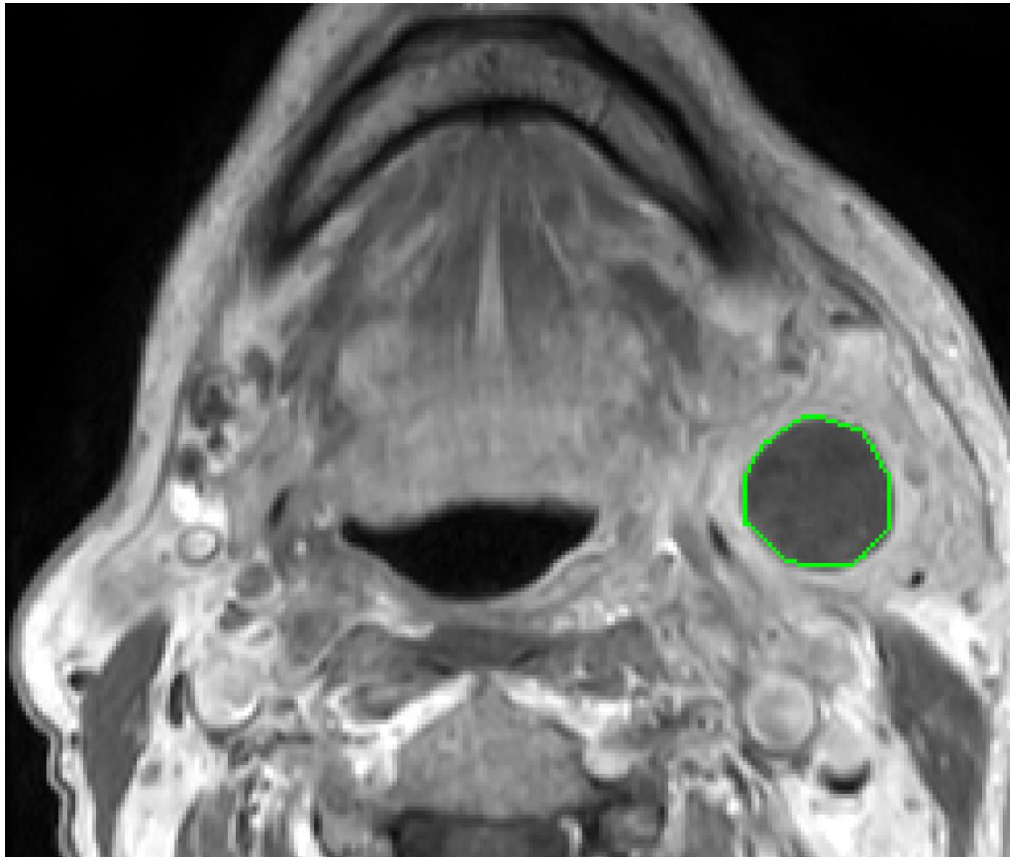


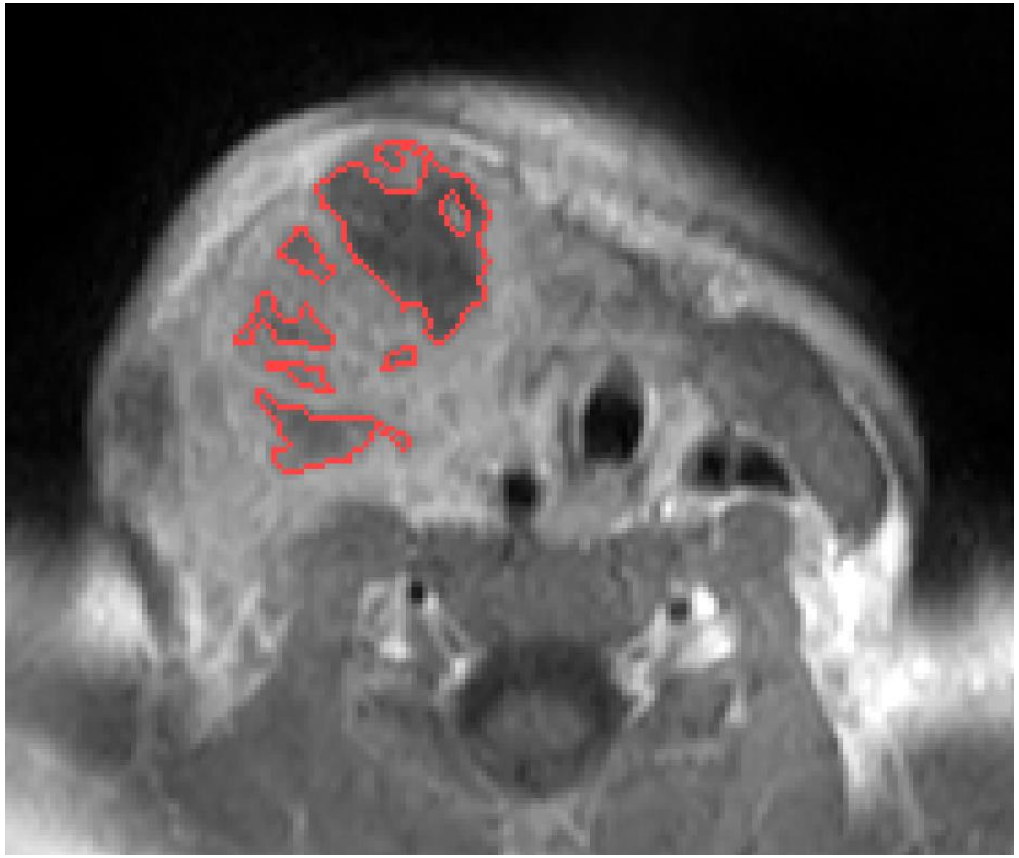

Case: Dr. Antti Markkola, Helsinki University Hospital, Finland

# Abscess irregularity carries a poor prognosis

**Round abscess; Volume = 6.4 cc**
**Sphericity = 0.76**
**Good outcome**

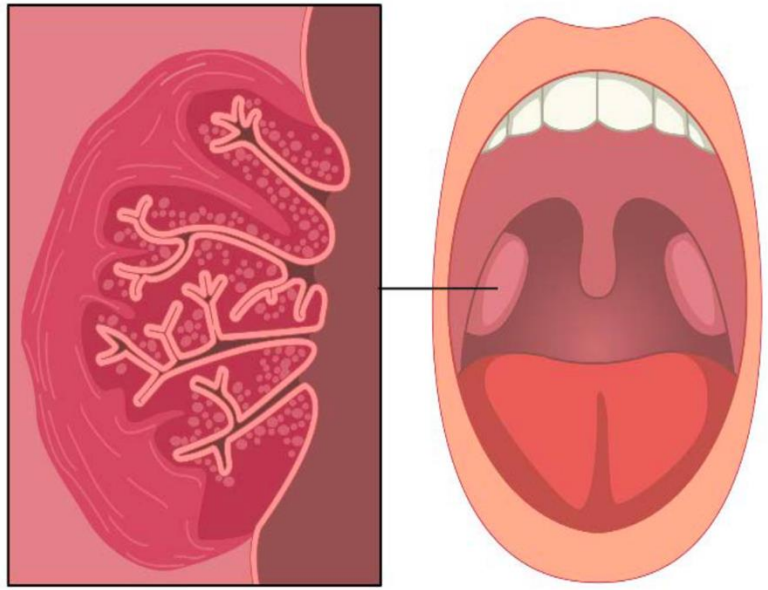


**Irregular abscess; Volume = 6.1 cc**
**Sphericity = 0.29**
**Intensive care unit + prolonged stay**



# Overview of tonsillar infections

- Palatine tonsils have lymphoid tissue (part of Waldeyer's ring)
- Tonsillar crypts are formed by deep invaginations of the epithelium into the tonsil, increasing surface area for interactions between antigens and lymphoid tissue
- Tonsillitis may be viral or bacterial
- Peritonsillar abscess (PTA, quincy) forms between tonsillar capsule and pharyngeal constrictor muscle
  - Tonsil lymphatics or minor salivary glands
- Parapharyngeal abscess (PPA) directly or as complication of PTA

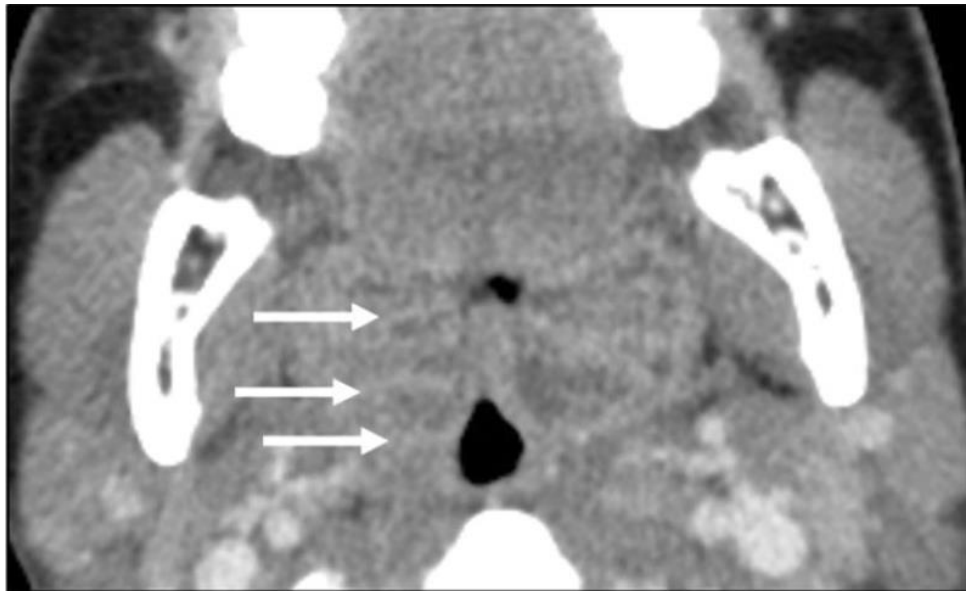


Klug TE (2017) Peritonsillar abscess: clinical aspects of microbiology, risk factors, and the association with parapharyngeal abscess. Dan Med J 64:B5333

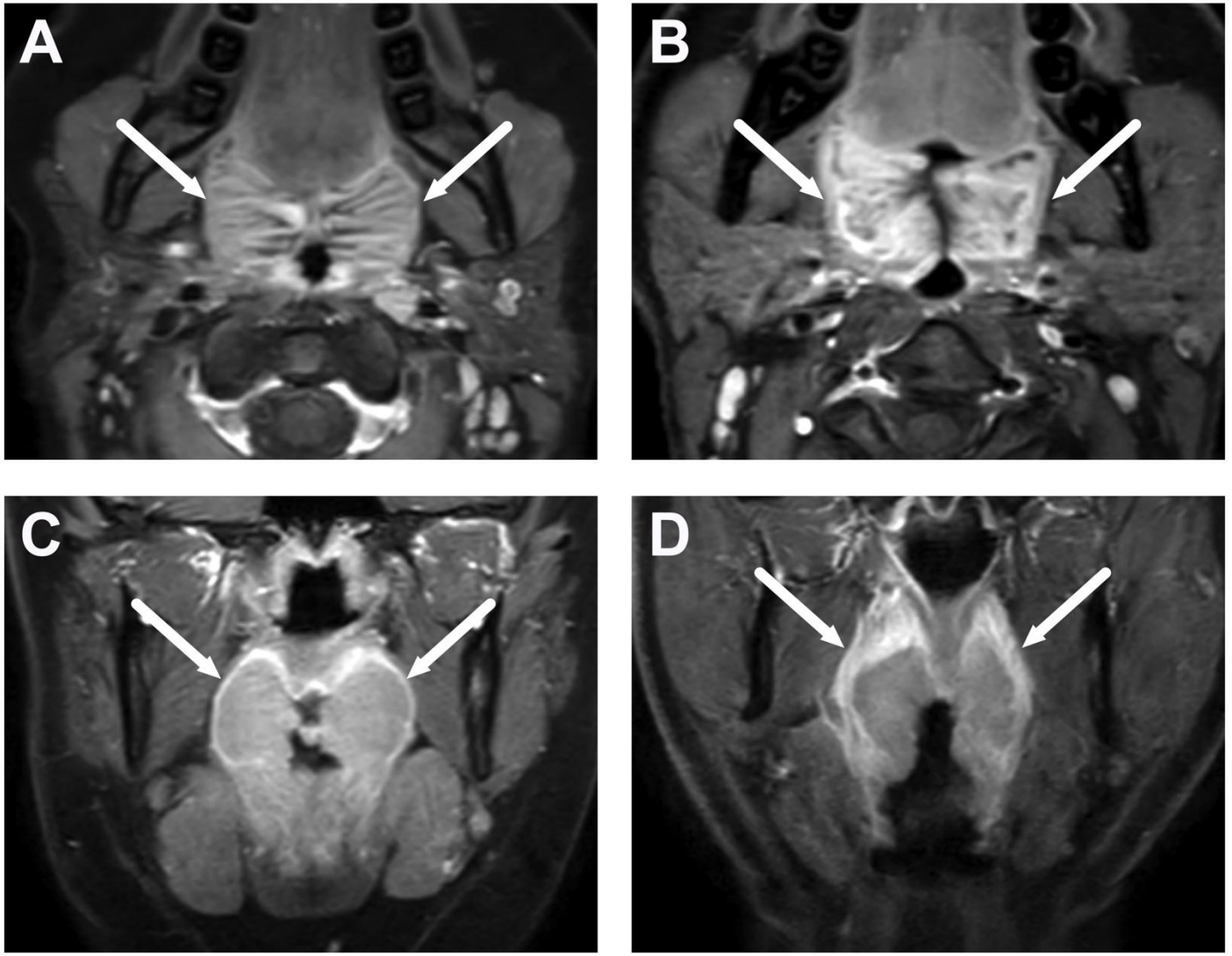
# Tonsillitis with no abscess

”Tonsillitis”
”Peritonsillitis”

Look for <u>tiger-stripe appearance</u>
(fluid within tonsillar crypts)



Bhatt *Emerg Rad* 2018

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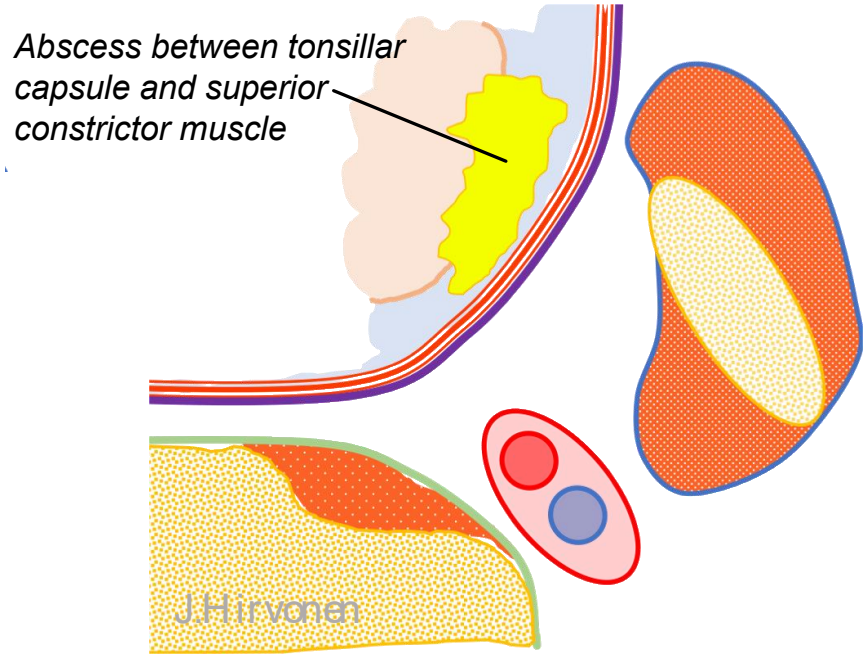
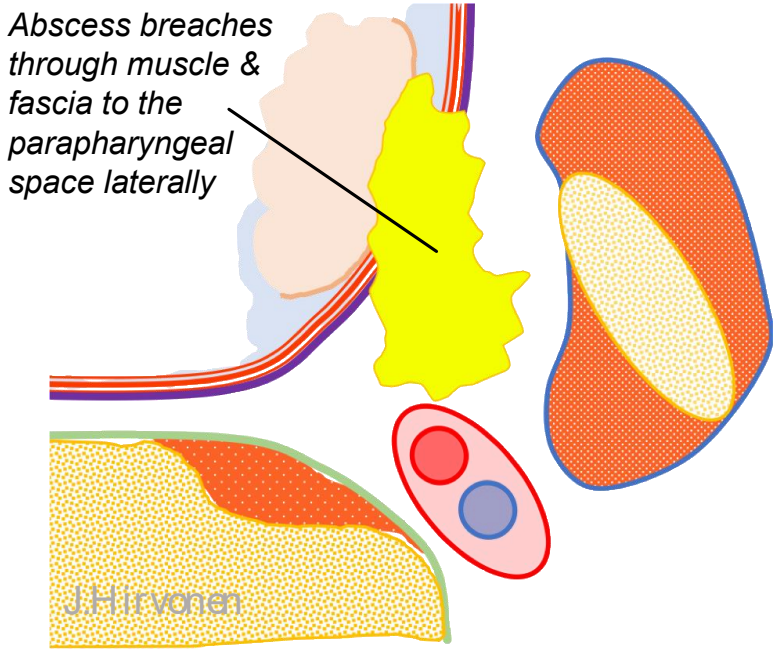
# Classification of tonsillar infections

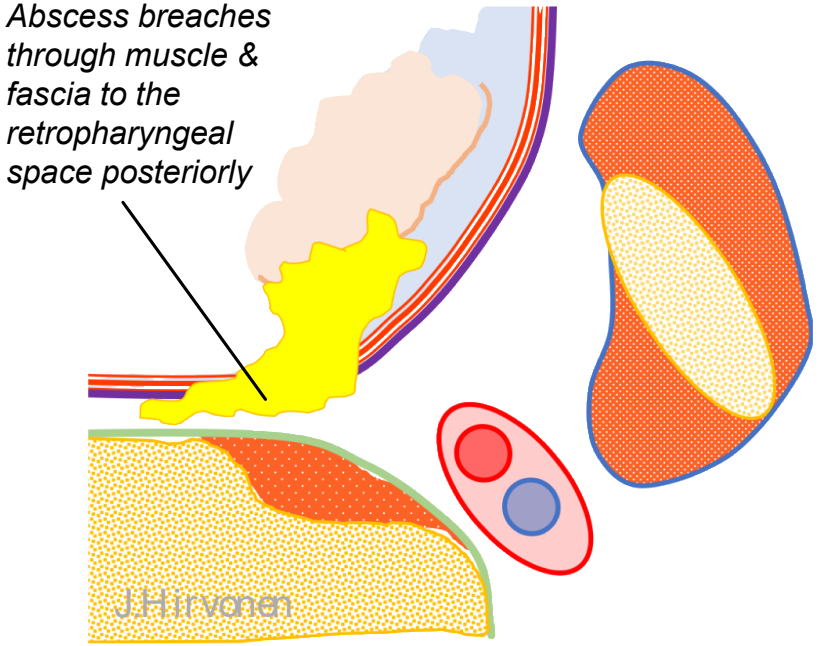
## Peritonsillar abscess (PTA)



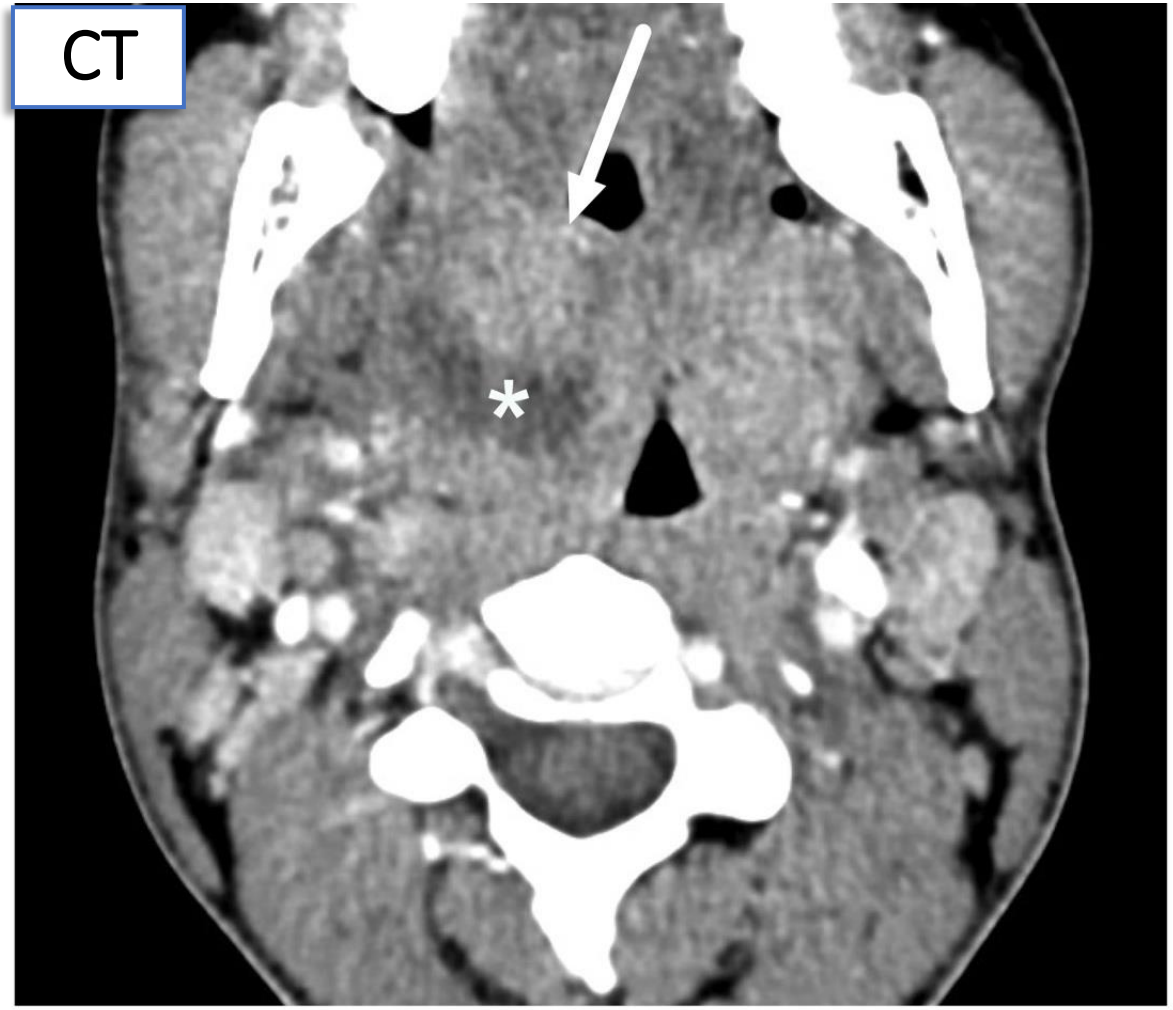

## Parapharyngeal abscess (PPA)

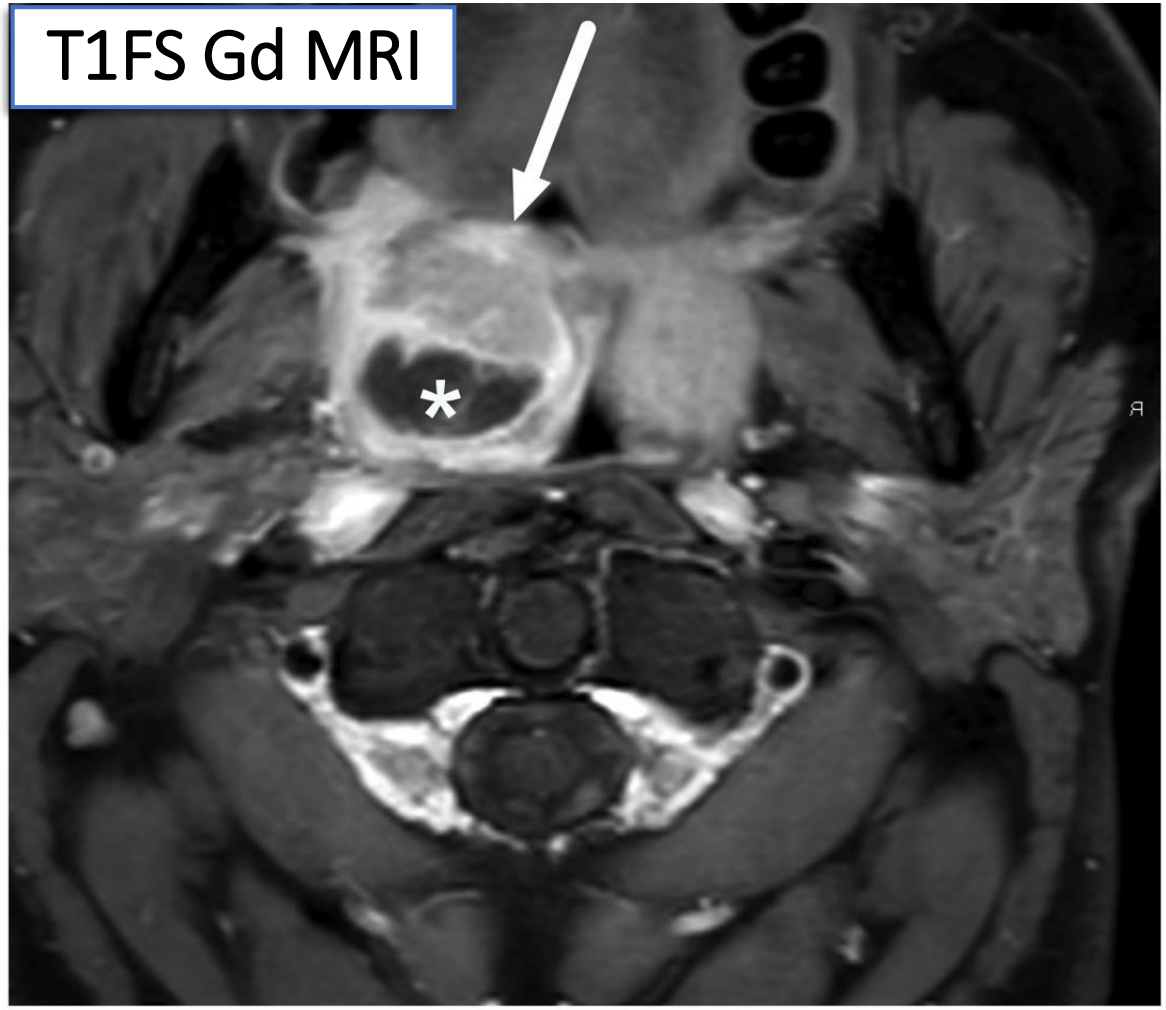



## Retropharyngeal abscess (RPA)



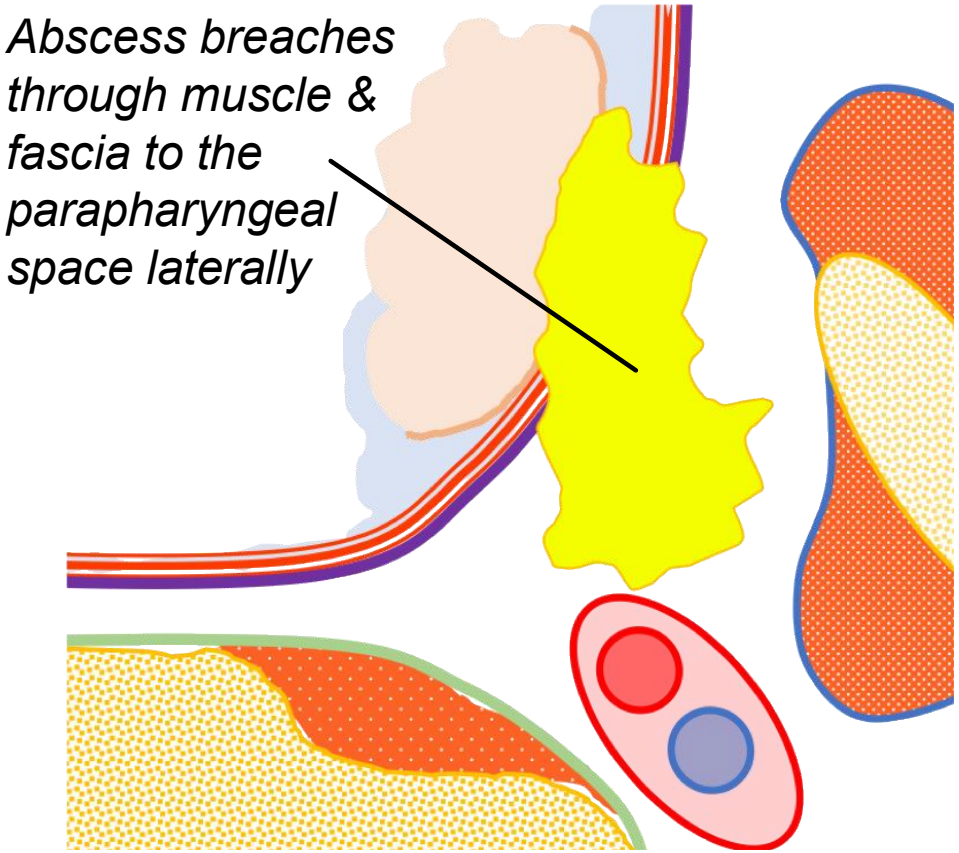
# Peritonsillar abscess (PTA)

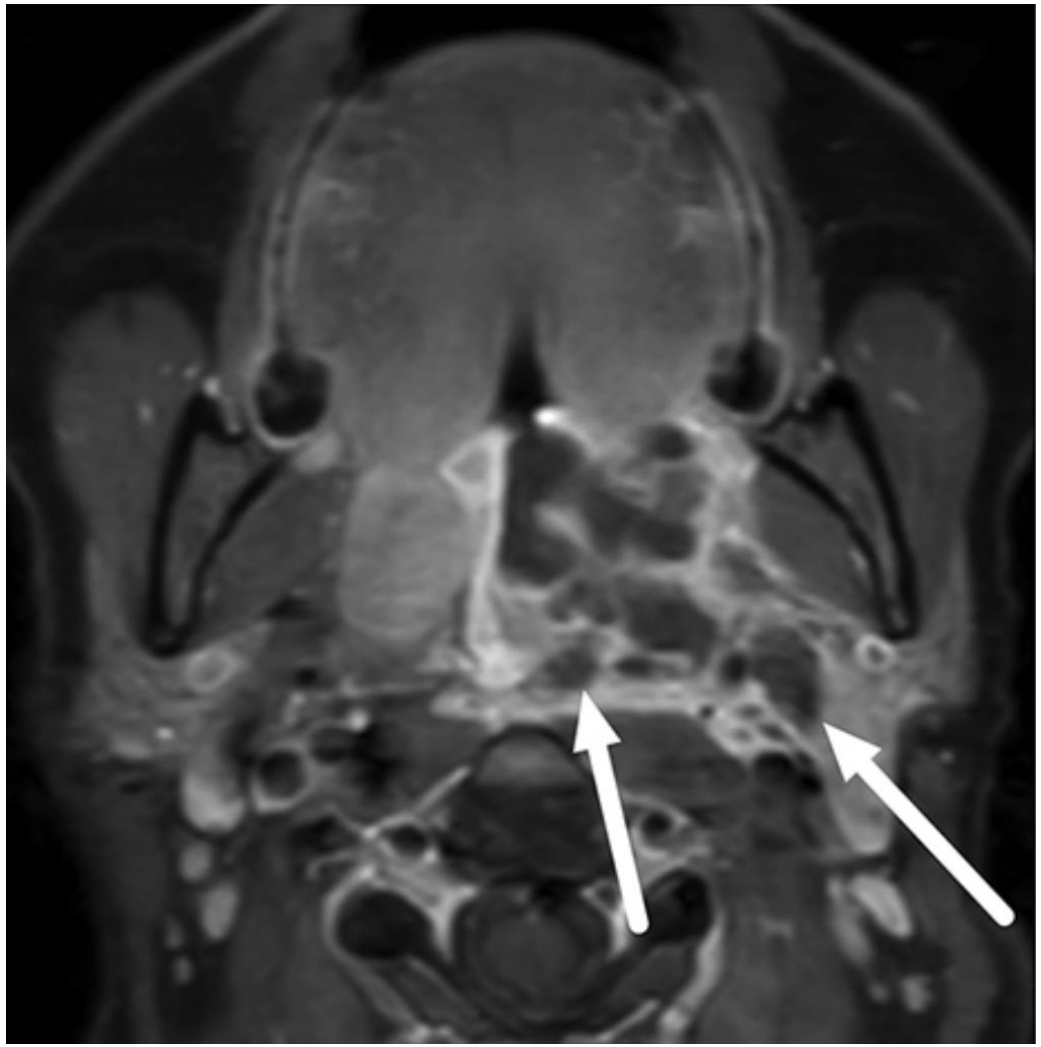


# Deep extension of PTA into PPS/RPS

## Parapharyngeal abscess (PPA)

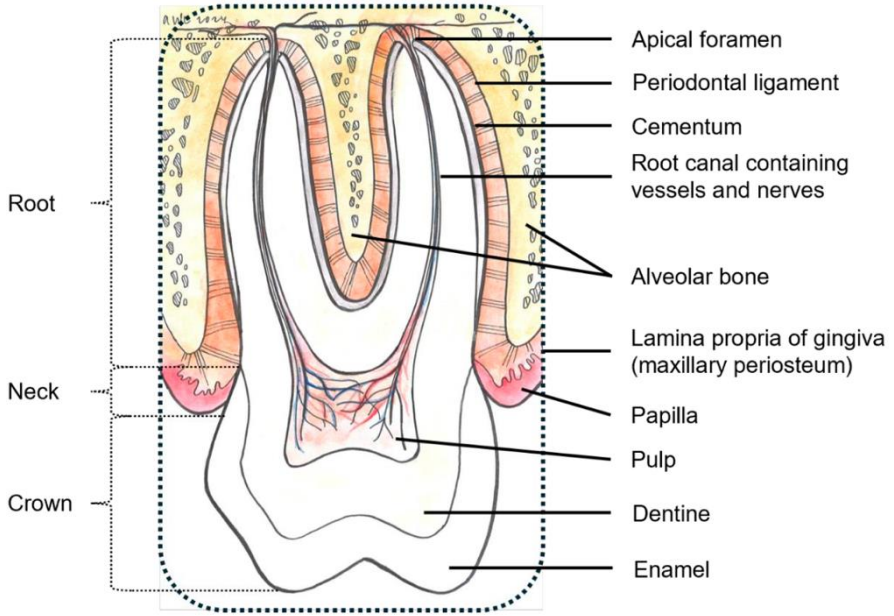


Heikkinen *et al*. *AJNR Am J Neurorad* 2022

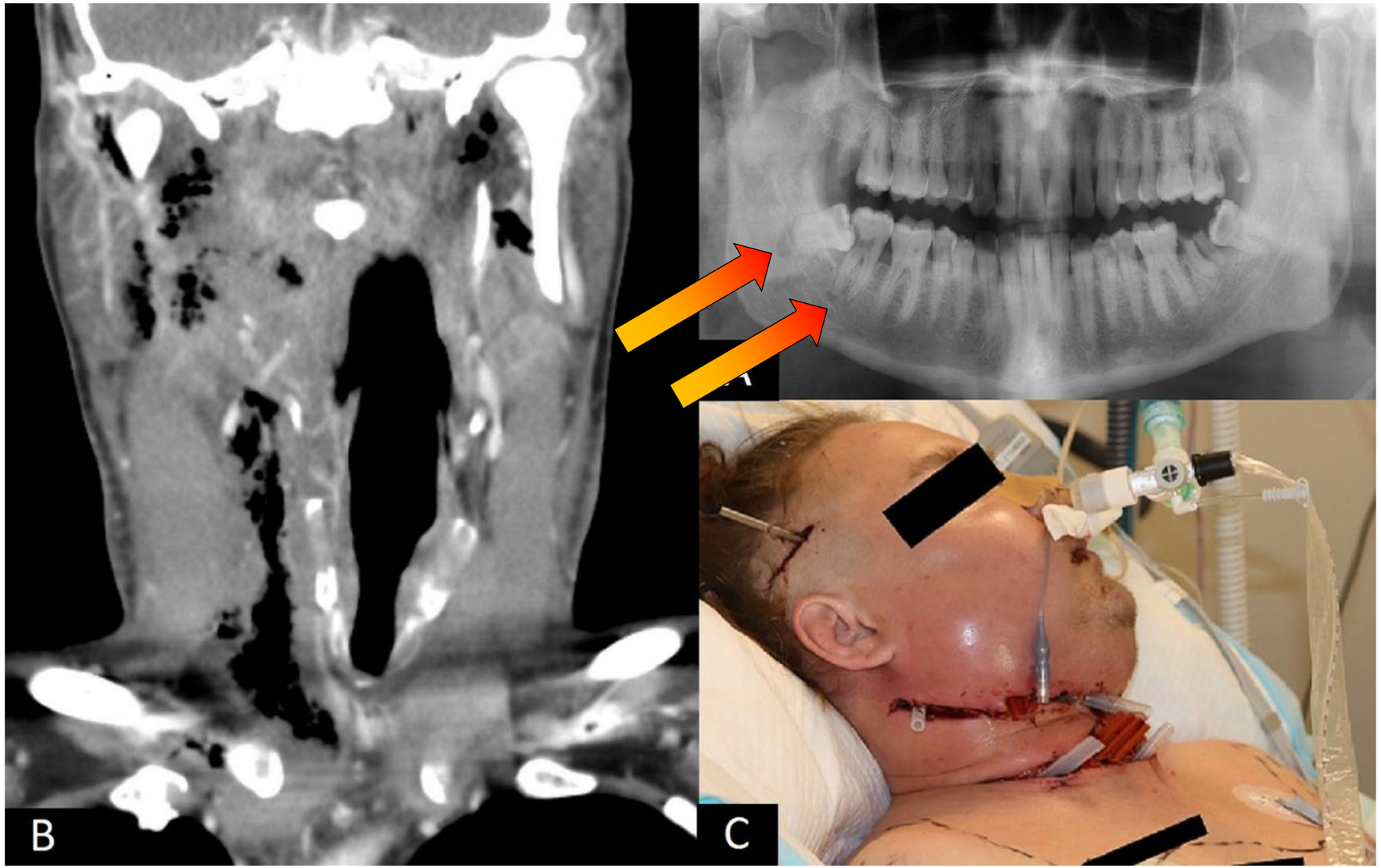
# Overview of odontogenic infections (OI)

- Periapical periodontitis and postoperative infections are the most common causes
- Mandibular molars are the most common teeth
- Polymicrobial etiology involving both aerobic and anaerobic microbes
  - *Str. anginosus* group most severe
- Deeply extending OI suggested by toothache, fever, breathing or swallowing difficulties, trismus, facial and neck swallowing
- Imaging required to demonstrate drainable abscesses and rule out complications




Dr. Annina Wuokko-Landén

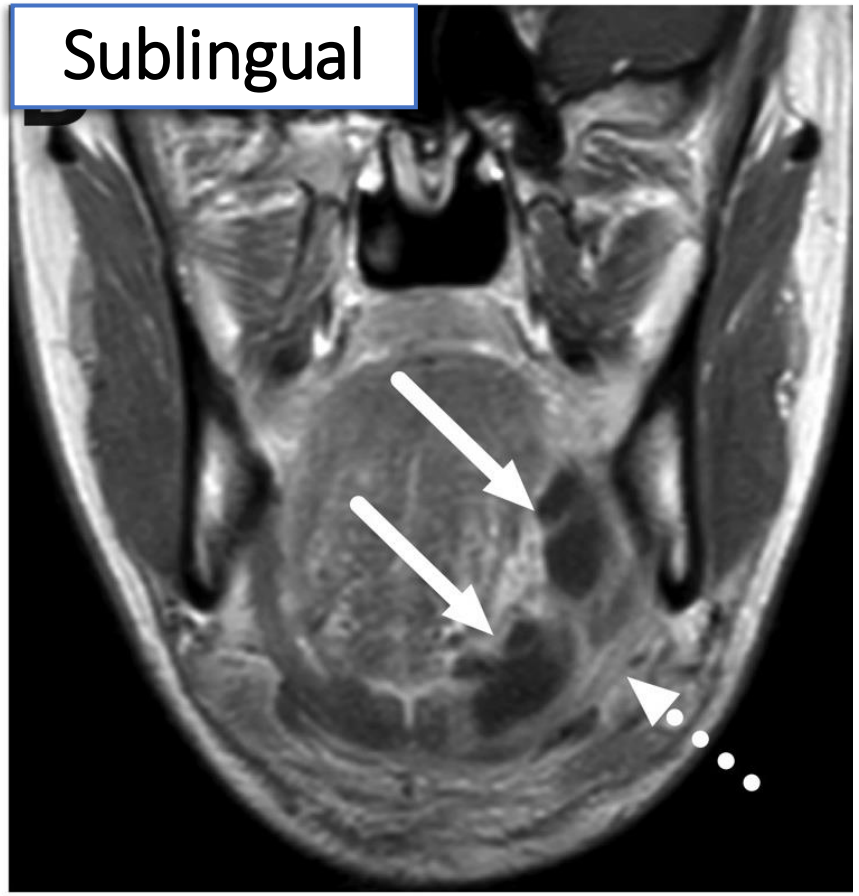
# Case example: severe deep odontogenic neck infection

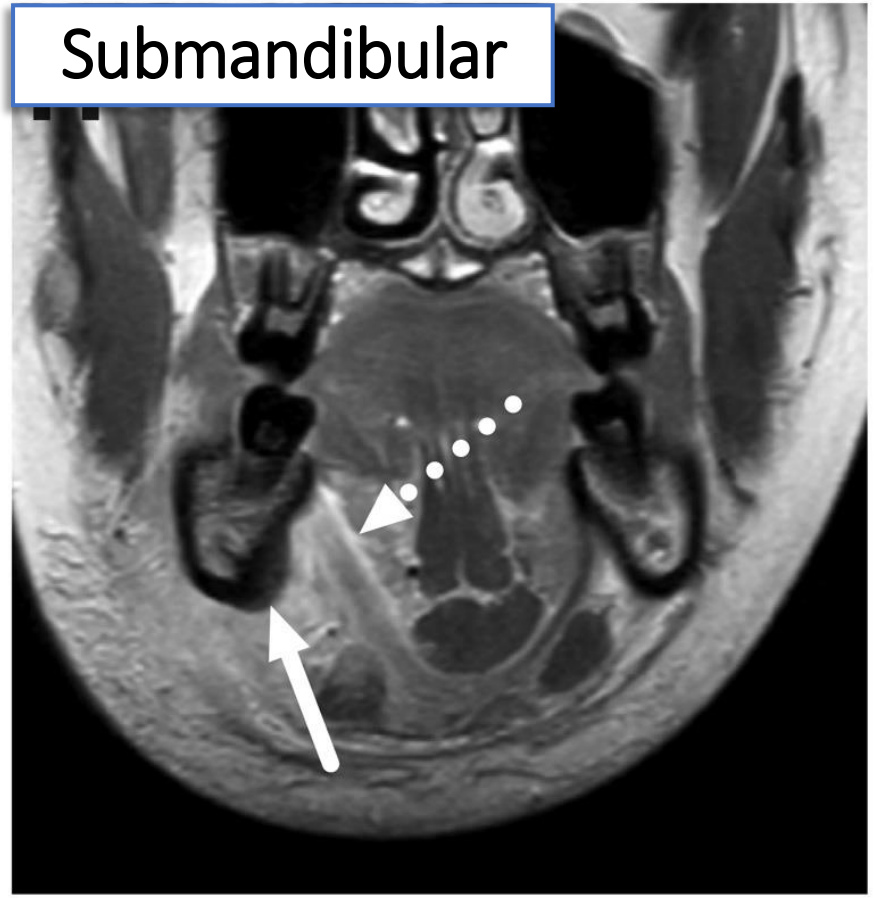


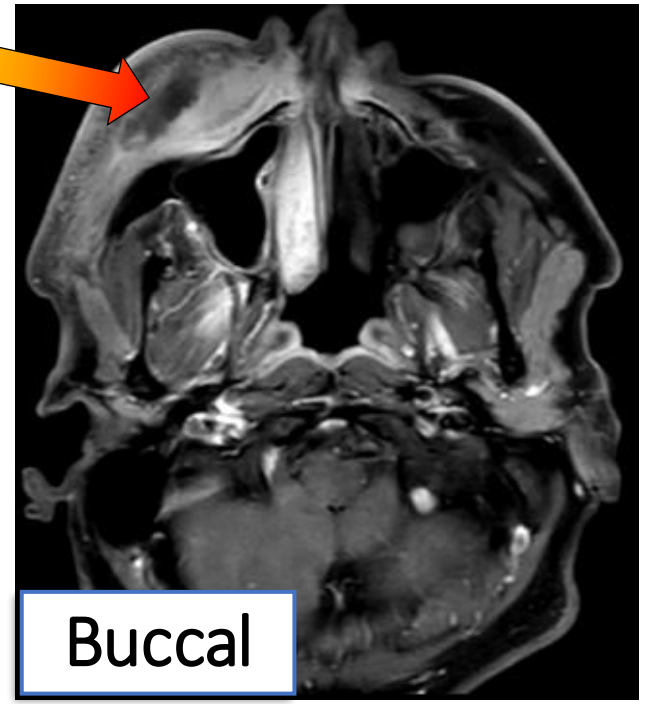

Furuholm et al. Odontology (2023) 111:522–530

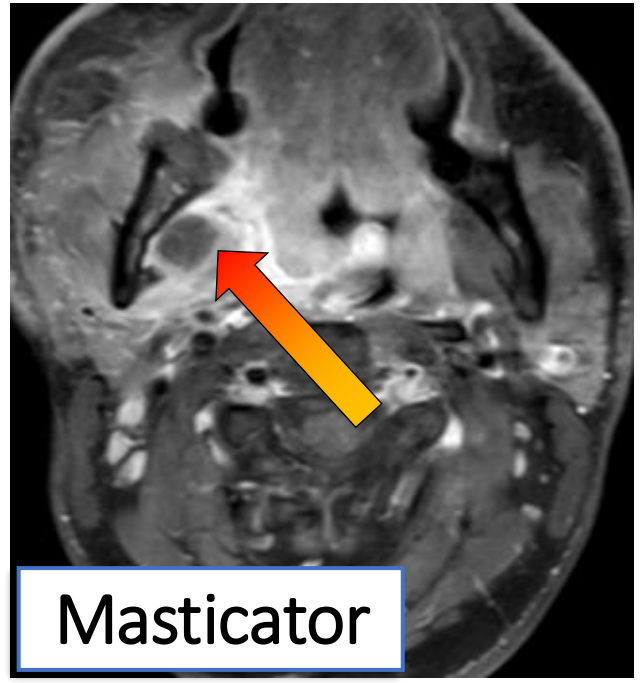
# Oral cavity: mostly odontogenic abscesses

- Tooth decay
- Periapical changes
- Bone marrow changes
- **Abscesses**

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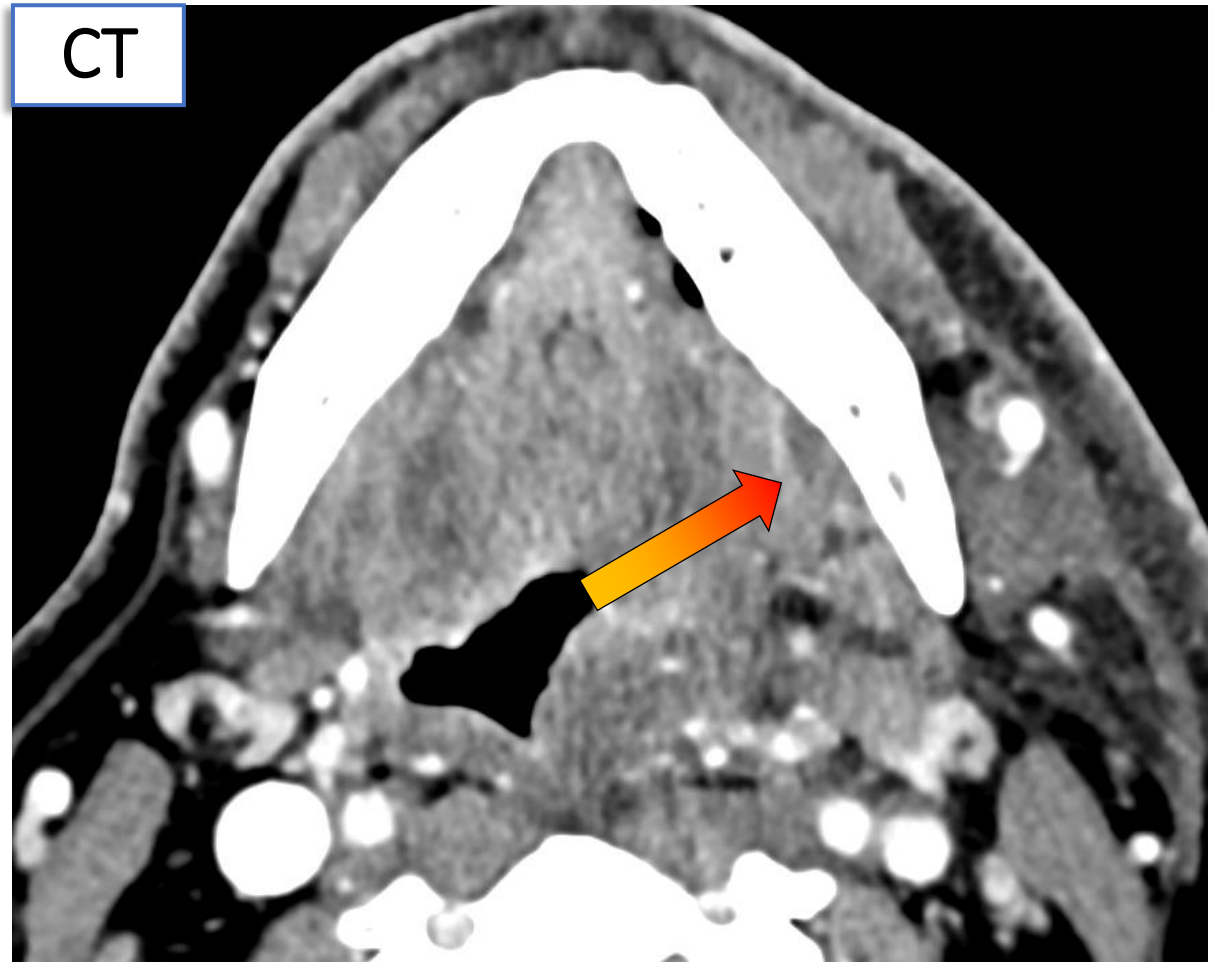
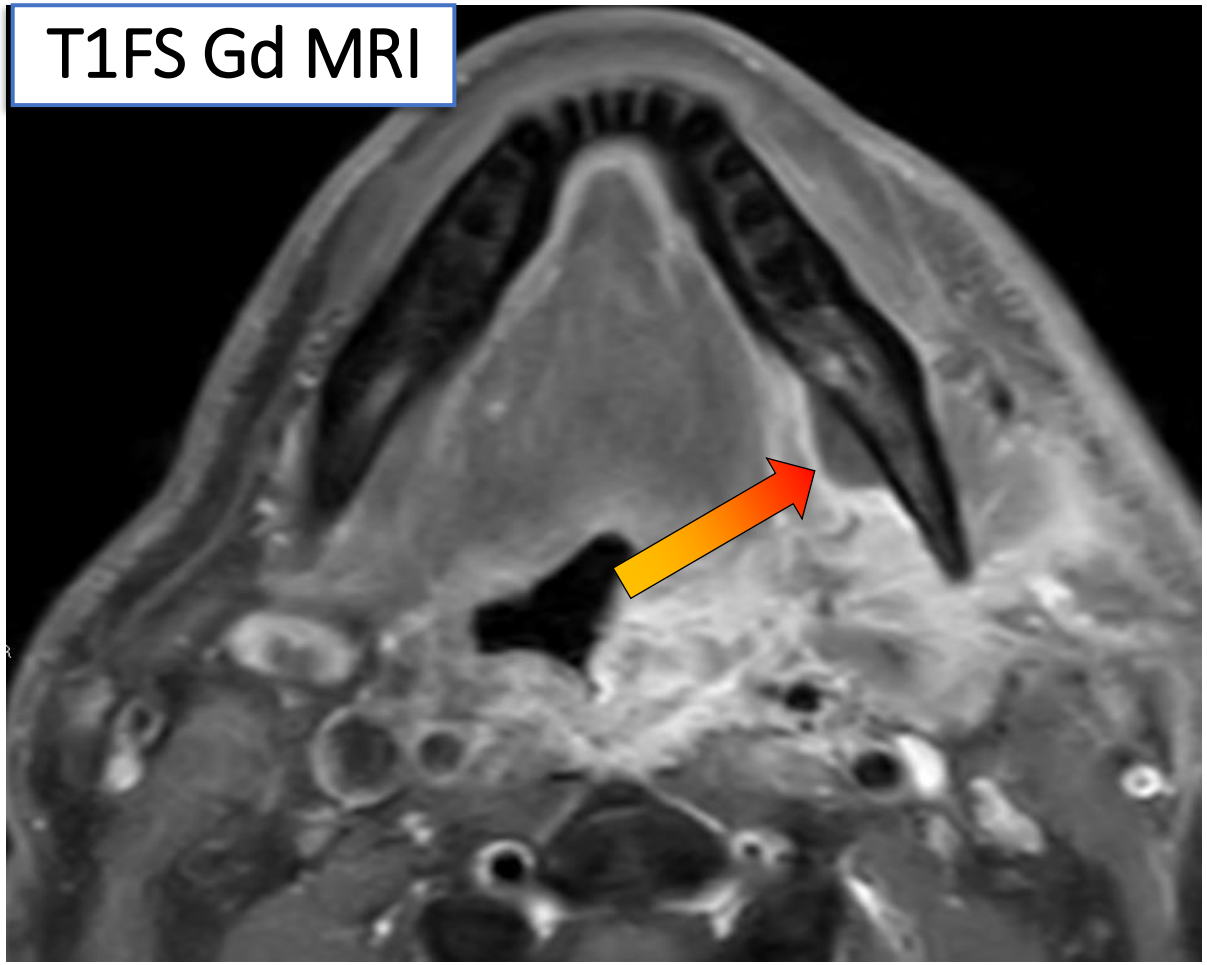
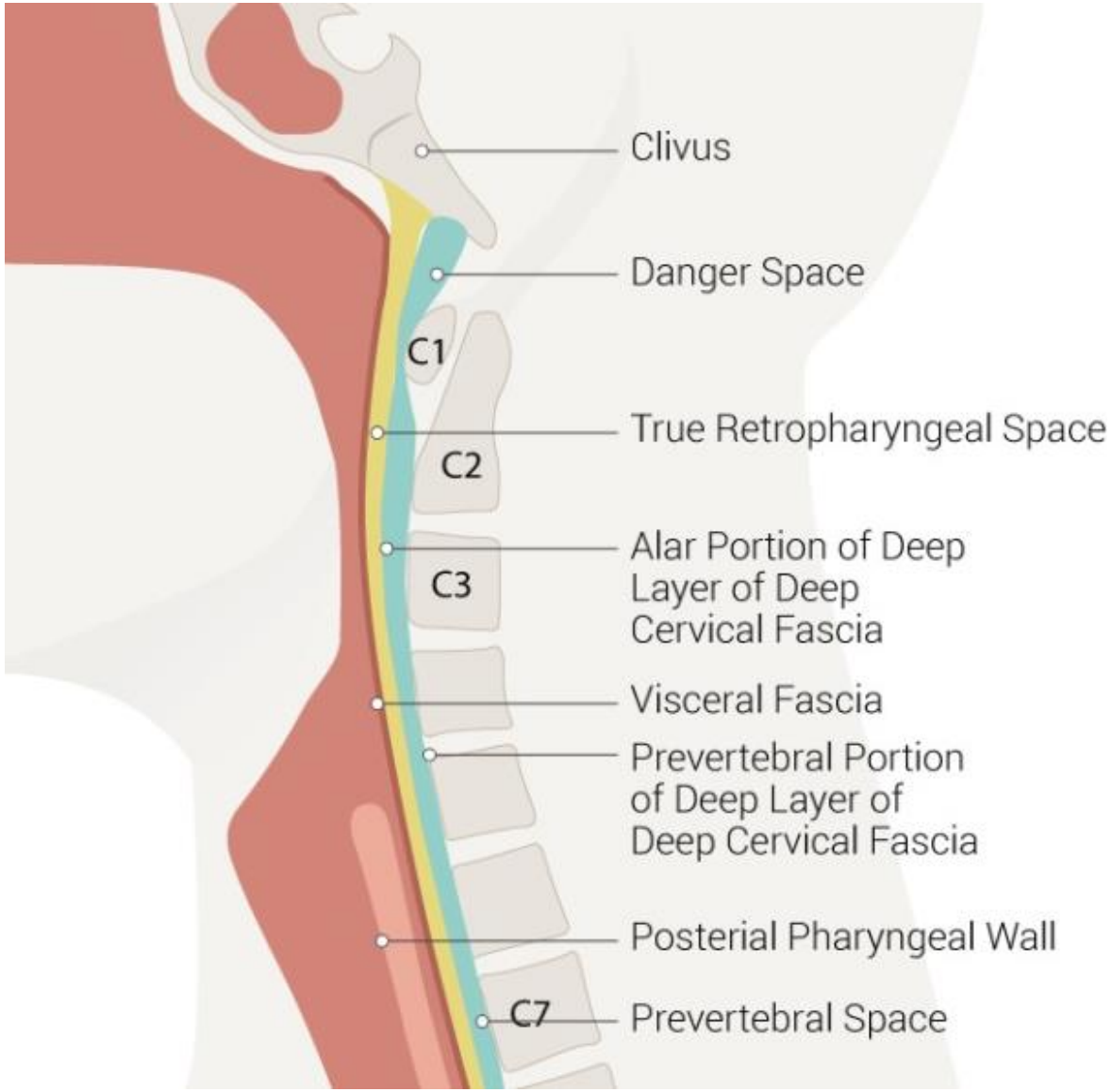
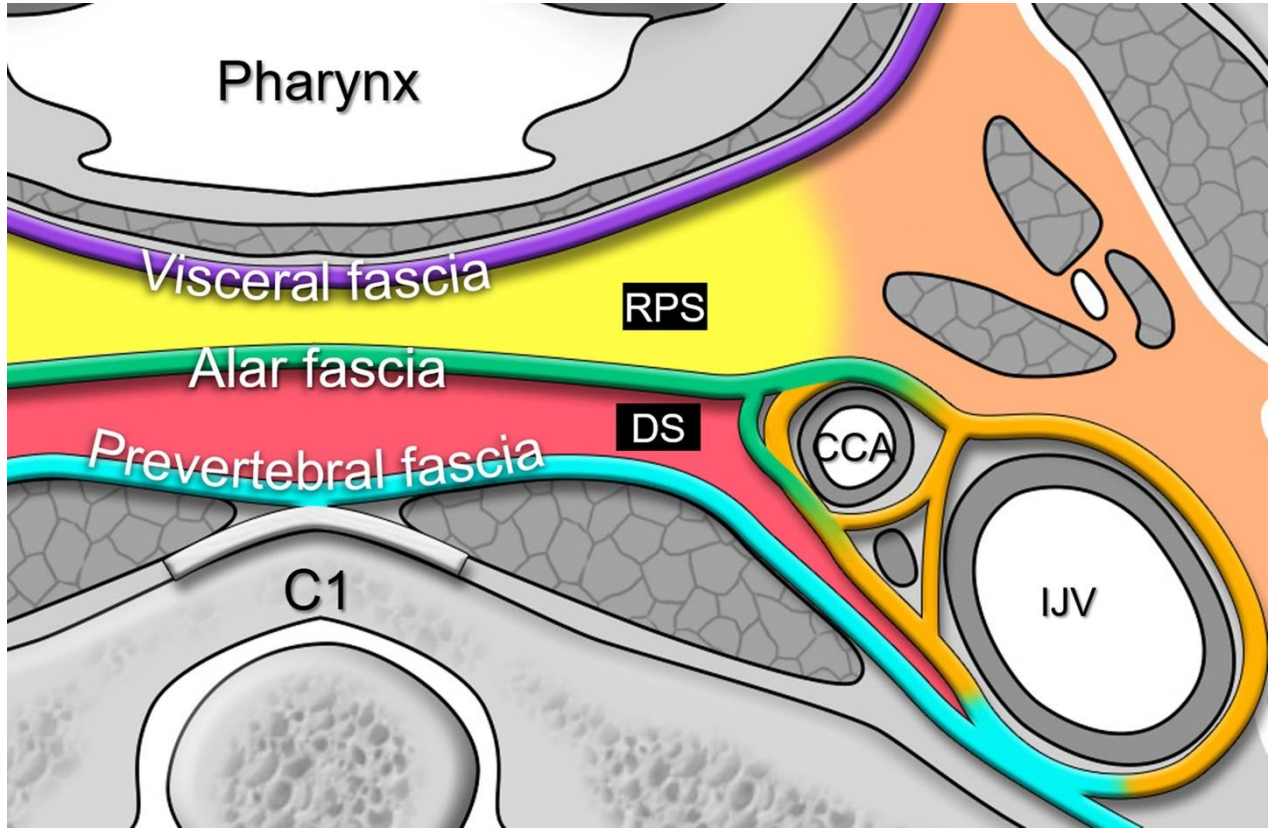
# Odontogenic **subperiosteal** abscess



# Retropharyngeal space – gateway to the mediastinum

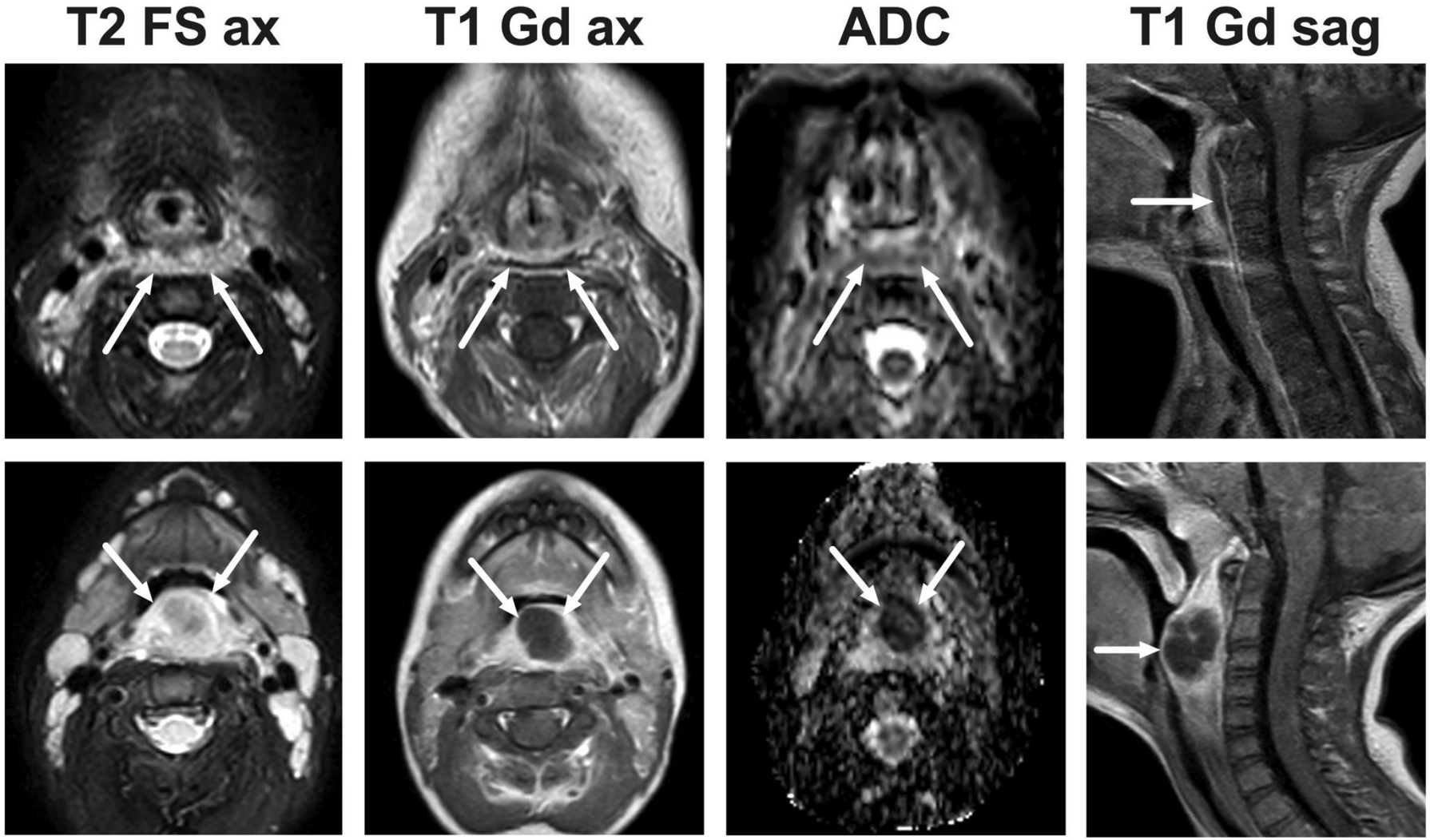



Gavid *et al*. Anatomical and histological study of the deep neck fasciae: does the alar fascia exist? Surg Radiol Anat 2018;40:917–922.

Snosek *et al*. Anatomical and histological study of the alar fascia. *Clinical Anatomy*. 2021; 34: 609– 616.

# Retropharyngeal abscess: often suppurative lymphadenitis

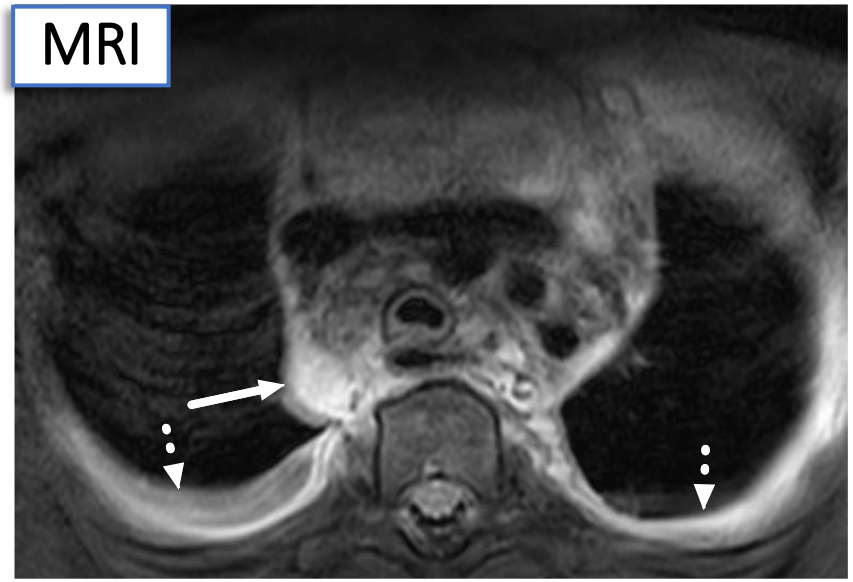



"True" RPA

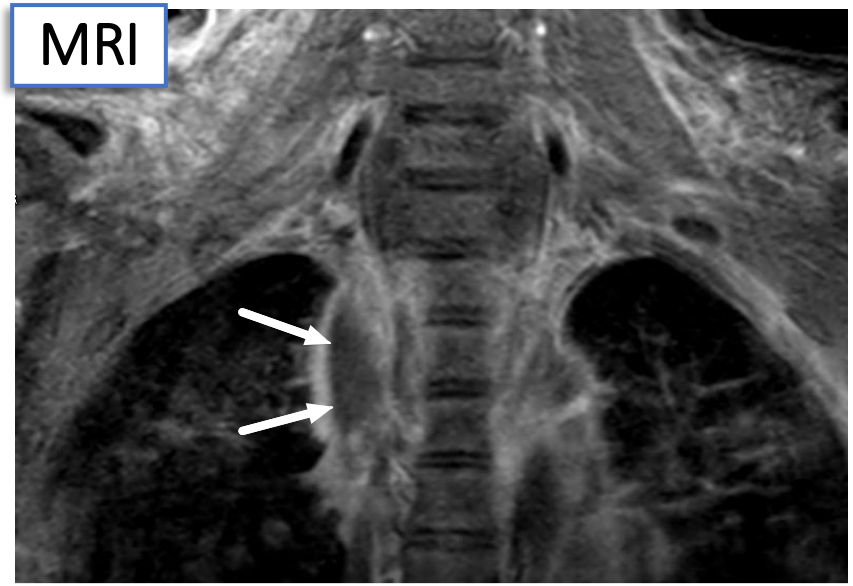
Suppurative lymphadenitis

Nurminen *et al*. *Pediatric Radiology* 2022

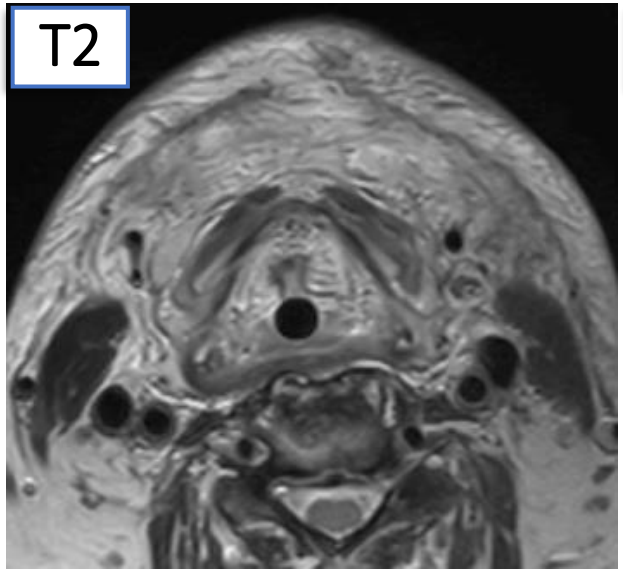
# Descending mediastinitis: posterior route

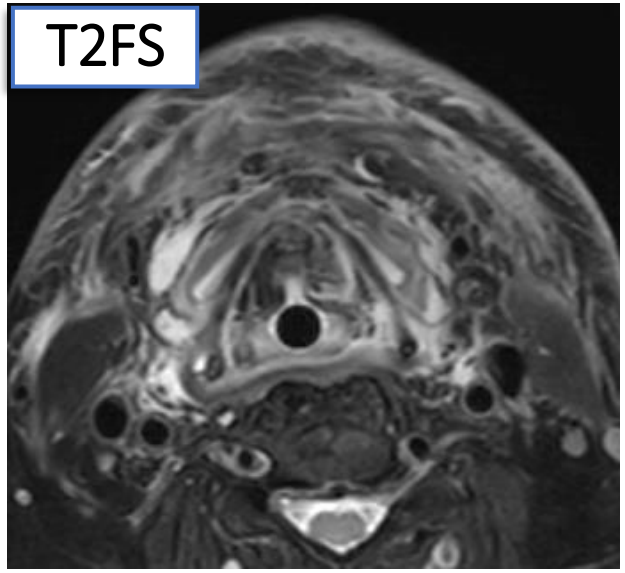




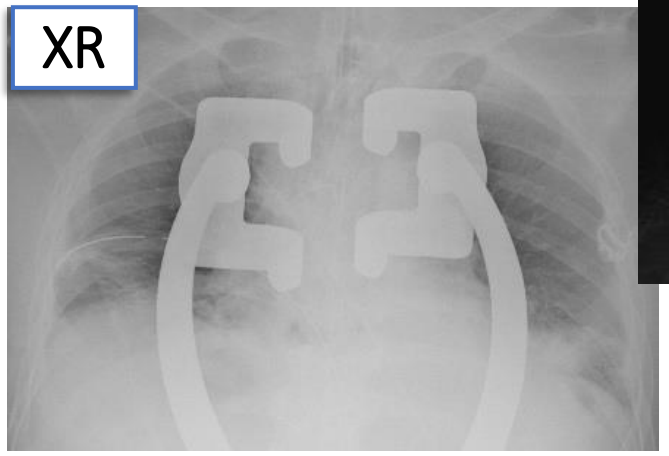


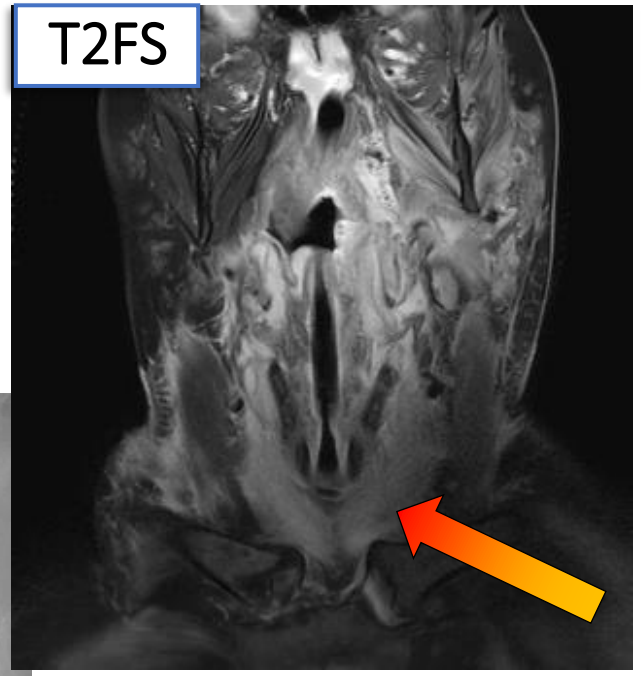

# Descending mediastinitis: anterior route

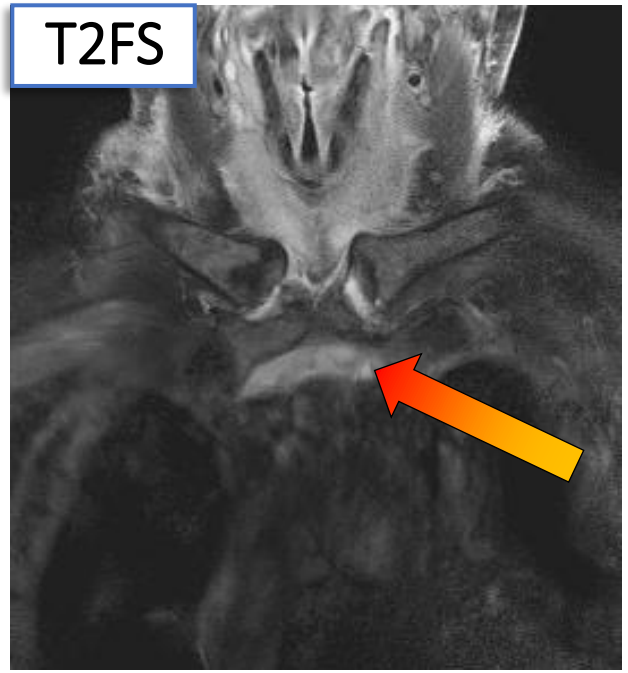


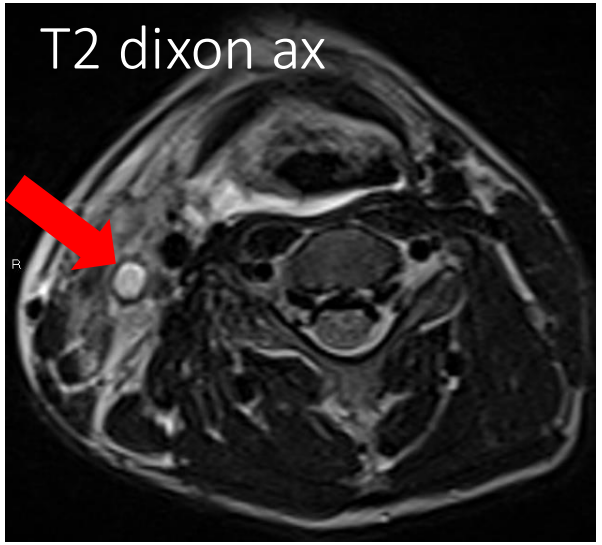


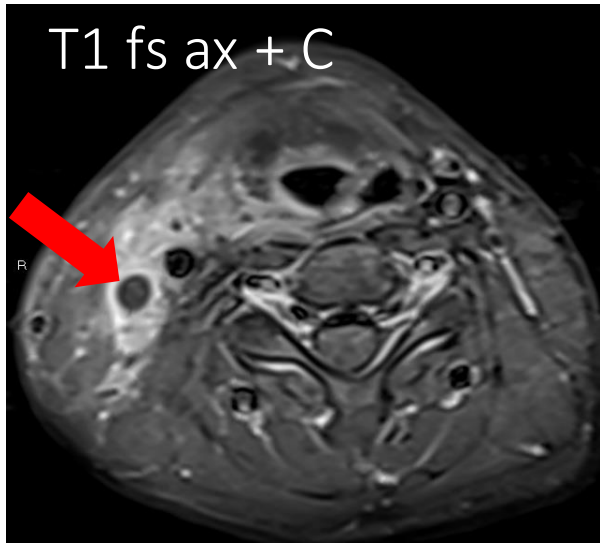


# **Complication**: venous thrombosis



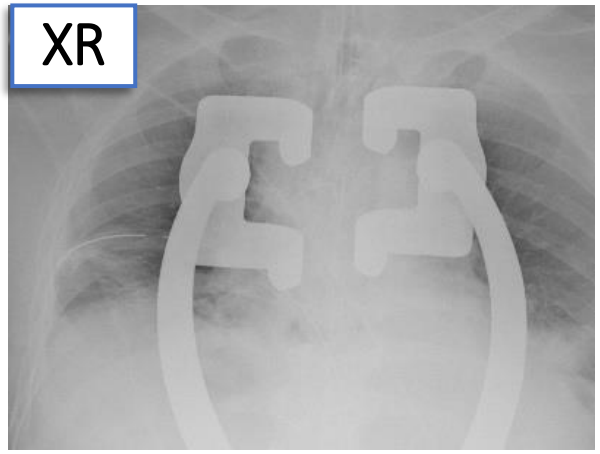



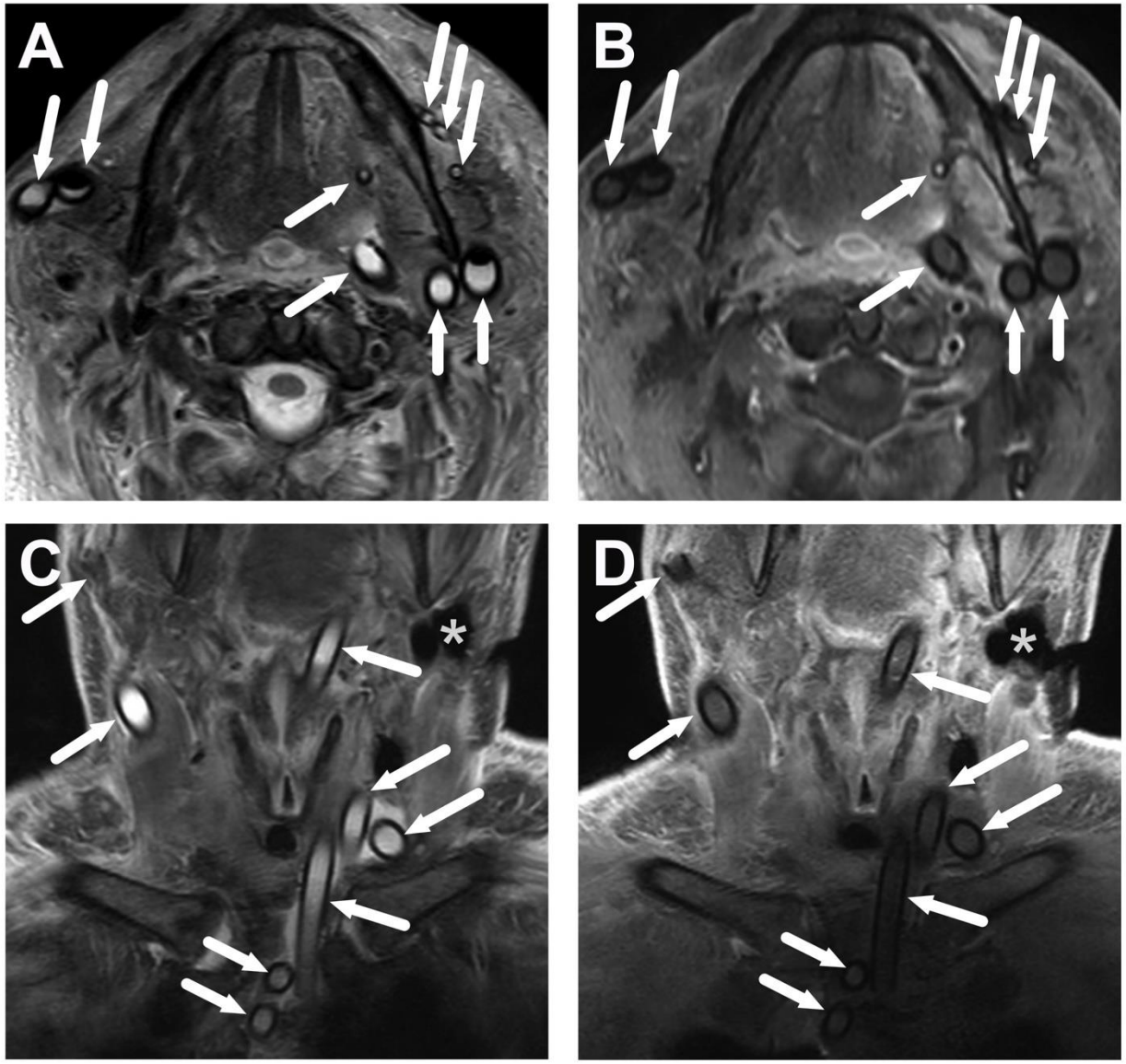


Dx: Lemierre syndrome (*F. necrophorum*)

# Post-operative scans

- Residual abscess collections
- Surgical drains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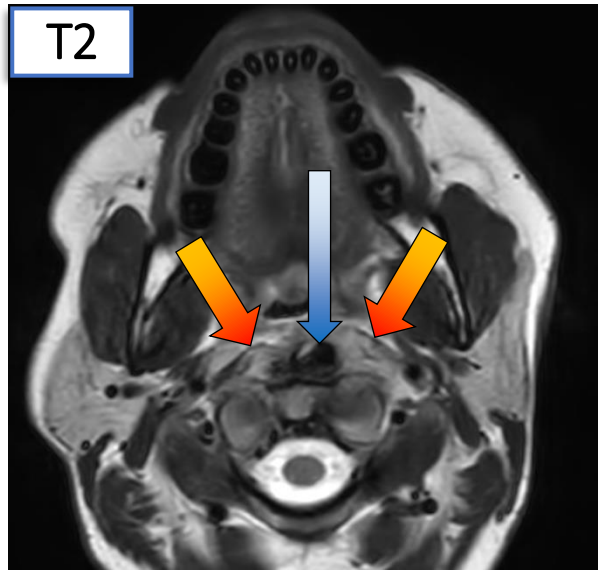
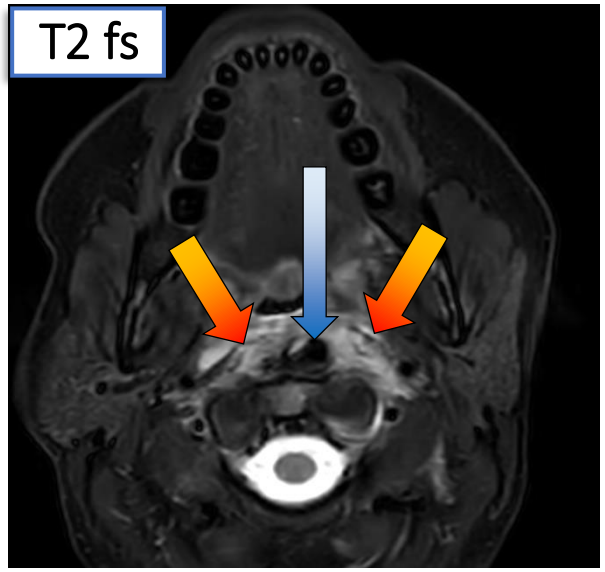
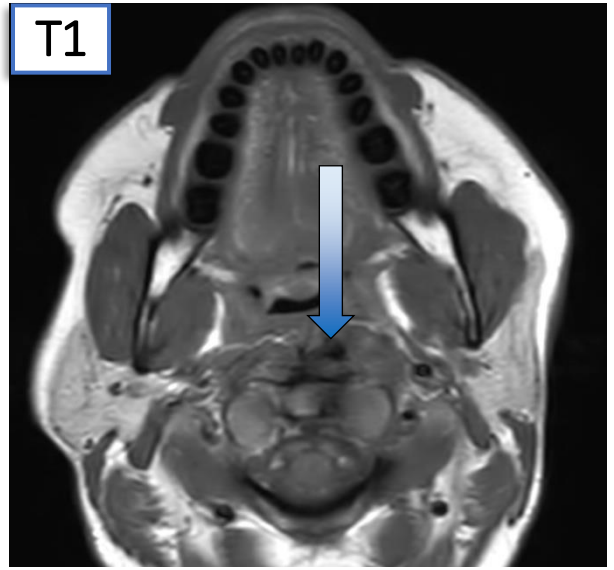
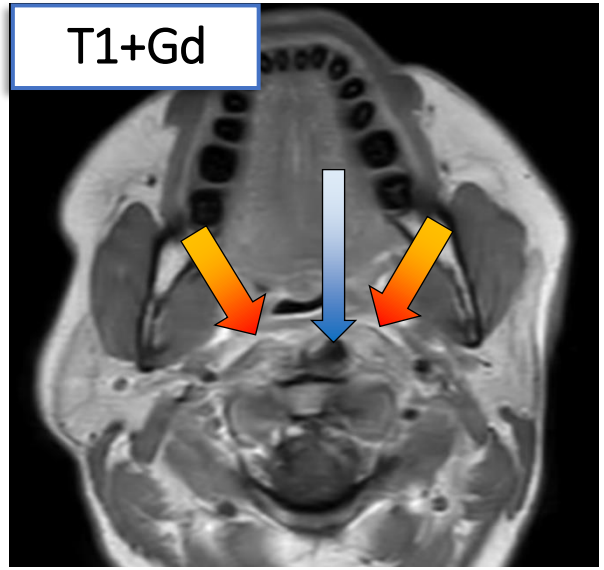
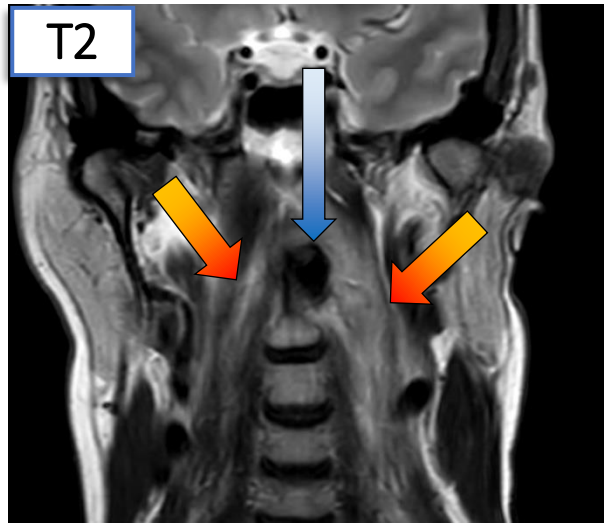
# <u>Infection mimic 1</u>: Middle-aged female, several days neck & throat pain and odynophagia, CRP 85, WBC 12.7

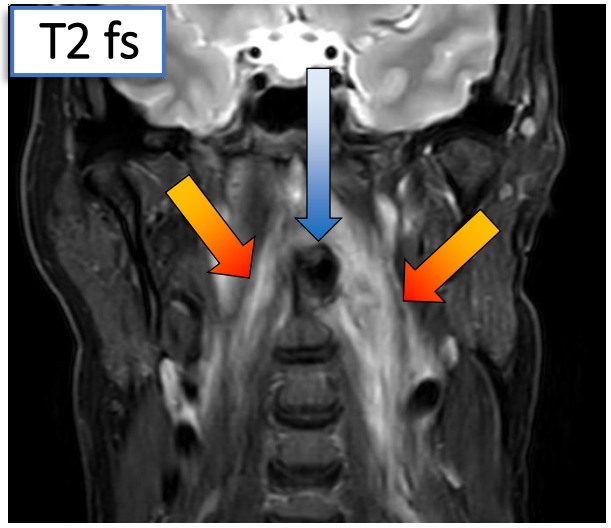


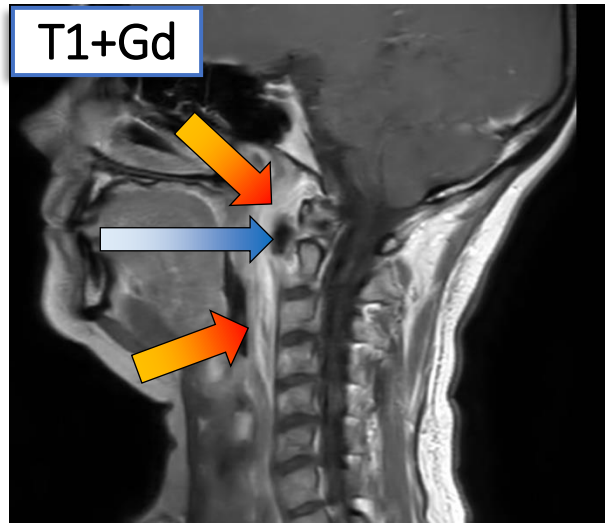



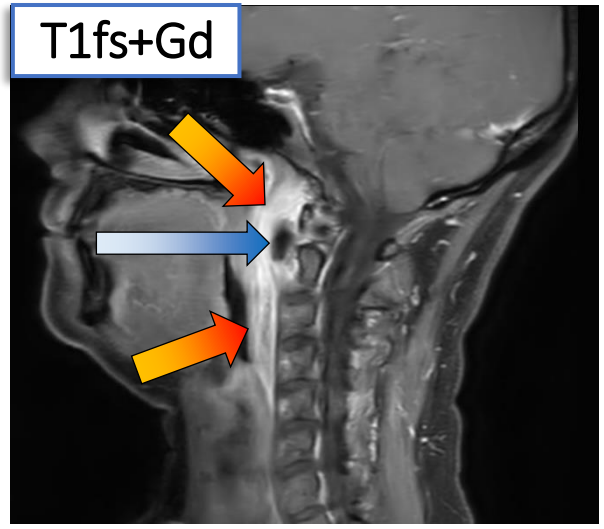



# Longus colli calcific tendinitis

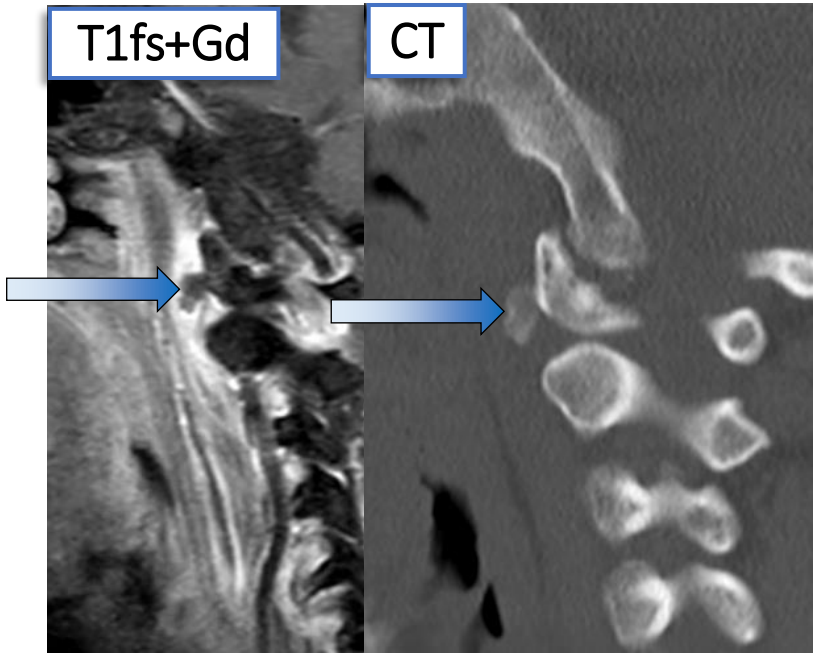
- A rare inflammatory disease with unknown origin[1]
- Incidence 1/1000 acute neck CT, usually not suspected[2]
- Calcium hydroxyapatite crystal deposits and inflammation in longus colli muscle tendons
- Clinical: neck pain and stiffness, odynofagia, fever, headache, elevated CRP & WBC
- Imaging findings:
  - Swollen and edematous longus colli muscles
  - May have retropharyngeal edema (no abscesses)
  - Amorphous calcifications (best seen on CT)
- Differential diagnosis:
  - Deep neck infection, retropharyngeal abscess, spondylodiscitis
- Treatment: NSAIDs

[1]Paik et al. J Comput Assist Tomogr. 2012;36(6):755-61.

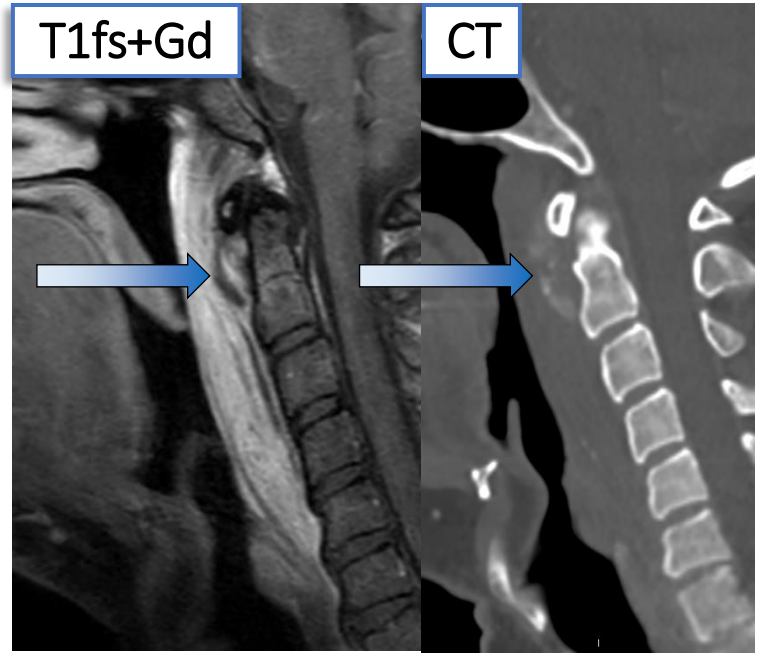
[2]Boardman et al. Emerg Radiol 2017;24(6):645-651.

# Companion cases: Longus colli calcific tendinitis

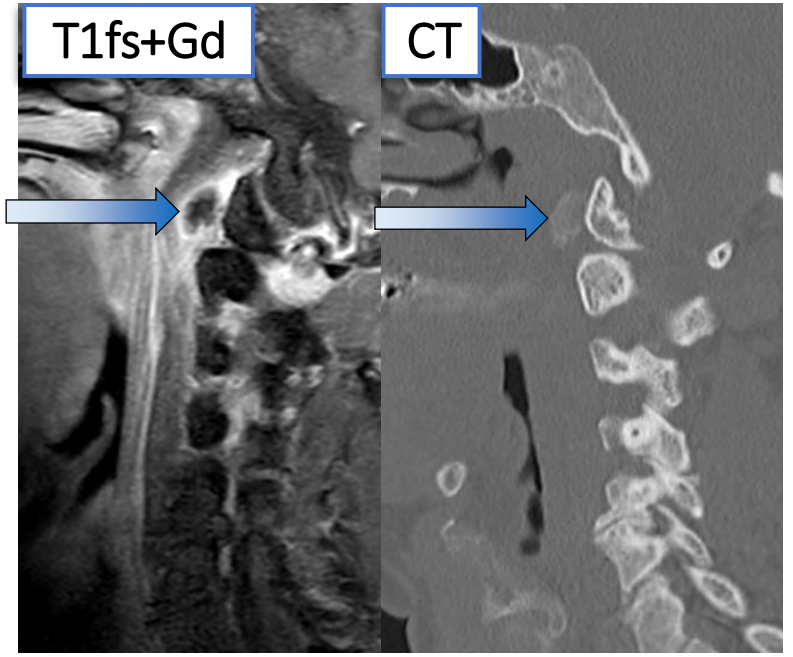
CRP 102, WBC 9.2




CRP 156, WBC 10.8



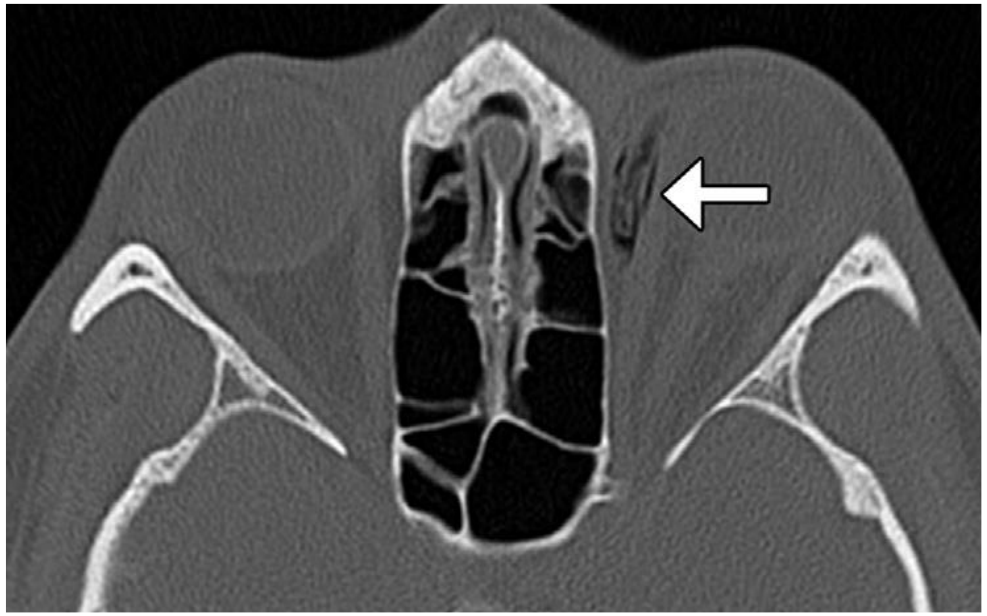

CRP 37, WBC 9.5

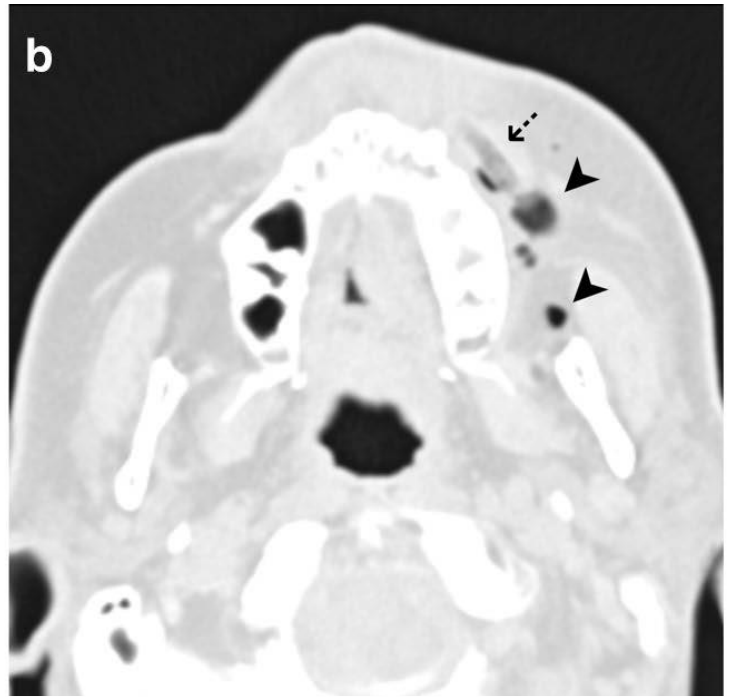


# Head and neck trauma

- **Penetrating injury**
  - Follow the trajectory
  - Look for foreign bodies
  - Vascular, airway, and brachial plexus injury
- **Laryngeal injury**
  - Cartilage fracture & dislocation
- **Blunt vascular trauma**
  - Mostly arterial injuries; use CTA

# Penetrating injury: Wood

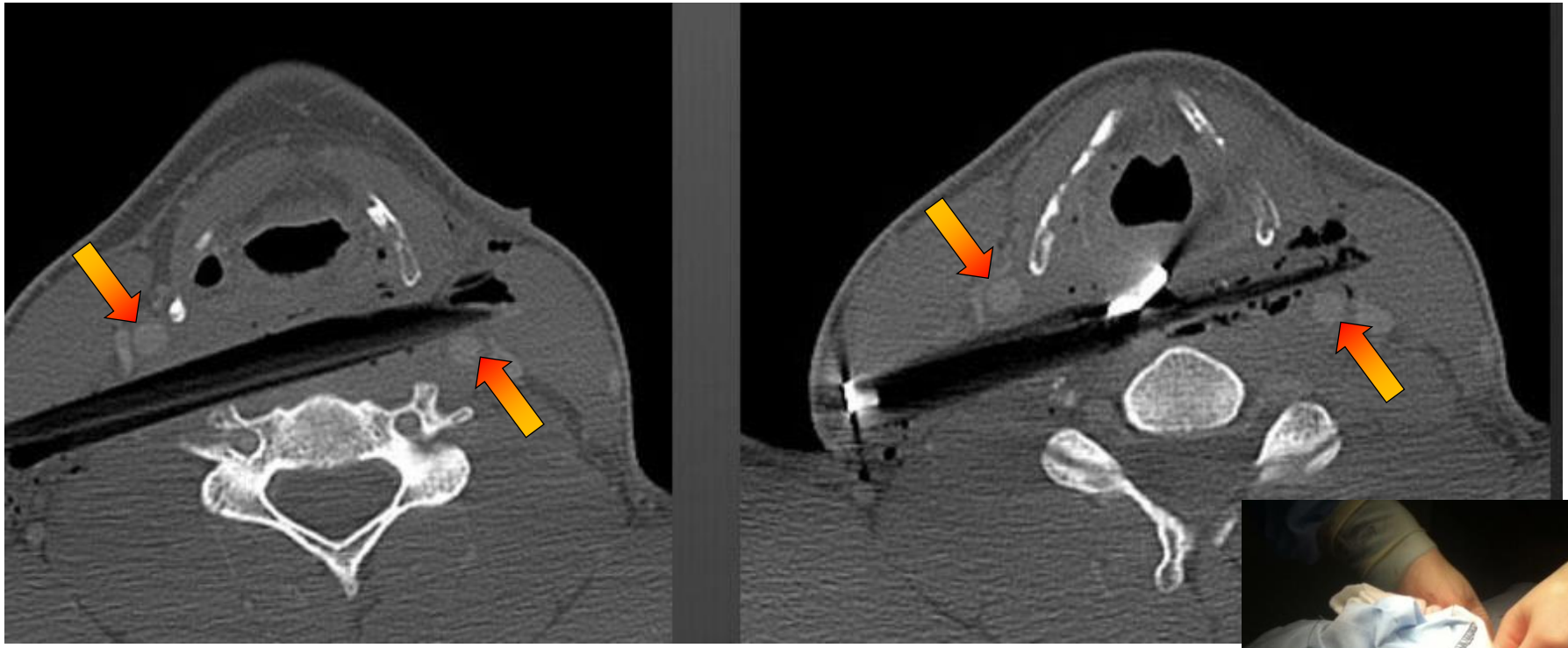



Ginat DT: Neuroimaging Clin N Am 2022 May;32(2):315-326.

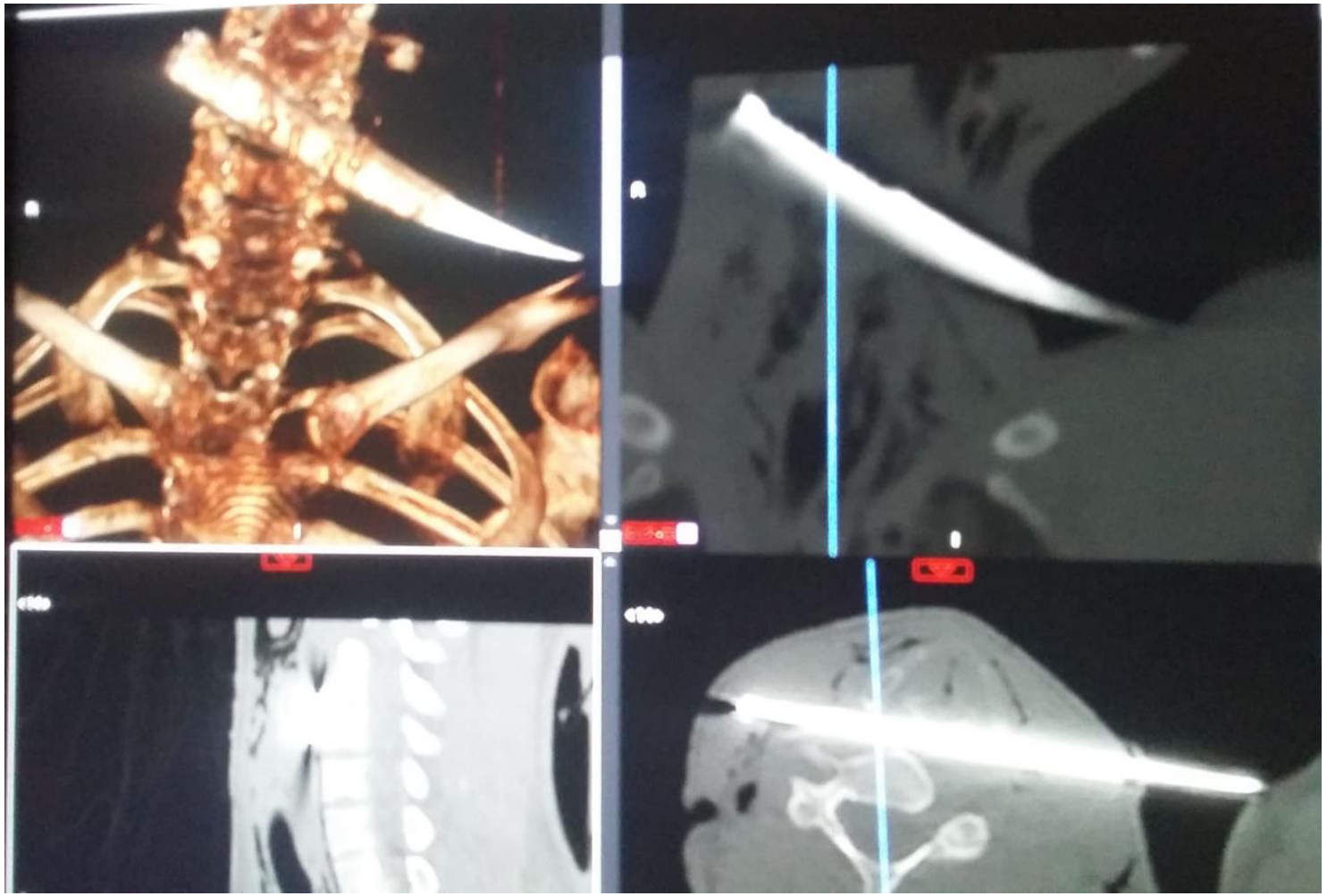
Voss *et al. Insights Imaging (2021) 12:20*
https://doi.org/10.1186/s13244-021-00969-9

# Penetrating injury: Wood



Case provided by Dr. Steve Colley (UK)

# Penetrating injury: Knife




Cases provided by Dr. Ville Jussila (FI)

# Penetrating injury: Nail

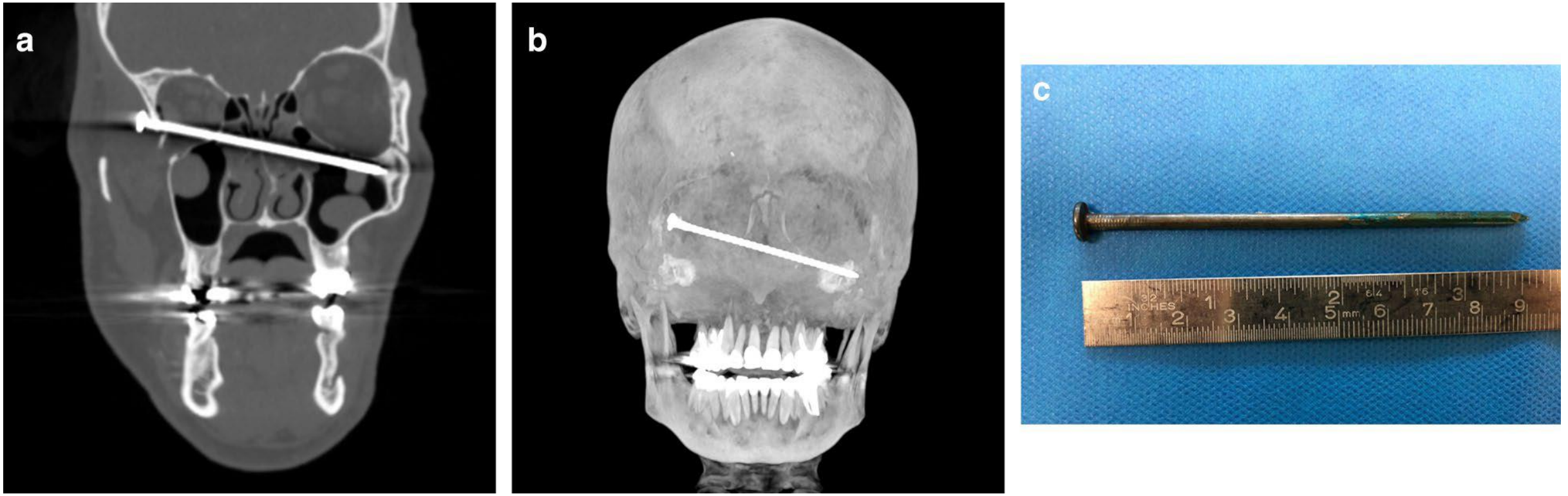
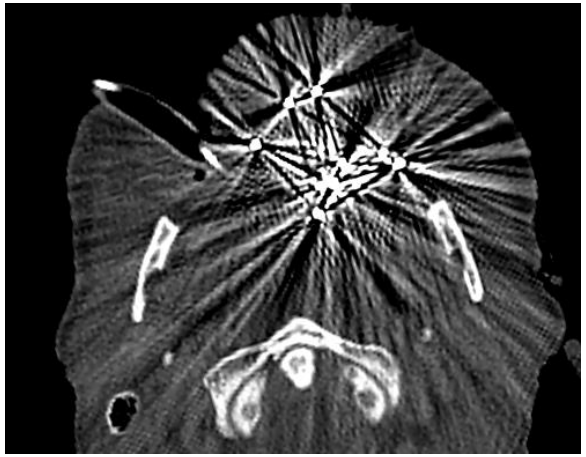


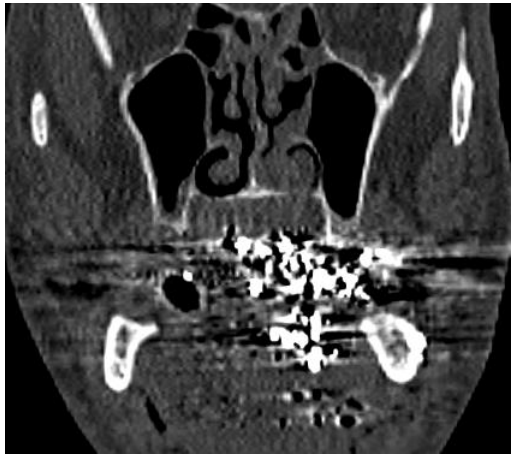

**Fig. 8** Nail gun. Para-coronal CT image (**a**) and a 3-dimensional maximum intensity projection (**b**) showing a hyperdense straight foreign object entering the right lateral wall of the orbit, penetrating the left ethmoidal cells and the left maxillary sinus. A photograph of a metal nail after removal from the midface (**c**)

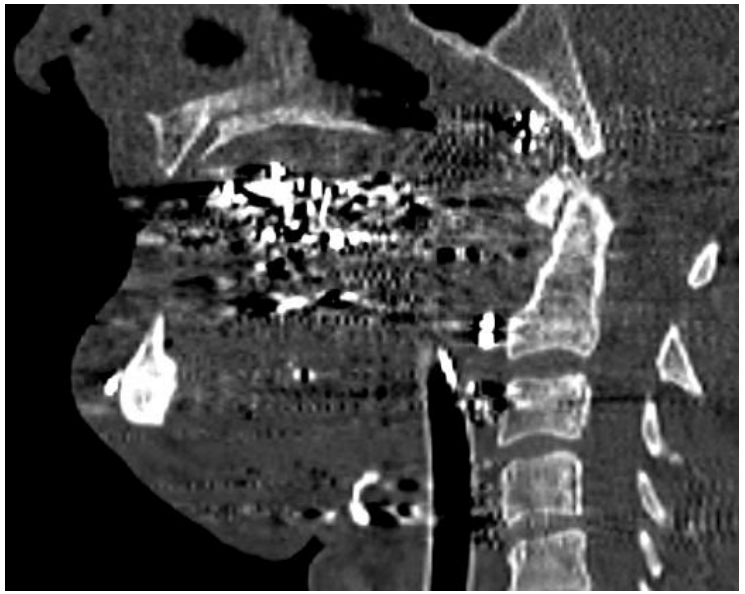
*MRI may be contraindicated!*

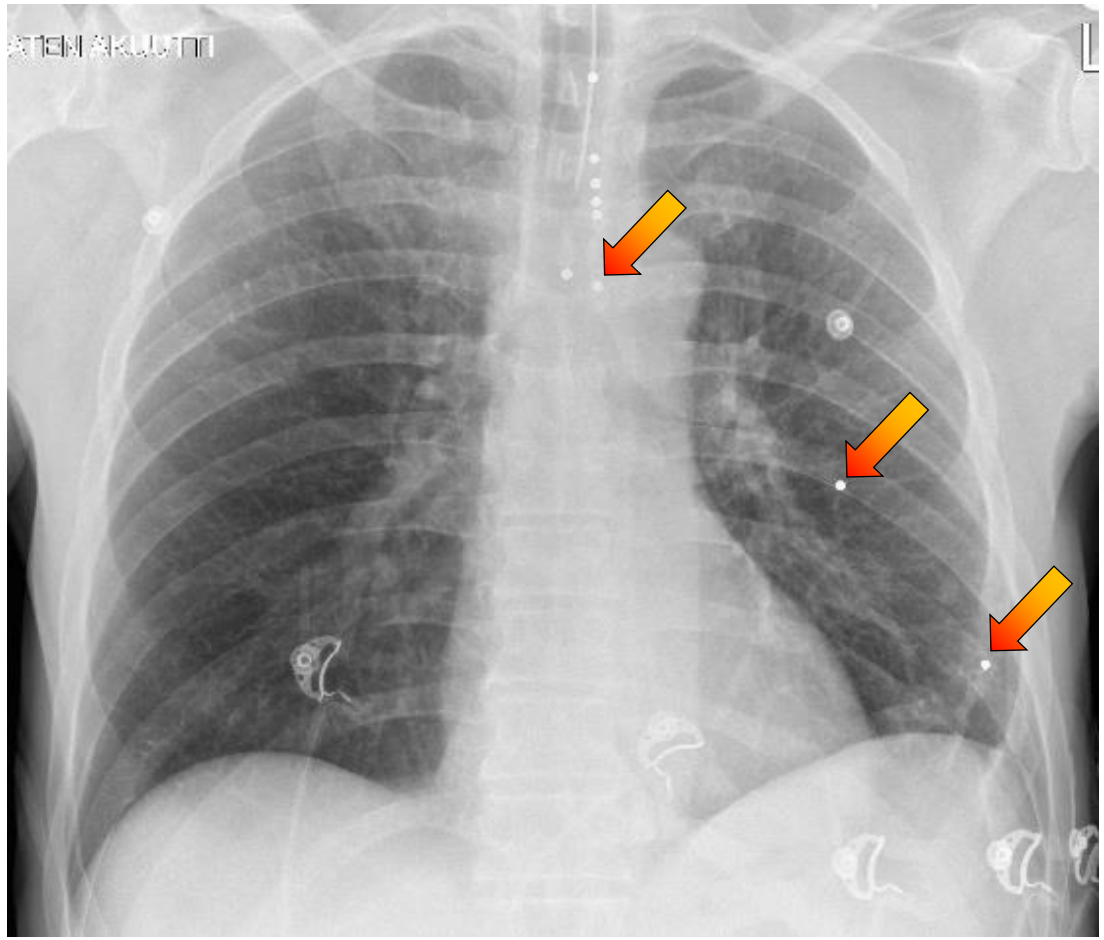
Voss *et al. Insights Imaging (2021) 12:20* https://doi.org/10.1186/s13244-021-00968-8

# Penetrating injury: Shotgun

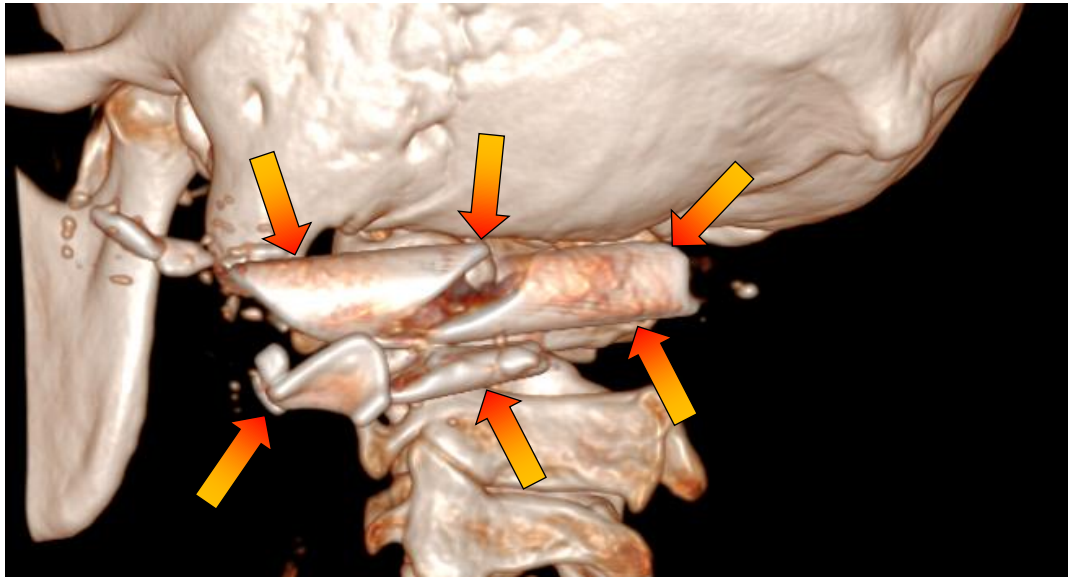


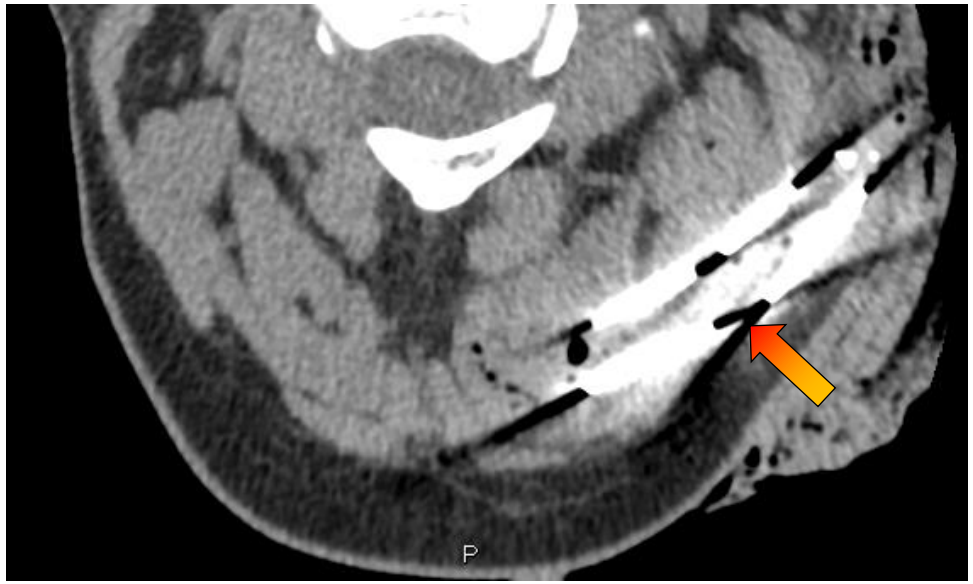


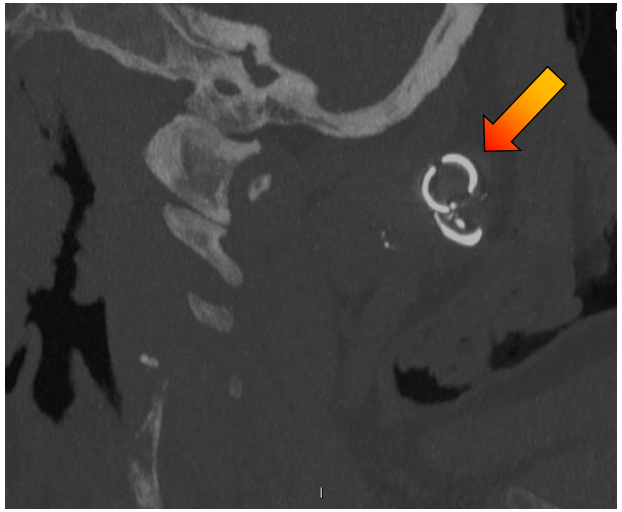


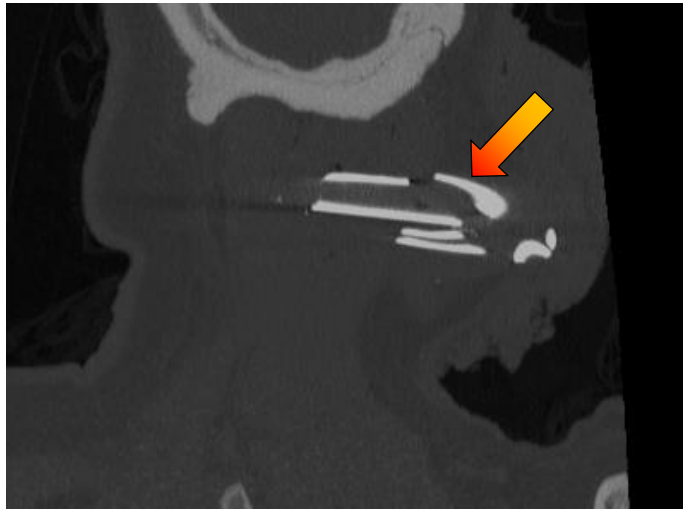


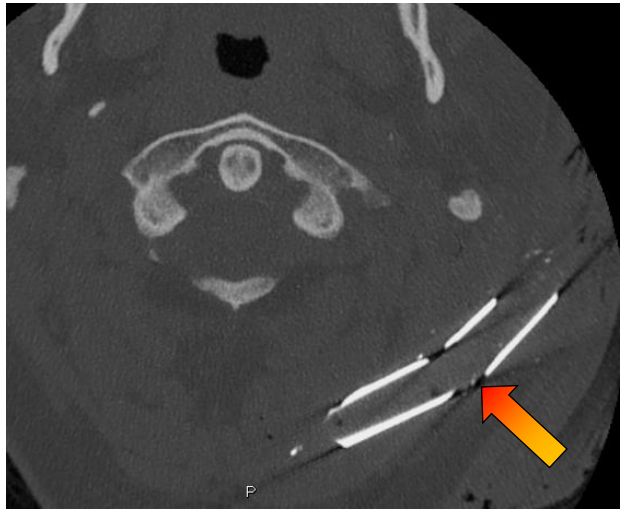
# Penetrating injury: Glass shard



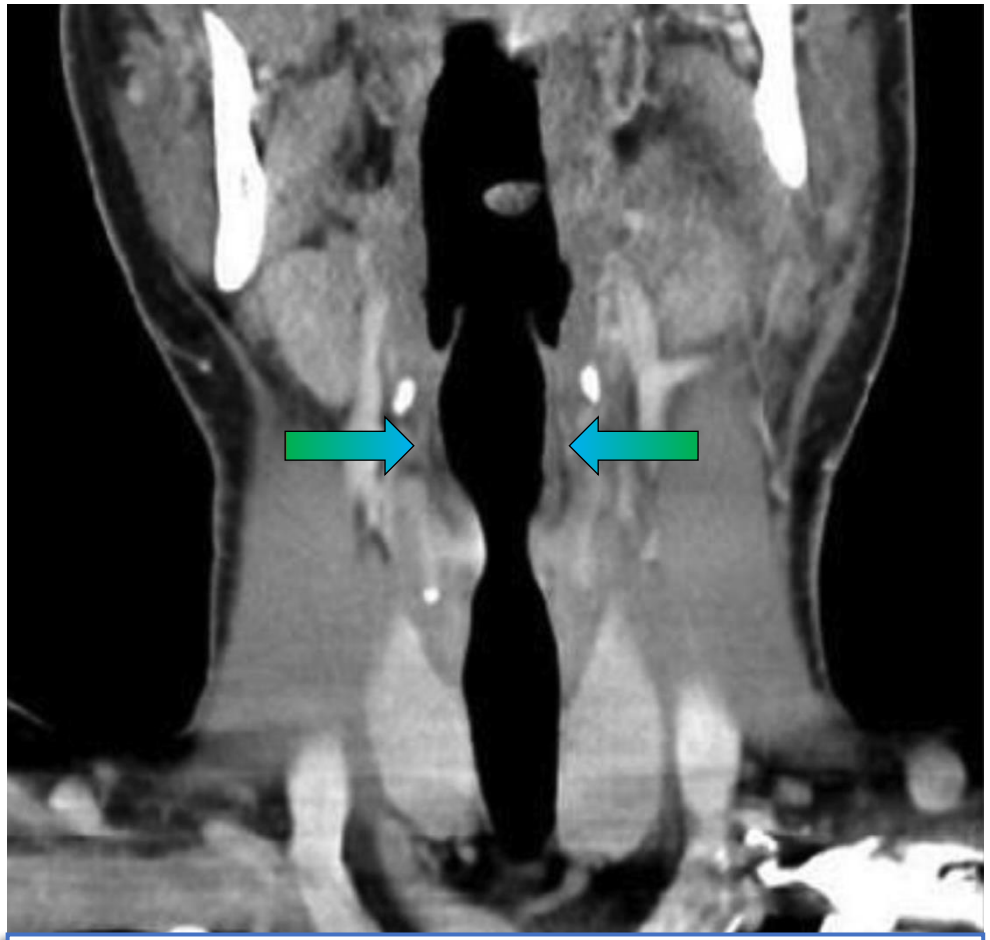








# Imaging assessment of airway compromise

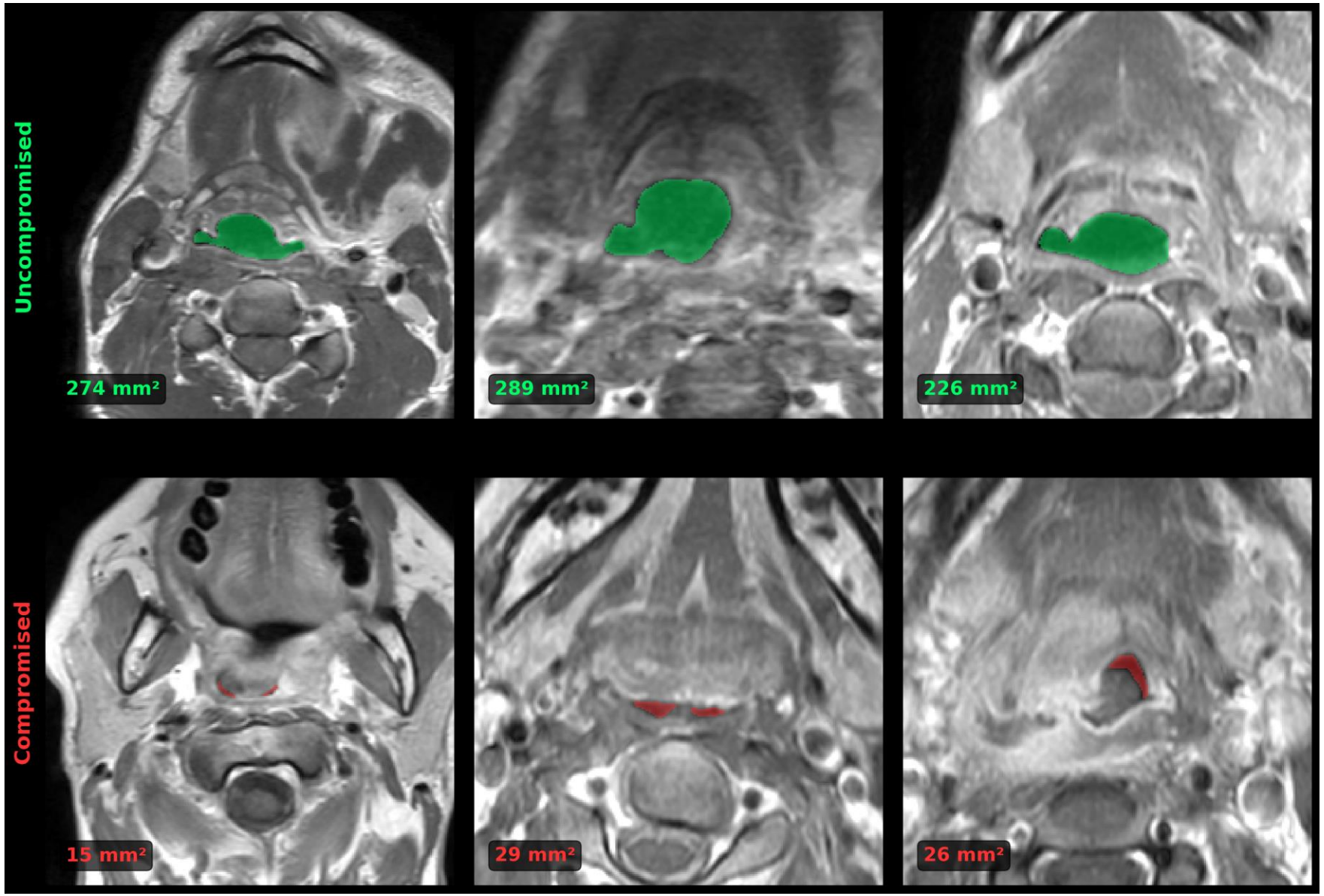


Uncompromised

Compromised

Rautaporras et al. Journal of Stomatology oral and Maxillofacial Surgery 124 (2023) 101424

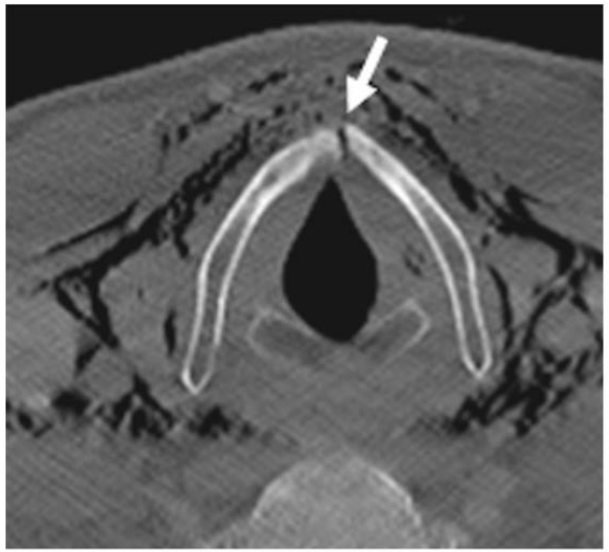
# Imaging assessment of airway compromise

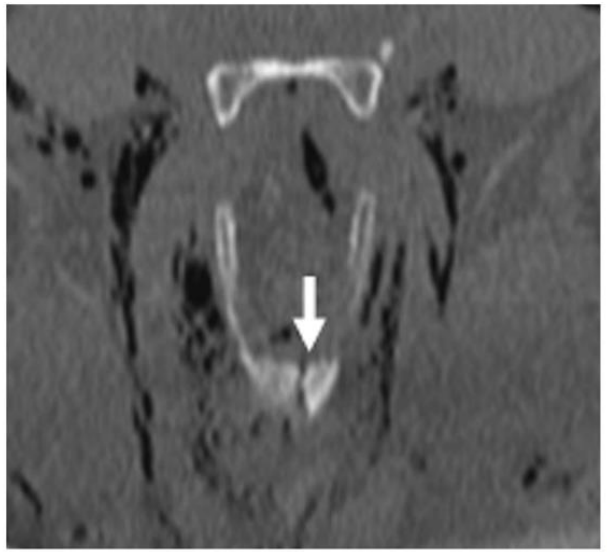


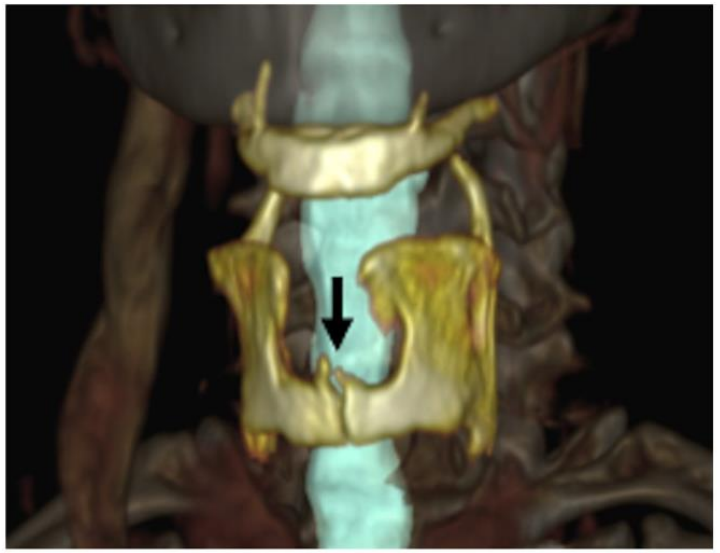
# Laryngeal trauma: classification and imaging

- **Epidemiology**
  - Rare: 1 in 5,000–137,000 ER visits; often occult with minimal external signs
  - MVA 49%, sports 29%, hanging, penetrating injuries
  - Associated: intracranial (17%), C-spine fractures (13%), facial fractures (9%)
- **Fuhrman-Schaefer classification (I–V)**
  - I: Minor hematoma/edema, no fracture
  - II: Nondisplaced fractures, no exposed cartilage
  - III: Displaced fractures, exposed cartilage, cord immobility
  - IV: Multiple fracture lines, skeletal instability
  - V: Complete laryngotracheal separation
- **Role of CT**
  - MDCT with 2D MPR and 3D reconstructions!

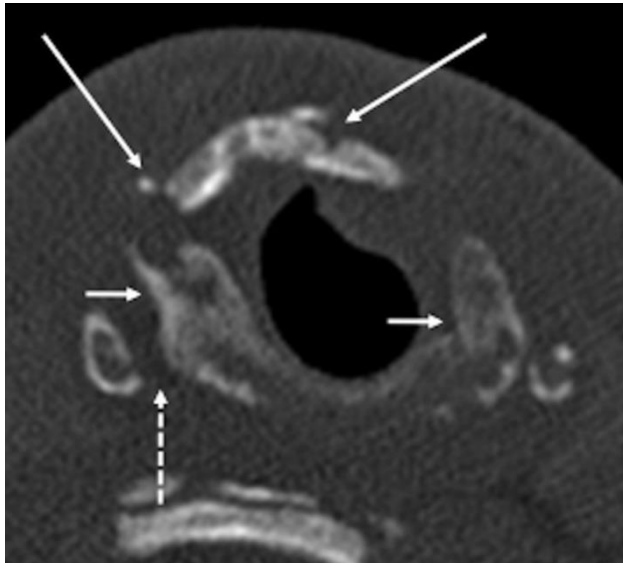
# Laryngeal trauma: CT findings







- Cartilage fractures (thyroid, cricoid, arytenoid), arytenoid dislocation
- Paraglottic and pre-epiglottic hematoma
- Subcutaneous emphysema, endolaryngeal mucosal disruption



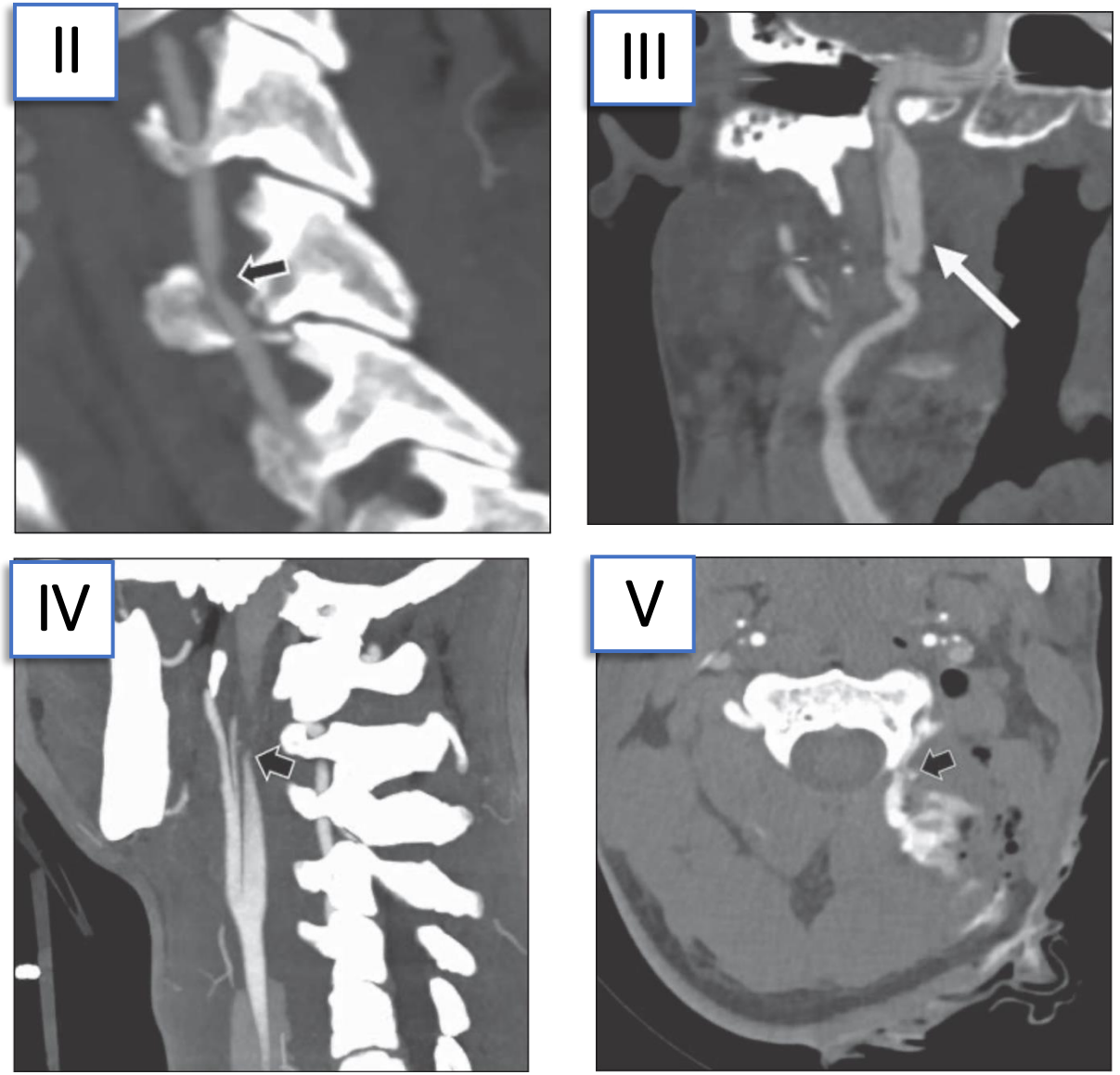
Becker *et al*. Eur J Radiol 2014;83:142– 154

# Blunt cerebrovascular injury: screening and CTA

- **Epidemiology**
  - 1–3% of craniocervical trauma; can cause stroke and mortality
  - Often asymptomatic initially; screening during latency window is key
- **Screening criteria**
  - Expanded Denver criteria: sensitivity 97%, NPV 99.6%
  - Triggers: C1–C3 fractures, subluxation, fractures through transverse foramen
  - Displaced midface fractures, mandibular condyle fractures
- **CTA as standard of care**
  - <1 mm slices, 75–100 mL contrast at 4–5 mL/s
  - Pooled sensitivity 64%, specificity 95%
  - Key pitfall: false-positive rate 45–47% (atherosclerosis, carotid webs, FMD)

# BCVI: Denver grading and findings

| Grade | Definition |
|---|---|
| I | Minor intimal irregularity or dissection with < 25% luminal narrowing |
| II | Dissection with ≥ 25% luminal narrowing, intramural hematoma, or visible dissection flap |
| III | Pseudoaneurysm |
| IV | Arterial occlusion |
| V | Transection with extravasation |




Chatterjee *et al*. AJR 2024; 223:e2329783

# Summary

1. To identify critical conditions: deep neck infections, traumatic injuries, and airway obstructions
2. To describe a practical approach: what to report urgently and how to prioritise findings
3. To illustrate real-world case discussions with interactive audience participation

# Suggested reading

## Deep neck infections

Hirvonen J, Lingam RK, Connor S. **ESR Essentials: acute infections of the head and neck—practice recommendations by the European Society of Head and Neck Radiology**. *Eur Radiol* 2026 https://doi.org/10.1007/s00330-025-11818-4

## Laryngeal trauma

Becker M, Leuchter I, Platon A, Becker CD, Dulguerov P, Varoquaux A. **Imaging of laryngeal trauma**. *Eur J Radiol* 2024;83:142– 154 https://doi.org/10.1016/j.ejrad.2013.10.021

## Blunt vascular trauma

Chatterjee AR, Malhotra A, Curl P, Andre JB, Guzman Perez-Carrillo GJ, Smith EB. **Traumatic Cervical Cerebrovascular Injury and the Role of CTA: AJR Expert Panel Narrative Review.** *AJR* 2024;223:e2329783. https://doi.org/10.2214/AJR.23.29783

## Foreign bodies in head and neck trauma

Voss JO, Maier C, Wüster J, Beck-Broichsitter B, Ebker T, Vater J, Dommerich S, Raguse JD, Böning G, Thieme N. **Imaging foreign bodies in head and neck trauma: a pictorial review**. *Insights Imaging* 2021;12:20 https://doi.org/10.1186/s13244-021-00969-9

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