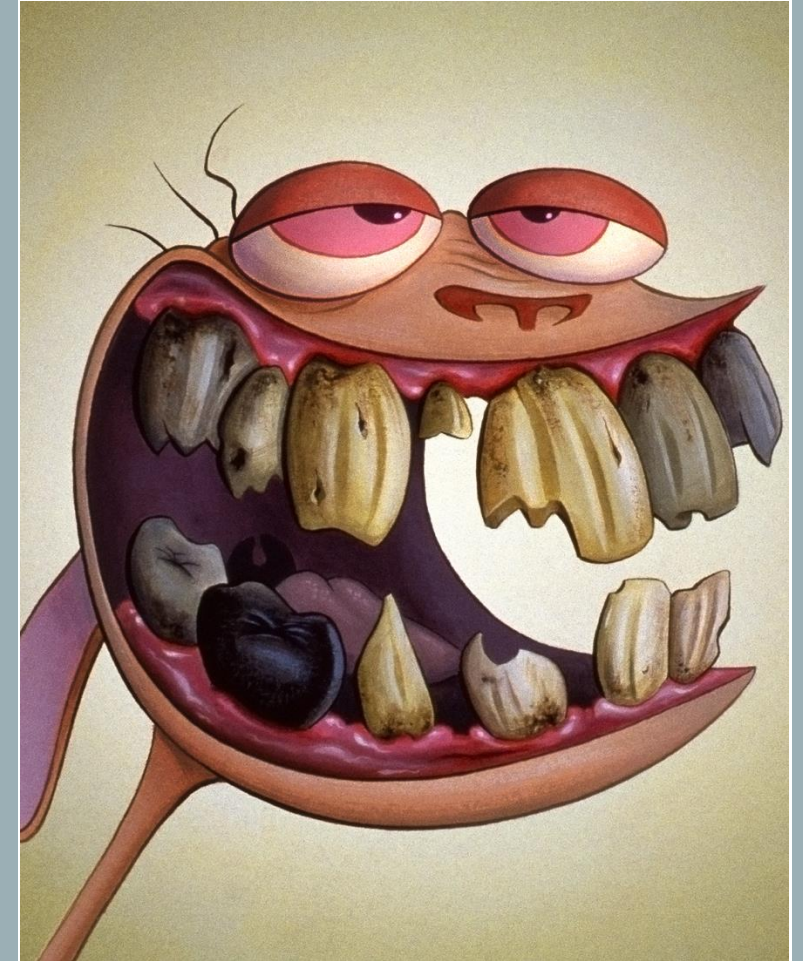
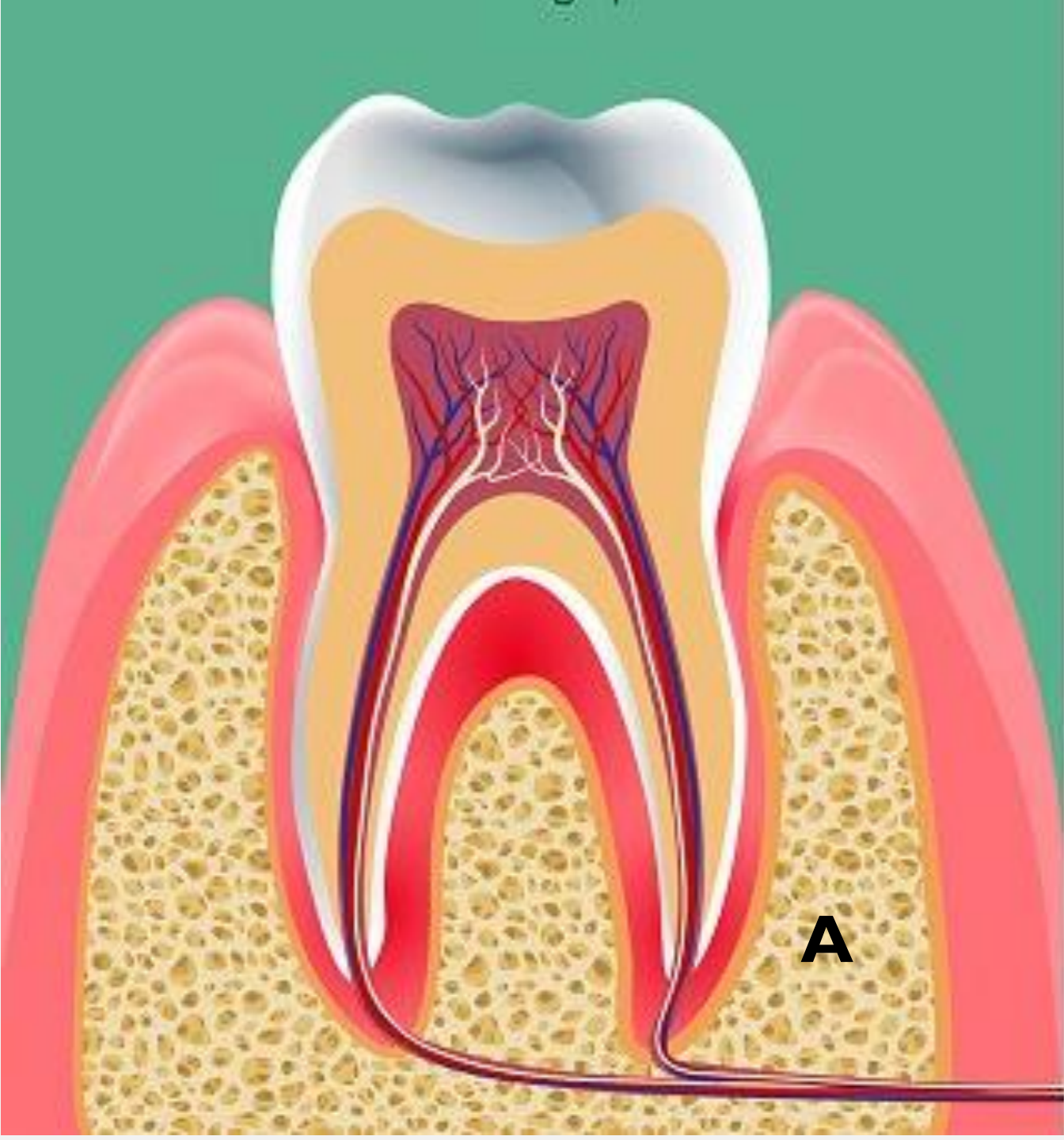


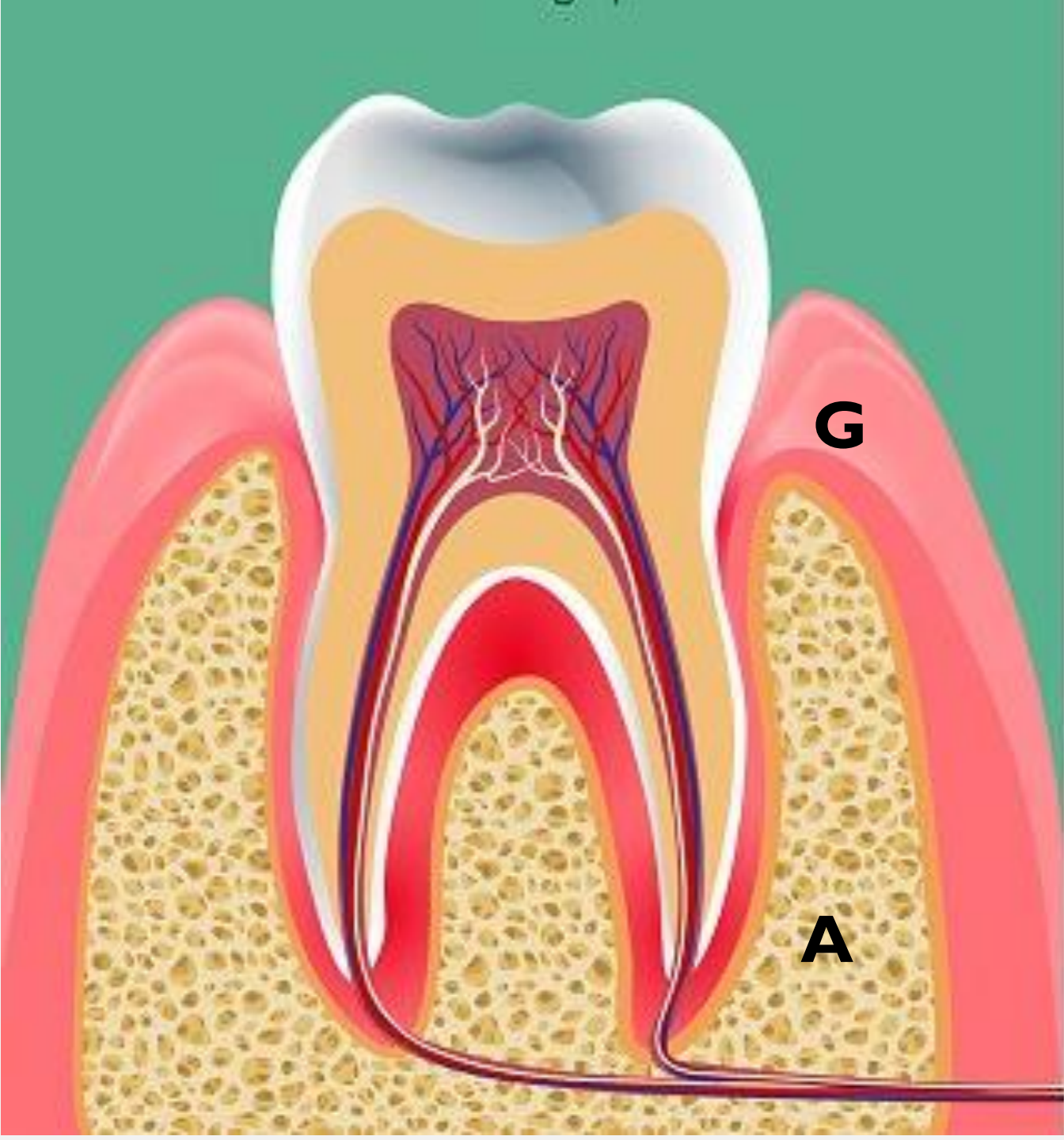
ODONTOGENIC LESIONS

Mahmud Mossa-Basha, MD
Professor of Radiology
University of Washington

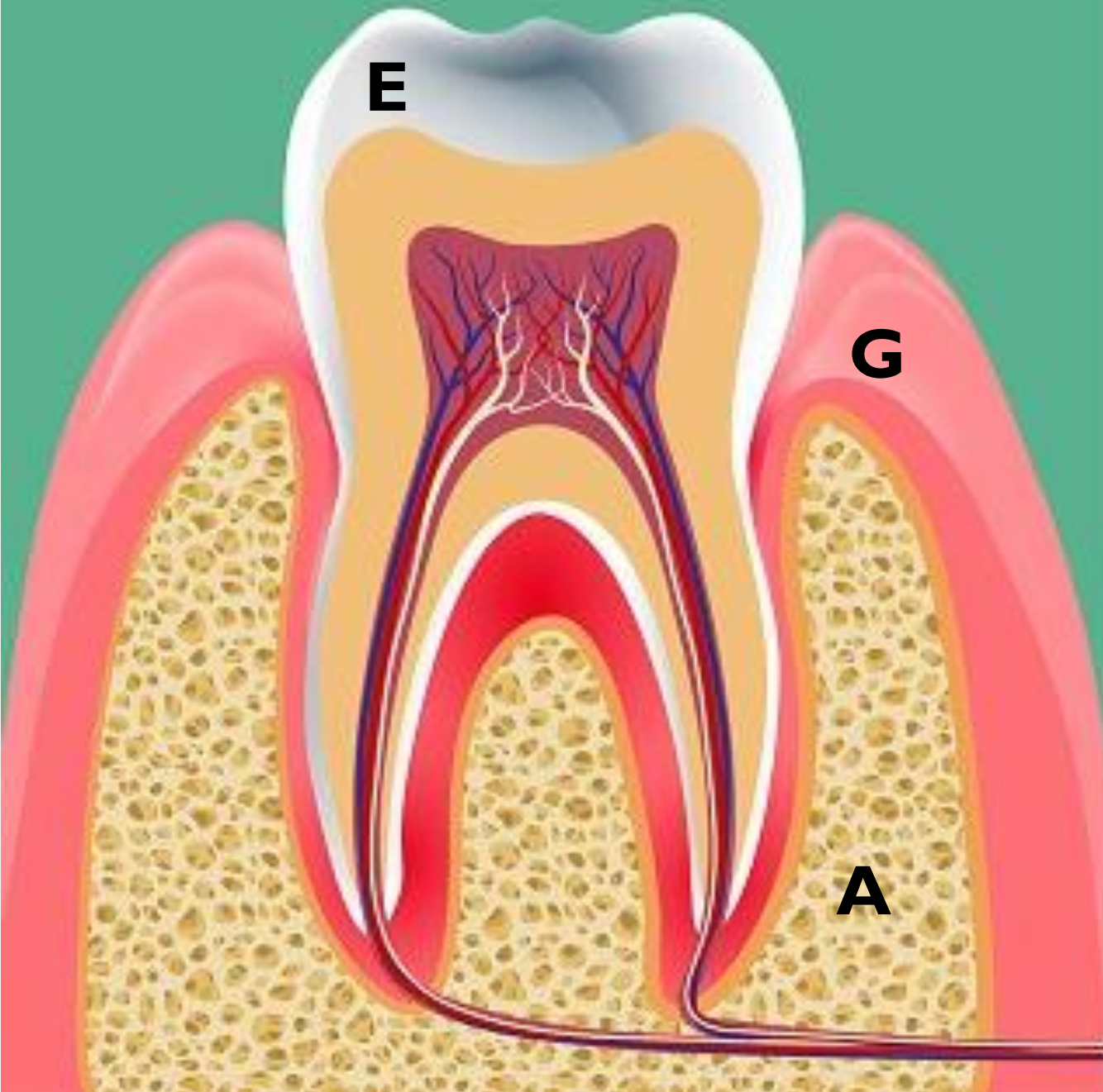




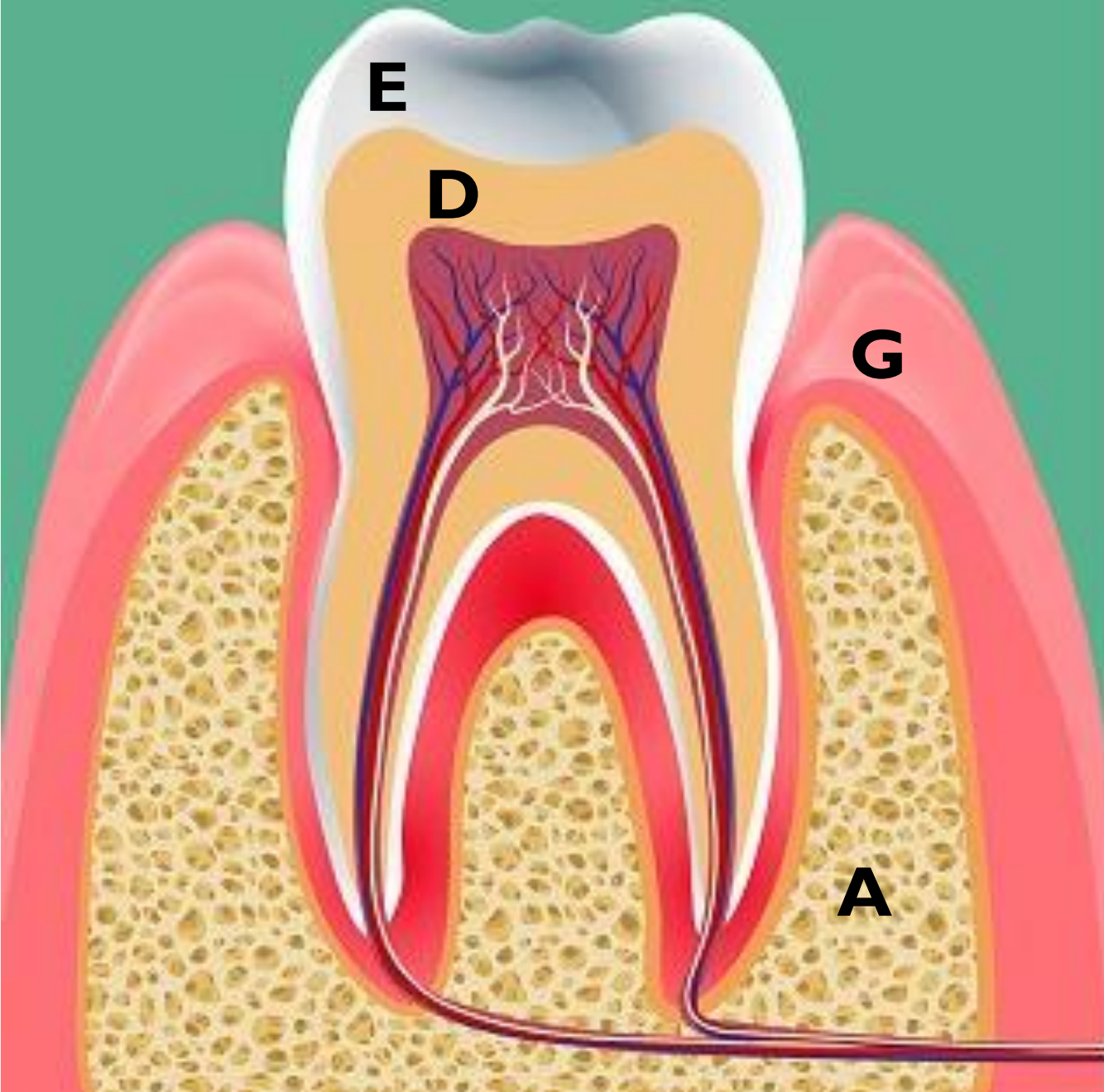
- Teeth are situated in the **alveolar process (A)** of the maxilla and mandible



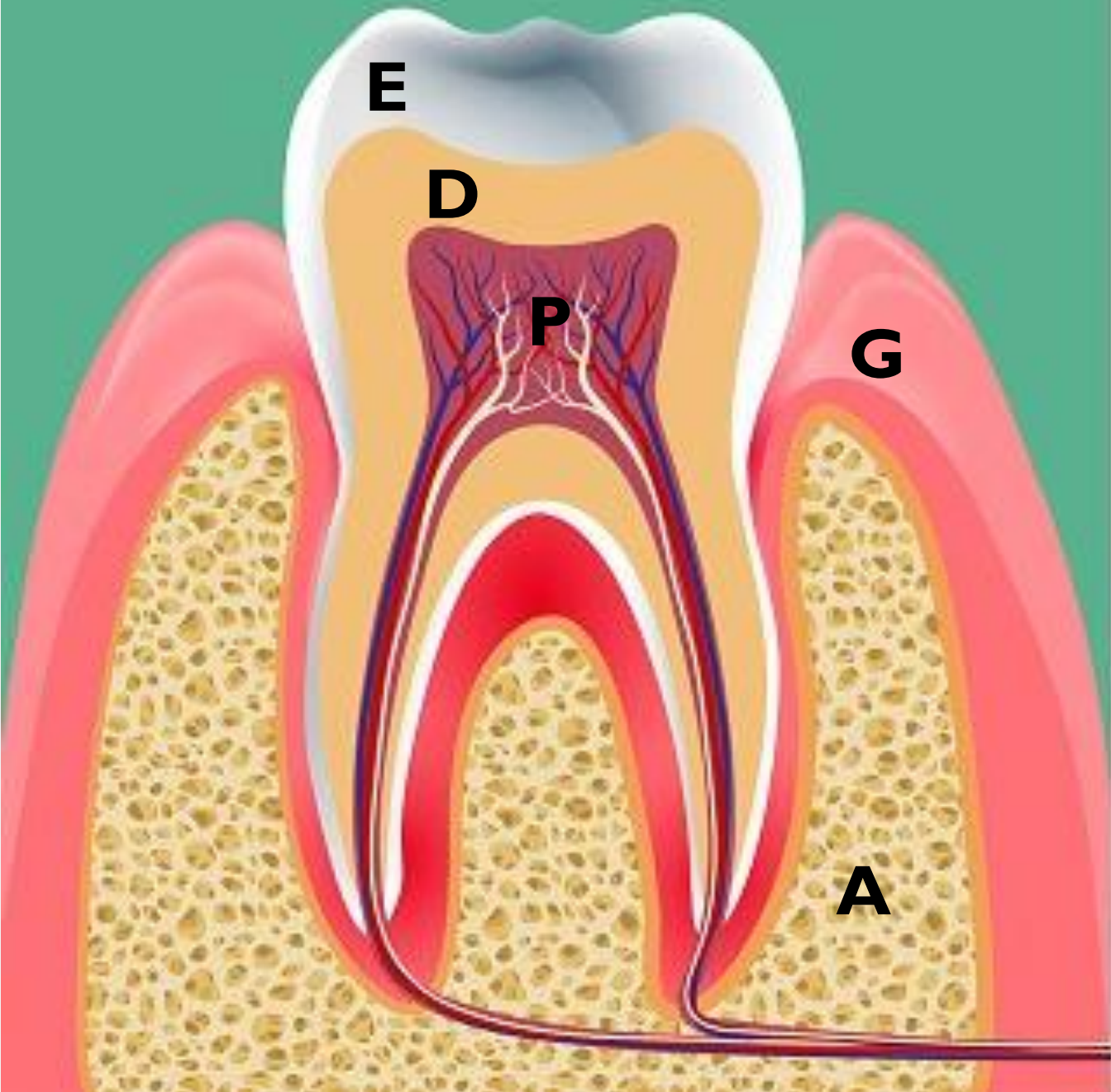
- Teeth are situated in the **alveolar process (A)** of the maxilla and mandible
- **Gingiva (G)** covers the alveolar process



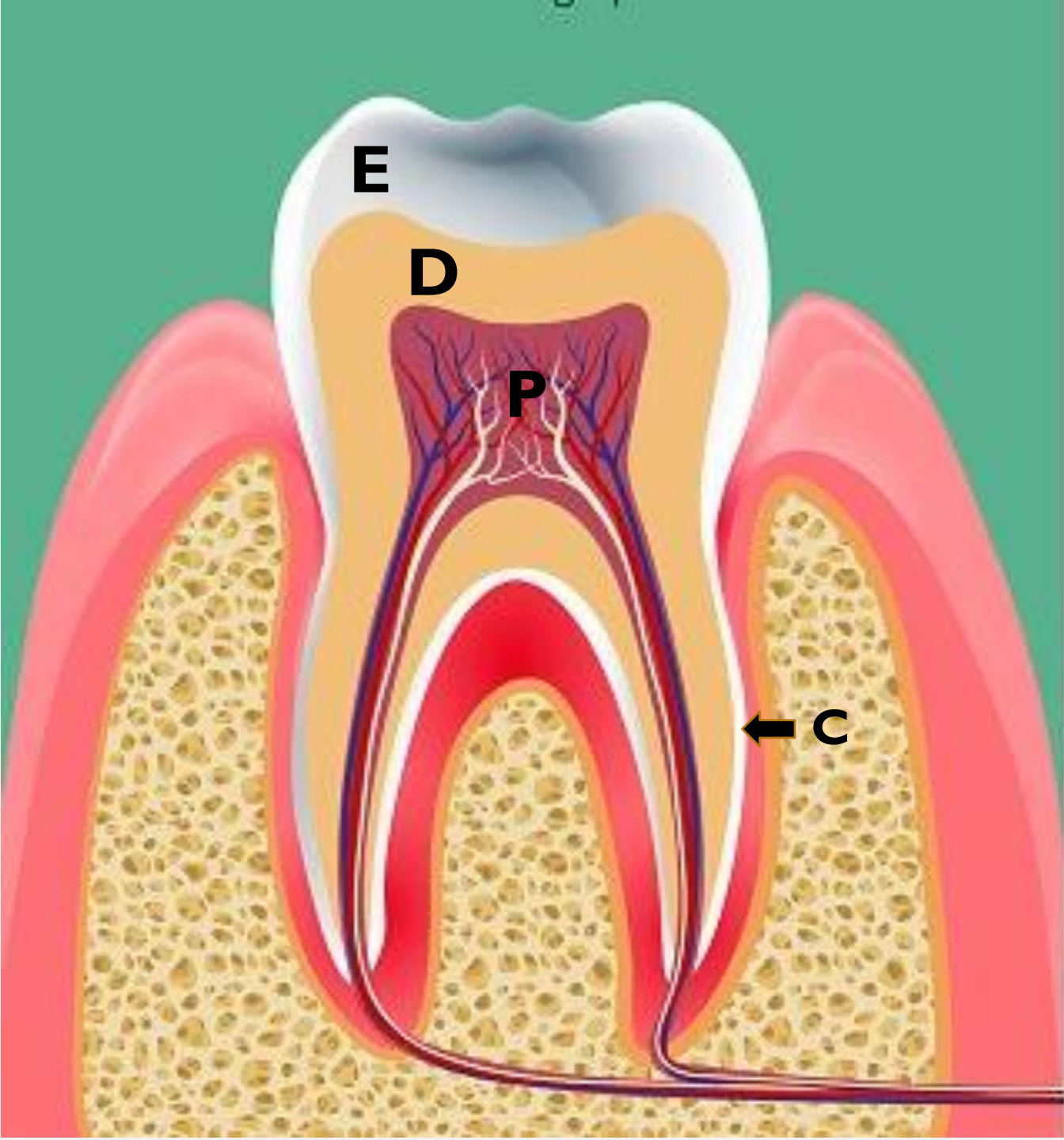
- Teeth are composed of multiple layers
- **Enamel (E)** covers the crown



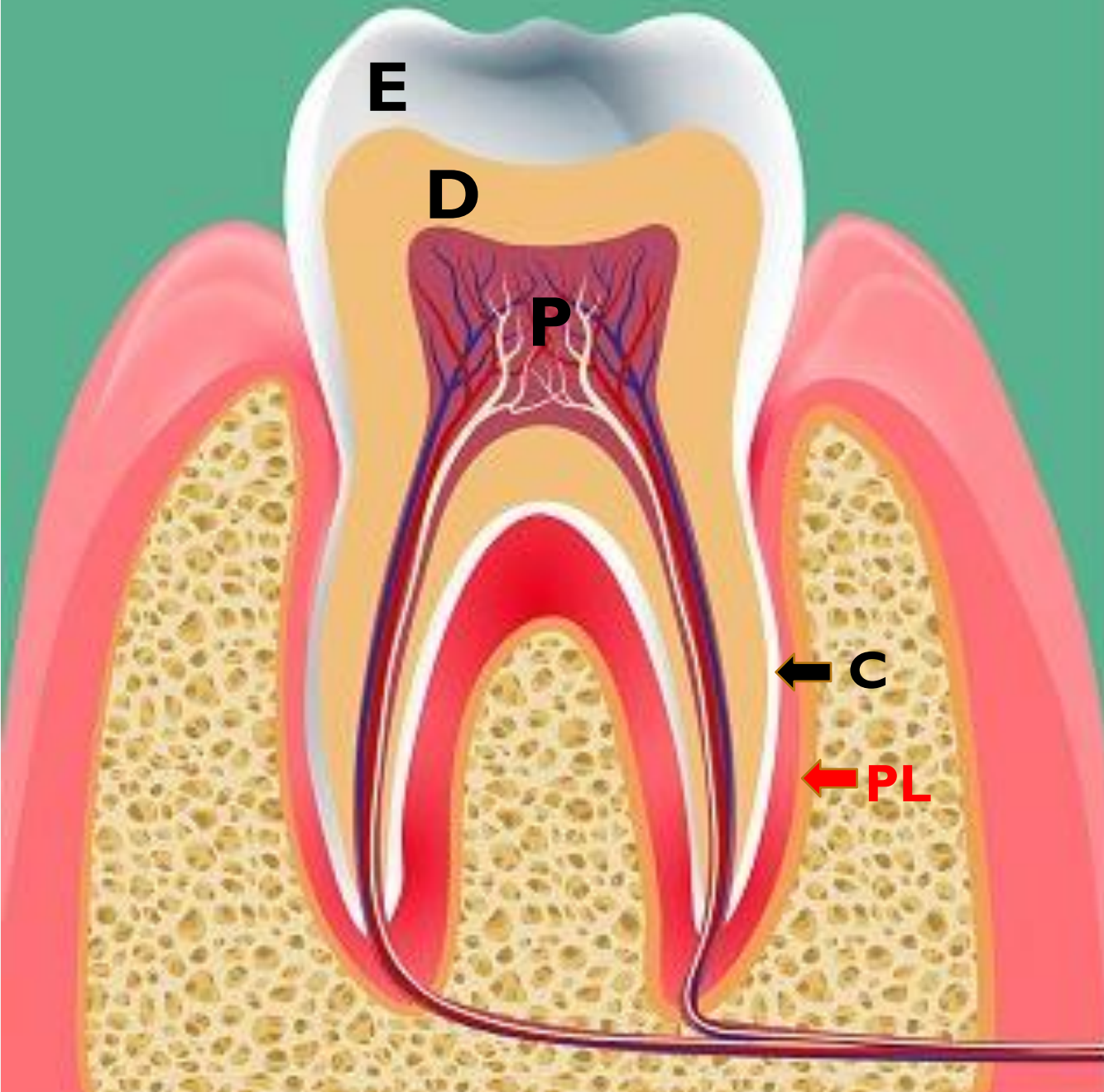
- Teeth are composed of multiple layers
- **Enamel (E)** covers the crown
- **Dentin (D)** is deep to the enamel



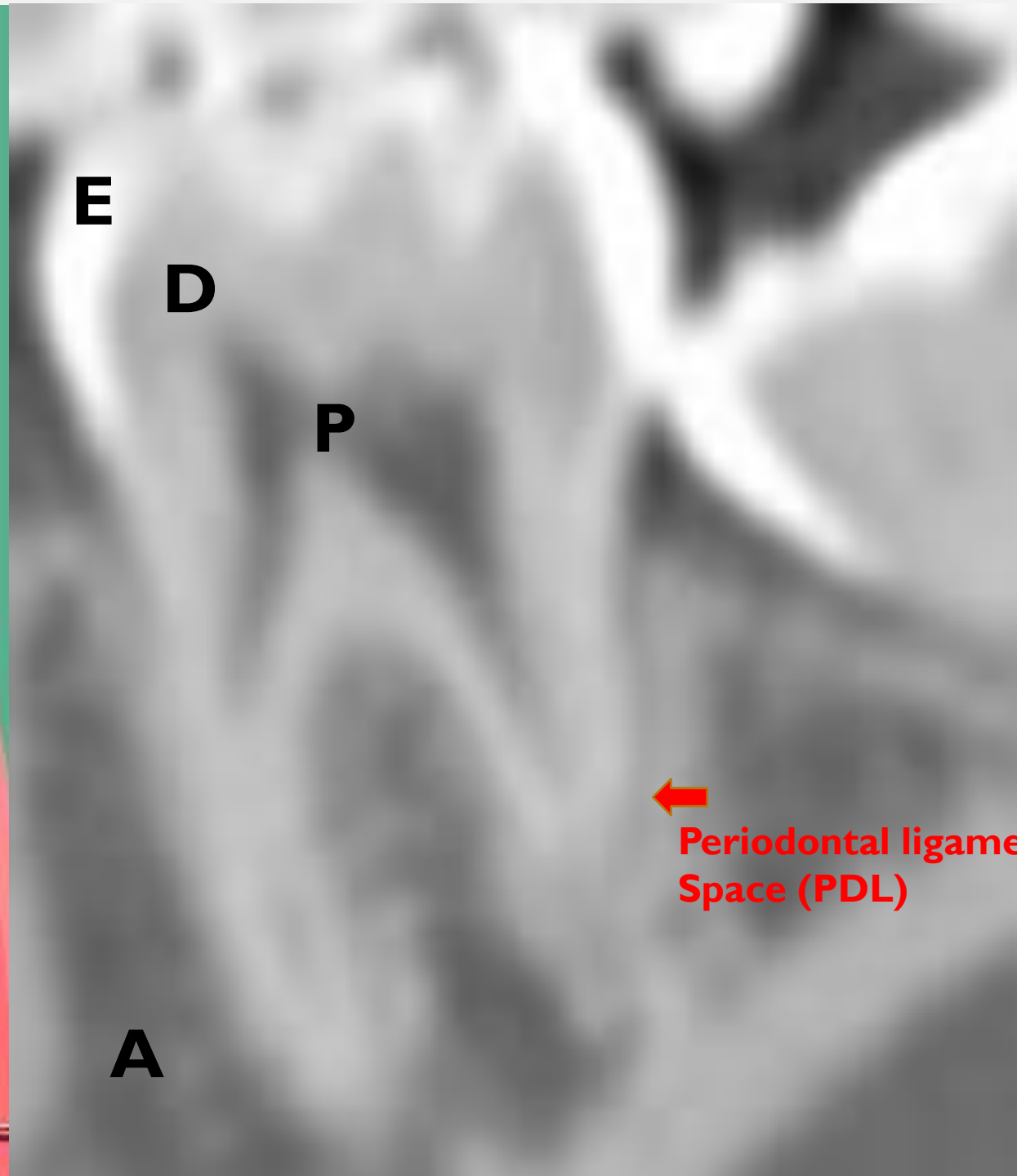
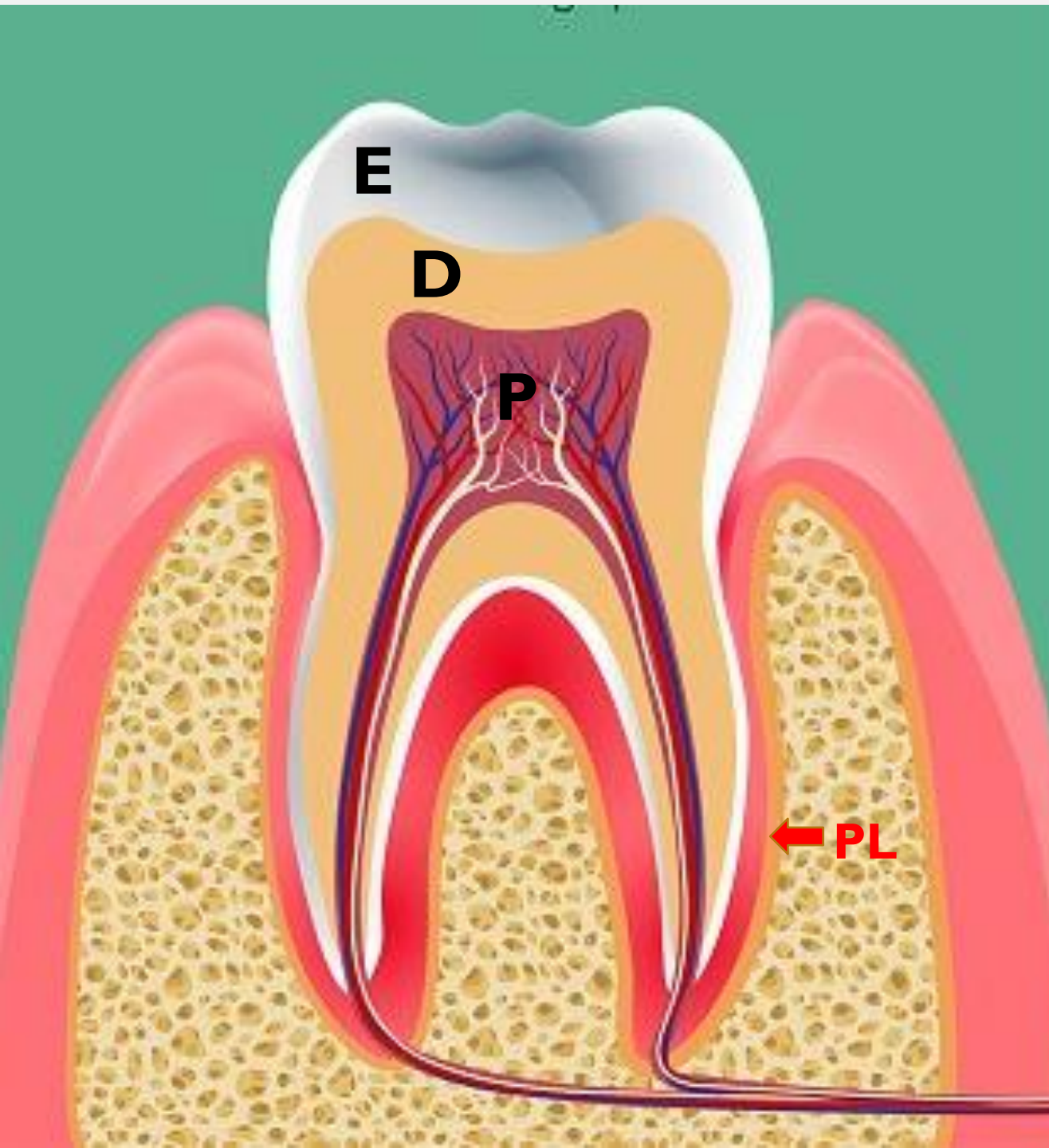
- Teeth are composed of multiple layers
- **Enamel (E)** covers the crown
- **Dentin (D)** is deep to the enamel
- **Pulp chamber (P)** or the root canal which contains the neurovascular elements is surrounded by dentin



- Teeth are composed of multiple layers
- **Enamel (E)** covers the crown
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- **Pulp chamber (P)** or the root canal which contains the neurovascular elements is surrounded by dentin
- **Cementum (C)** joins the enamel



- Teeth are composed of multiple layers
- **Enamel (E)** covers the crown
- **Dentin (D)** is deep to the enamel
- **Pulp chamber (P)** or the root canal which contains the neurovascular elements is surrounded by dentin
- **Cementum (C)** joins the enamel
- **Periodontal ligament (PL)** Teeth are held in the socket by periodontal ligament

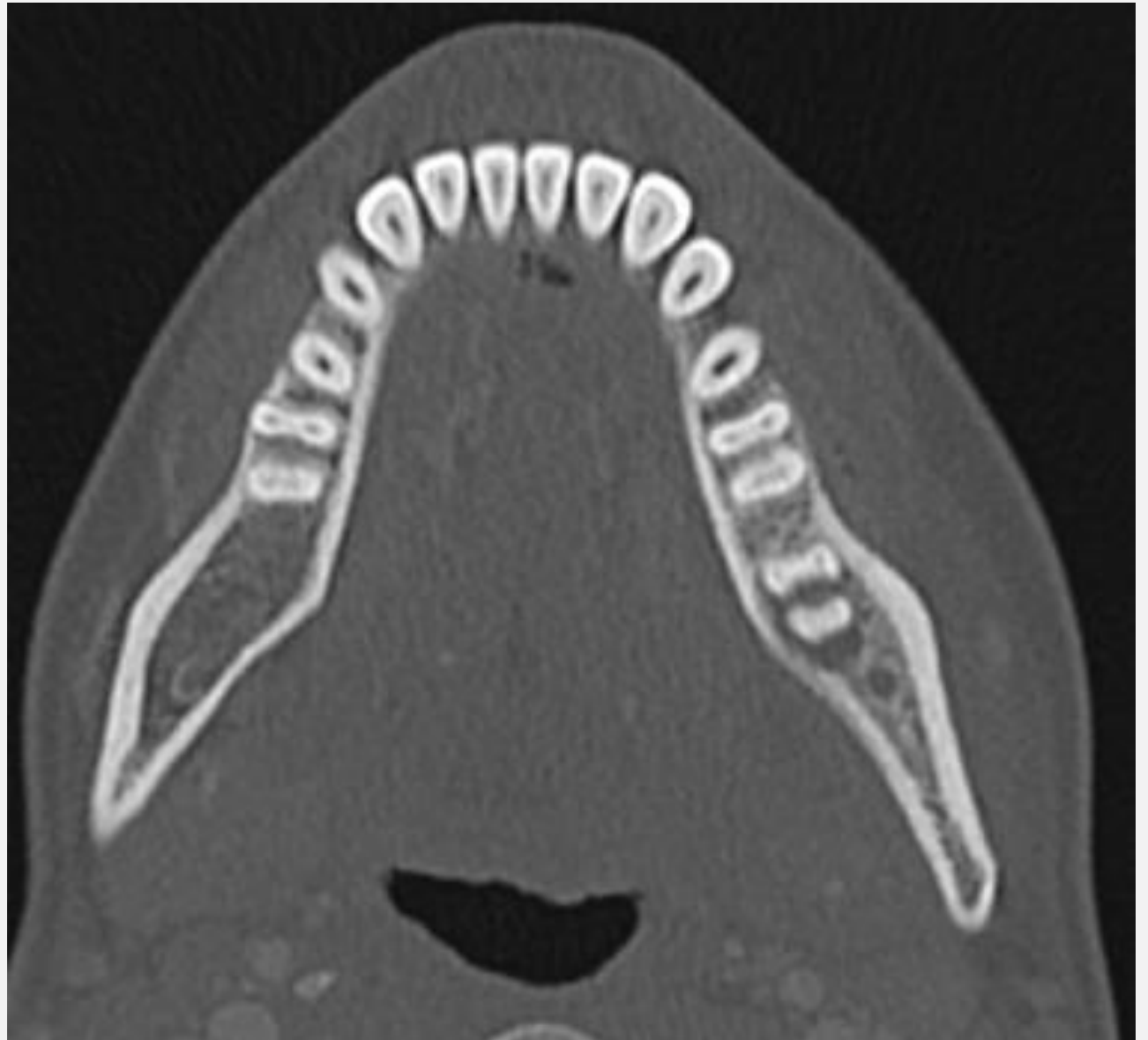


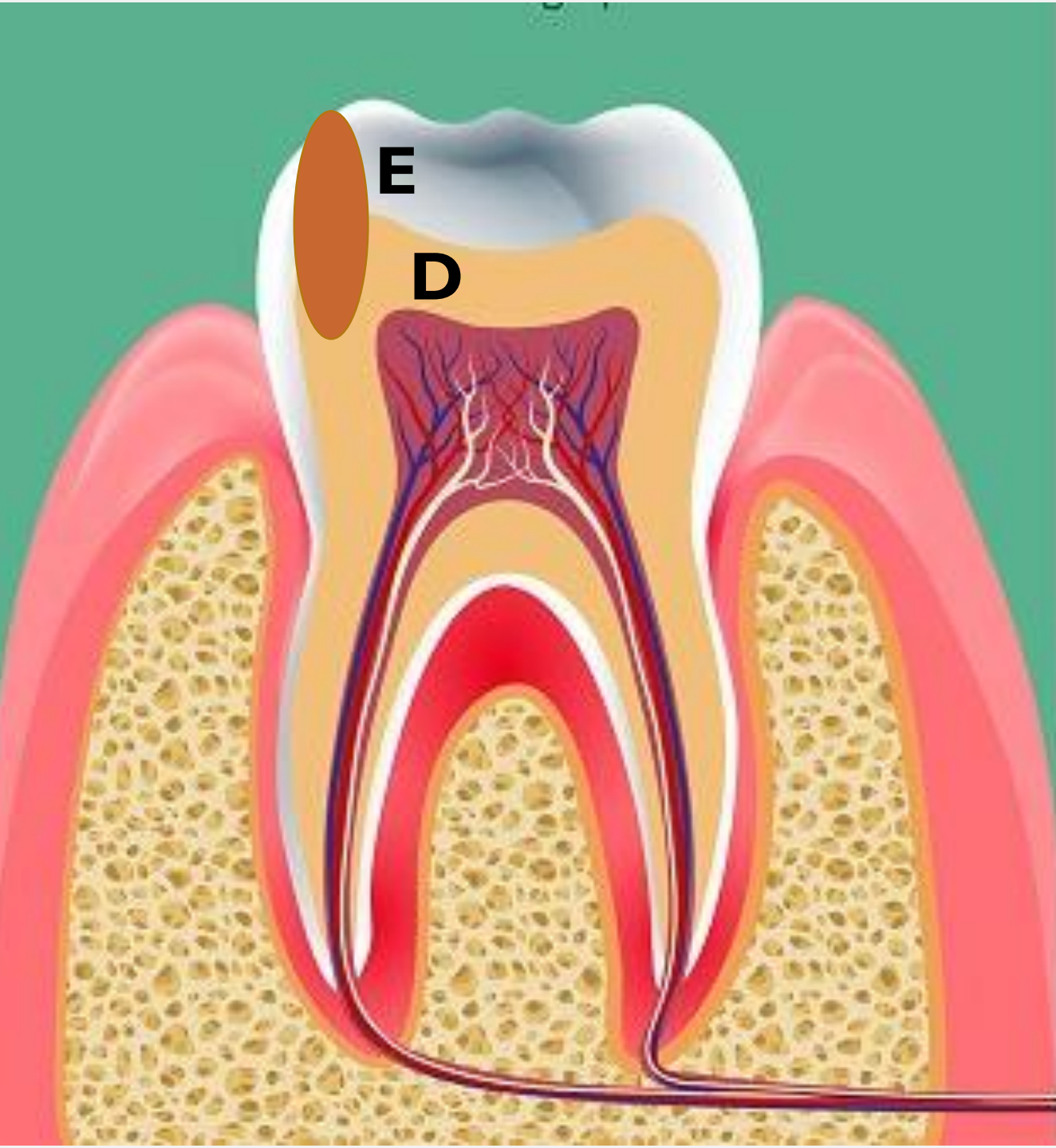
PERIODONTAL DISEASE

- Bacteria accumulate at the tooth-gingival interface, leading to gingivitis
- Infection extends along the periodontal ligament, and causes bone resorption.
- On imaging this is seen as **widening** of the normal **periodontal ligament space**



PERIODONTAL DISEASE

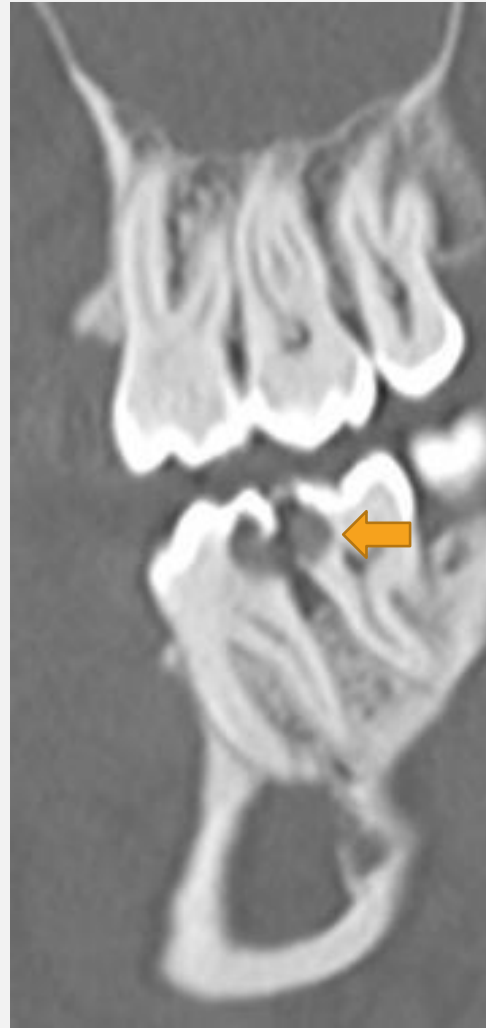




CARIOUS LESIONS

- **Enamel and Dentin** demineralization caused by acid from bacterial fermentation of carbohydrates
- Saliva reduces the incidence of carious lesions by neutralizing acid
- Increase of dental carious lesion in patients with xerostomia , Sjogren, psychoactive medications, radiation therapy

CARIOUS LESIONS



PERIAPICAL DISEASE

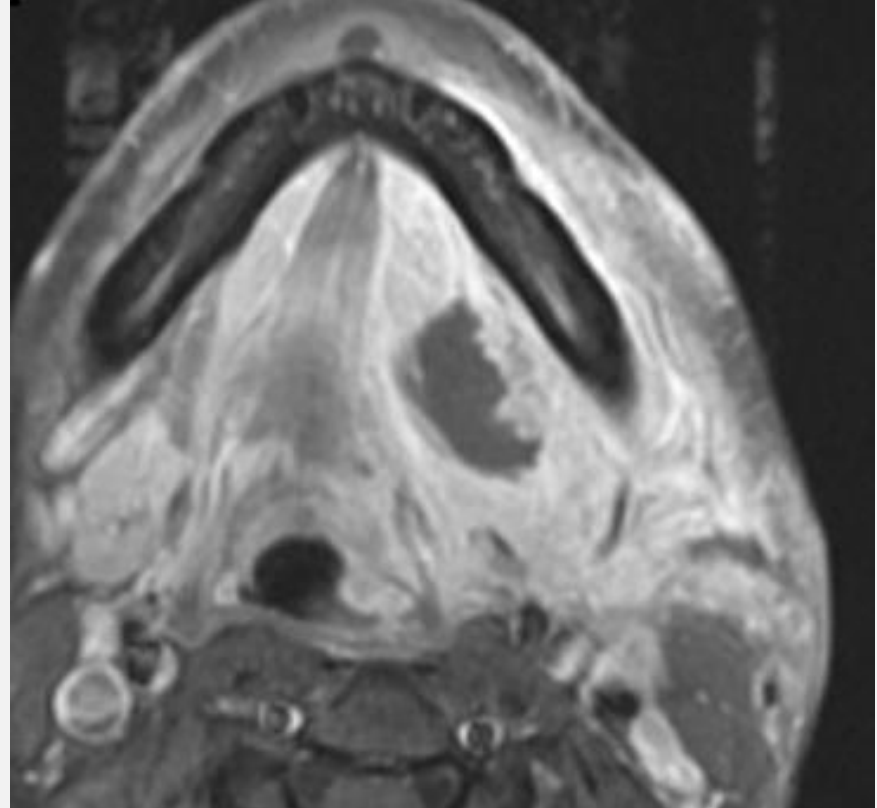
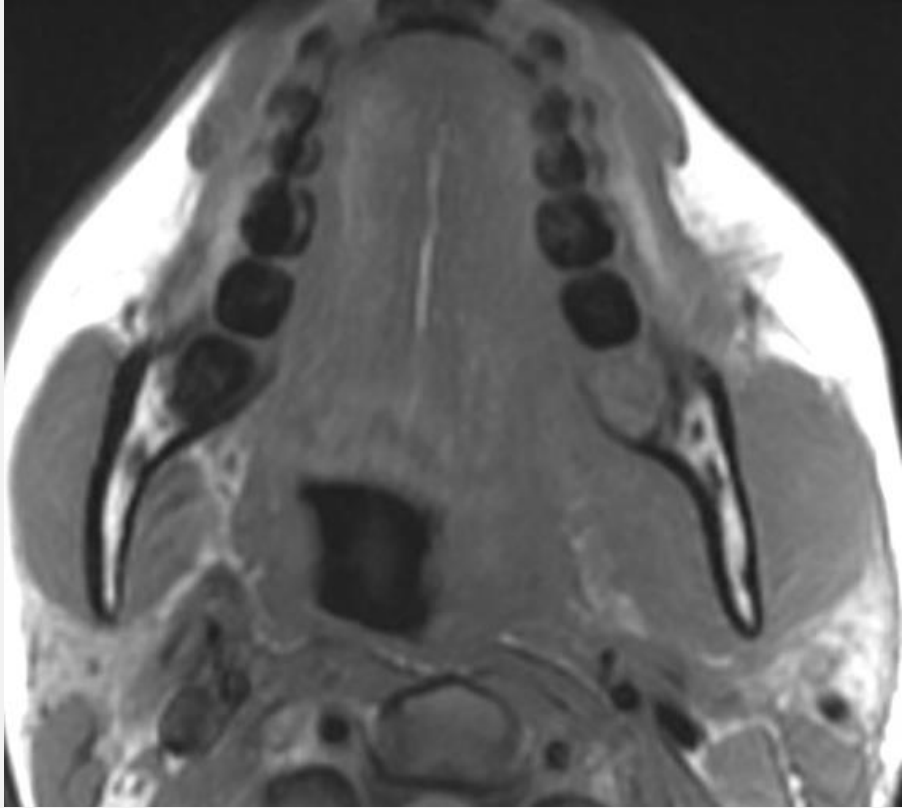
- Infection of the pulp usually results from carious lesion that have reached the pulp chamber.
- Increased pressure within the chamber activates pain fibers within the pulp causing pain





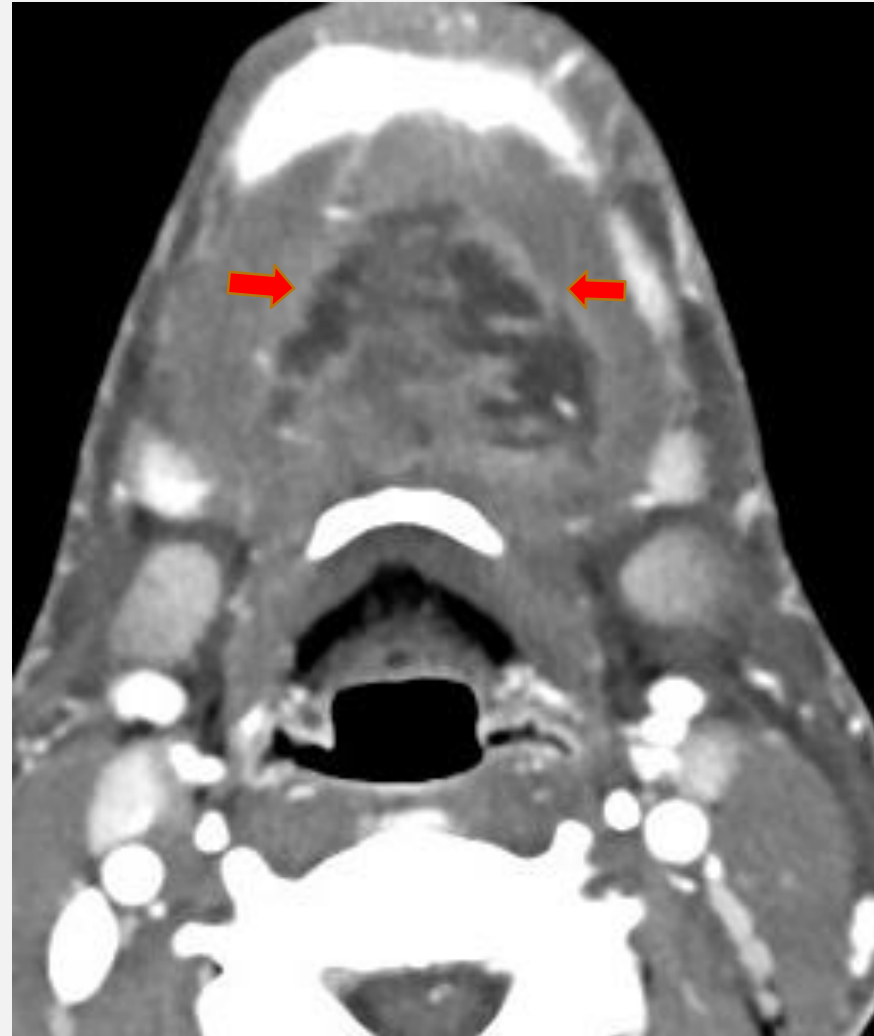
PERIAPICAL DISEASE

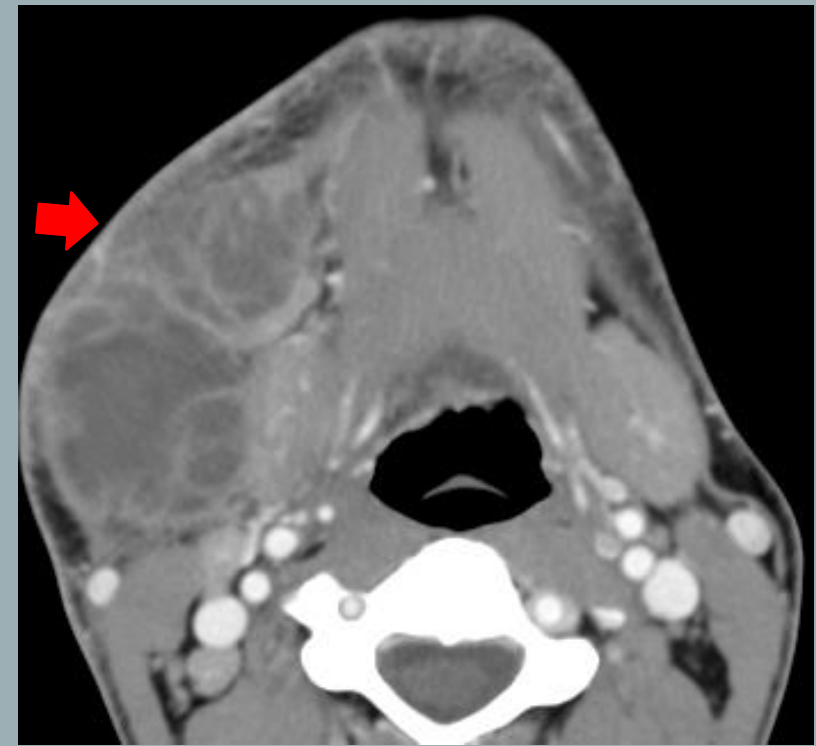
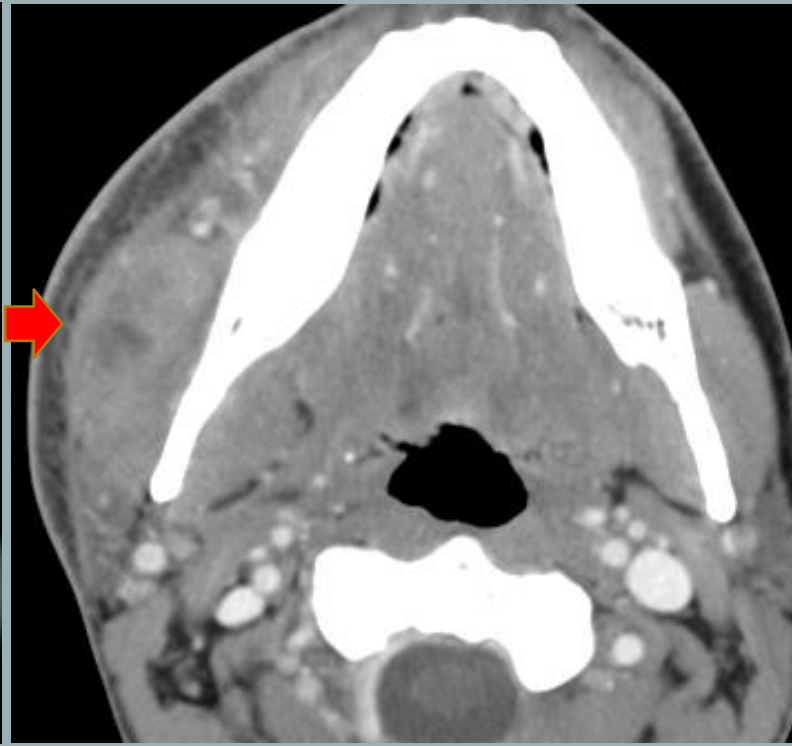
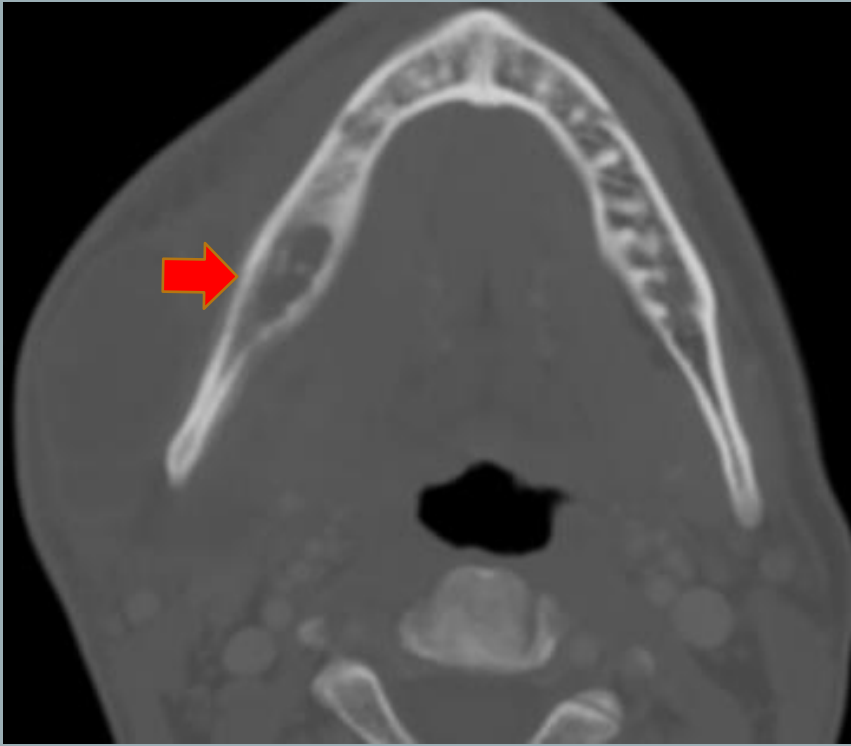




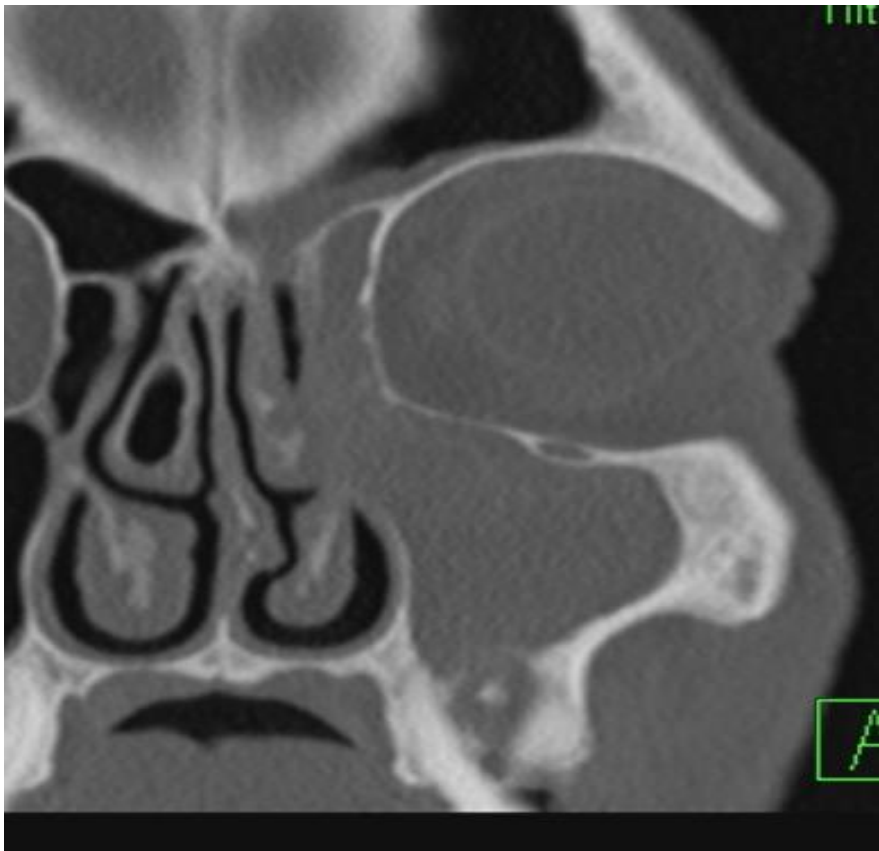
LUDWIG ANGINA

- Extension of odontogenic abscess into bilateral **submandibular** and sublingual spaces
- Symptoms: fever, firm neck swelling, edema and difficulty swallowing

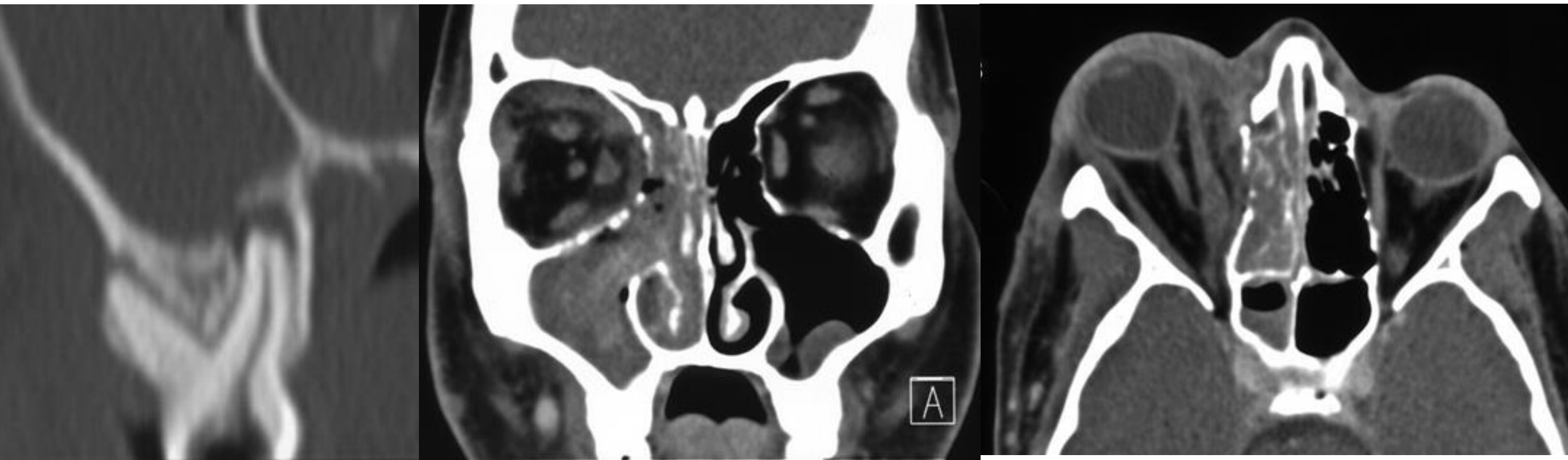




RECENT DENTAL EXTRACTION
ABSCESS: SUBMANDIBULAR, MASSETER



ODONTOGENIC MAXILLARY SINUSITIS



ODONTOGENIC ORBITAL CELLULITIS

CLASSIFICATION OF JAW LESIONS

Most lesions within the jaw are **inflammatory** in origin, related to sequelae of pulpal necrosis of the tooth

Lesions in the jaw are classified as:

Odontogenic vs. Nonodontogenic

- Odontogenic lesions have an epicenter within the dental alveolus generally superior to the inferior alveolar nerve canal (IAC)
- Nonodontogenic lesions involve the alveolus or teeth only after substantial growth

ODONTOGENIC LESIONS

RADIOLUCENT LESIONS:

Radicular Cyst

Residual Cyst

Dentigerous Cyst

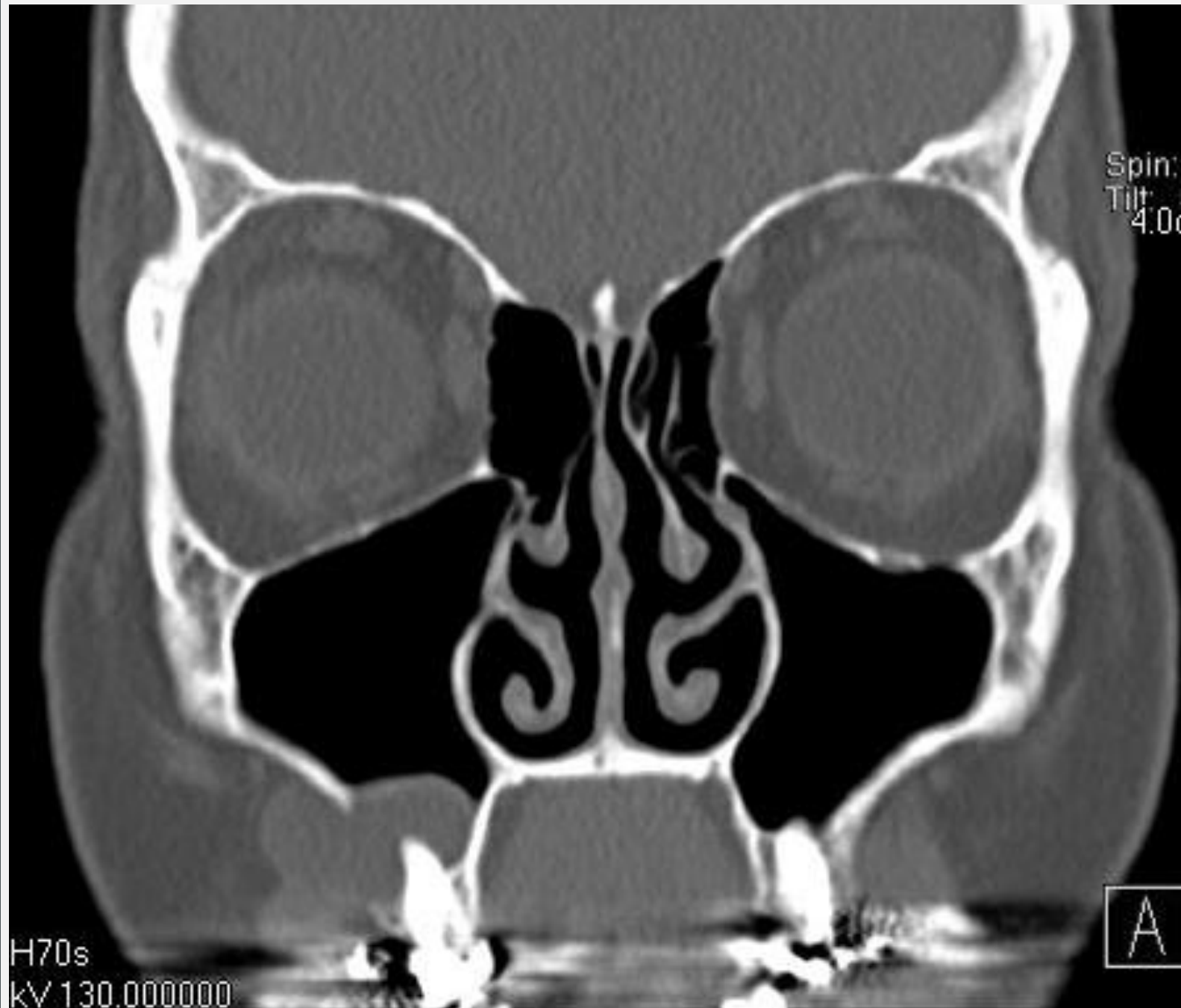
Odontogenic Keratocyst

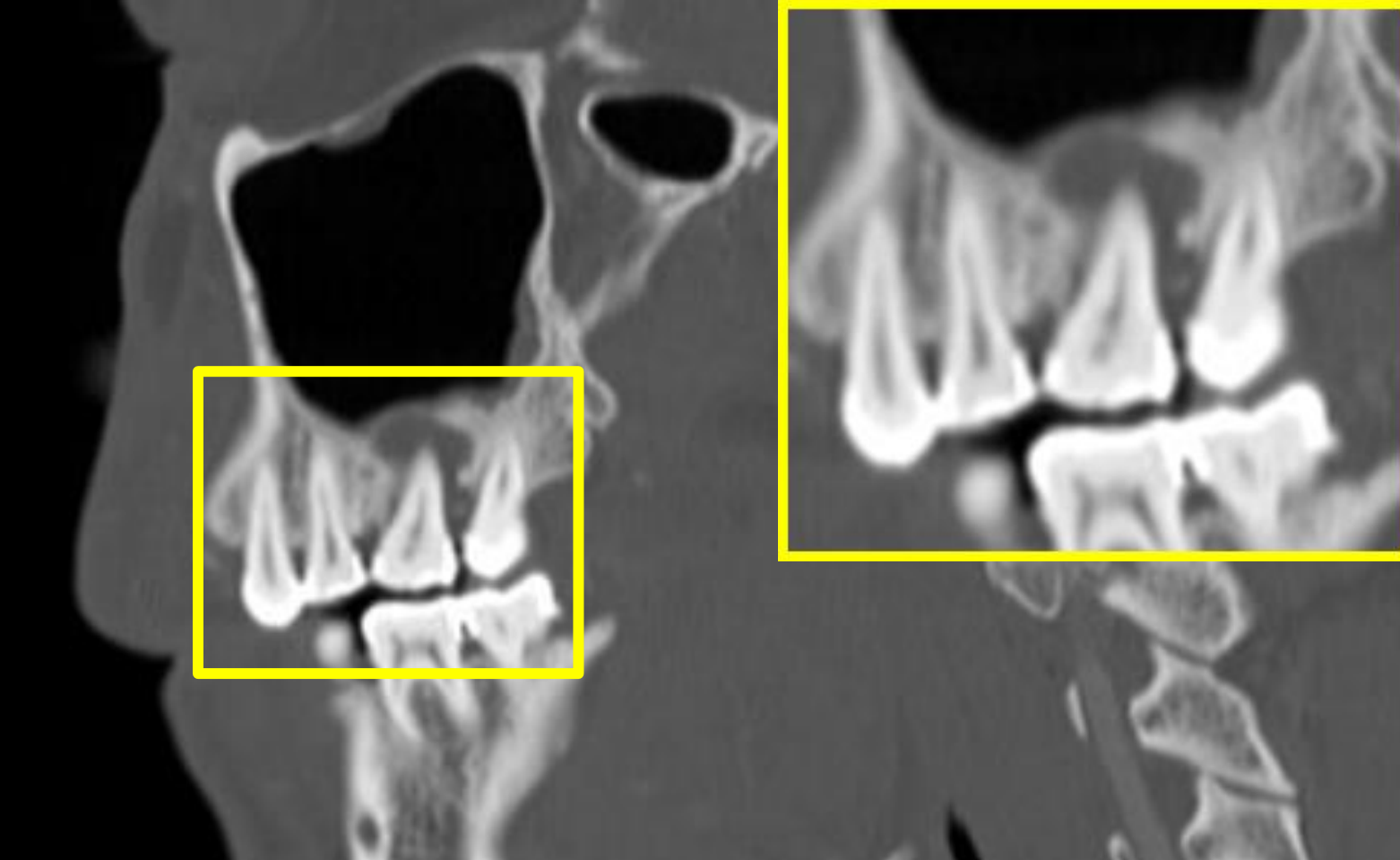
Ameloblastoma

Odontogenic Myxoma

RADICULAR CYST

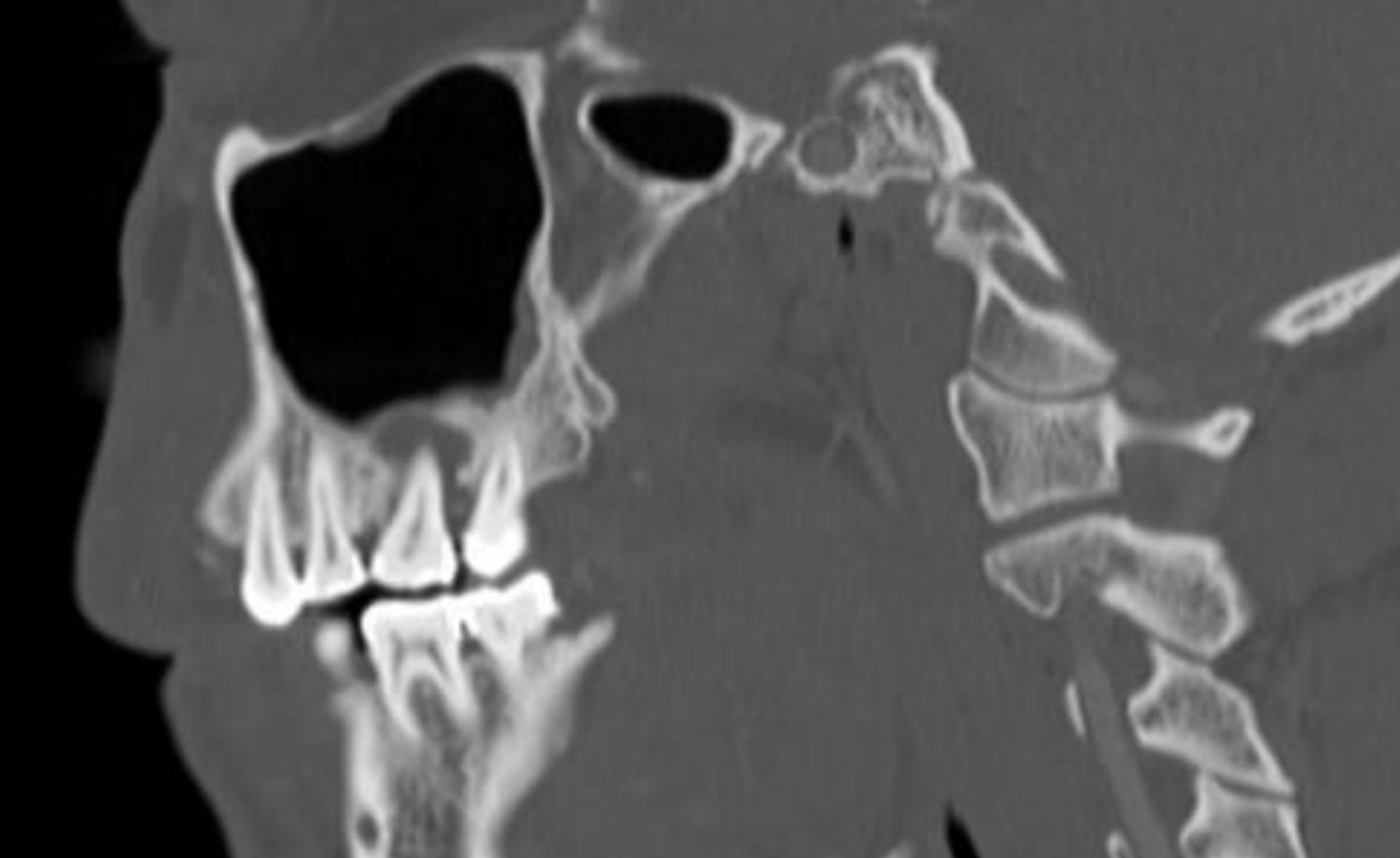
- aka periapical cyst
- Located at the apex of the root of a tooth
- Most common cyst found in the jaw
- Treatment is extraction or endodontic therapy of the involved tooth.





- Tooth infection leads to necrosis of the pulp cavity and spread to tooth apex with a periapical abscess which Gives rise to a radicular cyst Generally < 1 cm in diameter

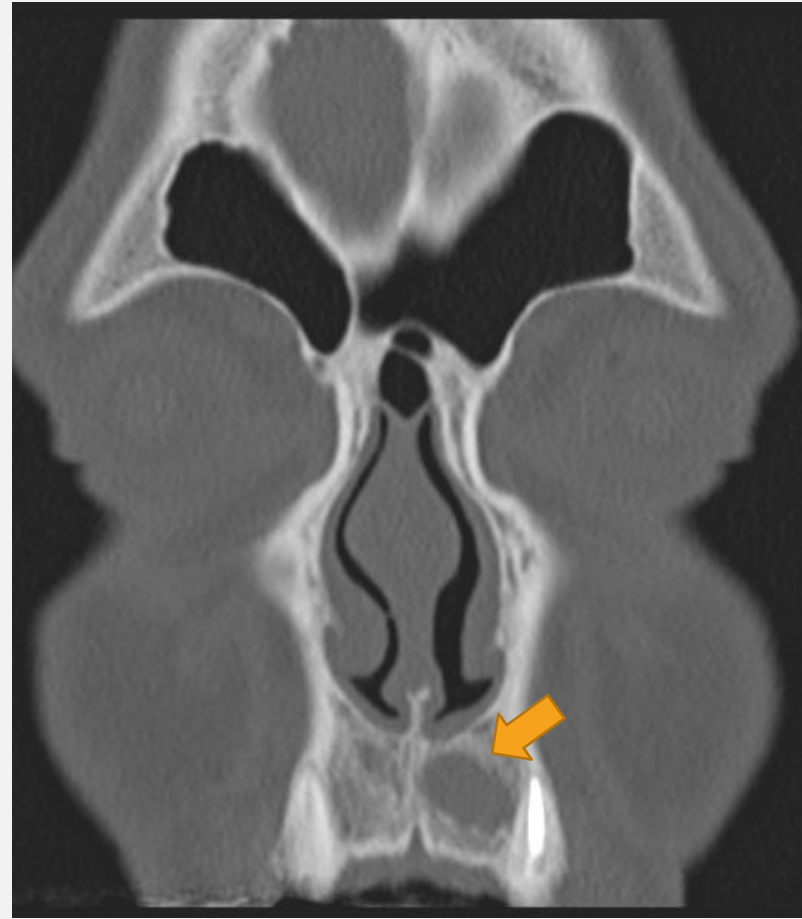
RADICULAR CYST

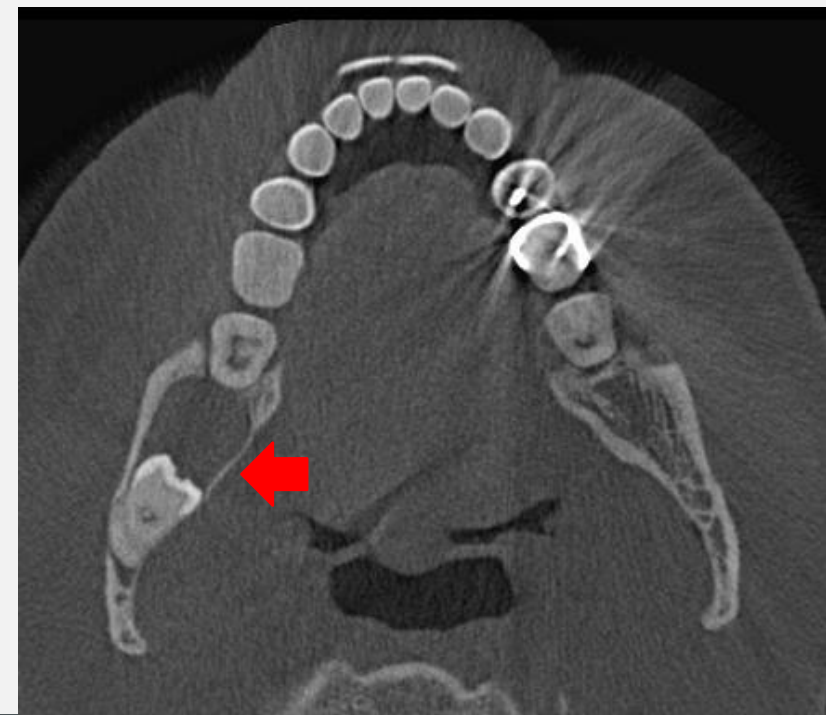
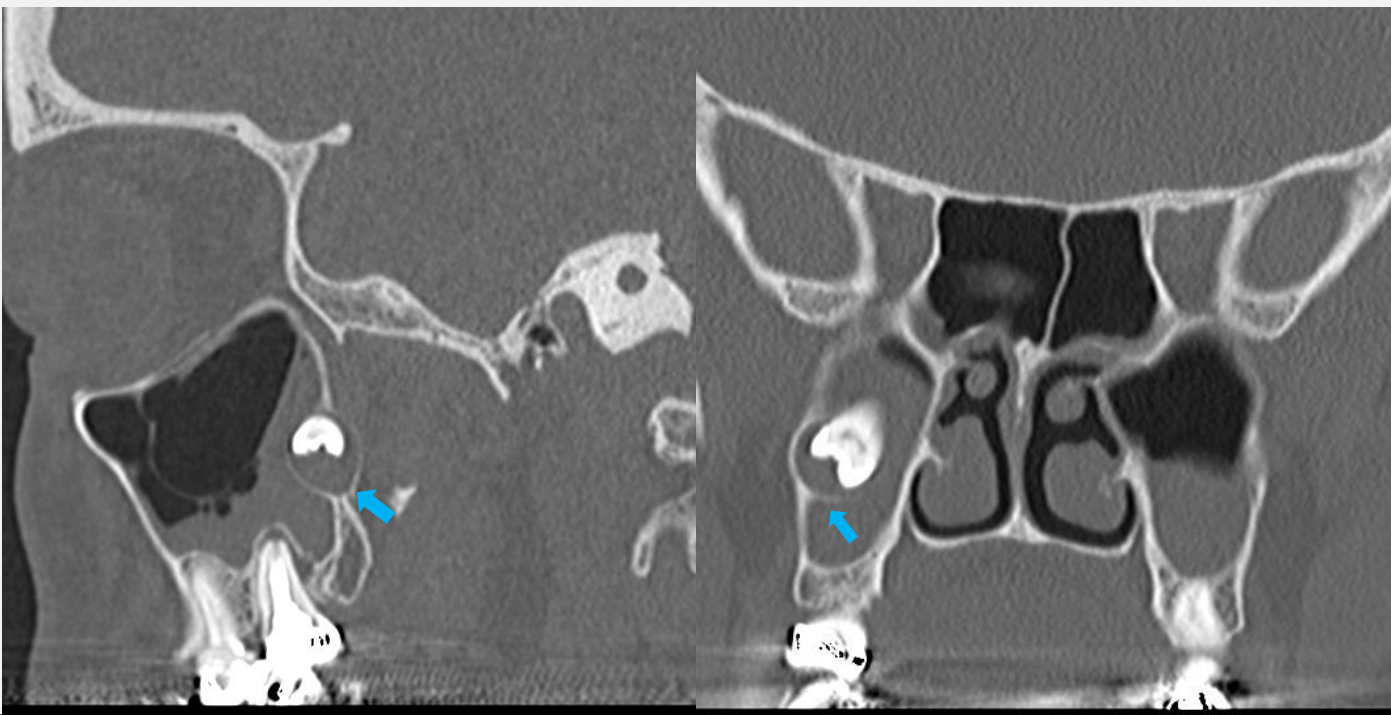


RADICULAR CYST

RESIDUAL CYST

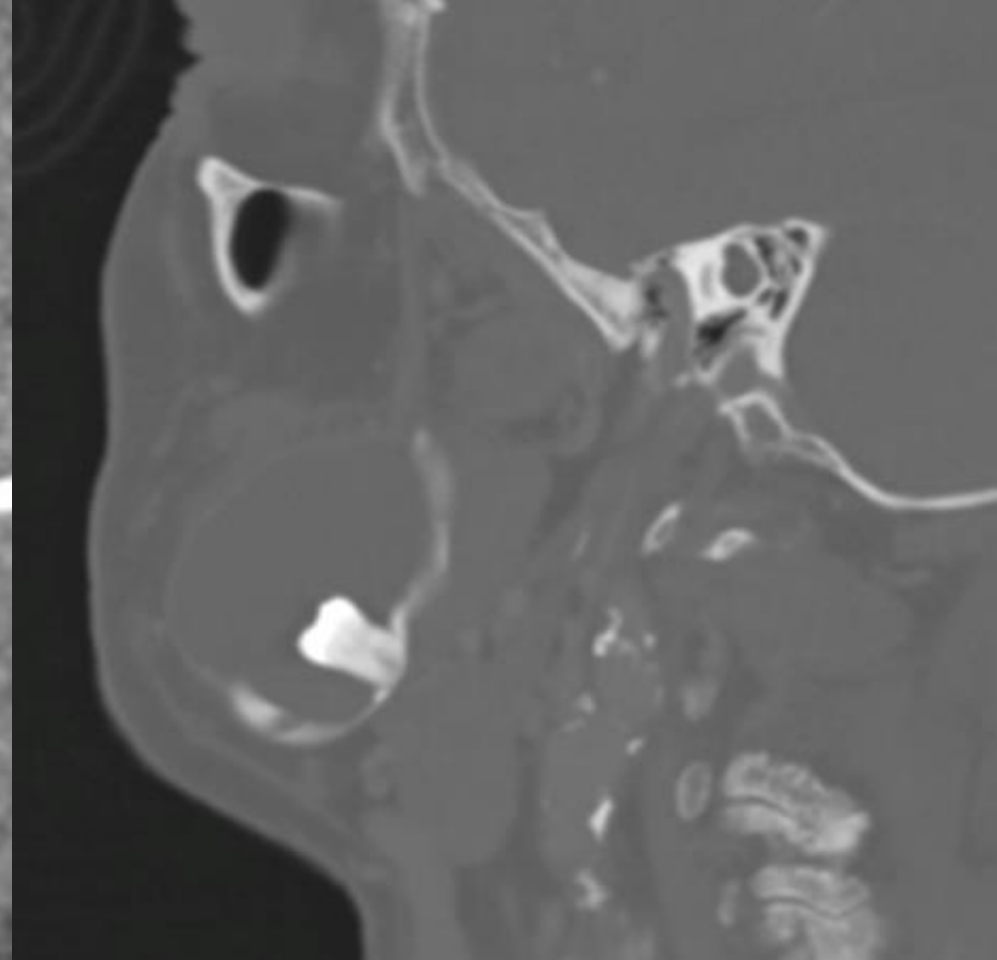
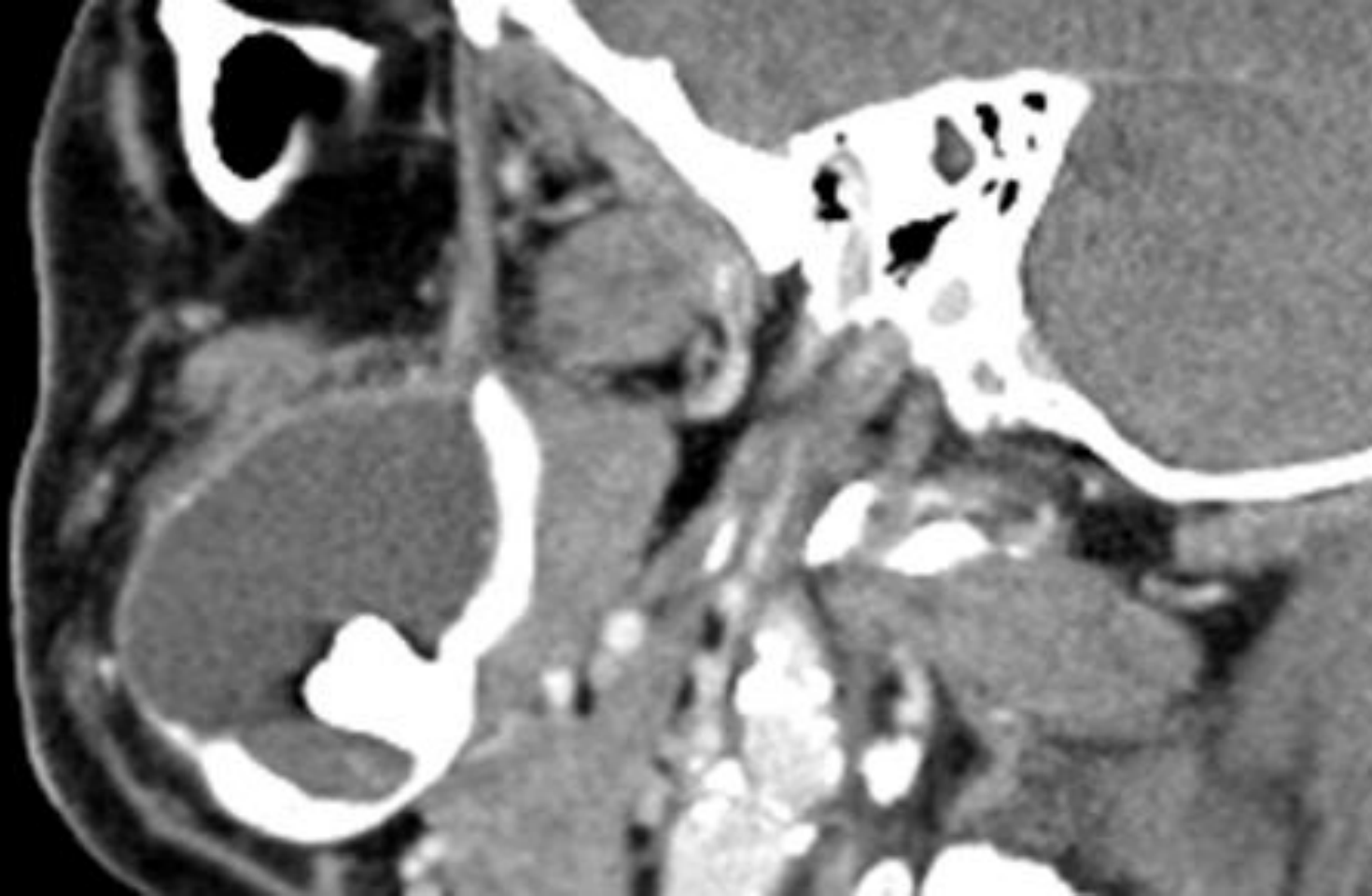
- **Residual cysts** are periapical cysts retained in the jaw after surgical removal of a non-vital tooth
- There is always a missing tooth





DENTIGEROUS CYST

- Develops around the crown of an unerupted tooth
- Most common mandibular 3rd molar, and maxillary canines
- Treatment: Enucleation and extraction
- Recurrence is rare



DENTIGEROUS CYST

ODONTOGENIC KERATOCYST

- Uni or multilocular lucent lesion with sclerotic margins

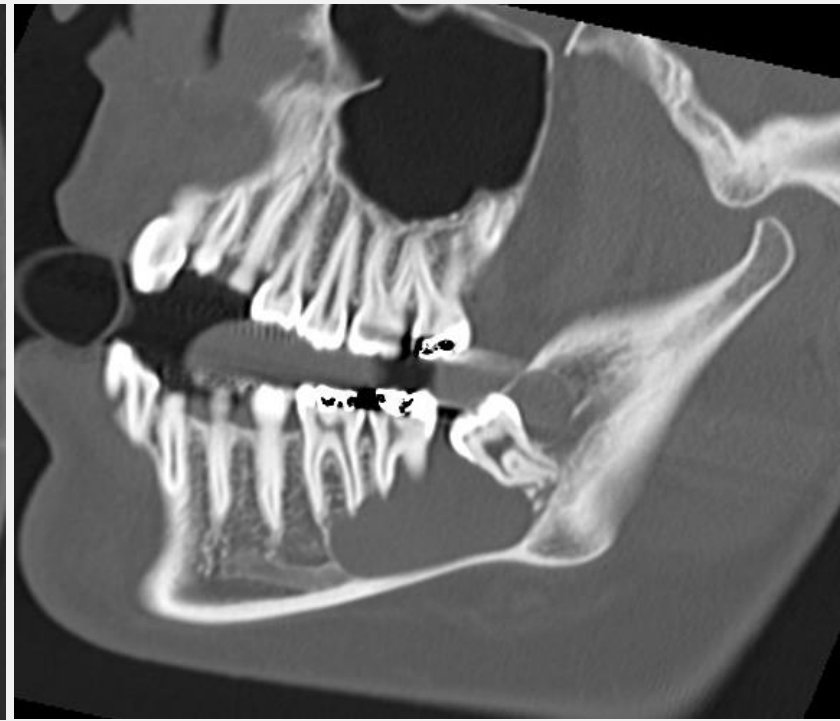


ODONTOGENIC KERATOCYST

- Uni or multilocular lucent lesion with sclerotic margins
- Contains cheese-like material on resection
 - High attenuation on CT
- High rate of recurrence post resection
- Multiple OKC can be associated with basal cell nevus syndrome



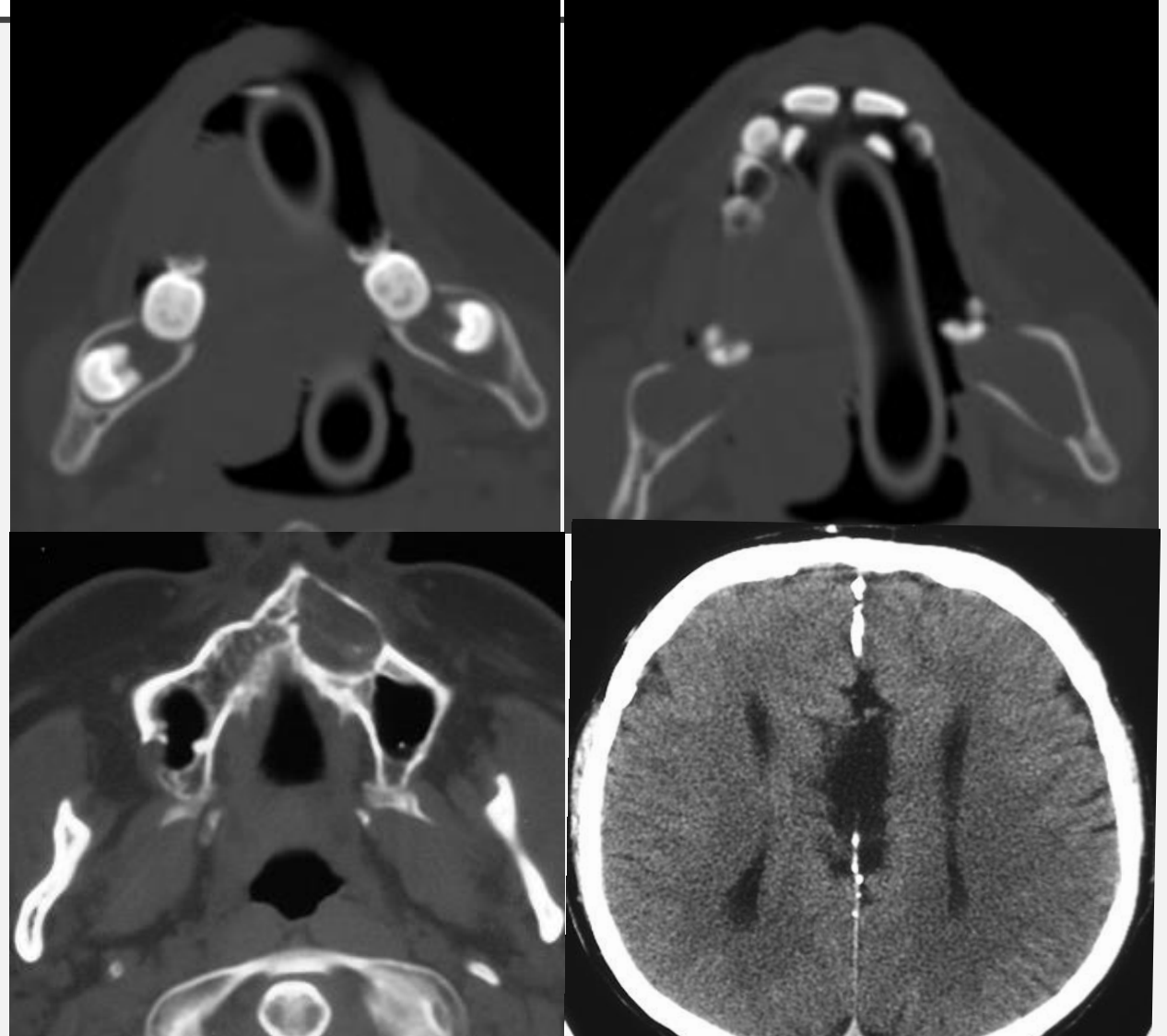
ODONTOGENIC KERATOCYST



Most commonly in the mandibular body and ramus

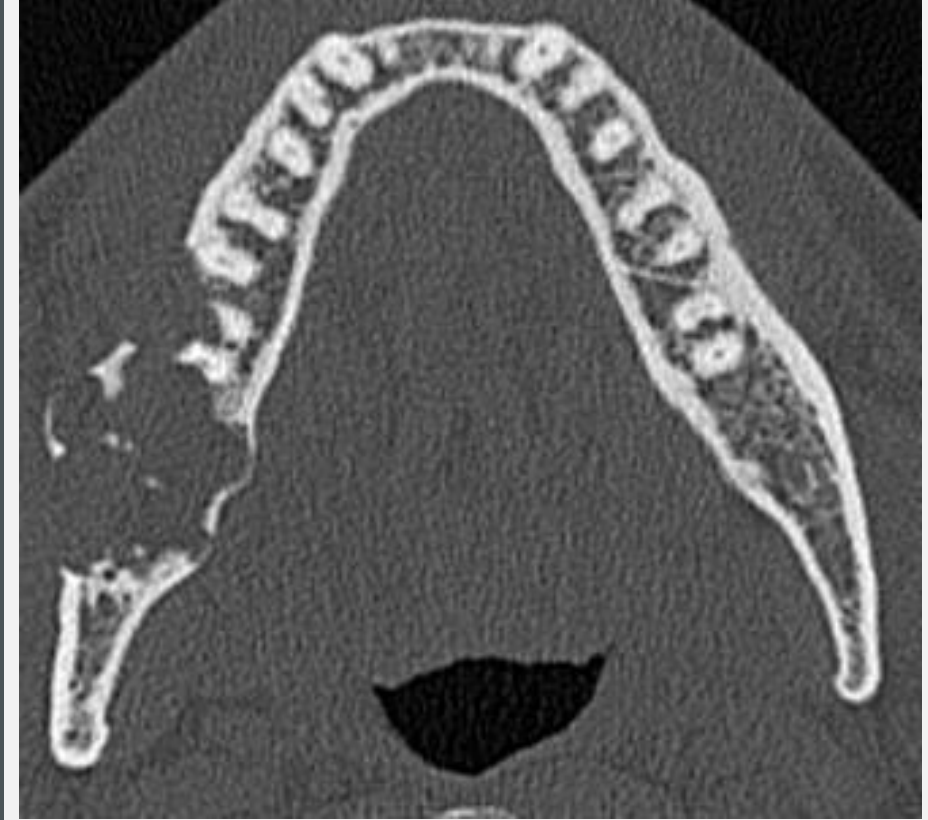
BASAL CELL NEVUS SYNDROME

- Multiple OKC can be associated with basal cell nevus syndrome
- Multiple expansile lucent lesions of the mandible and maxilla
- Associated with medulloblastoma, dural calcifications (80%), bifid ribs, scoliosis
- Syndrome apparent by age 5-10
- At third decade, nevoid BCC



AMELOBLASTOMA

- Radiologic appearance:
- **Uni or multilocular lucent with Soap Bubble or Honeycomb**, with sclerotic borders
- **posterior body and ramus**



AMELOBLASTOMA

- Radiologic appearance:
- **Uni or multilocular lucent with Soap Bubble or Honeycomb**, with sclerotic borders
- **posterior body and ramus**
- Hallmark:
Resorption of the roots

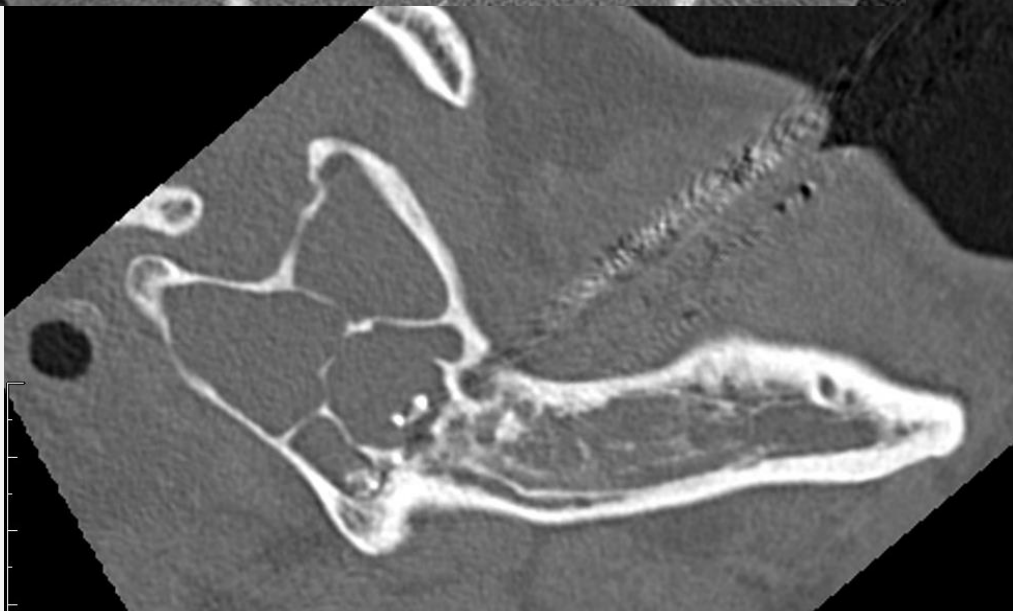


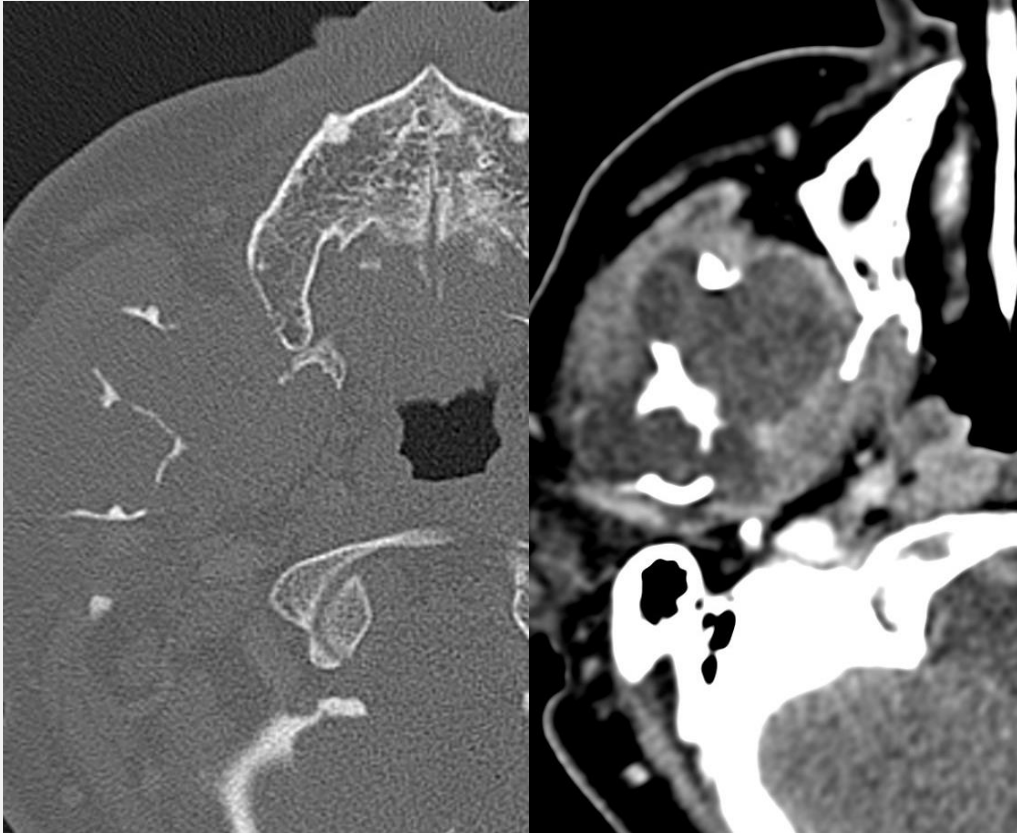


AMELOBLASTOMA

80% in posterior mandible

80% multiloculated





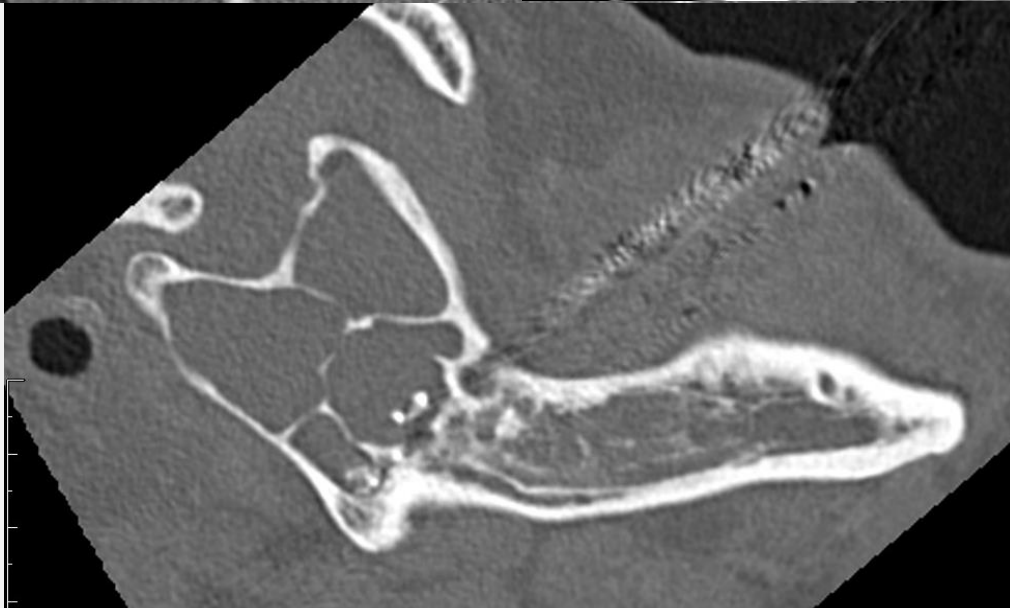
AMELOBLASTOMA

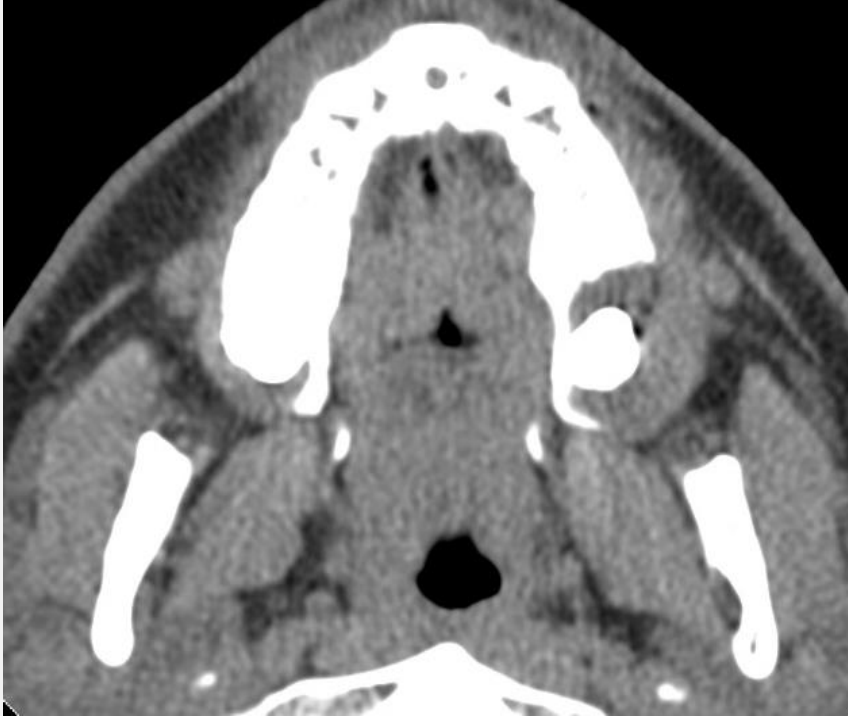
80% in posterior mandible

80% is multiloculated

Benign tumor but can be aggressive-
erode through bone and extend
into soft tissue

Large lesions produce orofacial
expansion





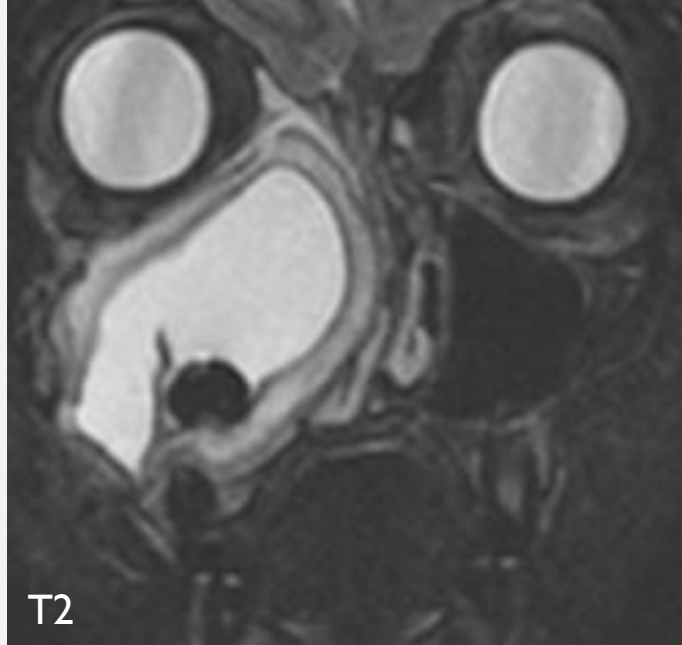
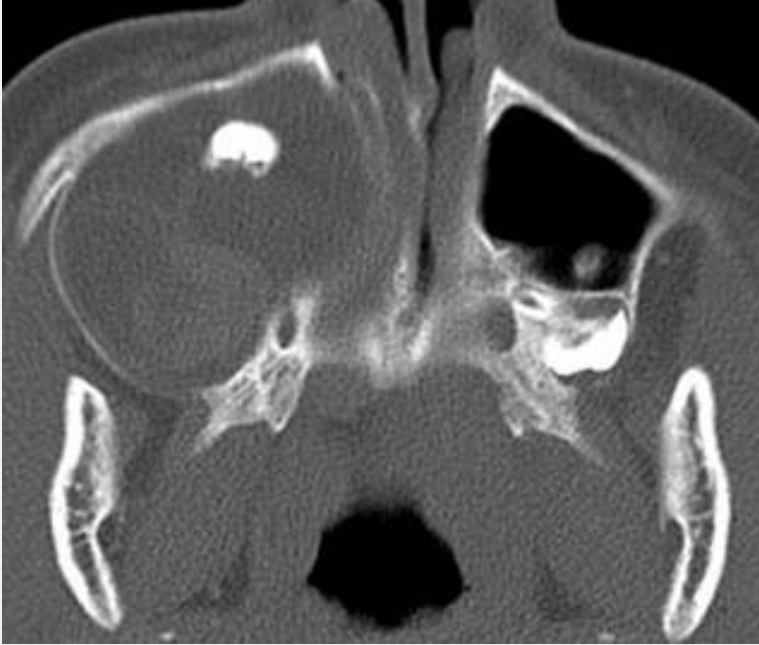
AMELOBLASTOMA

May be unicystic or multicystic

If unicystic may be radiographically indistinguishable from

Dentigerous cyst

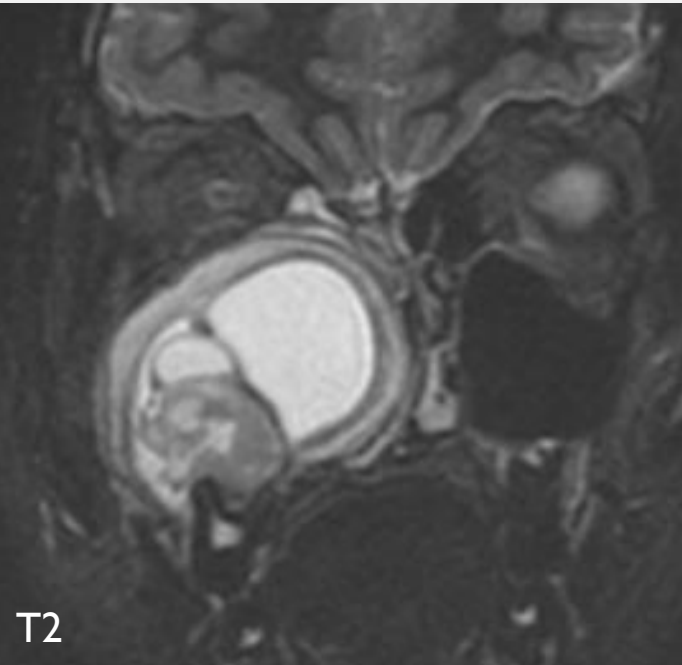
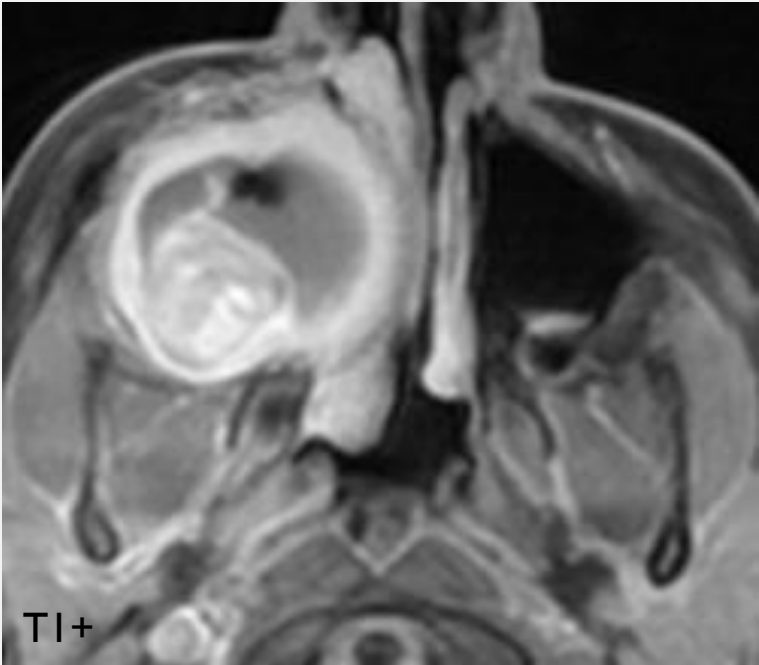
Odontogenic Keratocyst



AMELOBLASTOMA

On MRI, the solid component shows enhancement.

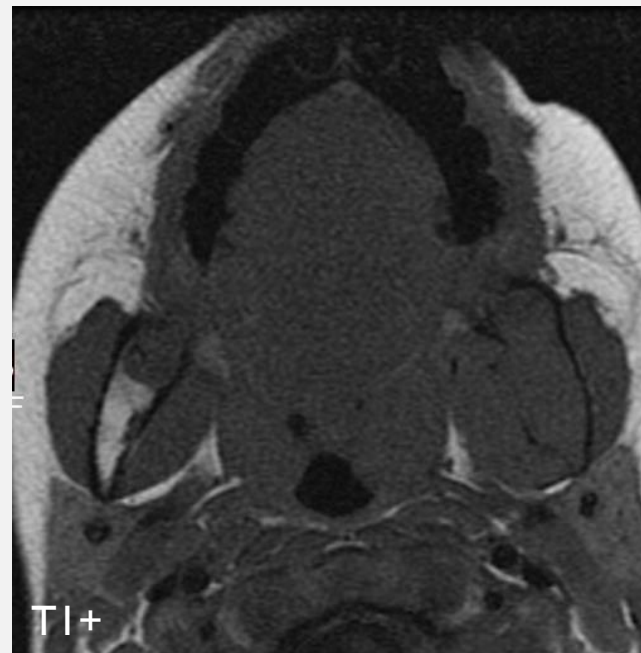
On T2 the cyst is high signal





ODONTOGENIC MYXOMA

- In tooth-bearing areas the tumor is scalloped **between the roots** with root resorption
- Can be unilocular or **multilocular radiolucent lesion** with internal trabeculae
- Benign but locally aggressive



ODONTOGENIC MYXOMA

- Unilocular appearance is more common in children

NON-ODONTOGENIC LESIONS

Nonodontogenic lesions, develop from osseous origin and are not tooth-related

When they present in the mandible, their imaging features are similar to those seen in other parts of the body.

Nonodontogenic lesions usually do not surround the tooth.

NON-ODONTOGENIC LESIONS

RADIOLUCENT LESIONS:

Metastases

Squamous Cell Carcinoma invading mandible

Multiple Myeloma

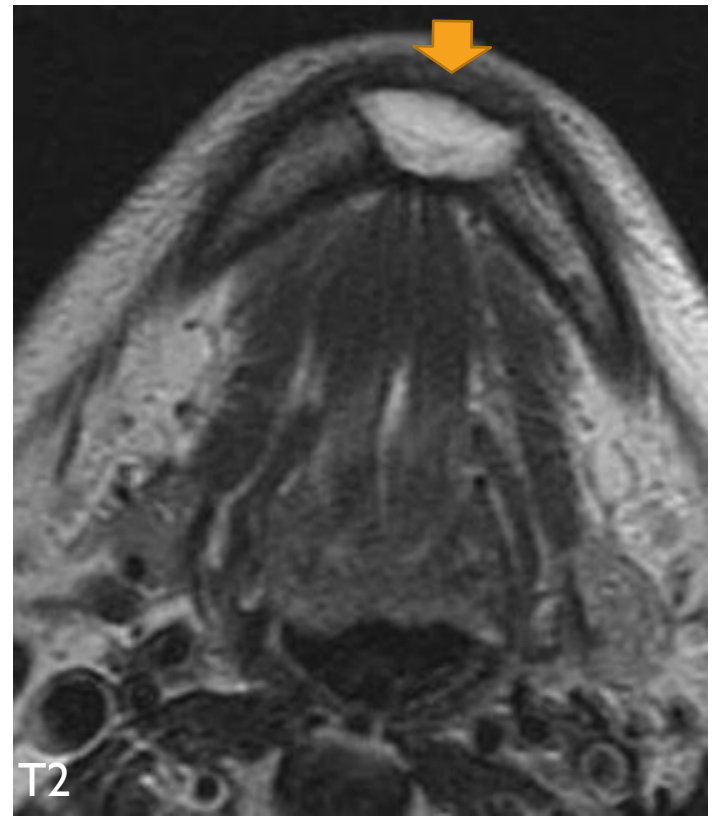
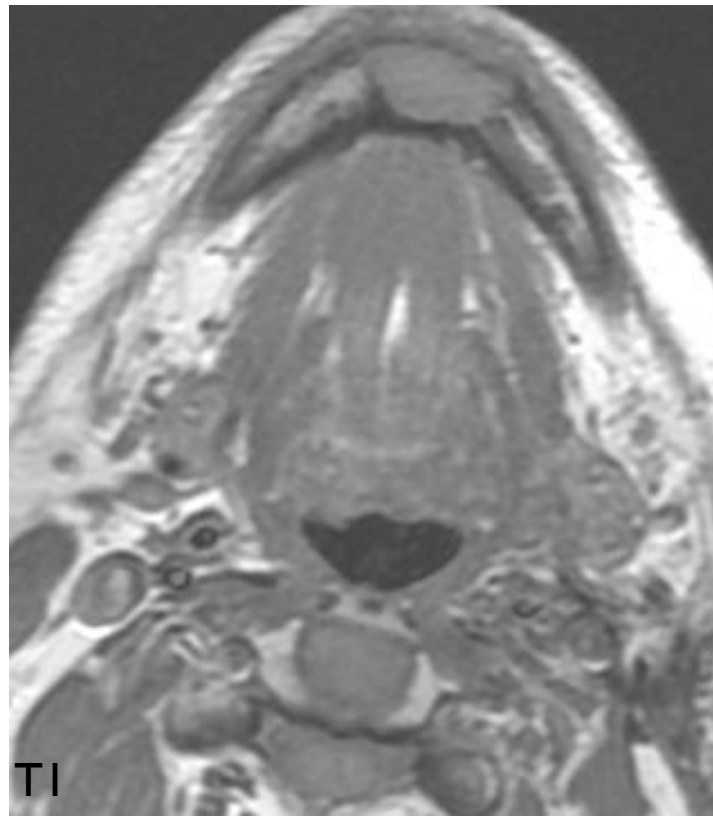
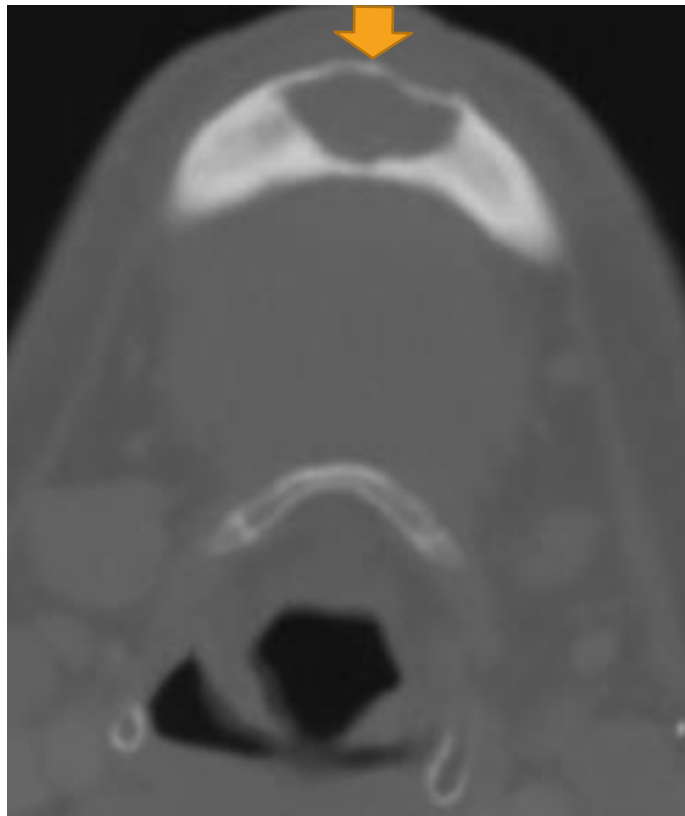
Giant cell Granuloma

Brown Tumor

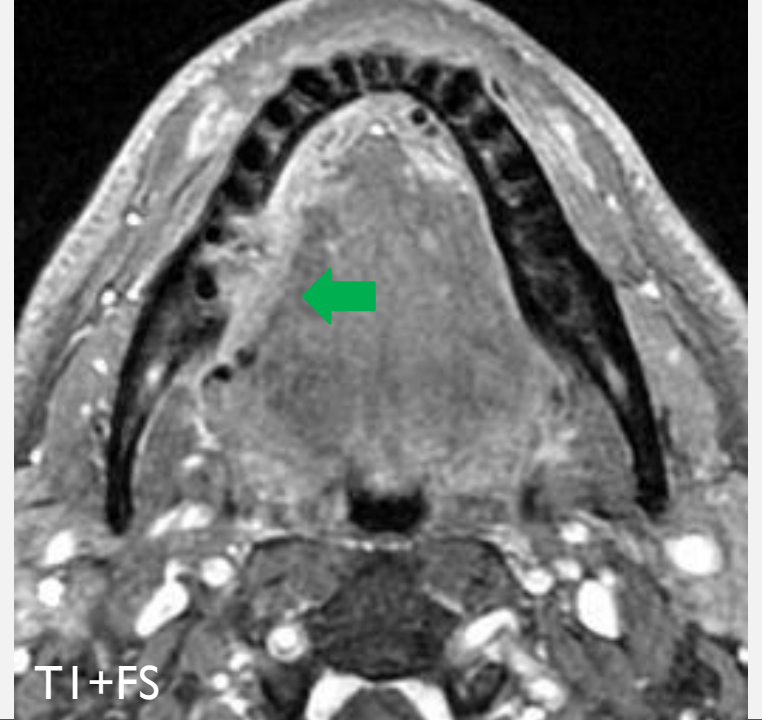
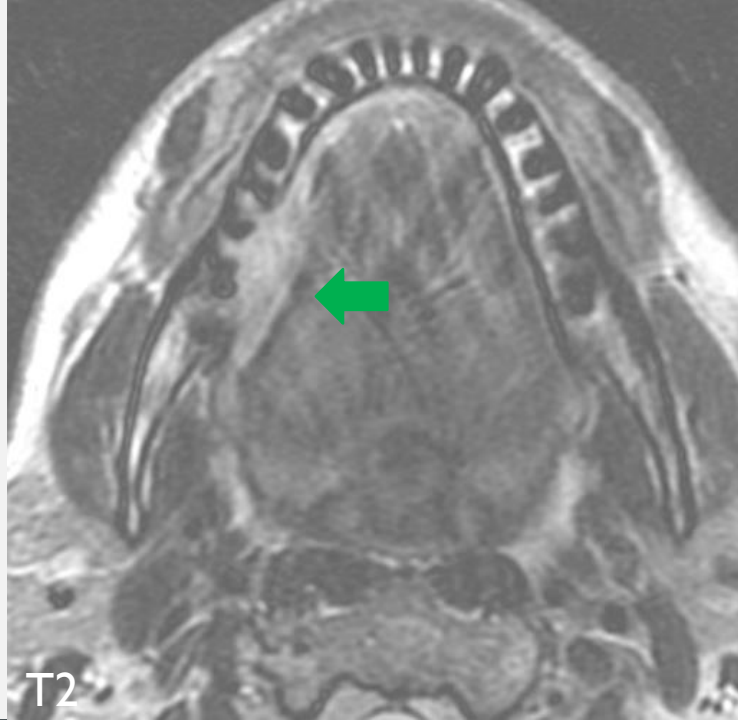
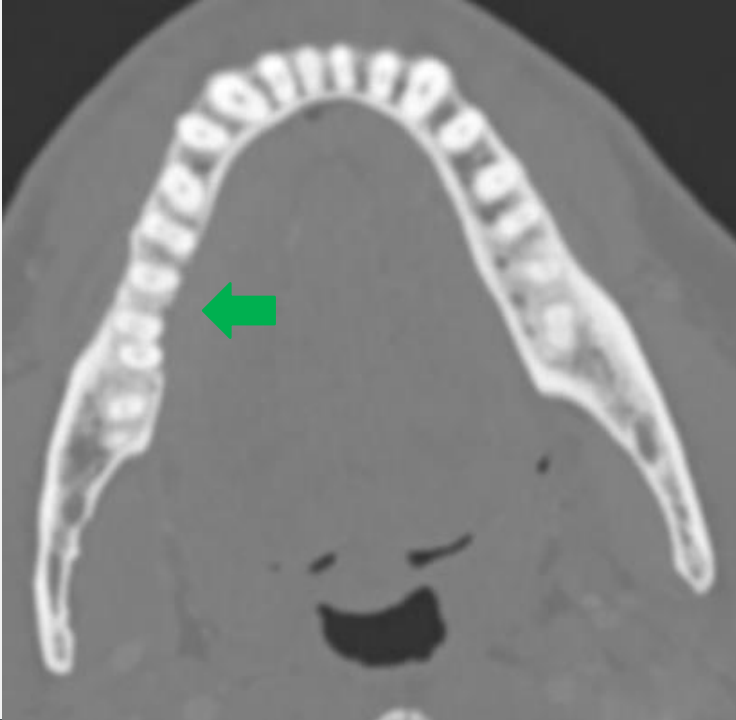
Aneurysmal bone cyst

Central mucoepidermoid carcinoma

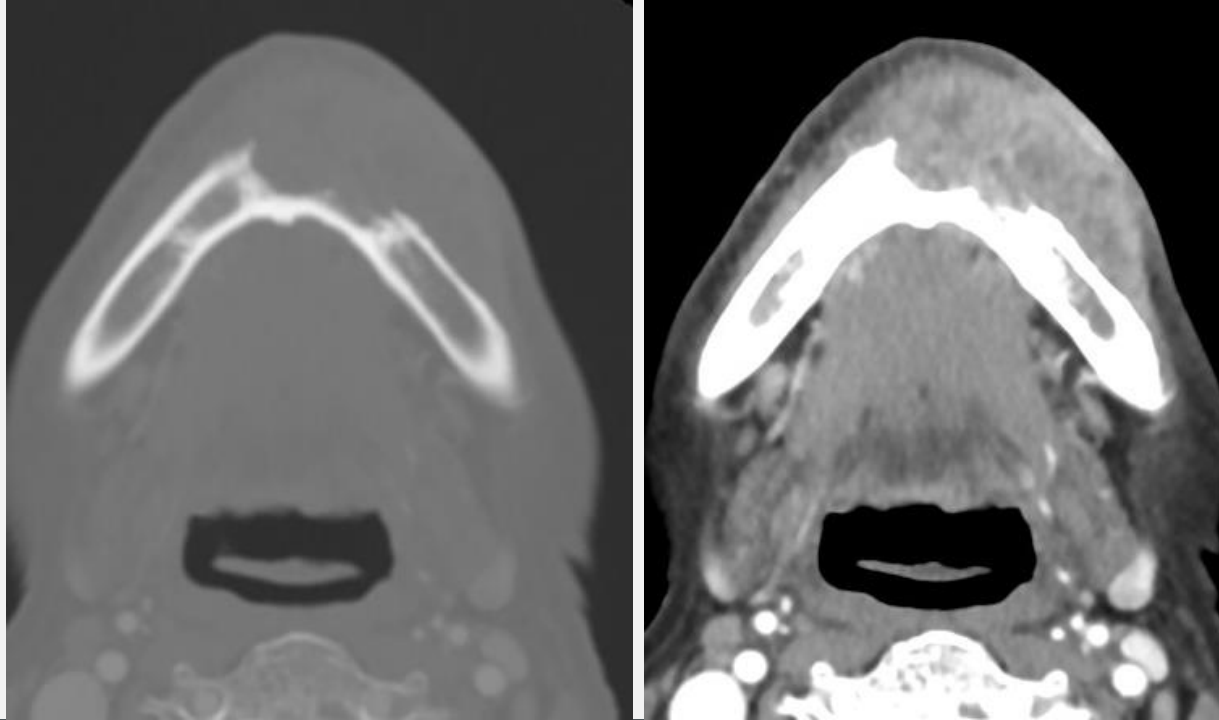
Langerhans cell histiocytosis



METASTATIC DISEASE TO THE MANDIBLE

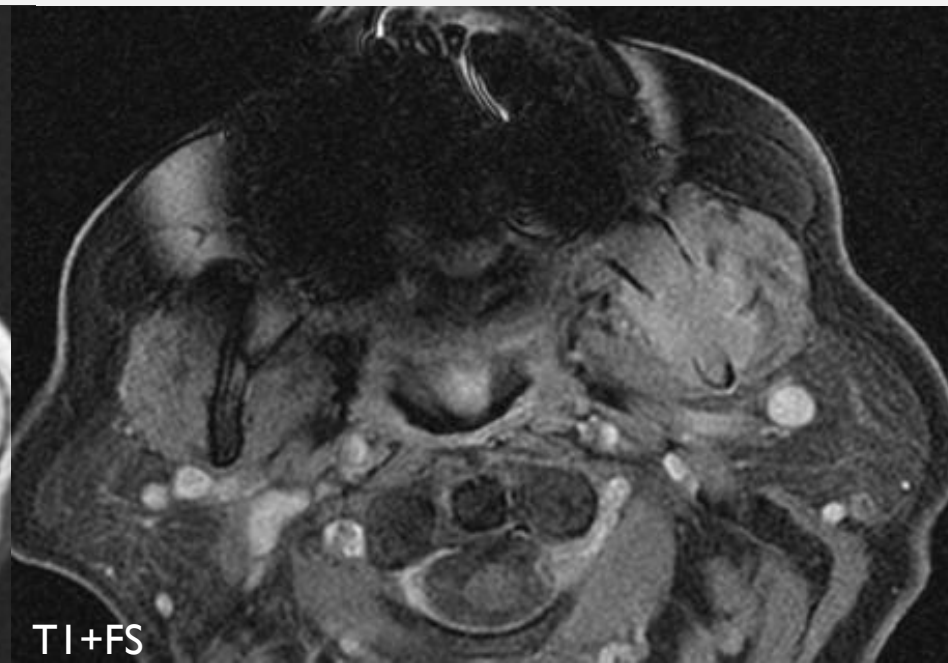
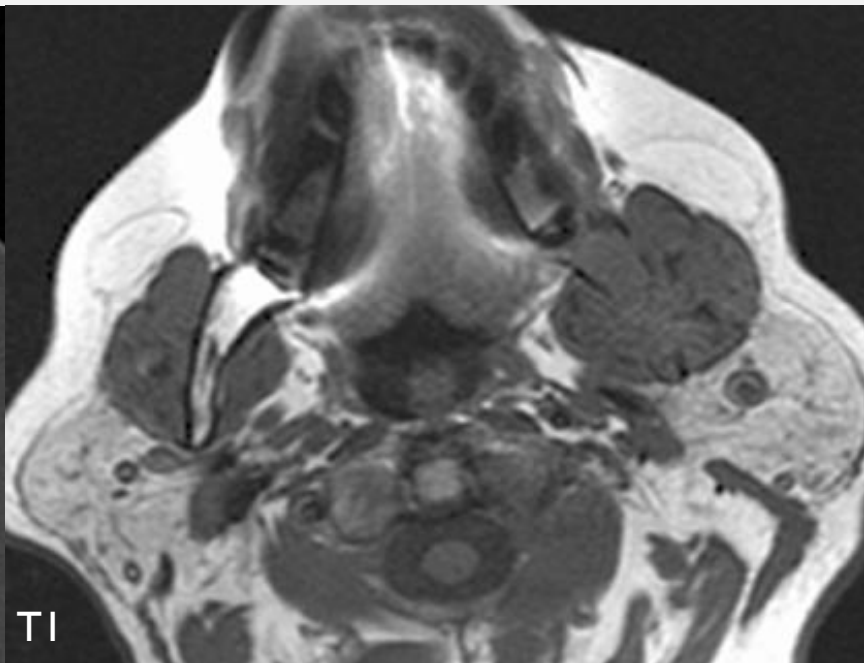


SQUAMOUS CELL CARCINOMA(SCC)



DIRECT INVASION FROM ADJACENT TUMOR

MULTIPLE MYELOMA



GIANT CELL RICH LESIONS

- Early stages radiographically could appear as a unilocular radiolucent lesion and be mistaken for an odontogenic cyst
- As lesion progress they become multilocular.



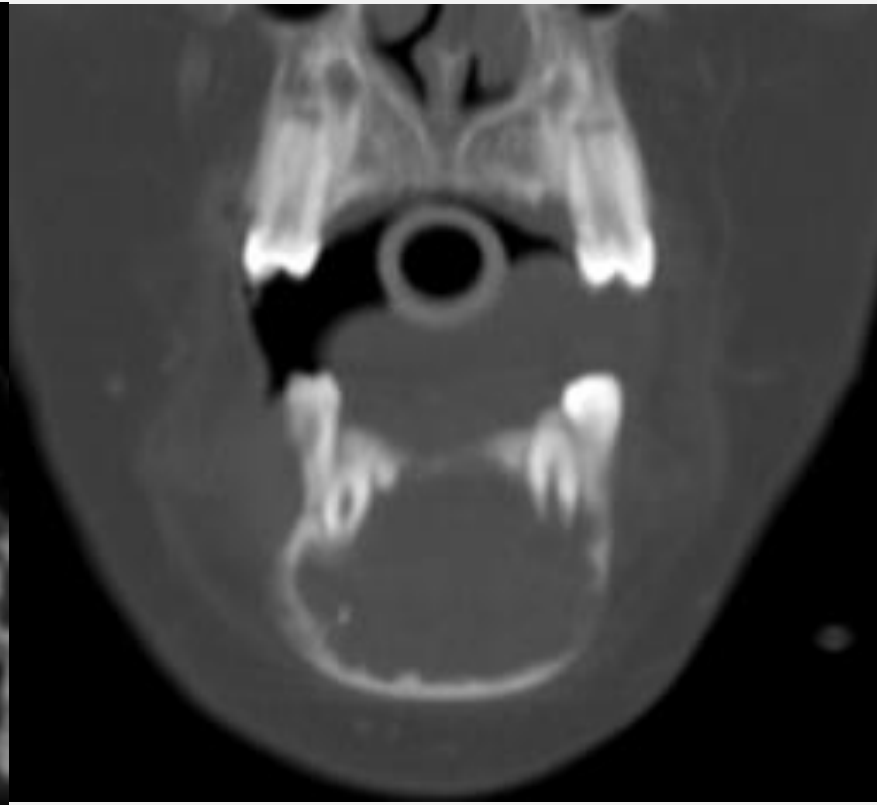
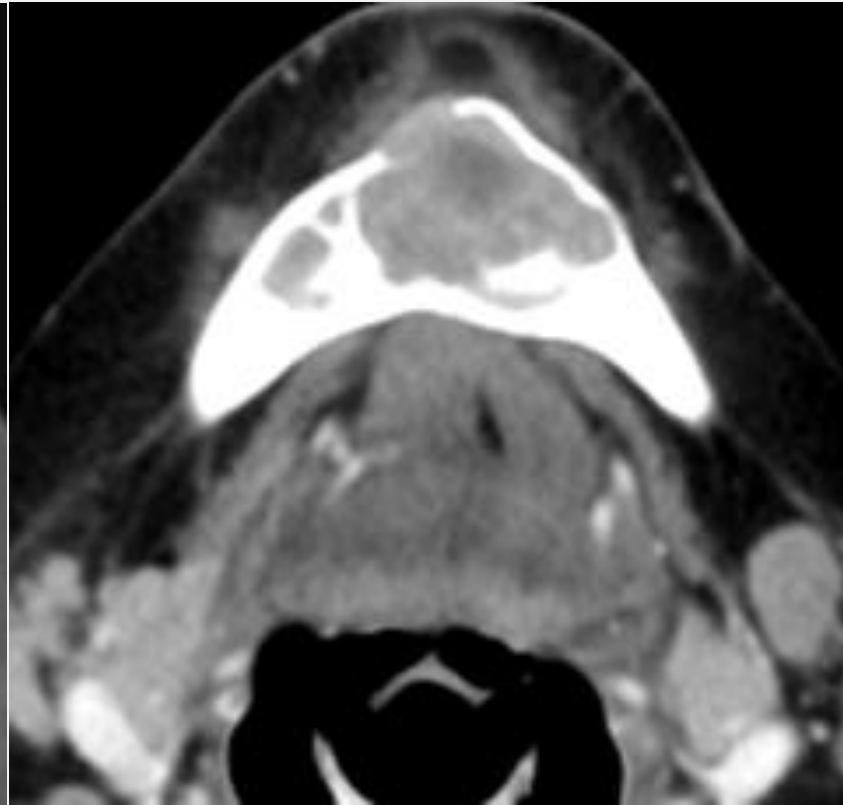
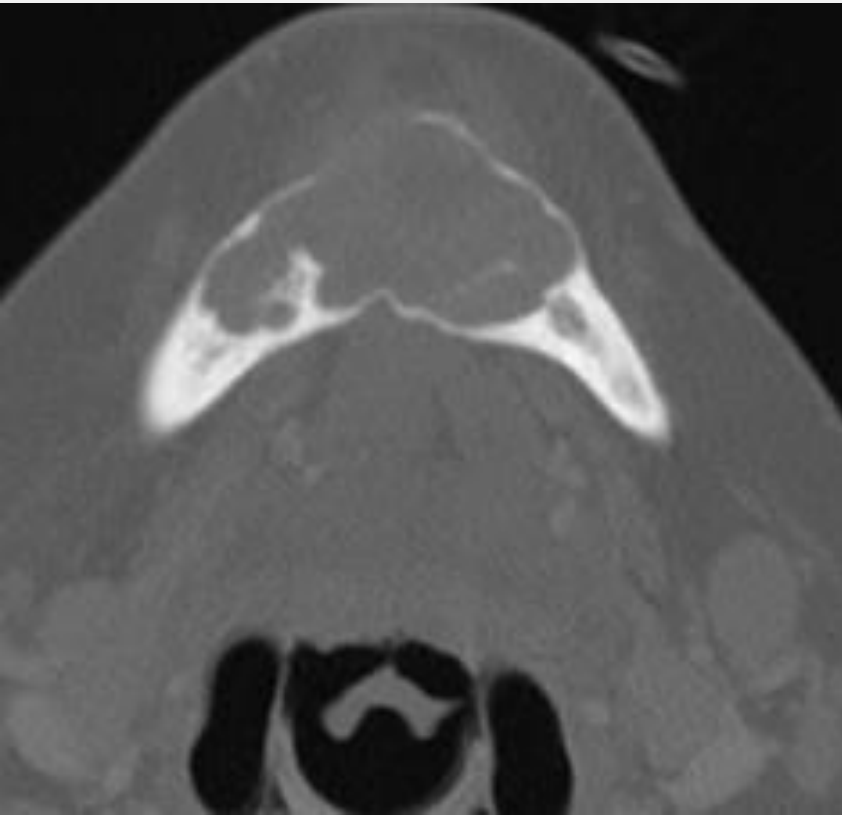
GIANT CELL GRANULOMA

- Large lesions can displace the adjacent teeth
- Similar category of lesions:
 - **Central giant cell granuloma**
 - **Giant cell tumor**
 - **Cherubism**
 - **Brown Tumor**

GIANT CELL GRANULOMA

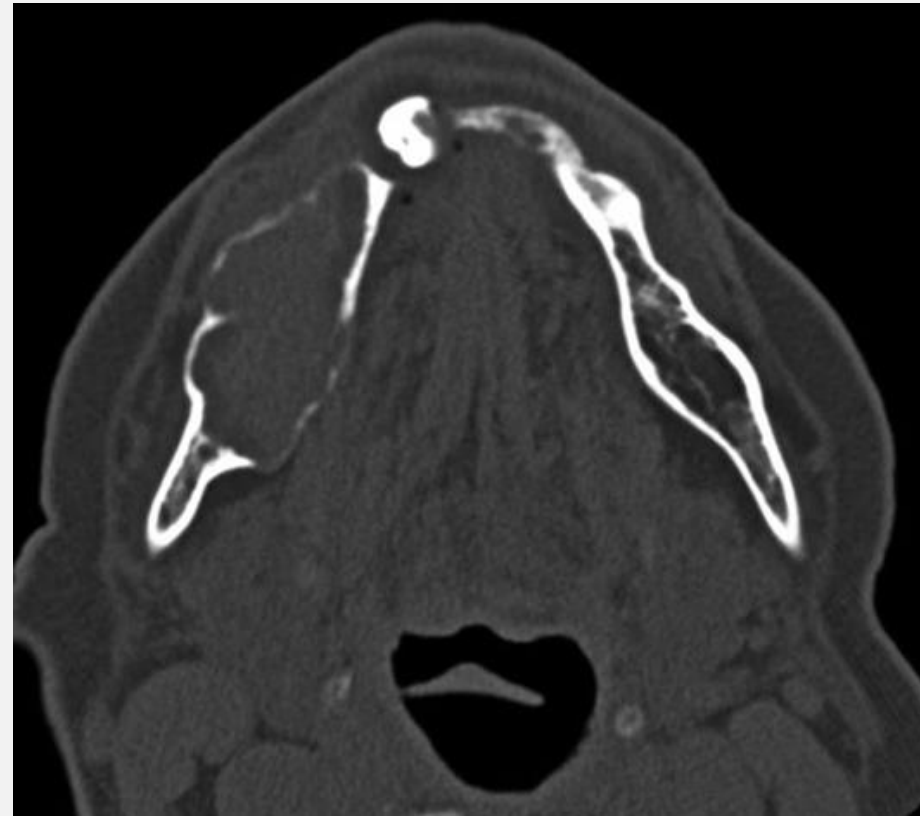


GIANT CELL TUMOR



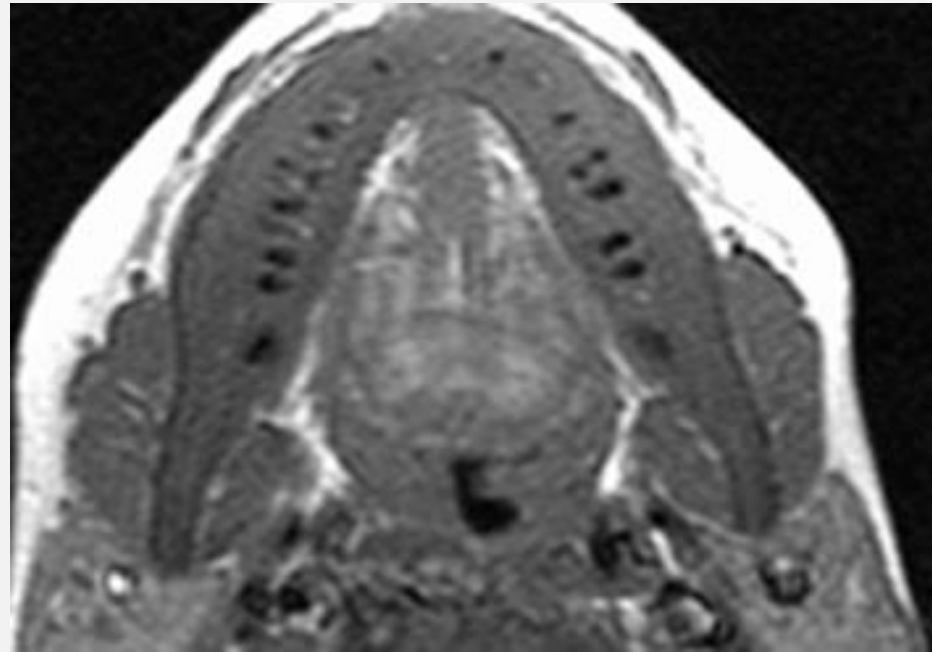
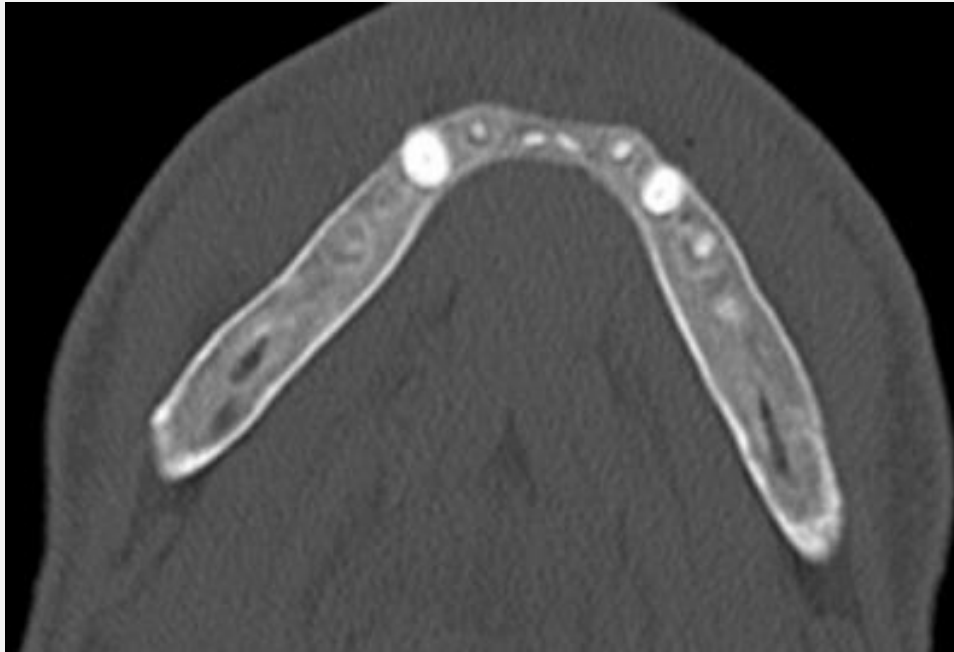
BROWN TUMOR OF HYPERPARATHYROIDISM

- Increased osteoclastic activity
- uni/multilocular osteolytic lesions with bone expansion, osteopenia,
- bone pain and pathologic fracture
- Lesion hemorrhage



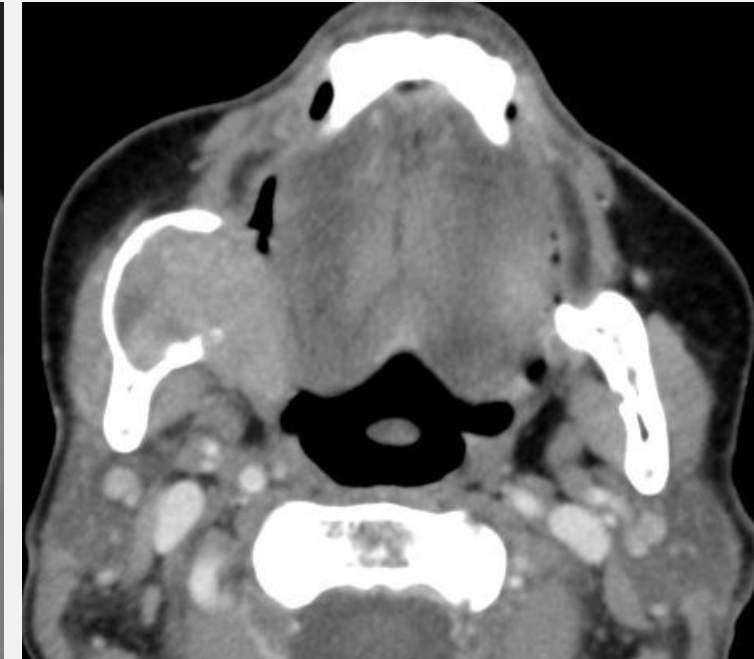
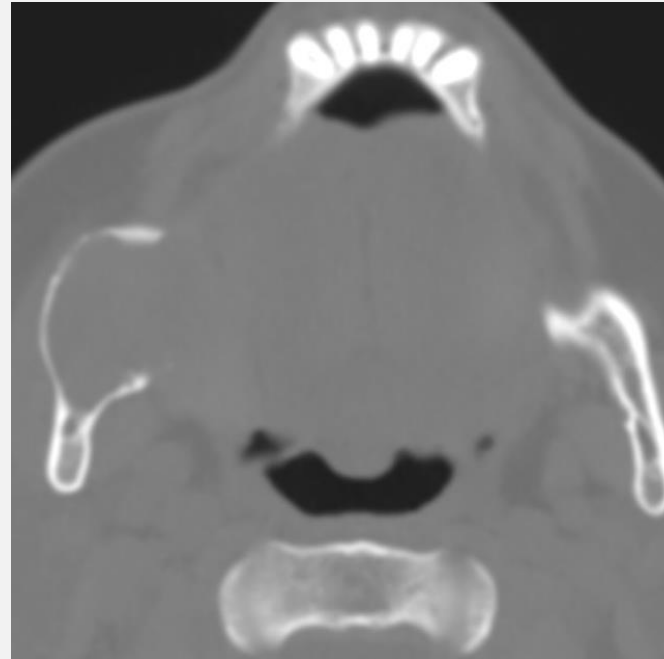
SECONDARY HPT

- Occurs in setting of chronic renal failure
- Hypocalcemia or Vitamin D deficiency act as a stimulus for PTH production

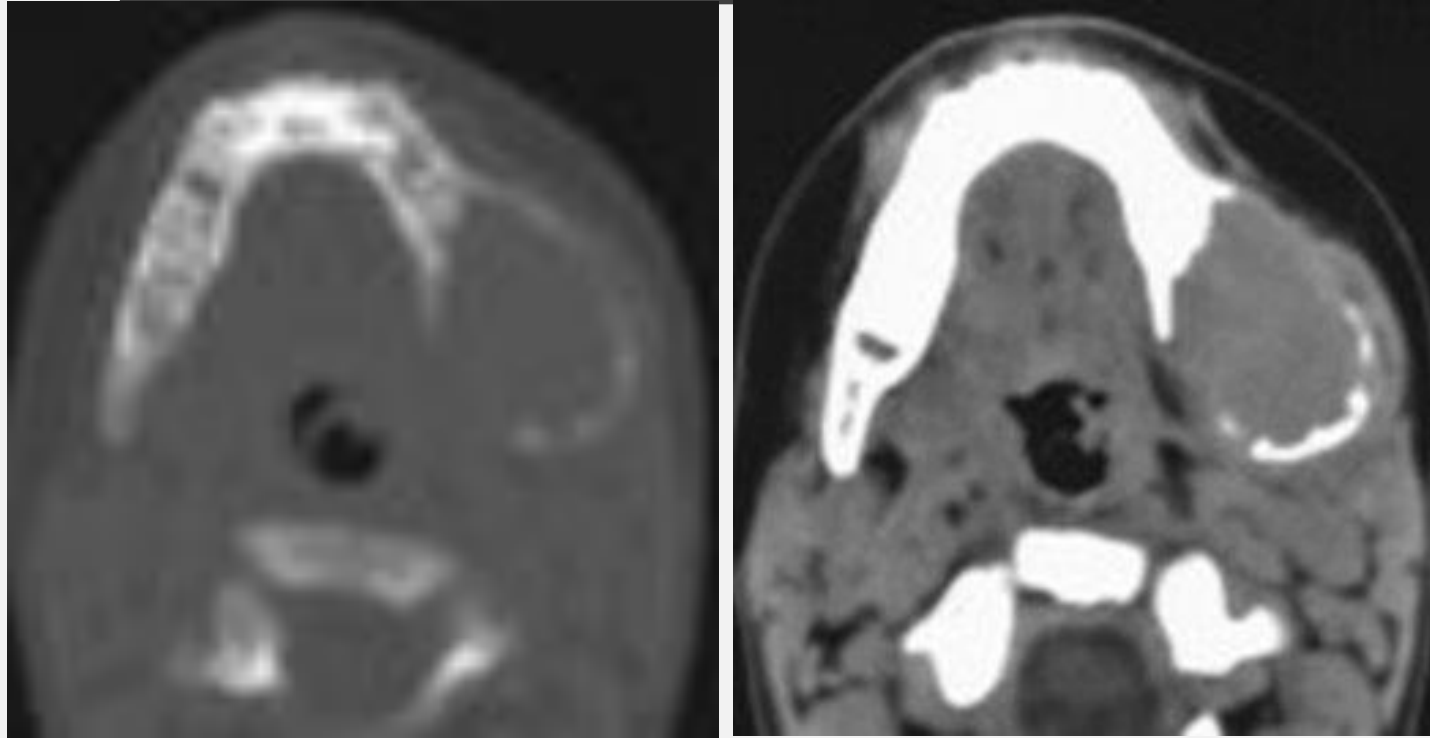


CENTRAL MUCOEPIDERMOID CARCINOMA

- Mucoepidermoid carcinoma(MEC) is the most common malignant salivary gland tumor to originate from ectopic salivary gland tissue
- Rarely, can be intraosseous- Central Mucoepidermoid Carcinoma(CMEC)
- Swelling of retromolar trigone



LANGERHANS CELL HISTIOCYTOSIS



- Affinity for bone, skin, lung and the pituitary.
- Lytic expansile lesion
- Final diagnosis must be confirmed by immunohistochemical staining because the Langerhans cells are positive for CD1a or S100 protein

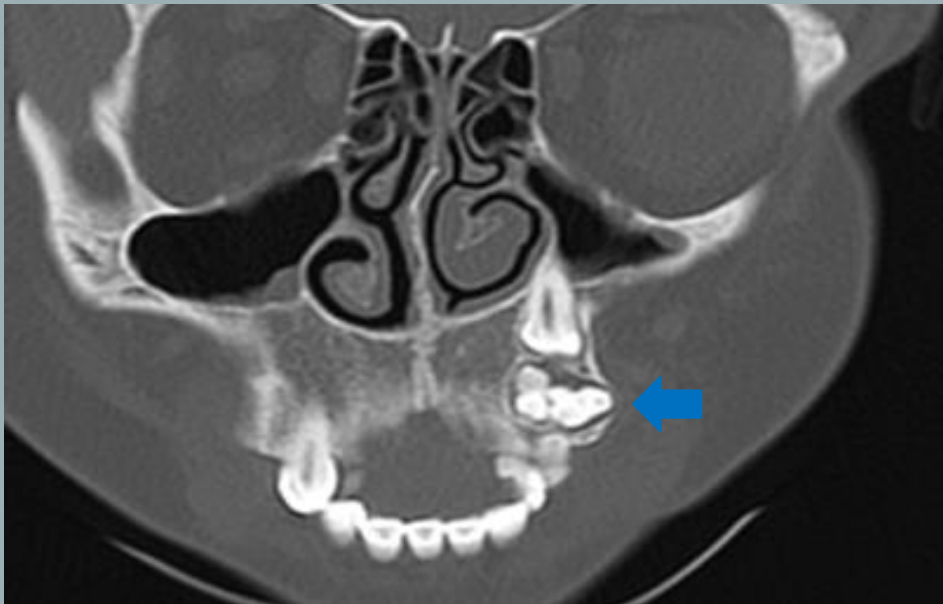
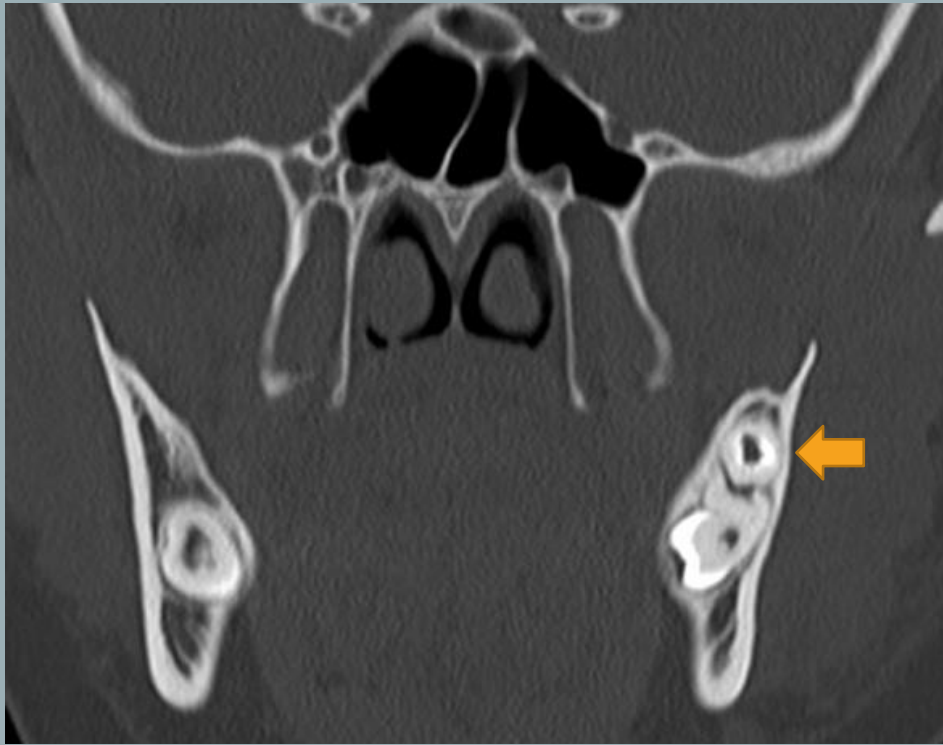
ODONTOGENIC LESIONS

RADIOPAQUE:

Odontoma

**Cementosseous
dysplasia**

Condensing Osteitis



ODONTOMA

They present as an asymptomatic well-defined expansive mass limited to the alveolus, often associated with the **failure of eruption of permanent tooth**.

Low attenuation halo

Two types:

Complex odontoma single unorganized amorphous mineralized mass

Compound odontoma

Multiple small tooth-like structures as a bag of teeth



CEMENTOOSSEOUS DYSPLASIA (COD)

Hamartoma associated with tooth apex.

Black and Asian women 4-5th decade

No treatment is indicated

Confined to the alveolar process

Associated with vital teeth

CEMENTOOSSEOUS DYSPLASIA (COD)

Three different types:

Periapical : anterior mandible
lower incisor

Focal COD: molar teeth

Florid COD: bilateral mandible



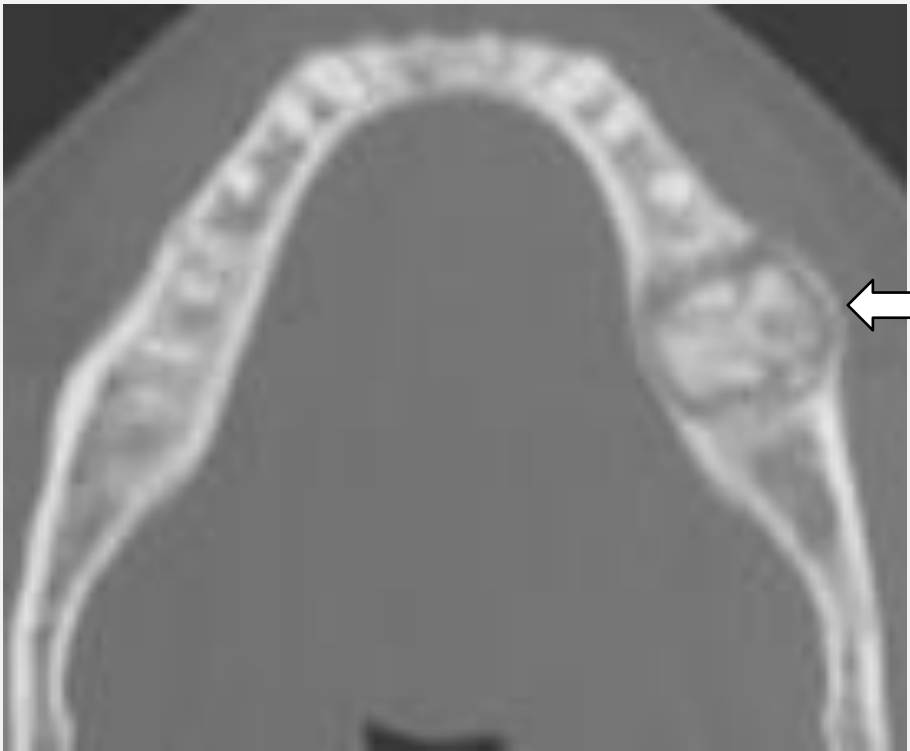
CEMENTOOSSEOUS DYSPLASIA (COD)

Three different types:

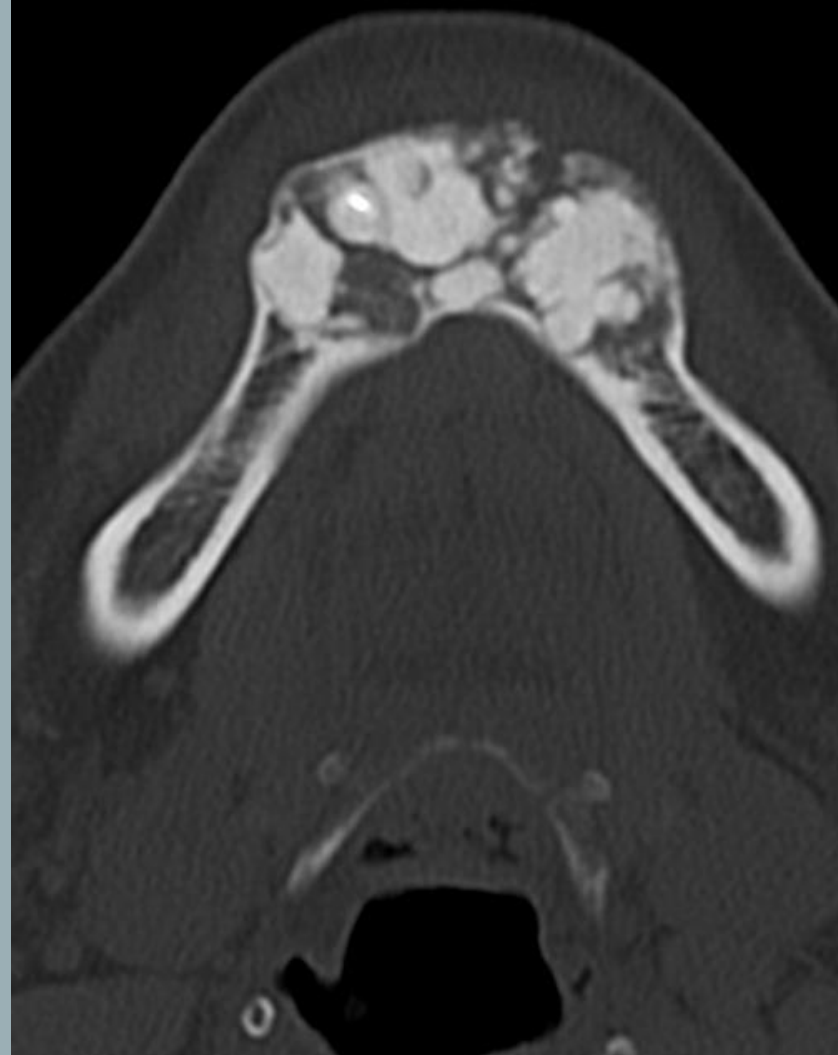
Periapical : anterior mandible
lower incisor

Focal COD: molar teeth

Florid COD: bilateral mandible



FLORID CEMENTO-OSSIFYING DYSPLASIA



Lobulated masses which can attain considerable size and expansion of the jaw

CONDENSING OSTEITIS

- localized form of reactive osteitis
- surrounds the apices of the teeth with pulpitis or pulpal necrosis
- Children or young adults
- Premolar and molar teeth



NON-ODONTOGENIC LESIONS

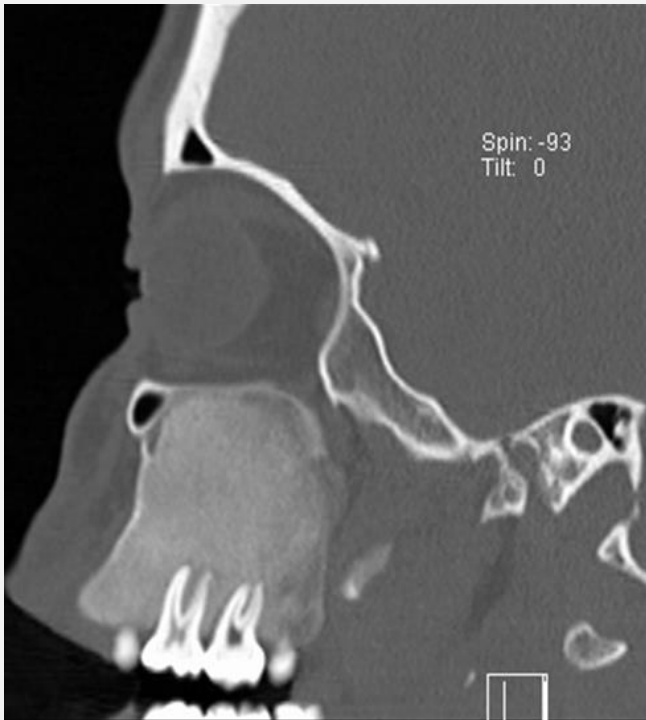
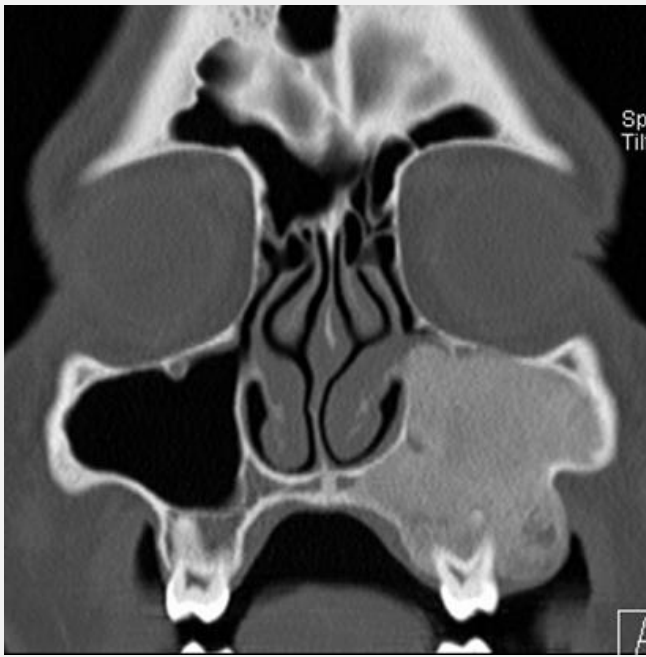
Mixed Lytic and Sclerotic

Fibro-Osseous Lesions

Osteomyelitis

Osteonecrosis

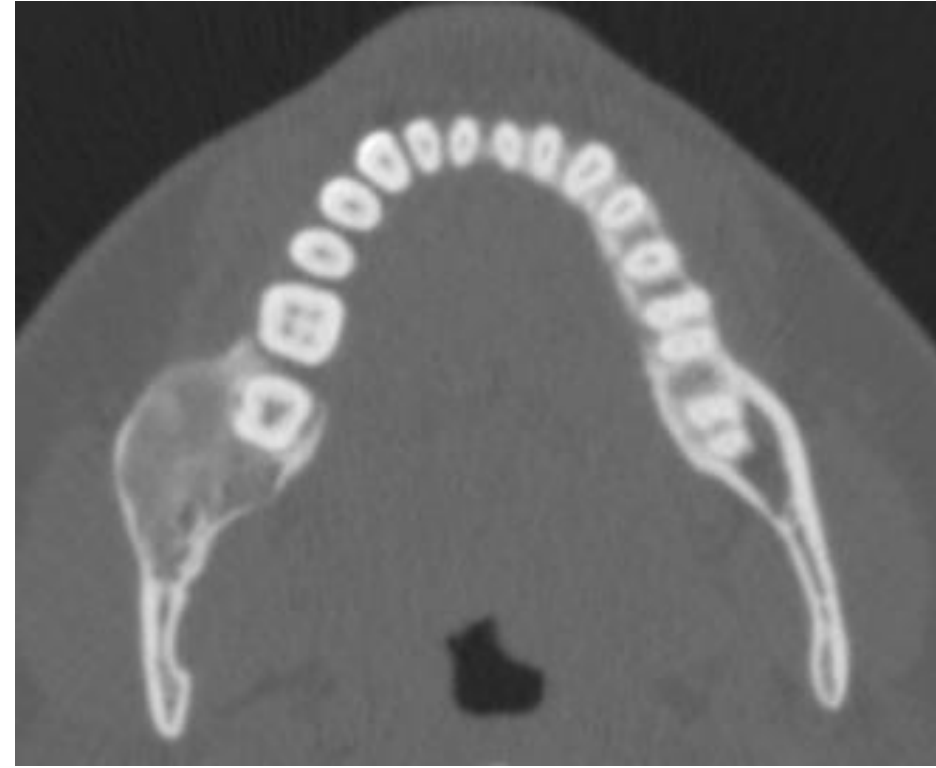
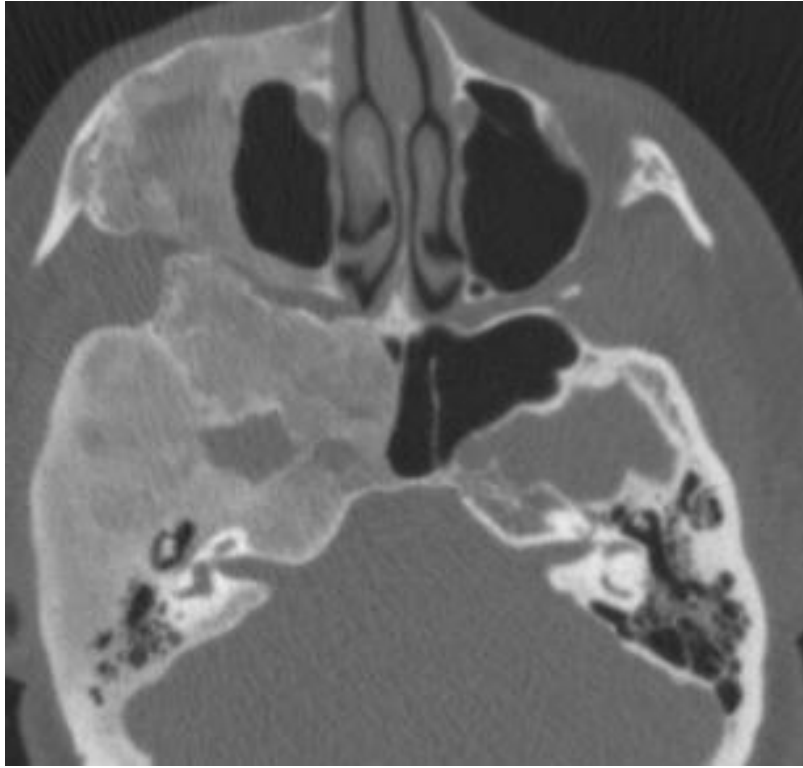
**Bisphosphonate related ORN of
the jaw**



BENIGN FIBRO-OSSEOUS LESIONS

The most common benign fibro-osseous lesions are

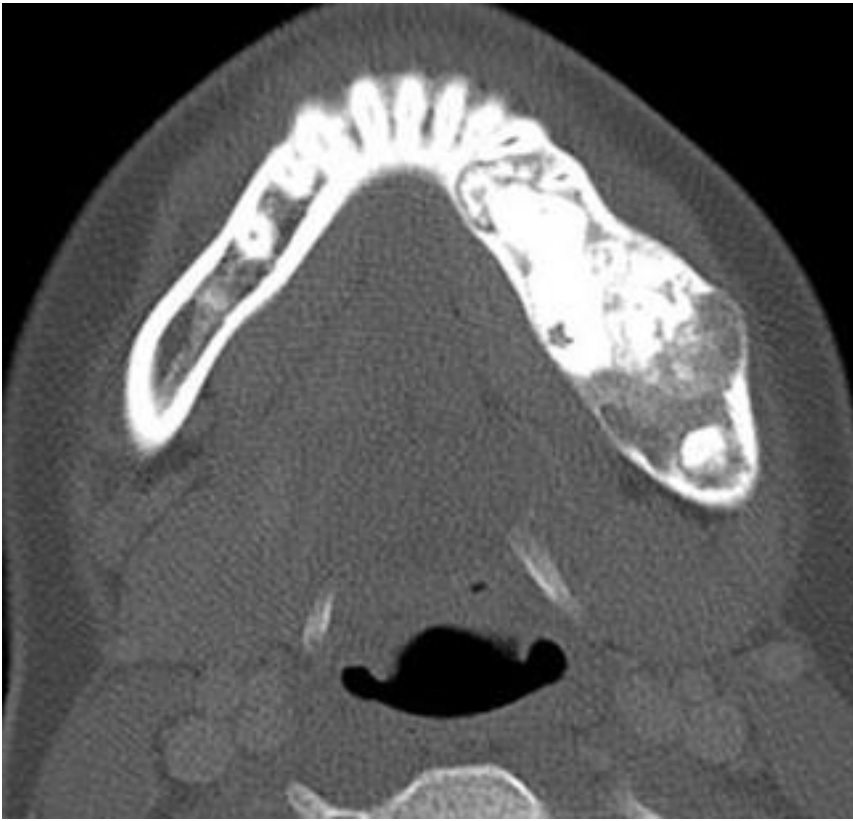
fibrous dysplasia,
osseous dysplasia,
ossifying fibroma



POLYOSTOTIC FIBROUS DYSPLASIA

Involves minimum of two bones or up to over 75% of the skeleton

1st decade of life, with bone pain and bony deformation

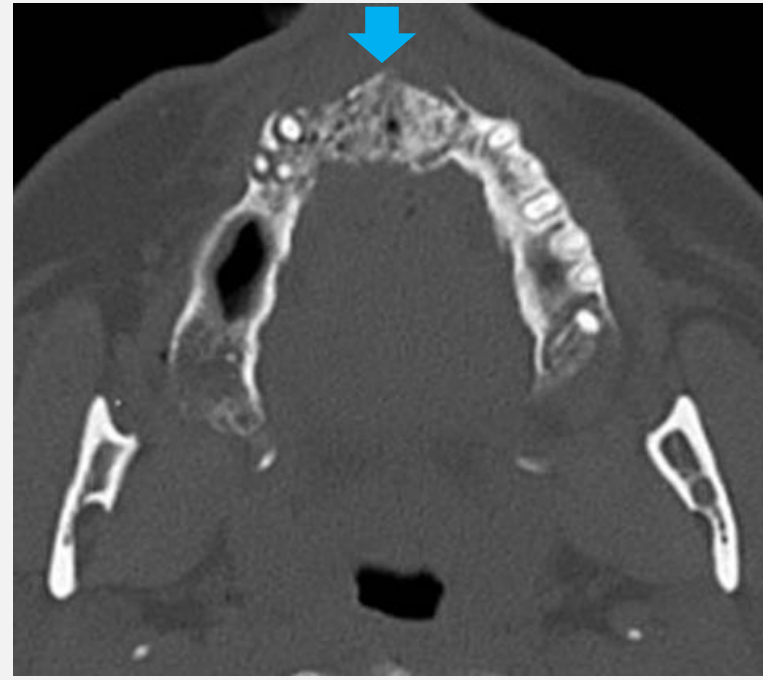
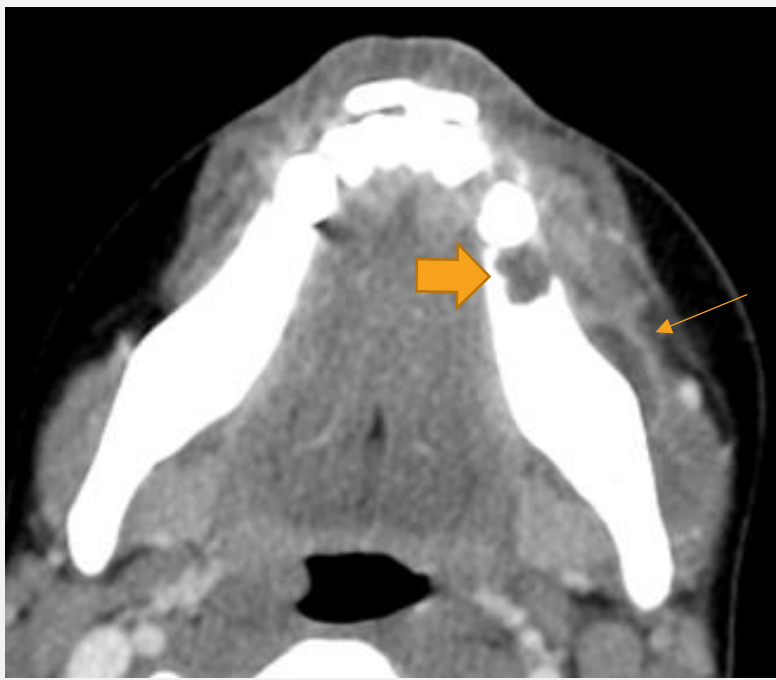


OSSIFYING FIBROMA

Appears similar to fibrous dysplasia but radiolucent boundaries

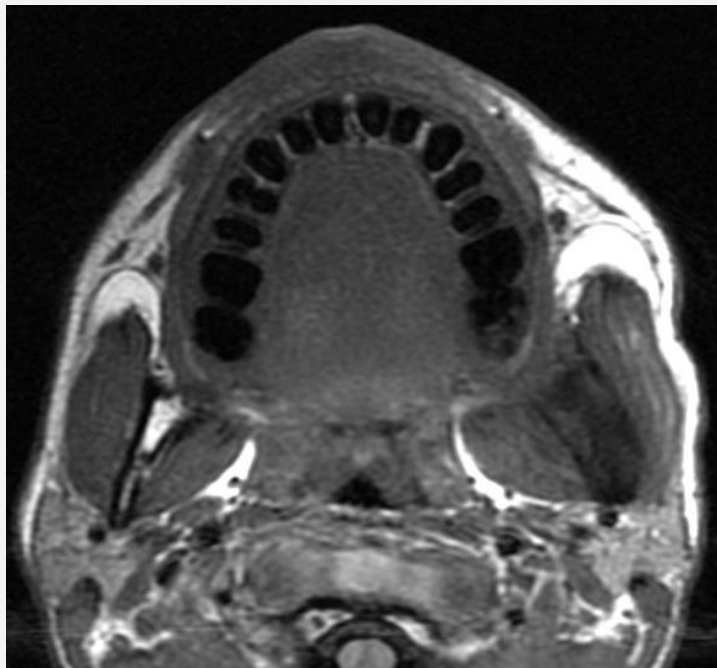
Mostly seen in posterior mandible. Molar, Premolar region of mandible

3rd and 4th decade. F>M

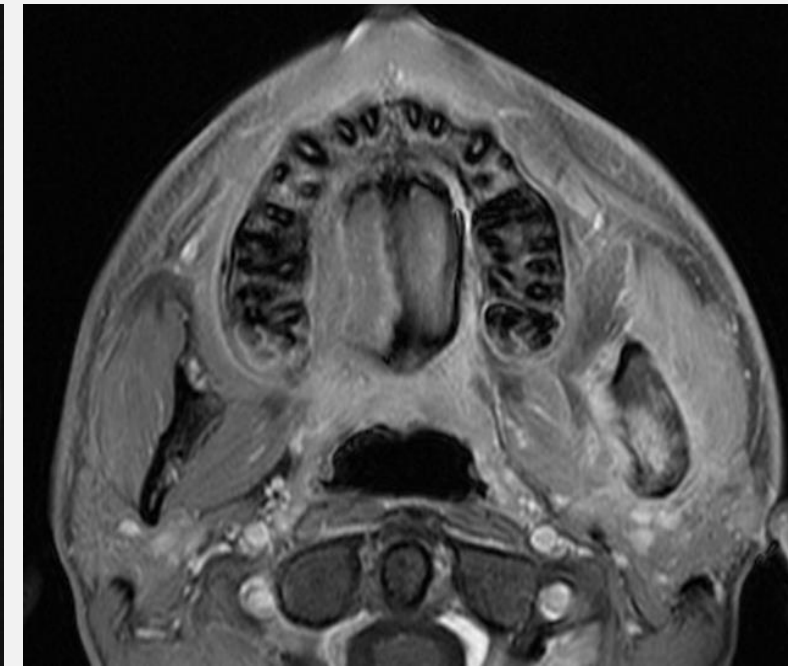
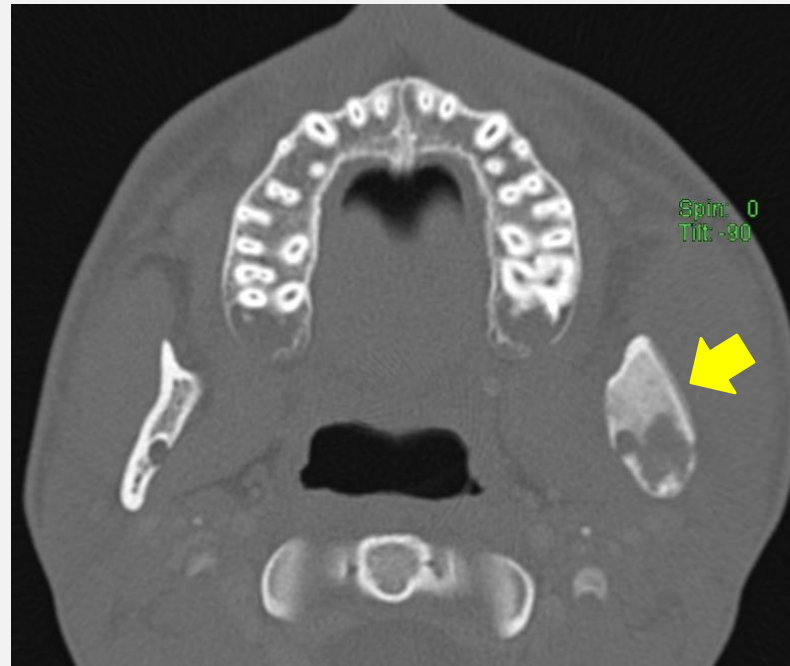


OSTEOMYELITIS

- Acute phase, pain swelling, fever, lymphadenopathy, maybe no radiographic signs
- Most commonly originate from odontogenic infection, periodontal disease, **extraction sites**, foreign bodies or fracture sites.

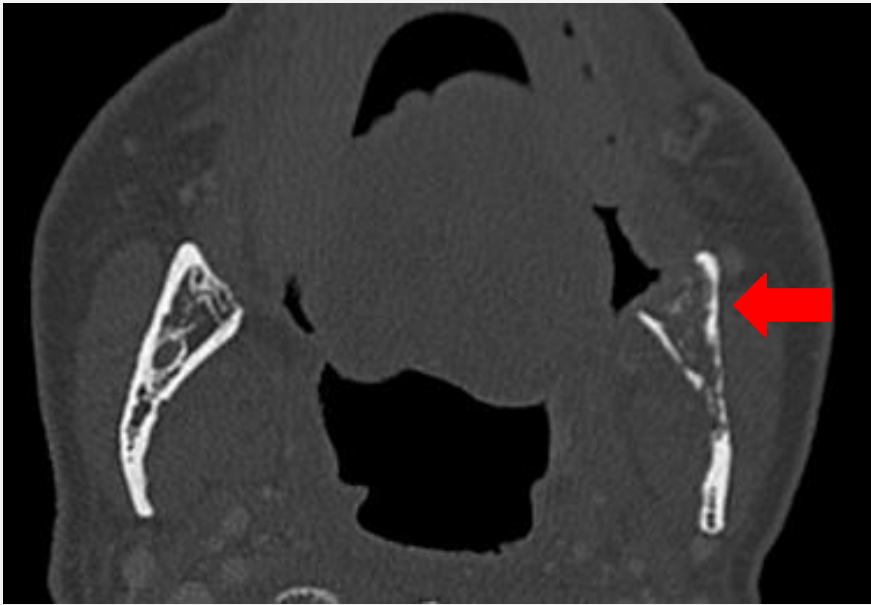


One YEAR
later



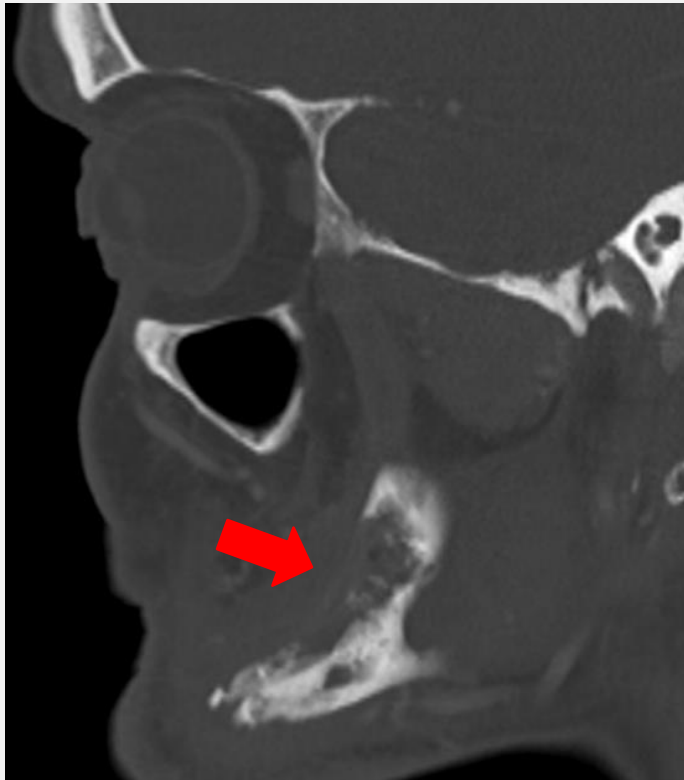
OSTEOMYELITIS

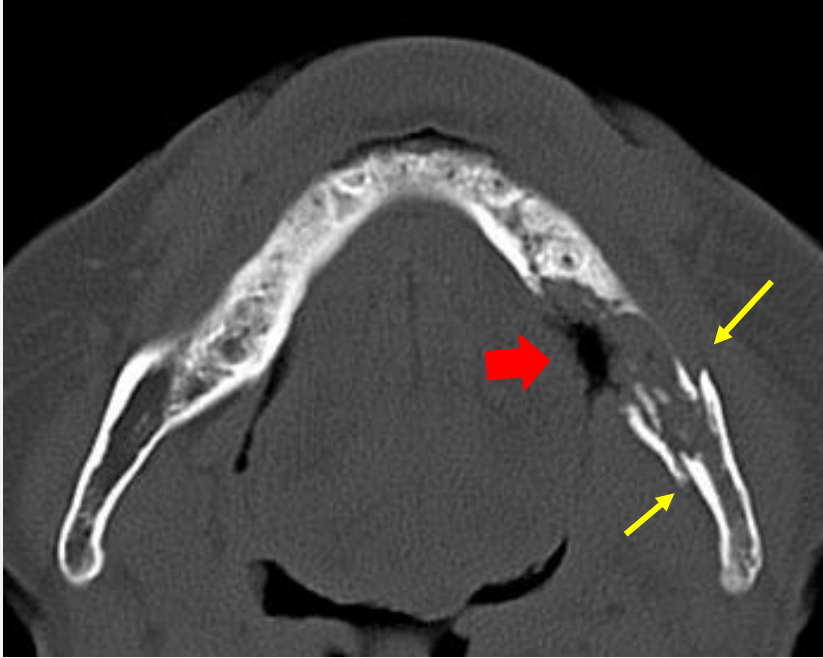
- MRI allows for early detection and to evaluate extent of disease
- Chronic Osteomyelitis, **mixed osteopenia, sclerosis and periosteal** reaction
- Mandible more common than maxilla



OSTEORADIONECHROSIS (ORN)

Complication of radiation therapy when the mandible is positioned in the radiation field
Usually exposed to doses exceeding 60 Gy.
Irregular, multifocal lytic changes

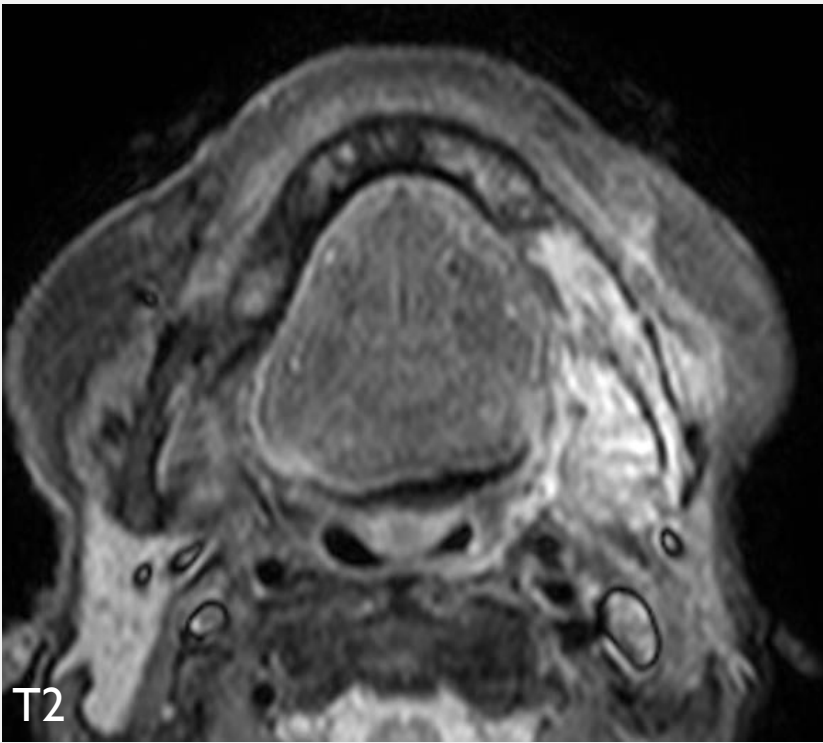




OSTEORADIONECCROSIS (ORN)

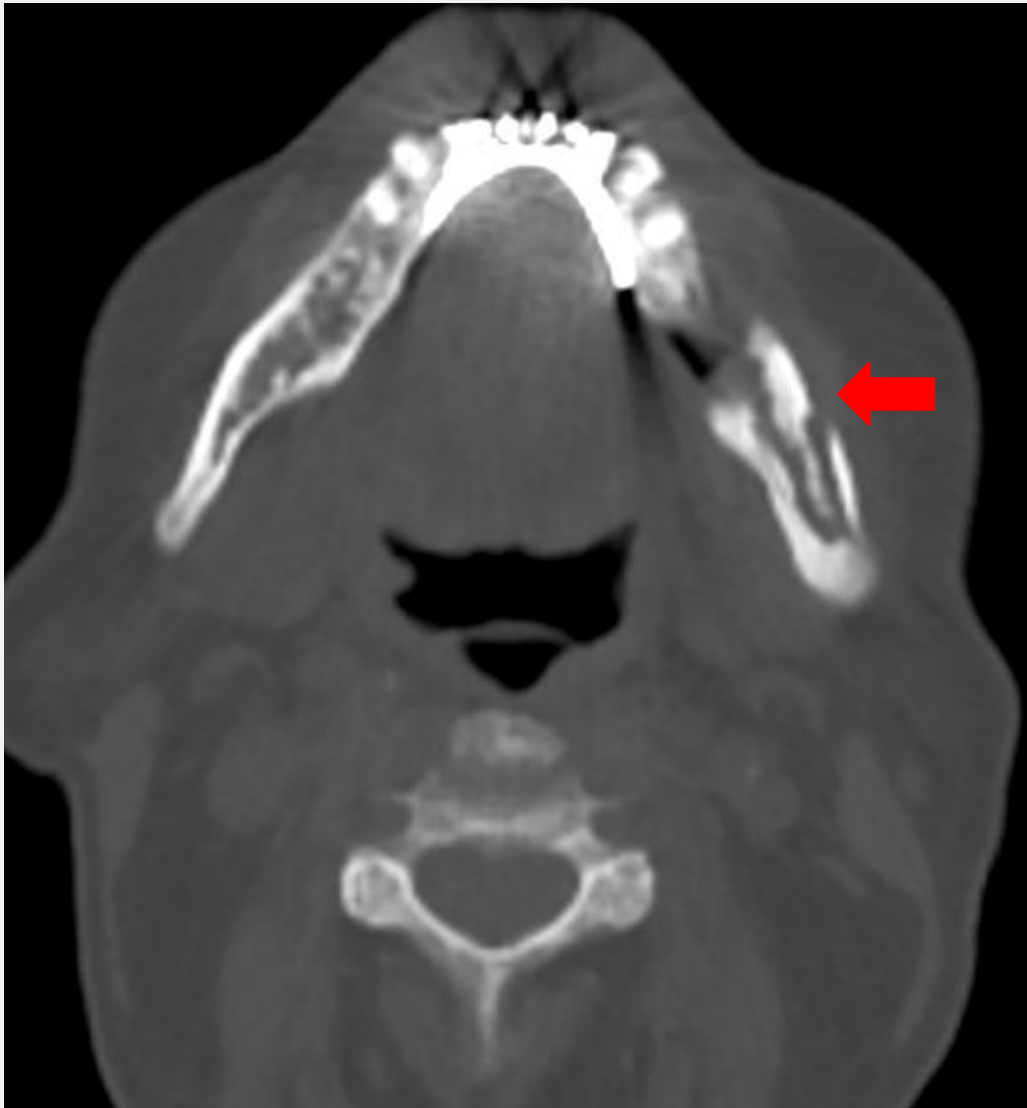
Sequestrum

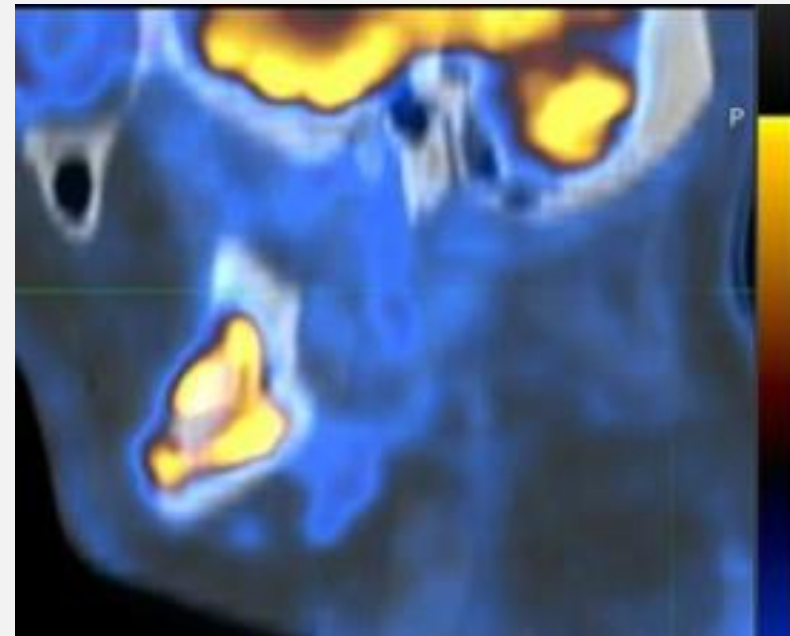
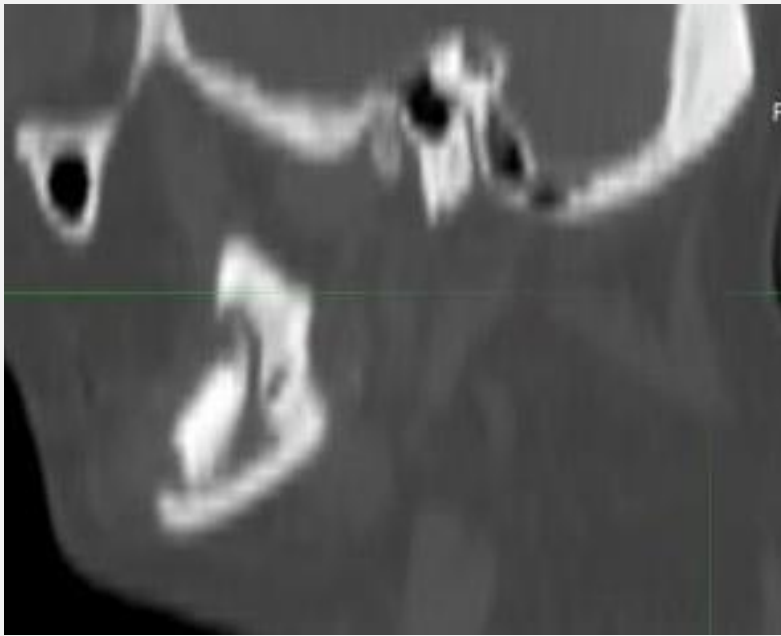
Advanced cases have pathologic fractures



OSTEORADIONECCROSIS (ORN)

Ddx: Osteomyelitis, ORN, bisphosphonate ON,
malignancy





BISPHOSPHONATE RELATED OSTEONECROSIS OF THE JAW- BRONJ

- Bisphosphonates are used in the management of bone disorders. Osteoporosis, Paget's disease, multiple myeloma, bone cancers or cancer-induced hypocalcemia.
- Bisphosphonates cause osteonecrosis of the mandible and maxilla.
- Osteolytic lesions and sclerotic regions with or without periosteal bone proliferation.
- Differential diagnosis is malignancy, osteomyelitis, osteoradionecrosis. History is key.

CONCLUSION

- Most of the odontogenic cases in clinical practices are **inflammatory**.
- Crown: caries
- Root: radicular cyst, periapical cyst
- Surrounding the tooth: periodontal disease

CONCLUSION

- Lytic lesions – ODONTOGENIC
 - **Dentigerous cyst:** unerupted tooth **crown**
 - OKC, Ameloblastoma cannot differentiate, biopsy
 - Myxoma are rare
- Lytic lesion – NON-ODONTOGENIC
 - Giant cell rich lesions: Midline
 - Mets, Myeloma, SCC invasion
 - **Mixed Lytic and Sclerotic**
 - Osteomyelitis, Osteonecrosis, Bisphosphonate
 - **need history**