IMAGING OF CYSTS OF THE JAWS.

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N. Serman

This is an area where radiology plays an important role in assisting with the diagnosis, determining the size of the lesion and the relationship to adjacent structure. **Cysts occur more commonly in the jaws than in any other bone.**

Definition: A cyst is an epithelial lined, pathological cavity having fluid, semi-fluid or gaseous contents: and surrounded by connective tissue.

TECHNICAL ASPECTS.

1. Occlusal view
2. Pan
3. PA, OM, lateral oblique
4. CT - for bony lesions.
5. MRI - for soft tissue lesions

ETIOLOGY.

Developmental
Inflammatory
Traumatic
Neoplastic

As the cyst enlarges it is more likely to cause cortical expansion (and thinning) but the margins tend to remain **intact.** Numerous classifications have been published of cysts of the jaws and most of them are satisfactory.

CLASSIFICATION.

N = asked on NERB
B = asked on Nat Boards

I. **BONE**

A. **EPITHELIAL**

1. **Developmental**

a. Odontogenic

i.	Dentigerous (follicular)	B. N.
ii.	Eruption	N
iii.	Lateral periodontal	B. N.
	Gingival cyst of adult	N
iv.	Keratocyst (primordial)	B.N
v.	Calcifying Odontogenic	B.N
vi.	Gingival cyst of newborn	

b. Non Odontogenic.

i.	Nasopalatine duct cyst	B.N.
	Cyst of incisive papilla	B.

ii. Globulomaxillary ? ? B.N.
iii. Median palatine. (mandibular)

2. **Inflammatory**

i. Radicular B. N.
ii. Residual. B. N.
iii. Paradental
iv. Collateral B. N.

B. **NON-EPITHELIAL**

i. Latent bone cyst/ lingual mandibular salivary gland depression (defect) / Stafne cyst B.N.
ii. Simple/unicameral / traumatic/ hemorrhagic B.N.
iii. Aneurysmal bone cyst
iv. Mucosal cyst of maxillary antrum B.N.
v. Extravacation cyst and ranula B

C. GORLIN GOLTZ / **Basal cell nevus syndrome** B.N.

II. **SOFT TISSUE.**

i. Nasolabial N. B
ii. Dermoid N. B
iii. Thyroglossal N.
iv. Branchial cleft N
[Also called Lympho-epithelial]

A. **EPITHELIAL**.

1. **Developmental**

Clinically, cysts may achieve extreme size before they are discovered clinically; especially true in the mandible.

A. **ODONTOGENIC CYSTS.**

I. DENTIGEROUS CYST

A follicular cyst, or dentigerous cyst is a developmental odontogenic cyst which develops around the fully-formed **crown of an unerupted** tooth. Most are discovered on routine radiographs, when a tooth has failed to erupt, a tooth is missing, teeth are tilted or are otherwise out of alignment. The dentigerous cyst is most frequently found in the **age group 20 - 40** years. The most prevalent areas for dentigerous cysts are, in order of frequency, the **mandibular third** molar, **maxillary third** molar, maxillary canine and mandibular second premolar. i.e. teeth that are prone to impaction. About 75% are located in the mandible. This is the most common pericoronal cyst

Radiographically. There is no sharp borderline between a normal enlarged pericoronal space and a cyst; if the width of this space has reached more than 2.5

mm [and has an **irregular** outline] it is probably a dentigerous cyst. Dentigerous cysts may be classified according to the site at which the cyst develops in relation to the crown of the tooth. It may be of the **central** or **lateral** type. Impacted supernumerary teeth often develop dentigerous cysts. Dentigerous cysts have a greater tendency than other jaw cysts to produce **root resorption** of adjacent teeth i.e. they are the most aggressive of the cysts. Found after the age at which the tooth should have erupted. In younger patients consider a differential diagnosis of ameloblastic fibroma.

ii ERUPTION CYST

Is a variation of a dentigerous cyst and occurs partly in the soft tissue. The eruption cyst may impede a tooth in its eruption within soft tissues overlying the bone. The eruption cyst produces a smooth, fluctuant swelling over the erupting tooth which may be either the color of normal gingiva, or **pale blue**. It is usually painless unless infected.

Radiographically - The cyst may throw a soft-tissue peri-coronal shadow, but there is little bone involvement except that the dilated and open tooth crypt around the unerupted crown, may be seen on the radiograph.

iii LATERAL PERIODONTAL CYST / GINGIVAL CYST OF ADULT

Lateral periodontal cysts occur most frequently in the mandibular canine-premolar area in young adults . They are usually symptomless and are discovered during routine radiological examination of the teeth.

Radiographically - shows a well-defined, unilocular, round or avoid lucent area. The cyst lies somewhere between the apex and the cervical margin of vital teeth. They vary in size from as small as 1 mm to larger lesions which may involve the length of the root. The Botyroid cyst is a multilocular variation

iv. ODONTOGENIC KERATOCYST and (PRIMORDIAL CYST)

Keratocyst or primordial is a cyst with keratinized epithelium. A primordial cyst forms from the tooth bud and forms instead of a tooth. All primordial cysts are keratocysts but all keratocysts are NOT primordial cysts. The keratocyst arises directly from the dental lamina or remnants thereof. Often contains cheesy material that is produced by the epithelium. Some investigators use the non-committal term odontogenic keratocyst regarding the pathogenesis and only state that the cyst lining is keratinized.

Keratocysts have characteristic locations, the ramus of the mandible, the canine region in the maxilla and mandible, and the mandibular third molar region. In many instances, patients are free of symptoms until the cysts have reached a large size.

Patients may complain of either pain, swelling or discharge. The primordial cyst tends to extend in the medullary cavity and expansion of the cortex occurs late. The enlarging cyst may produce displacement of the teeth

Radiographically. Primordial cysts may appear as **unilocular**, round or avoid radiolucent areas. Often the lesions are extensive. Most are well demarcated with a **distinct sclerotic** margins as expected from a slowly enlarging lesion. If **multilocular**, the locules are **well demarcated** and may be misinterpreted as an ameloblastoma. The scalloped margins suggest that unequal growth activity may be taking place in different parts of the cyst. Primordial cysts may impede the eruption of adjacent teeth and this results in a "dentigerous" appearance radiologically. The mandibular canal is often displaced and highlighted. Keratocysts have a pronounced tendency to **recur**. Most common distal to the canine tooth. Primordial cysts forms in place of a tooth; most commonly found in the mandibular third molar region.

v. CALCIFYING ODONTOGENIC (EPITHELIAL) CYST - GORLIN

The calcifying odontogenic cyst has many features of an odontogenic cyst and tumor - epithelial proliferation and continuous growth. It originates from developmental odontogenic epithelial tissue. The lesion usually occurs as a slowly enlarging, frequently painless and non-tender swelling of the jaw. Intra- osseous lesions may produce a bony expansion and may be fairly extensive. Often associated with en unerupted tooth. **Affects females under 40 and males over age 40.**

Radiographically The lesion appears as a well defined, uni- or multilocular radiolucent, **cystic** area. Initially there are no calcifications and thus appears as a non-specific cyst. Later, small irregular calcified [opaque] bodies may be seen in the radiolucent area and in some cases the calcification may be substantial and occupy the greater part of the lesion. This is the only cystic lesion with opacities.

Differential Diagnosis partially calcified odontoma, adenomatoid odontogenic tumor, ossifying fibroma; ameloblastic fibro-odontoma, calcifying epithelial odontogenic tumor.

vi. GINGIVAL CYST of newborn or adult Not seen radiologically. Not to be mistaken with Epstein's Pearl (on median palatal raphe) and Bhon's nodule - seen on alveolar ridge of the newborn.

B **NON-ODONTOGENIC CYSTS.**

i. Nasopalatine Duct Cyst / Cyst of the Incisal canal (Incisive papilla cyst)

Is a non-odontogenic developmental cyst located in the incisive canal or in the anterior palatine papilla and develops from the embryonic ducts of Scarpa and Stenson. (primitive organs of smell)

Etiologically when the incisive canals are formed, the nasopalatine ducts are enclosed within the canals, as a regular duct, an epithelial cord or as interrupted epithelial islands.

Clinically - the most common signs are palatal swelling and displacement of **vital** central incisor teeth. Swelling may occur in the midline on the labial aspects of the alveolar ridge. Found in **older patient** (40) who may complain of a salty taste.

Radiographically the nasopalatine duct cyst is a well-demarcated radiolucency in the midline of the palate, apical to the central incisor teeth. The lucency varies from **round** to oval or **heart-shaped**.

Cysts may develop bilaterally in both Stenson canals and in some instances the radiolucency may be seen laterally if a single cyst develops in one of the major lateral canals of Stenson. Very large cysts extend posteriorly and superiorly. The margins of nasopalatine duct cysts are well-corticated unless they become infected. Root resorption rarely occurs. Teeth are **vital.**

Differentiating between cyst and large incisal foramen.

The cyst has well defined borders all the way around the cyst. As it enlarges it becomes heart-shaped and pushes the apices of the centrals apart. Usually larger than 1 cm. Foramen well defined along lateral borders only and has an irregular shape with indistinct borders. According to S. White, the median palatine cyst is an extension of the incisive canal cyst .

ii.Nasolabial / Naso-[extra] alveolar Cyst

The nasolabial cyst occurs outside the bone in the nasolabial folds below the ala nasi. It is classified as a soft tissue cyst. The most frequent symptom is swelling and difficulty in nasal breathing. Rarely patients complain of pain. In most cases the cysts are unilateral, grow slowly. They fill out the nasolabial fold and may **lift** the ala nasi, distort the nostril and produce a swelling of the floor of the nose. Intra-orally they form a bulge in the labial sulcus. The majority of cases appear in adults with a predominance in females.

Radiographically -The cyst can be seen radiographically only if the kVp is reduced and the correct angle used. Otherwise, nothing is seen, unless opacifier is injected. It is then seen as a spherical radiopacity lying against the inferior and lateral borders of the anterior bony aperture of the nose, extending from near the midline to the canine fossa.

iii. Globulomaxillary cyst.

Clinically: Usually nothing until it becomes very large. Many authorities feel it is either a radicular or a keratocyst.

Radiographically: Seen between the vital maxillary lateral incisor and canine as a well demarcated, unilocular, **pear**-shaped lucency.

2. INFLAMMATORY (ODONTOGENIC)

i. Radicular Cyst

Radicular cysts arise from epithelial residues in the periodontal ligament as a result of low grade irritation. (inflammation). The inflammation follows upon necrosis of the dental pulp and cysts arising in this way are found most commonly at the apices of **non**-vital teeth. In deciduous teeth the **furcation** area is initially involved. They may, however, also be found on the lateral aspects of the roots in relation to lateral accessory root canals - then called a collateral or accessory cyst. Radicular cysts are by far the most common cystic lesion in the jaw. They may be the result of trauma in which case no caries will be seen.

Clinically, the radicular cyst is usually symptomless in its early stages and may cause rather

extensive destruction before it is discovered. It may cause expansion of the affected area. Radicular cysts on maxillary lateral incisor, often cause an expansion of palatal bone and mucosa.

Radiographically, the radicular cyst is a well circumscribed periapical, **unilocular**, radiolucency. The cyst may cause the neighboring structures to be displaced, especially in the maxillary sinus and the mandibular canal. Root resorption is occasionally seen. An acute exacerbation may result in the disappearance of the characteristic peripheral cortical rim.

ii. Paradental cyst

The paradental cyst (Shear 1983) and the mandibular infected buccal cyst (Stoneman and Worth 1983) may be the same entity. Both cysts appear on the lateral aspect of partially erupted **vital** mandibular molar teeth. The paradental cyst is seen in older patients in association with third mandibular molar and the mandibular infected buccal cyst usually around the first or second molar teeth in children or young adults.

Radiographically A well demarcated radiolucency distal [and buccal] to a partially erupted tooth. A 90 degree occlusal view will show that it is **more buccally** situated than distally.

iii. Residual dental cyst

The residual dental cyst results where a collateral, lateral periodontal, radicular, or any other cyst or granuloma remains after the extraction of a tooth or a root.

Radiographically - A round unilocular, radiolucency with well defined borders in an edentulous area. Differential diagnosis important

iv. Collateral [accessory canal] cyst

Found on the lateral aspect of **roots of non vital** teeth. Following necrosis of the dental pulp the irritation follows the tract of the lateral accessory root canal. Should the tooth be removed this can also result in a residual dental cyst.

Radiographically - Very similar to a lateral periodontal cyst but the associated tooth will be found clinically to be **non vital**.

B. **NON-EPITHELIAL**

i. Lingual Mandibular Salivary Gland Defect / Latent bone cyst / defect (Stafne Cyst)

The lesion is developmental but the pathogenesis of this entity is still unknown.
Rarely found in young people. There is no epithelial lining and this is **NOT a cyst**

Clinically there are no symptoms. The lesion is detected incidentally on radiographs of the mandible. They represent developmental defects, on the lingual aspects of the mandible and which are occupied by a **lobe of normal submandibular salivary gland**. The defects are not necessarily congenital. Tolman and Stafne (1967) have shown that radiological evidence of their development may first appear after the patients have reached middle age.

Radiographically. The elliptical or ovoid radiolucency has a well- defined radiopaque border. Normally, it is situated, **inferior** to the mandibular canal in the molar area and is round to oval. Sialography will show that the defect contains healthy salivary tissue.

ii. Simple / Unicameral / Hemorrhagic / Traumatic Bone Cyst

The simple bone cyst, which occurs in the mandible and never in the maxilla, is a **unicameral** cavity, empty or partly filled with a clear or a sero-sanguinous fluid. Does **not** have an epithelial lining. The lesion has been described under a variety of names, such as **solitary** bone cyst, **hemorrhagic** bone cyst, **traumatic** bone cyst, etc. Seen in **young** individuals.

Clinically, more than 50 per cent of the reported cases present a definite history of trauma, which also is the most favored theory of origin. The simple bone cyst is often discovered incidentally, but swelling due to lateral expansion of the mandible and pain is present in more than 30 per cent of the cases. The mandibular **premolar / molar** area of **young adults** is the most frequent site. Teeth are **vital**.

Radiographically, the lesion appears as a radiolucency with an irregular but fairly well demarcated outline. Often the lesion extends upward between the roots, producing the characteristic **scalloped** outline. The lamina dura of the teeth is identifiable in most cases. **NO tilting** of teeth and **NO root resorption** occurs.

iii Aneurysmal Bone Cyst

The aneurysmal bone cyst is a benign intra-osseous lesion characterized by blood filled spaces of varying size. The cyst occurs almost exclusively in children and young adults. There are 3 stages of development; an ***initial stage*** due to a lytic reaction; a ***growth stage*** with an enlarged area of bone destruction and peripheral cortication; and a ***mature stage*** with bony expansion, cortication of the margins and septae formation [which often appears multilocular]

Clinically, the lesion is found most often in the mandible. It is unilateral, and often is asymptomatic except for tension; characterized as a fast growing expansive lesion.

Radiographically, the aneurysmal bone cyst is characterized by irregular cyst-like radiolucencies intermingled with thin **bony trabeculae** giving a honeycomb or **soap-bubble** appearance. Laterally, the lesion is usually covered by a thin cortical layer. Is this a cyst?

iv Mucosal cyst of the Maxillary Antrum / Mucocele / pseudocyst

The mucosal cyst of the maxillary antrum, referred to as a mucocele or mucous retention cyst, probably occurs more commonly than was previously thought. See lecture on maxillary sinus.

The mucosal cyst is characterized by the absence of symptoms in most cases and are usually discovered in the course of radiological examination. The cysts appear as **dome-shaped** radiopacities on the floor of the sinus and which have smooth and uniform outline. They vary in size from minute to very large and may occupy the entire maxillary sinus. The smooth curved borders are well-defined but not corticated. There is no resorption of adjacent bone and of particular importance is the persistence of the thin radio-opaque line of the antral cortex itself.

3. Multiple Cysts and Basal Cell Nevus Syndrome / Gorlin-Goltz Syndrome

This syndrome consists of a number of changes, of which **multiple kerato and dentigerous cysts**, multiple basal cell nevi on the skin of **young people** and skeletal abnormalities are among the most frequent. It is inherited as an autosomal dominant trait, but with a varying, often poor, penatrance. The cysts appear early in adolescence.

Clinically, frontal bossing, hypertelorism with a broad nasal root and occasionally a slight mandibular prognathism gives patients with this syndrome a rather characteristic face. Numerous small, flattened, brownish / red basal cell tumors in young people are found in the skin, especially on the face, trunk, neck and arms.

Radiographically, cystic radiolucencies in the mandible and the maxilla. The impacted teeth, NOT supernumary teeth, often with kerato and dentigerous cysts, are displaced and may have malformed roots. **Calcification of falx cerebri occurs. Bifid ribs**

II. **SOFT TISSUE CYSTS**

Not within the scope of Dental Radiology.

i. Nasolabial discussed above Nerb
ii. Dermoid
iii. Thyroglossal Nerb
iv. Branchial cleft Nerb
v. Sebaceous
vi. Extravasation cyst. / ranula Nerb

Remember the cyst of the incisal papilla is also soft tissue cysts. Also extravacation cyst, and the cyst-like lesions seen in early herpes and herpes zoster[shingles]