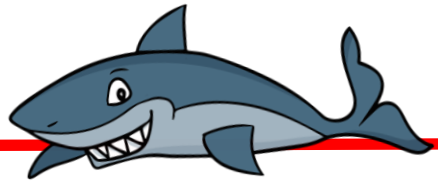
Jaw Lesions

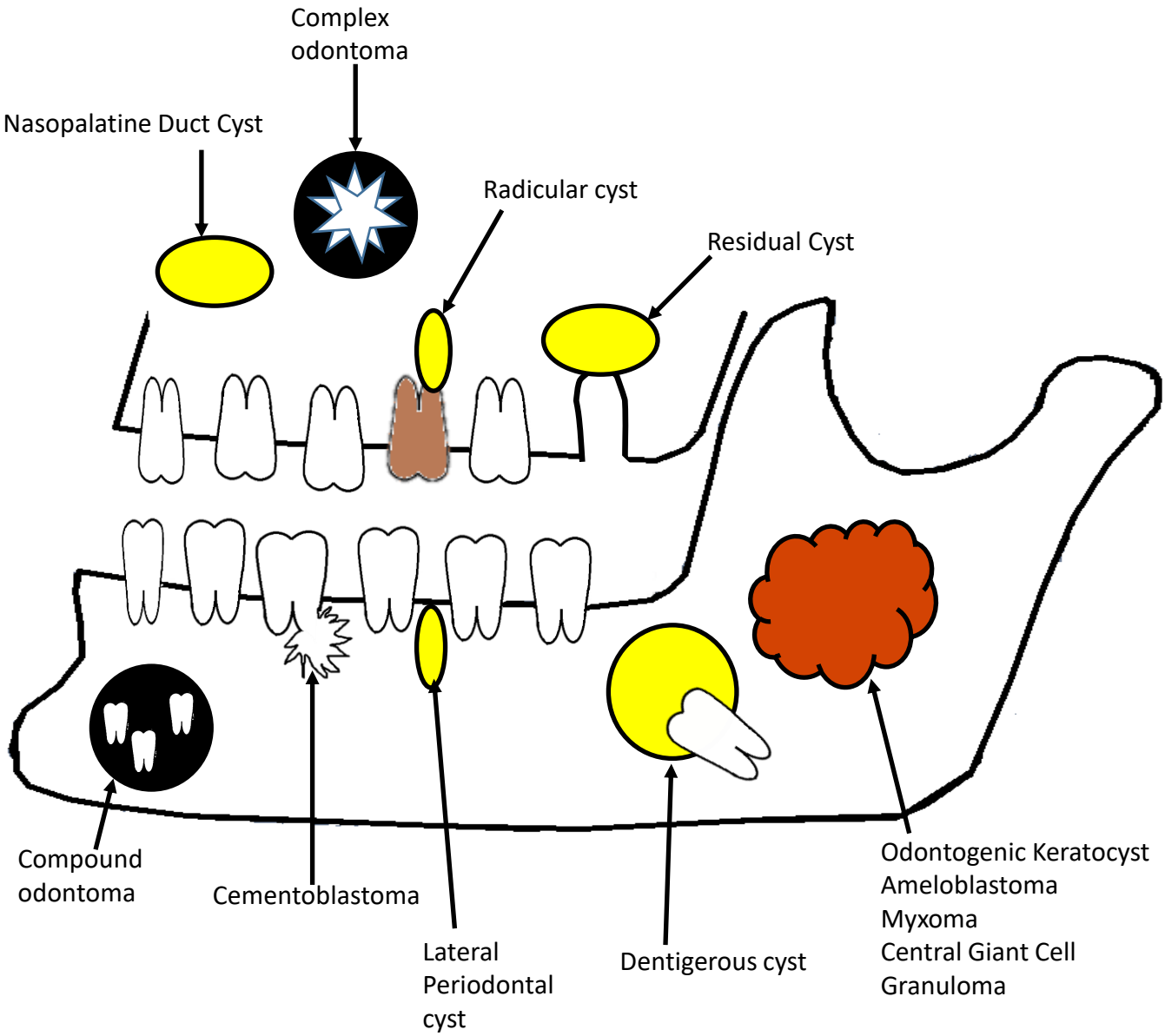


General

Diverse array of cysts, tumors, and reactive lesions can arise in the jaw—many of which are associated with odontogenesis, which can involve both epithelial and mesenchymal elements.

Overall, odontogenic tumors are *relatively rare*, comprising <1% of all oral tumors.
Although most odontogenic tumors are benign, they can be **locally aggressive** and have a high rate of recurrence.

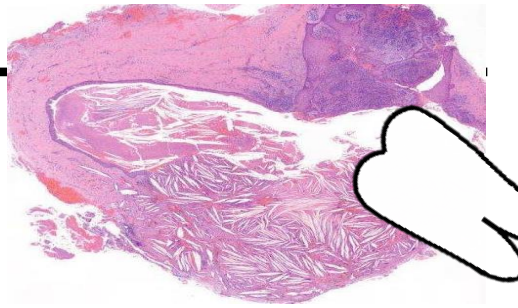
Like with other bone tumors, **radiographic and clinical correlations is essential** to form a diagnosis.
Particularly for odontogenic tumors, it is essential to know the relationship of the lesion to nearby teeth



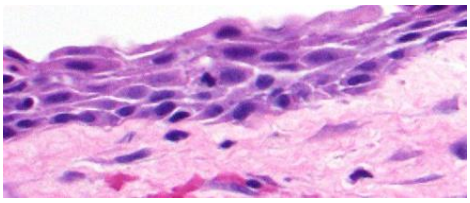
Developmental Cysts

Dentigerous Cyst

aka Follicular Cyst



Most common developmental cyst. Unilocular.
Envelops the crown of an unerupted tooth (most common around impacted teeth, especially mandibular third molars→ so most common in teenagers). Often found incidentally on X-ray looking for missing tooth.

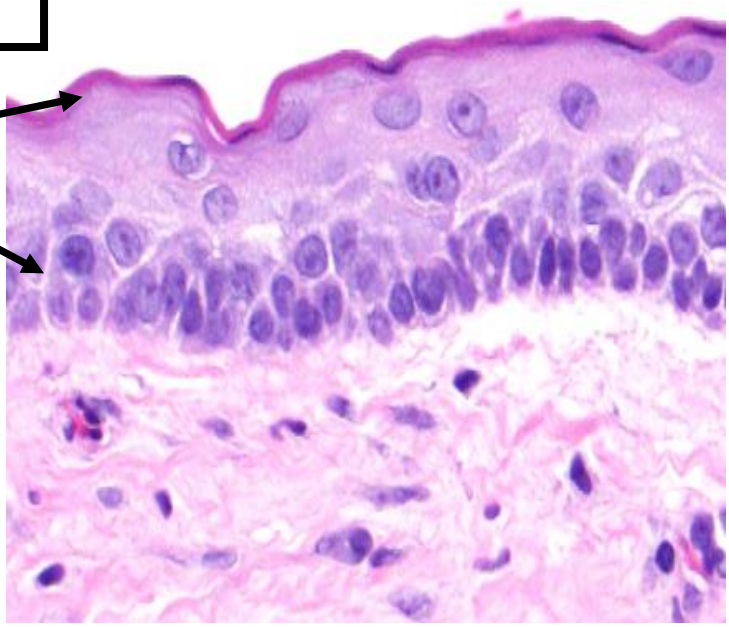


Wall of **fibrous tissue with regular squamoid epithelium** (sometimes glandular).
Variable **inflammation**, **cholesterol clefts**, epidermal hyperplasia.

Cured with excision.

Odontogenetic Keratocyst (OKC)

Odontogenic cyst with thin, regular lining of **parakeratinized squamous epithelium** with basal **palisading hyperchromatic cells**.



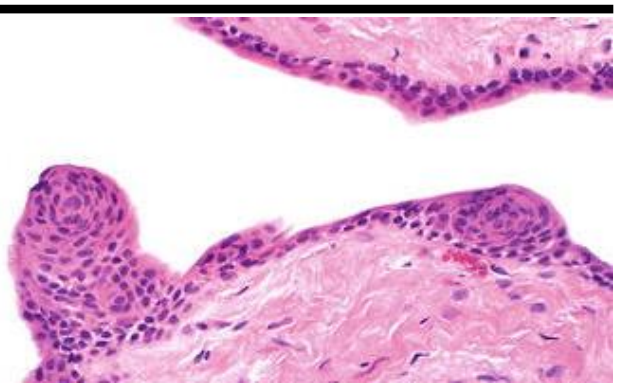
Second-most common odontogenic cyst.
Occur over a broad age range, majority in the mandible. Usually incidental painless findings.

Can see satellite cysts & islands in wall.

If multiple or young patient→ think about **Gorlin syndrome** (Nevoid basal cell carcinoma syndrome), which is associated with germline PTCH1 mutations and multiple cutaneous BCC's (among other things).
PTCH1 mutations are also seen in sporadic OKC

Higher rate of recurrence (~25%).

Lateral Periodontal Cyst



Odontogenic cyst lined by **non-keratinizing squamous epithelium**. Arises from the **lateral aspect or between the roots of erupted teeth**.
Epithelium usually only 1-2 cells thick with focal thicker whorled areas (similar to gingival cyst below).

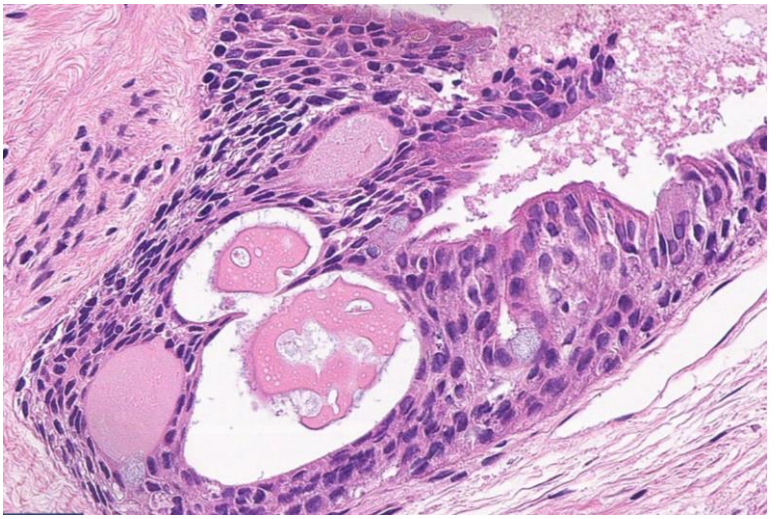
Uncommon. Usually adults in the mandible.
Multicystic variant = Botryoid odontogenic cyst

Gingival Cyst

Odontogenic cysts in the **alveolar mucosa j**ust below oral mucosa surface.
Lined by a thin layer of squamous mucosa 1-2 cells thick with focal thickening. (Similar to lateral periodontal cyst above)

Very common in infants (but often not biopsied as often spontaneously resolve).

Glandular Odontogenic Cyst

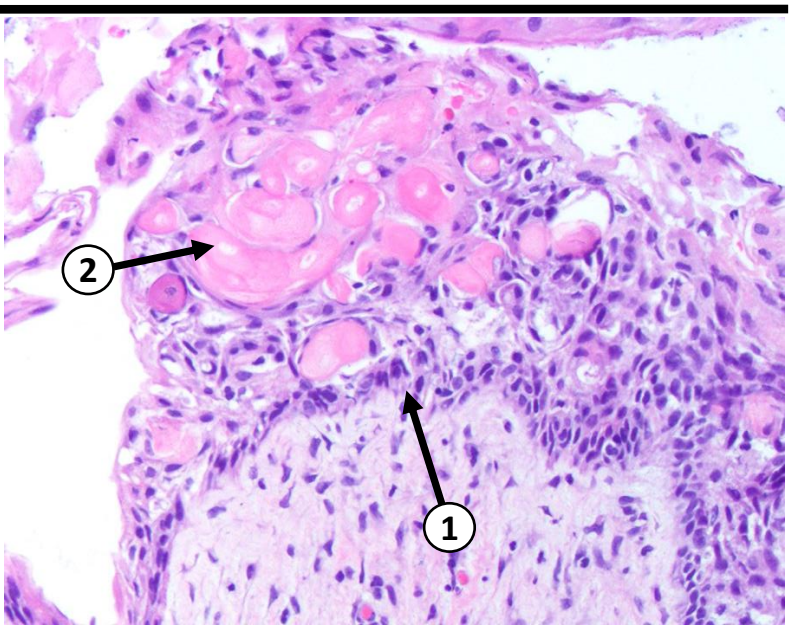


Cyst with epithelial features that simulate **salivary gland differentiation.**

Variable epithelium from 2-3 cells to thicker stratified **squamous epithelium**. Also can see **cuboidal cells**, **microcysts**, **apocrine metaplasia**, clear cells, tufting, **mucous cells**, and cilia

Rare. Often asymptomatic and mandibular. Associated with roots of multiple teeth. High rate of recurrence. Must exclude mucoepidermoid carcinoma

Calcifying Odontogenic Cyst

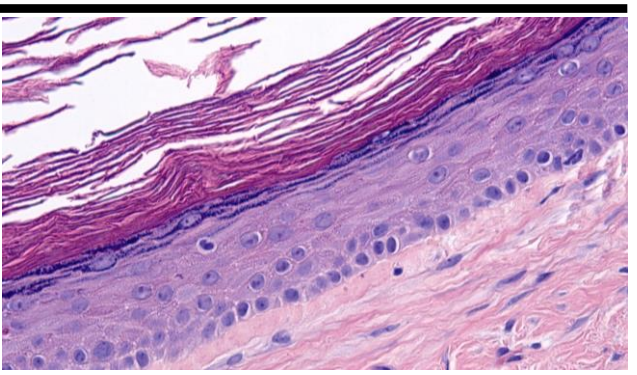


A simple cyst lined by **1) ameloblastoma-like epithelium** (basal layer with palisading columnar cells with overlying area resembling stellate reticulum), which often contains focal accumulations of 2) **"ghost" cells**, which can **calcify**.

Sometimes called "Calcifying *ghost cell* odontogenic cyst."

Rare. Can be associated with an odontoma. Recurrence is rare.

Orthokeratinized Odontogenic Cyst



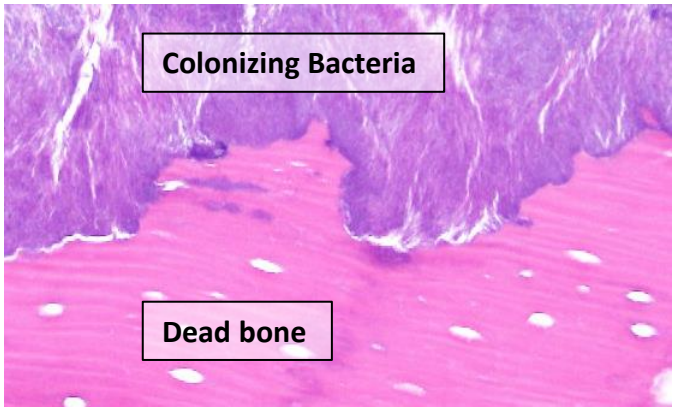
Odontogenic cyst lined by **orthokeratinized squamous epithelium with a prominent granular layer** (looks like skin but without rete ridges).

Nasopalatine Duct Cyst

Non-odontogenic cyst that arises in the **midline of the anterior maxilla** in the hard palate.
Lined by mostly by **stratified squamous epithelium**. May see focal cuboidal, columnar, or ciliated areas.

Reactive/Inflammatory Conditions

Osteonecrosis

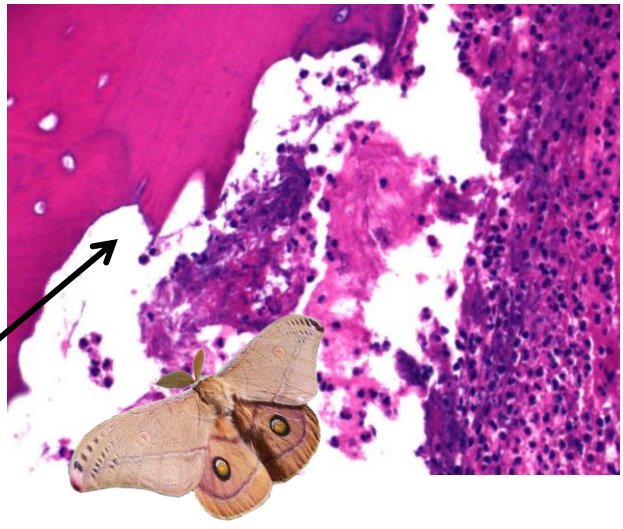


Avascular bone necrosis.
Common causes:
1) **Radiation therapy** (Osteoradionecrosis)
2) **Bisphosphonates**

Necrotic, devitalized bone (empty lacunae).
Fibrosis, fibrinous exudate, and inflammation.
Frequent bacterial colonization.

Overlapping histologic findings with infection/trauma

Osteomyelitis

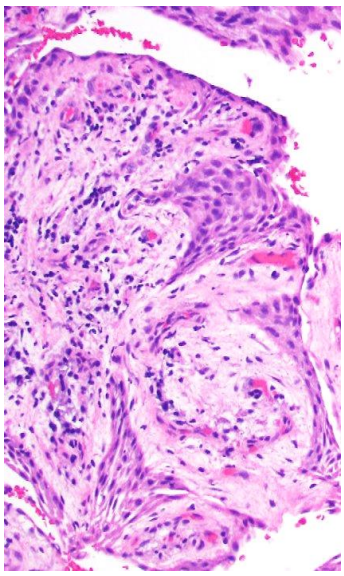


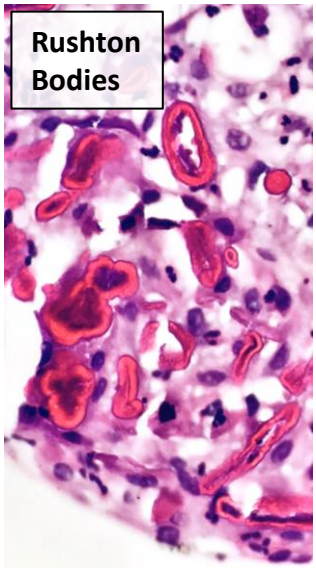
Acute Osteomyelitis: **Neutrophilic inflammation** with **bone destruction, edema, and fibrosis**
Chronic Osteomyelitis: **Plasma cells and lymphocyte-rich inflammation with bone destruction, edema, and fibrosis**

Necrotic bone with empty osteocyte lacunae.
May see brisk osteoclast activity.
Bone often appears "moth eaten" (irregular erosions) with lots of "rat bites."

Often secondary to **poor dentition or dental extractions** (direct inoculation). Can also result from hematogenous spread.

Radicular (Periapical) Cyst





Inflammatory odontogenic cyst **associated with nonvital teeth**. Most common cysts of the Jaw!
Usually in maxilla at apex of tooth root

Formed from proliferating tooth root sheath after pulp necrosis (usually due to dental caries)

Wall of inflamed **fibrous/granulation tissue** with non-keratinizing hyperplastic "arcading" **squamous epithelium**. Often foamy macrophages and cholesterol clefts and eosinophilic **"Rushton" bodies** (nonspecific)

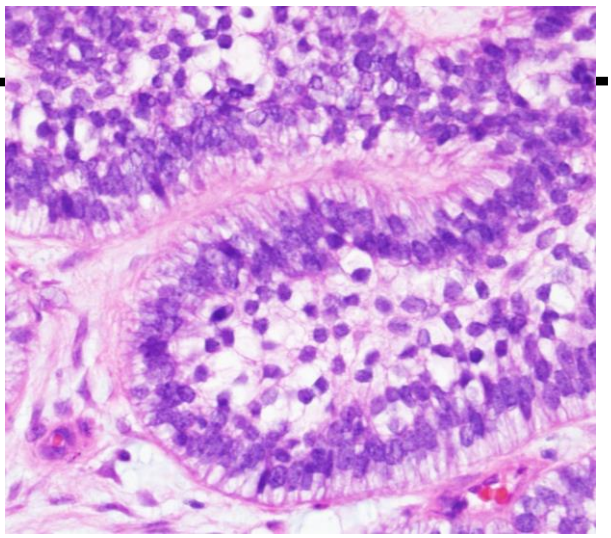
If remains after tooth is extracted→ ***residual cyst***

Inflammatory Collateral Cyst

Inflammatory odontogenic cysts arising on the buccal aspect of toots of partially or recently erupted teeth as a result of inflammation of the pericoronal tissues (tissue over the crown).
Nonspecific morphology→ indistinguishable for radicular cyst.

Epithelial Odontogenic Tumors

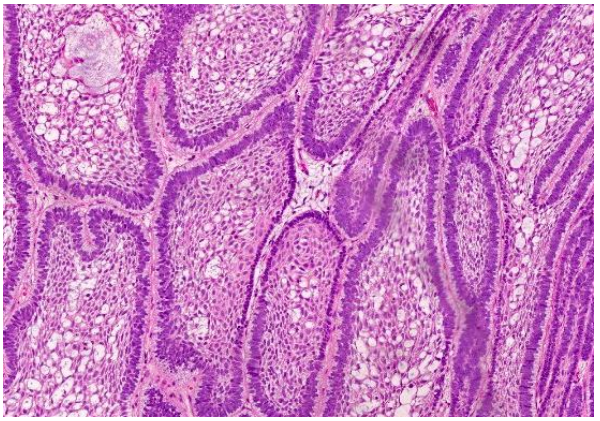
Ameloblastoma



Benign, **intraosseous tumor**. Most often in mandible.
Most common odontogenic tumor (excluding odontomas).
Variable appearance of solid to cystic.
Most common is follicular type:
Columnar/cuboidal palisading cells with hyperchromatic nuclei and reverse polarity. (think of piano keys!)
Central loosely arranged stellate cells resembling stellate reticulum, can undergo cystic change.

Other subtypes: desmoplastic, plexiform, granular, acanthomatous, and basaloid.

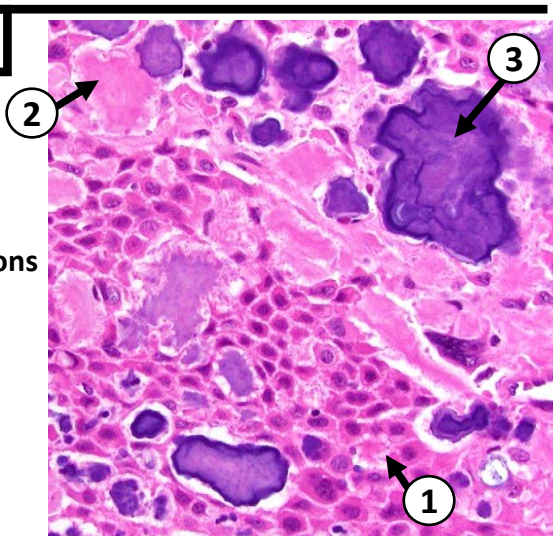
Usually MAPK pathway activation, frequently **BRAF V600E**
IHC: SOX10 Negative (as opposed to basaloid salivary tumors)



Expansile growth. **Tendency to recur** if not completely resected→ so treat with wide local excision.
Unicystic type→ occurs as a single cystic cavity. Often associated with impacted tooth.
Extraosseous/Peripheral type→ in soft tissues of gingiva
Metastasizing ameloblastoma→ Rare. metastasizes despite benign appearance

Calcifying Epithelial Odontogenic Tumor

aka "CEOT" or "Pindborg Tumor"



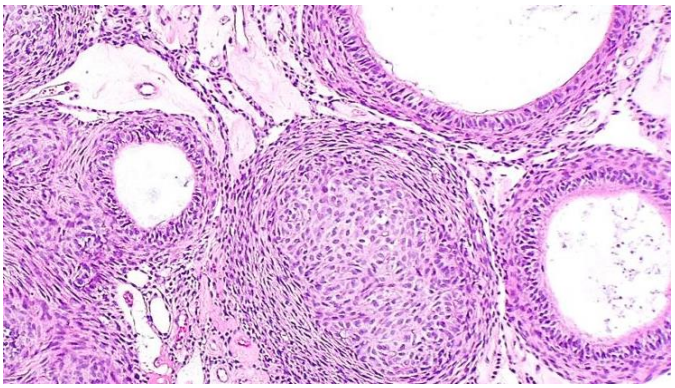
Benign. Relatively rare.

1) Polygonal cells with abundant cytoplasm and intercellular bridges. **2) Abundant pink amyloid** (Congo Red +). **3) Calcifications** often (concentric = "Liesegang rings")

Pleomorphic and giant nuclei, but low mitotic rate and Ki67.

Infiltrate bone, but less aggressive than ameloblastoma.
Treat with excision.

Adenomatoid Odontogenic Tumor

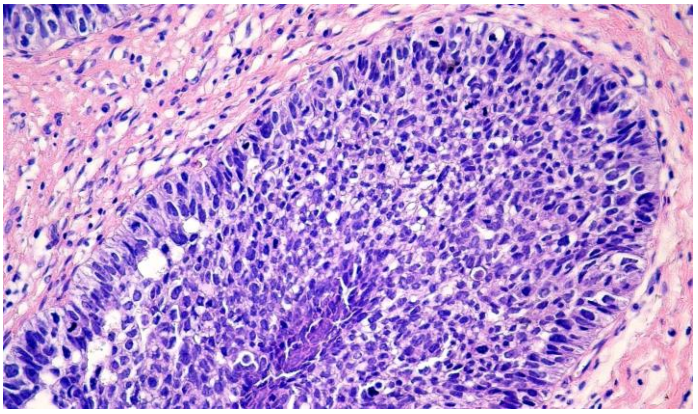


Benign tumor. Usually teens or young adults.
Intraosseous, often in maxilla with unerupted teeth.

Encapsulated. Multinodular with minimal stroma, **spindled epithelial cells**, and rosette or **duct-like spaces** with outward oriented nuclei

Limited growth potential (possibly hamartomas).
Enucleate with low recurrence rate.

Ameloblastic Carcinoma

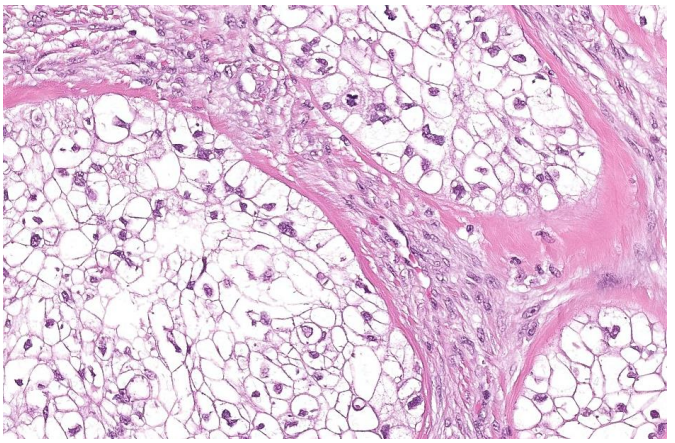


Malignant counterpart to ameloblastoma.
Rare. Ameloblastoma histology (peripheral palisading, etc…) but with cytologically malignant cells.

Often see: nuclear pleomorphism, mitoses, hyperchromasia, vascular/perineural invasion, and/or necrosis (the usual findings of malignancy).

Frequent BRAF mutations.
Multimodal treatment. Reasonable survival.

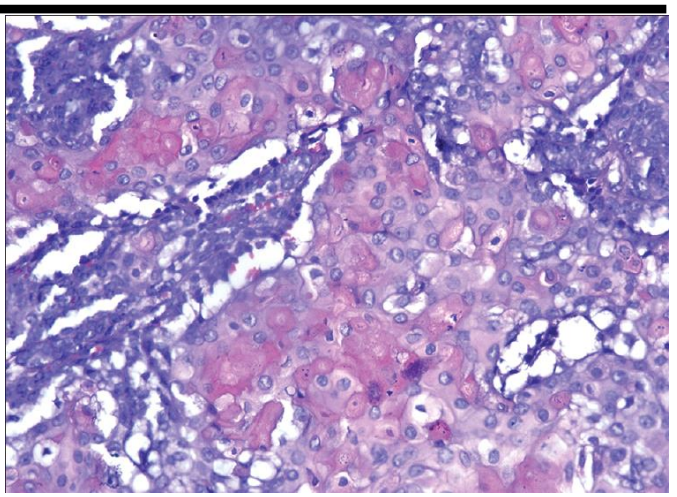
Clear Cell Odontogenic Carcinoma



Odontogenic carcinoma with **sheets and islands of vacuolated clear cells** (glycogen-rich)**.**
Cells have distinct cell membranes and irregular small dark nuclei. Often basaloid at periphery of tumor.
IHC: CK AE1/AE3 (+)

Molecular: **EWSR1-ATF1 translocations** in majority (same as **clear cell carcinoma of the salivary gland**!!)

Ghost Cell Odontogenic Carcinoma



Think of as a ***malignant*** **Calcifying Odontogenic Cyst** or Dentinogenic Ghost Cell Tumor (sometimes even present as a precursor).

Odontogenic carcinoma with "ghost cells," abherent keratinization, and dentinoid deposition in variable quantities with features of malignancy like pleomorphism, mitoses, necrosis, etc…

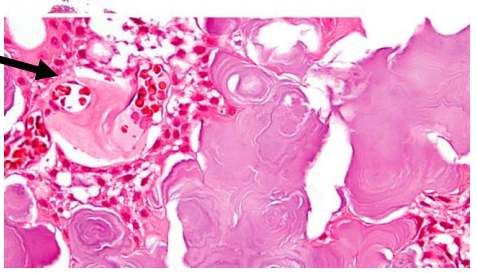
Rarer Odontogenic Epithelial Tumors

Sclerosing Odontogenic Carcinoma
Primary intraosseous carcinoma with cytologically bland infiltrating cords of tumor cells, markedly sclerotic stroma. Often PNI.

Squamous Odontogenic Tumor
Very Rare. Benign intraosseous tumor with bland squamous cell islands of varying size. Usually young patients with slow-growing lesion. Outer layer is flat (NOT palisading).

Odontogenic Tumors with a Mesenchymal Component

Odontoma



Hamartomas (epithelial & mesenchymal malformations)
Most common odontogenic tumor!
More common in young, often seen with unerupted teeth.

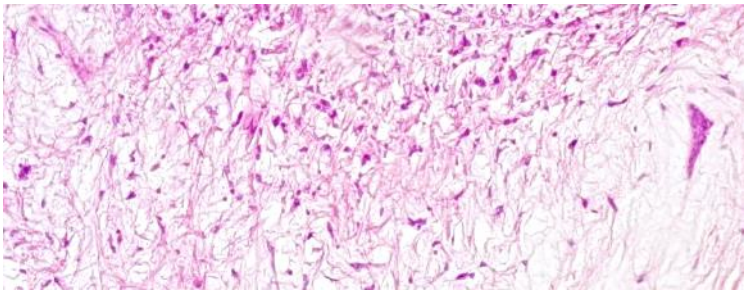
Compound odontoma—**multiple rudimentary teeth** (with dentin, cementum, enamel, pulp, etc…).

Complex odontoma—**irregular mass of tooth components** (with *no* anatomic resemblance to a tooth)

Associated with Gardner Syndrome (FAP).

Vs Supernumerary tooth (Hyperdontia)→ complete, well-formed tooth

Odontogenic Myxoma

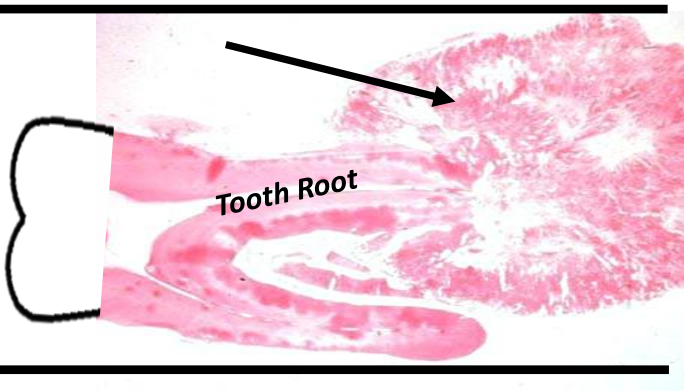


Benign.

Stellate to spindled cells in abundant myxoid matrix. May see rare odontogenic epithelium.

Good prognosis, but can recur if not completely removed.

Cementoblastoma



Benign.

Calcified cementum-like tissue deposited directly on a tooth root.

Odontogenic fibroma—Rare. Mature fibrous tissue with variable amounts of inactive-looking odontogenic epithelium (± calcifications). Can be intra- or extraosseous.

Ameloblastic fibroma—Rare. Mixed tumor consisting of odontogenic mesenchyme resembling dental papilla and epithelial tissue resembling odontogenic epithelium (but with no dental hard tissue, otherwise consider an odontoma)

Dentinogenic ghost cell tumor—Benign but locally infiltrative neoplasm with predominant ameloblastomatous component with stellate reticulum, aberrant keratinization, ghost cells and material resembling dentin.

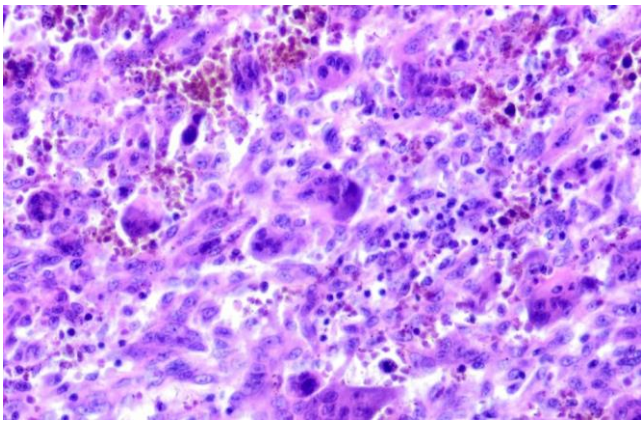
Ondontogenic carcinosarcoma—Extremely rare. Proliferation of malignant epithelial proliferation (Ameloblastic carcinoma) and a sarcoma

Odontogenic sarcomas—Rare. Cytologically malignant mesenchymal proliferation with a benign epithelial component (malignant counterpart of amelobastic fibroma)

Giant Cell-rich Tumors

Many of these have identical morphology, so clinical correlation (e.g., PTH, radiology) is essential!!

Central Giant Cell Granuloma



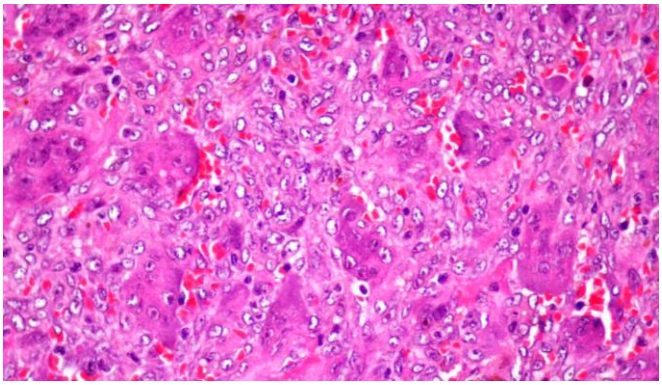
Old name: Reparative Giant Cell Granuloma

Benign. Usually females <20yrs. Often in **mandible**. Localized (but sometimes aggressive) osteolytic lesion.

Mononuclear spindle-shaped/polygonal cells with osteoclast-type giant cells in a vascular background with hemorrhage & hemosiderin.

Usually treat with curettage.

Peripheral Giant Cell Granuloma



aka Giant cell epulis

Reactive (Benign). Most common oral giant cell lesion.

Occurs in **gingiva or alveolar mucosa** (*outside* of bone)
Localized response to chronic irritation

Proliferation of mononuclear spindle cells with osteoclast-like giant cells in a vascular stroma with hemorrhage, hemosiderin, and immature bone.

Cherubism

Autosomal Dominant inherited condition
Symmetrical expansion of the maxilla and mandible
→ give a "heavenly gaze" (big cheeks, upward gaze)
→ look like cherubs in Renaissance paintings→

Presents in **childhood**→ often regresses spontaneous by adulthood. Mutations in **SH3BP2.**

Nonspecific histology (similar to above)

Aneurysmal Bone Cyst— Cystic/multicystic osteolytic neoplasm composed of blood-filled spaces lined by fibrous septae with osteoclast-type giant cells. USP6 Translocations. Relatively rare in jaw. Usually young.

Simple Bone Cyst— (aka unicameral bone cyst) Intraosseous cavity lined by fibrous tissue filled with serous or bloody fluid. Usually long bones, rarely in mandible.

Hyperparathyroidism—Hyperparathyroidism (often due to adenoma) stimulates a proliferation of osteoclasts with fibrous tissue and hemorrhage. Forms a mass lesion, often in Mandible and Maxilla. Resembles many other giant cell-rich lesions, so knowing PTH is key. Treat with parathyroidectomy.

Giant Cell Tumor of Bone—Usually in long bones of adults (**not** in Jaw). Local proliferation of numerous (reactive) large osteoclasts together with a mononuclear neoplastic component without atypia. IHC: (+)H3.3 G34W, often p63,

Bone/Cartilage Tumors with a special predilection for the Jaw

Note: You can get pretty much *any bone tumor* in the jaw, so also look at the dedicated bone guide ;-)

Melanotic Neuroectodermal Tumor of Infancy

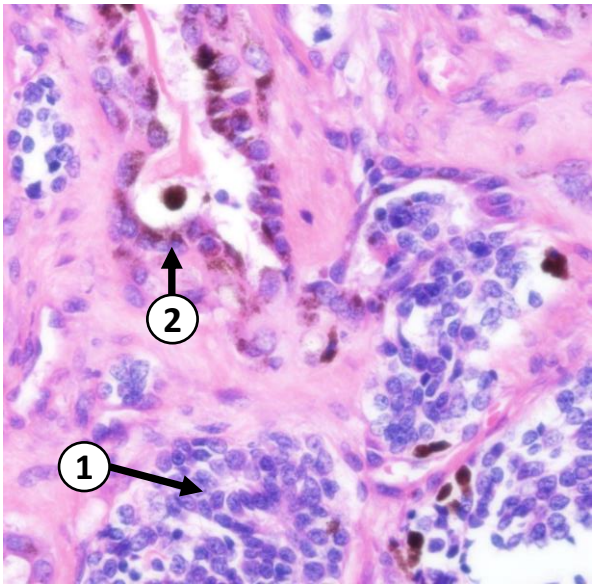
Benign but locally aggressive. Rare.
Usually **infants** (<1 yr) in the **maxilla**.
Rapidly enlarges causes deformity.

Biphasic with: 1) **small neuroblast-like cells** surrounded by 2) **larger melanin producing epithelioid cells**
Arranged in alveolar structures with cords and trabeculae set in **fibrous stroma**

Because of melanin, often grossly appears blue.

IHC: Both cell types (+) synaptophysin. Larger epitheloid cells (+) CK and HMB45 (but not other melanoma stains). Usually (-) desmin, chromogranin, S100, NF.

Locally destructive, but usually cured by complete excision.



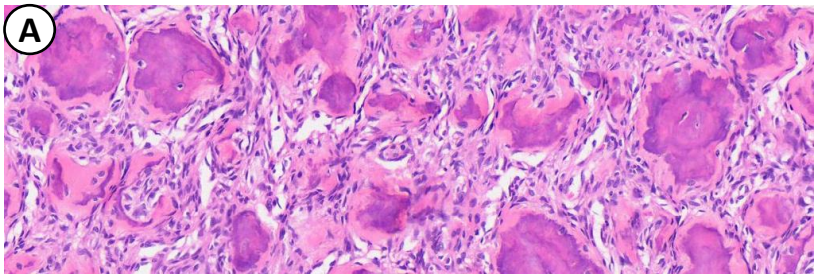
Ossifying Fibroma

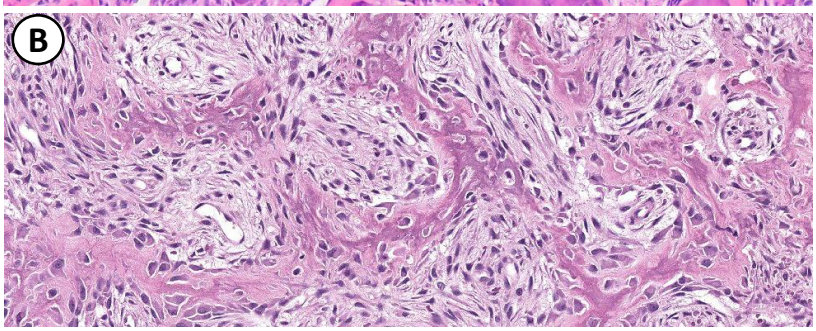
Benign.
Usually in Jaw. Sometimes craniofacial.

Well-defined fibro-osseous lesions with hypercellular **fibroblastic stroma containing variable amounts of osteoid** or cementum-like material. Osteoblastic rimming.

Hyperchromatic nuclei, but no significant pleomorphism or mitoses

3 subtypes
A) Juvenile psammomatoid OF
B) Juvenile trabecular OF
C) Cemento-ossifying fibroma





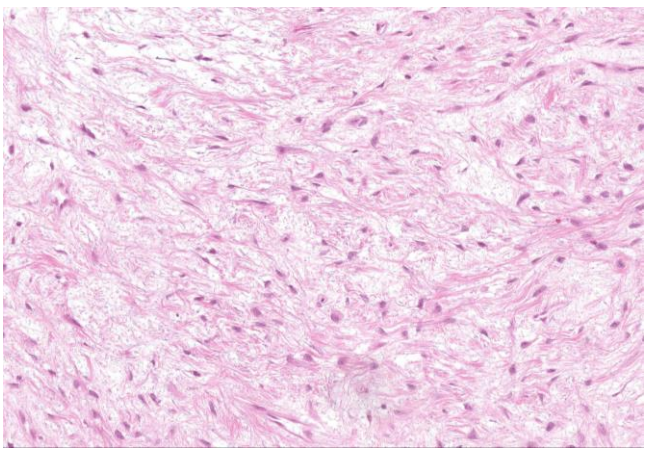
Desmoplastic Fibroma

aka "Desmoid tumor of bone"

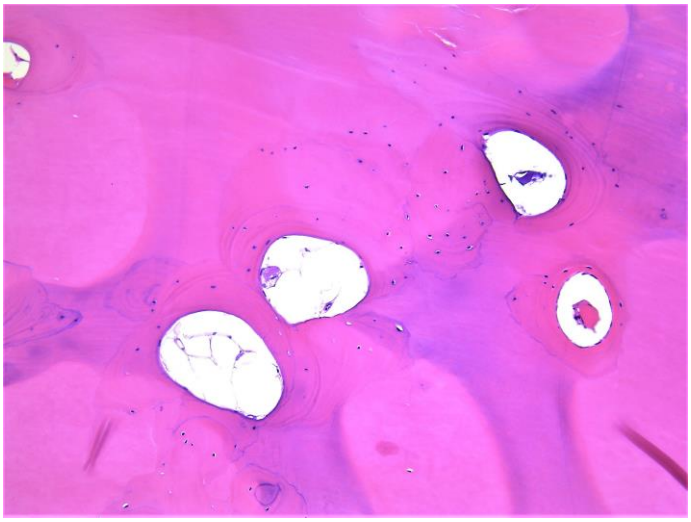
Locally aggressive (myo)fibroblastic lesion of bone.
Often young patients, most often in mandible.

Infiltrative/permeative lesion composed of fascicles of uniform myofibroblasts with slender tapering nuclei.

IHC: (+) SMA, Sometimes nuclear β-catenin.
Molecular: CTNNB1 hotspot mutations or APC mutations.
Recurrence may occur.



Osteoma



Benign. Usually on face or jaw bones (sites of membranous ossification).

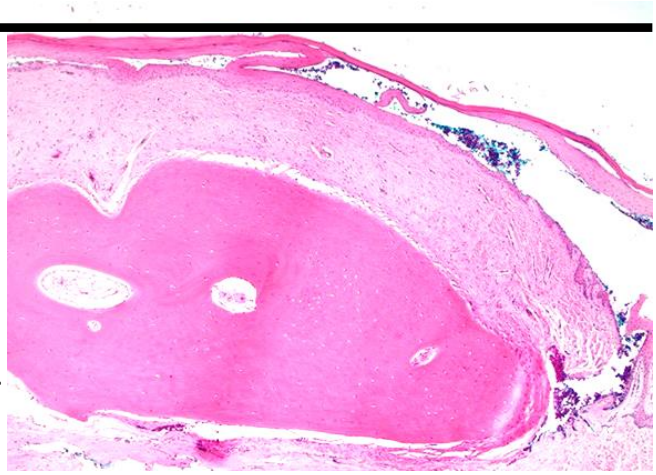
Often on the **surface**.
Composed of **lamellar/cortical-type bone.**
Osteoblasts are inconspicuous.

When develops in medullary cavity→ use the term "Bone Island"

Multiple osteomas→ seen in Gardner's syndrome (subset of FAP)

Generally require no treatment unless symptomatic

Torus/Exostosis

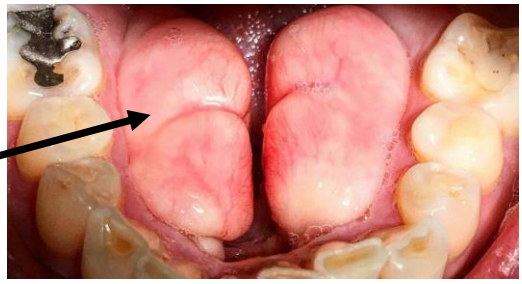


Benign. Thought to be reactive/developmental.
First appear when young adult and slowly grow.
Seem to grow in locations of mechanical stress.

Usually composed of dense, mature, lamellar bone
Minimal osteoblastic activity. Fatty marrow.
Frequently become ischemic→ loose osteocytes.

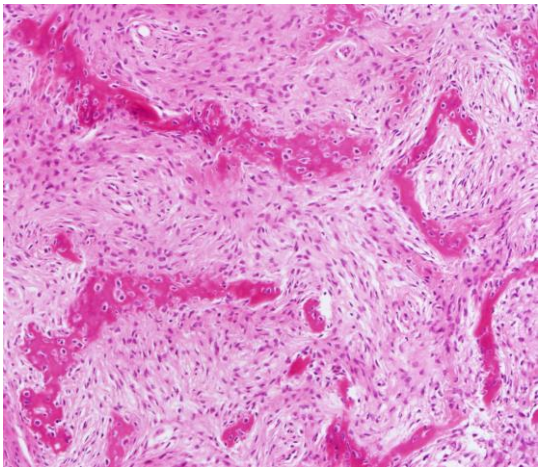
Don't need to be treated unless troublesome to patient.

May be hard to differentiate from osteoma (above) pathologically, so may have to rely on clinical information to differentiate.



3 main locations: (Tori are usually bilateral and multilobulated/bossellated)
Palatal torus→ midline of hard palate
Mandibular torus→ lingual surface of the mandible
Buccal exostosis→ facial surface of alveolar bone

Fibrous Dysplasia 骨病理很棒



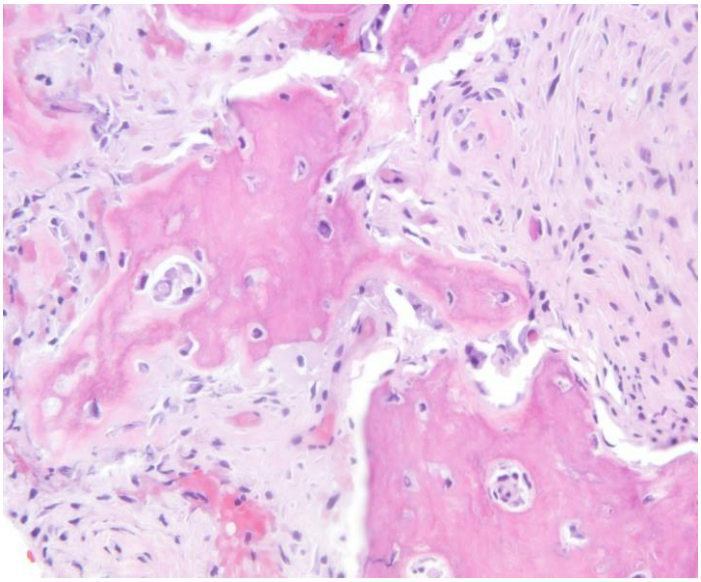
Benign. Often **medullary** in the craniofacial bones or femur.
Can be monostotic (one bone, more common) or polyostotic (multiple bones, often presenting younger)

Fibro-osseous lesion with: 1)**Irregular, curvilinear woven bone** ("Chinese letters") without conspicuous osteoblastic rimming, and 2)**fibrous tissue** composed of bland fibroblastic cells.

Molecular: **GNAS** activating missense mutations

Both ***Mazabraud syndrome*** (FD + Intramuscular myxomas) and ***McCune-Albright syndrome*** (FD + Café-au-lait macules + endocrinopathies) have GNAS mutations

Cemento-osseous Dysplasia

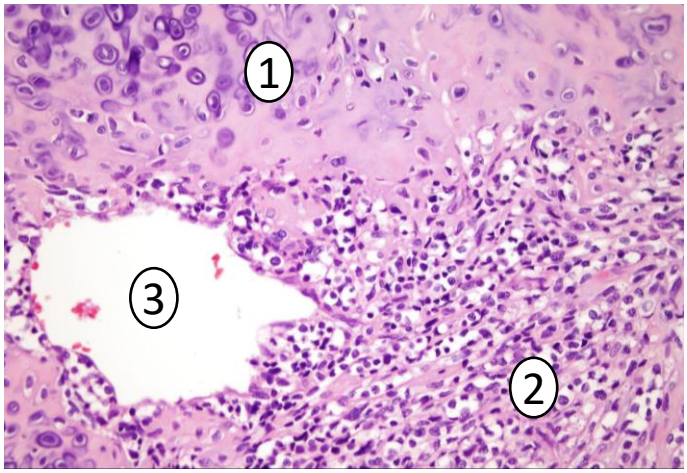


Benign. Non-neoplastic.
Most common fibro-osseous lesion of the jaw.

Occurs exclusively in tooth-bearing regions of jaws.
Relatively common, especially among middle-age African-American women.
Often can be identified clinically/radiographically (with no need for pathologic Dx!)
Well-circumscribed with a thin radiolucent rim, not fused to roots

Variably cellular fibrous stroma.
Mineralizing osteoid and cementum-like material.
Become increasingly calcified with age.

Mesenchymal Chondrosarcoma



Biphasic tumor with 1)Islands of organized **hyaline cartilage** in 2)an **undifferentiated component with high N:C ratios**.
Frequent staghorn vessels (3).

Varied locations, but often craniofacial

Molecular: **HEY1-NCOA2 fusions**.

Aggressive behavior.