

Cysts of the oral region

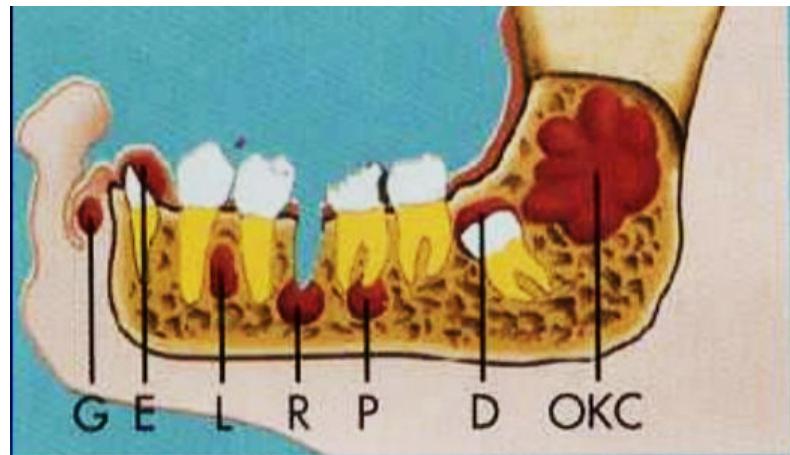
Dr. Natheer Al-Rawi
Thursday 5/9/2019



Dr. Natheer Al-Rawi

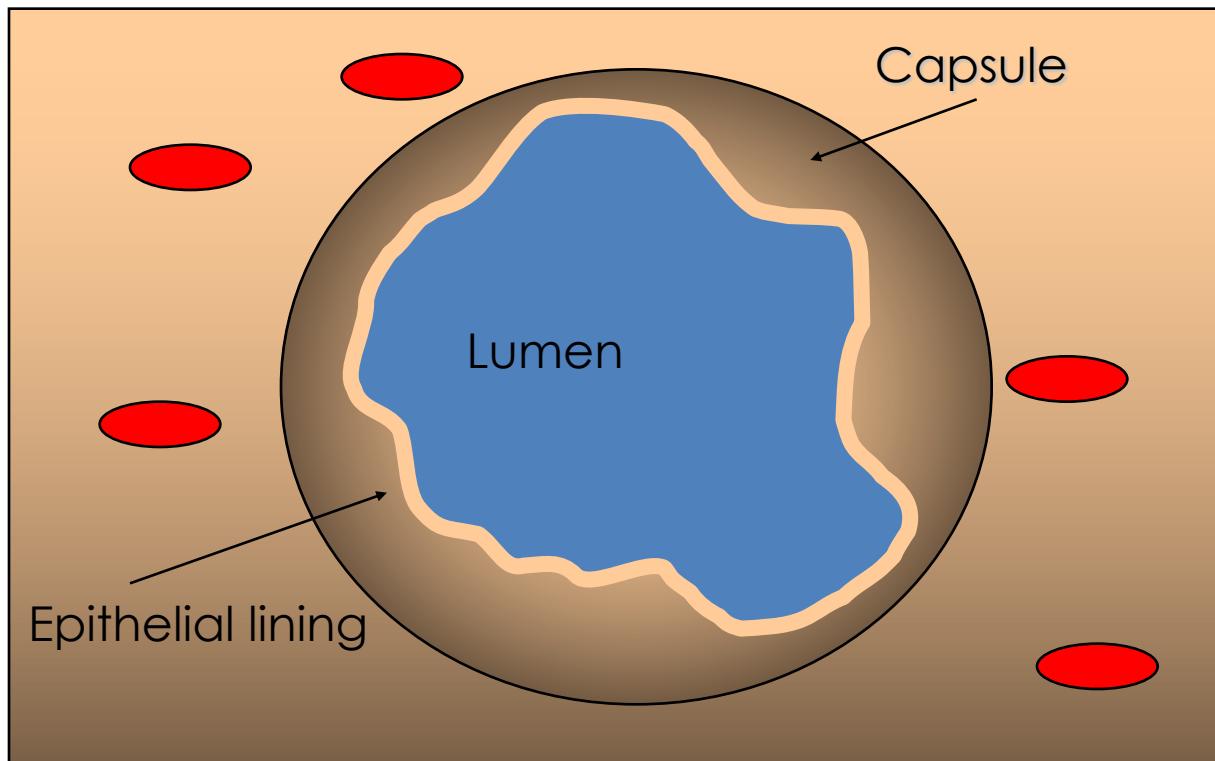
Learning Objectives:

- Define & Classify cysts affecting Oral & Paraoral structures.
- Distinguish between intraosseous & extraosseous cysts.
- Differentiate between Odontogenic & Non-odontogenic cysts.
- Enumerate the diagnostic tests of assistance in confirmation .
- Describe clinical, radiographic & histopathological features of different types of cysts.
- Enumerate the DD of Od. & non-Od cysts
- State the recurrence rate & prognosis of specific cysts.



CYST

- Fluid -filled pathologic cavity lined by epithelium & surrounded by a definite CT wall.



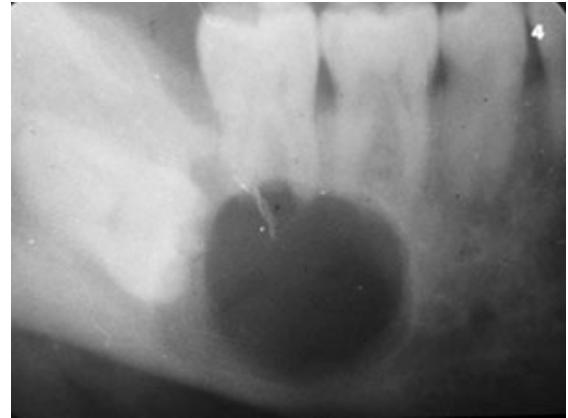
Questions need answers:

- Cysts occur more often in the jaw bones than in any other bones! Why?
- Where the fluid of the cyst is coming from?
- Why cysts has spherical or round shape?
- What are the most common clinical features of the cyst?

Why we study cysts?

Cysts are common lesions & are **clinically important** because they are:

- Often **destructive**.
- They produce significant signs & symptoms , especially when they become **large or infected**.



Cysts can be classified into:

- I . Cysts of the jaws
- II . Cysts associated with the maxillary antrum
- III. Cysts of the soft tissues of the mouth, face, neck and salivary glands

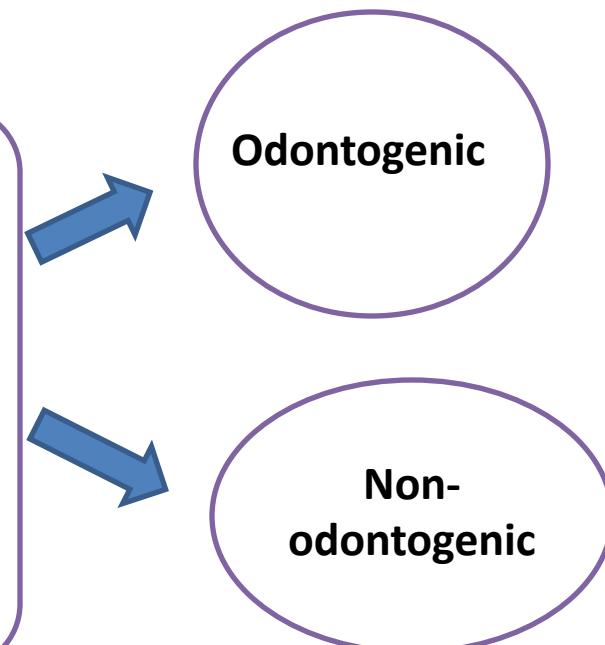
Cysts could be:

- Epithelial lined (True cysts)
- Non –epithelial lined (pseudocysts)

True cysts of oral region can be divided into:

Inflammatory

Developmental



WHO Classification

Developmental Cysts

Odontogenic

Non Odontogenic

- Nasopalatine duct cyst
- Nasolabial cyst
- Median Palatal
- Others

- ✓ Dentigerous
- ✓ Eruption
- ✓ OKC ?!
- ✓ Lateral Periodontal
- ✓ Gingival
- ✓ Glandular

Inflammatory Cysts

Radicular

Paradental

- Apical
- Lateral
- Residual

Cysts of Maxillary antrum

- Mucocele
- Retention cyst
- Pseudocyst
- Postoperative maxillary cyst

Frequency of occurrence of cysts

Table 1.1 Distribution of 3498 jaw cysts according to diagnosis.

Cysts	Number	%
Radicular/residual cyst	1825	52.2
Dentigerous (follicular) cyst	599	17.1
Odontogenic keratocyst (including orthokeratinised)	355	10.2
Nasopalatine duct cyst	404	11.6
Paradental cyst (including juvenile type)	94	2.7
Solitary bone cyst	35	1.0
Calcifying cystic odontogenic tumour	28	0.8
Eruption cyst	27	0.8
Developmental lateral periodontal cyst	24	0.7
Nasolabial cyst	21	0.6
Gingival cyst of adults	21	0.6
So-called 'globulomaxillary' cysts	18	0.5
Inflammatory collateral cyst	15	0.4
Aneurysmal bone cyst	15	0.4
Glandular odontogenic cyst (since 1992)	6	0.2
Postoperative maxillary cyst	5	0.1
Mucosal cyst of maxillary antrum	4	0.1
Total	3498	100.00

Table 1.2 Distribution of 7121 odontogenic cysts according to diagnosis. From Jones *et al.* (2006), Sheffield.

Cysts	Number	%
Radicular cyst	3724	52.3
Dentigerous cyst	1292	18.1
Odontogenic keratocyst (including orthokeratinised)	828	11.6
Residual cyst	573	8.0
Paradental cyst	402	5.6
Unclassified odontogenic cysts	210	2.9
Lateral periodontal cyst	28	0.4
Calcifying odontogenic cyst	21	0.3
Gingival cyst	16	0.2
Eruption cyst	15	0.2
Glandular odontogenic cyst	11	0.2
Epstein pearl	1	0.0
Total	7121	100.00

Prevalence of odontogenic cysts and tumors among UAE population

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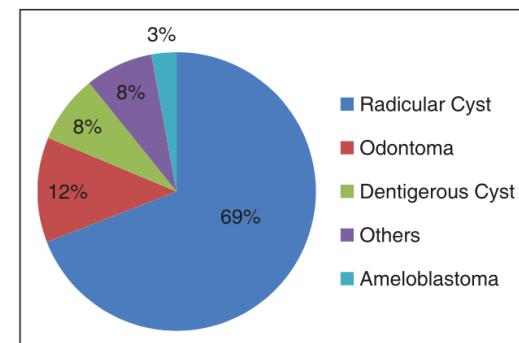


Figure 1: Distribution of odontogenic cysts and tumors among a sample from the UAE population

ODONTOGENIC CYSTS

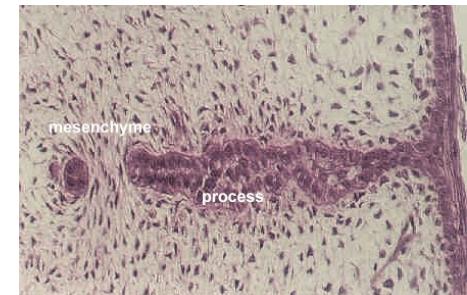
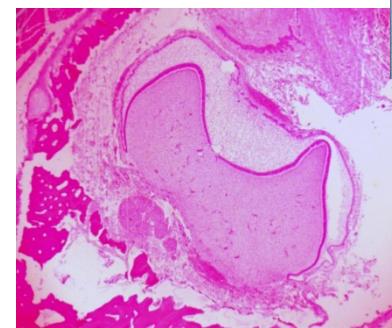
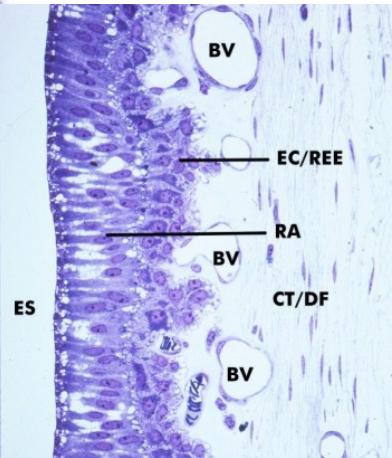
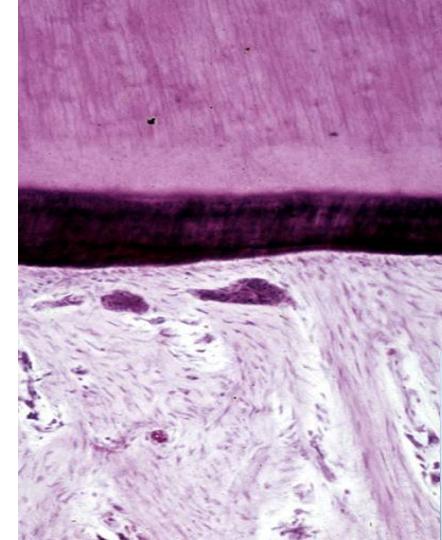
Cysts in which the lining of the lumen is derived from epithelium produced during tooth development.

Odontogenic cysts are derived from the epithelial structures:

Rest of Malassez: Remnant of Hertwig's epithelial root sheath, they persist in periodontal ligament after complete root formation.

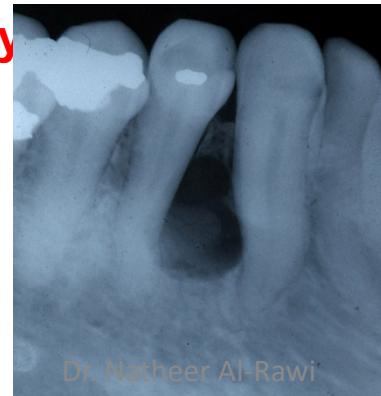
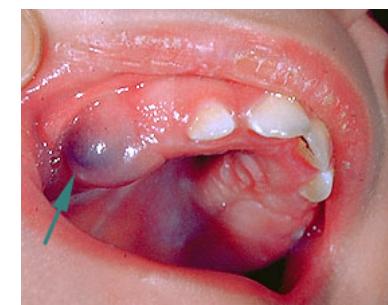
Reduced Enamel Epithelium: Residual epithelium that surrounds the crown after complete enamel formation.

Remnants of dental Lamina : Islands & strands of epithelium that originate from oral epithelium in tissue after inducing tooth development.



Histogenic classification of Odontogenic Cysts

- Cysts derived from Rests of Malassez:
 - ✓ **Periapical cysts**
 - ✓ **Residual cyst**
- Cysts derived from Reduced Enamel Epithelium:
 - ✓ **Dentigerous cyst**
 - ✓ **Eruption cyst**
- Cysts derived from dental lamina:
 - ✓ **Odontogenic keratocyst**
 - ✓ **Lateral periodontal cyst**
 - ✓ **Gingival cyst of the adult**
 - ✓ **Dental Lamina cyst of the newborn**
 - ✓ **Glandular odontogenic cyst**
- Unclassified:
 - ✓ **Paradental cyst**



RADICULAR CYST

Synonyms: Periapical cyst or dental cyst or apical periodontal cyst

Disease mechanism: Epithelial cell rest of Malassez prolif.---cystic degeneration by infl. from non-vital tooth. Cyst expand by osmotic pressure.

Clinical features:

- **Most common odontogenic cyst**
- **Associated with non-vital tooth**
- **Asymptomatic unless secondarily infected.**
- **On palpation:**

Hard; when outer bony cortex is intact.

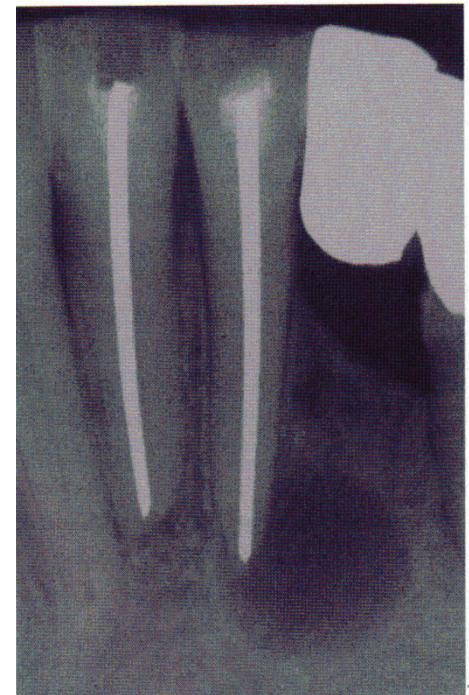
Crepitant; when cortex is thin (egg shell crackling)

Rubbery & fluctuant; if outer cortex is perforated.

Imaging features:

1. Location:

- At the apex of non vital tooth, occasionally on mesial or distal.
- 60% in maxilla (esp. incisors & canines)
- Buccal to developing bicuspid if deciduous molars are affected.



2. Periphery & shape:

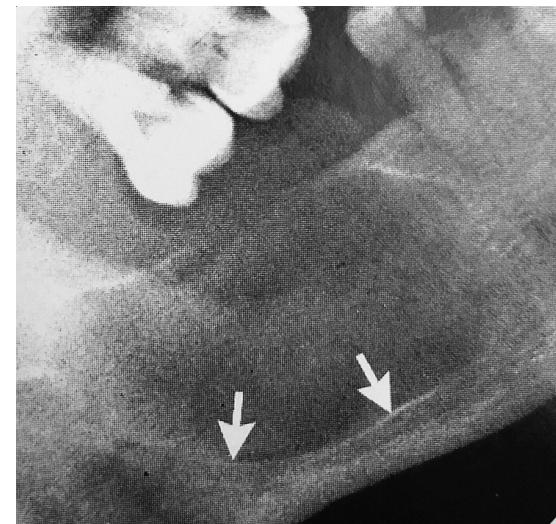
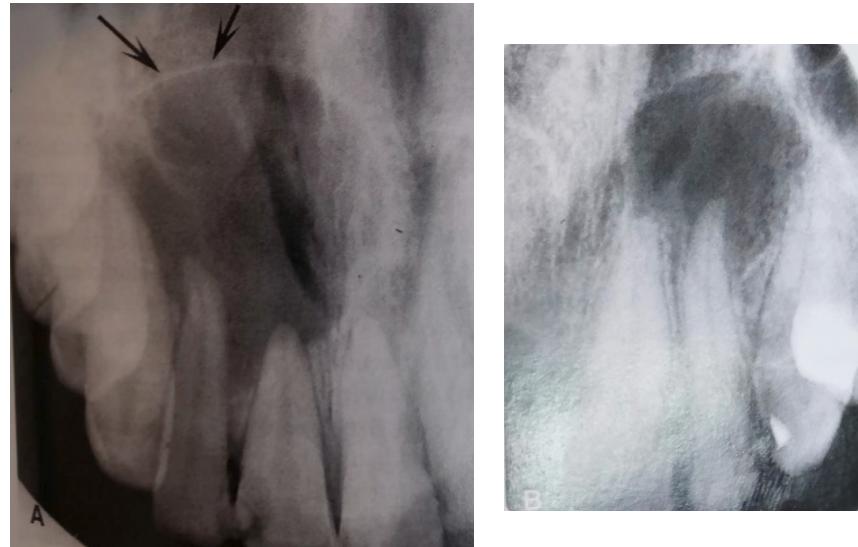
- Well defined cortical border which is lost when secondarily infected.
- The outline is usually curved or circular, unless influenced by surrounding structures such as cortical boundaries.

3. Internal structures:

- Mostly radiolucent
- Occasionally with dystrophic calcification (long-standing cyst) [sparsely distributed particulate RO].

4. Effects on surrounding structures:

- Displacement & resorption of roots of adjacent teeth (if large).
- Resorption pattern have curved outline.
- Sometimes cyst may resorb the roots of the related non-vital tooth.
- Cyst may displace the IDC inferiorly.



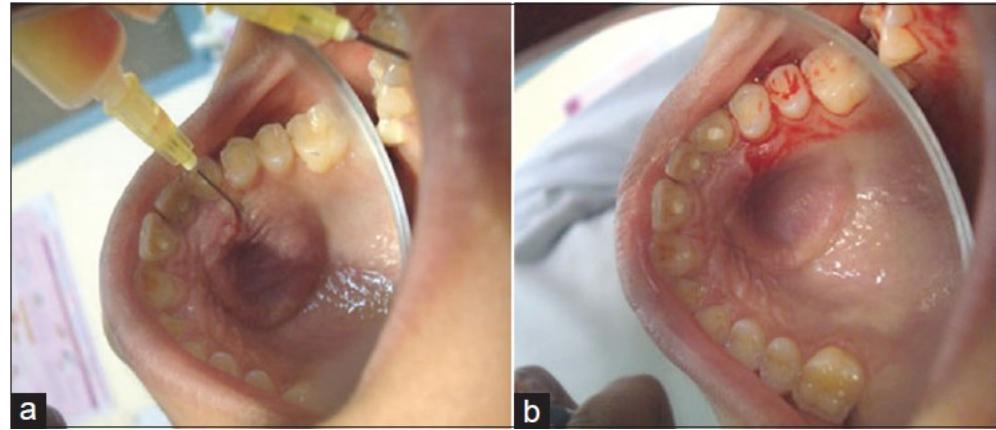
5. Differential Diagnosis:

Small cysts (< 1 cm)

- I. apical granuloma
- II. Periapical pocket cyst

Larger cyst (> 2cm)

- I. Apical scar
- II. PA cemental dysplasia (early stage)



Cyst with upper lateral may be positioned palatal or between laterals and canine:

- I. Small OKC
- II. Lateral Periodontal cyst

Discussion:

Radicular cyst is associated with non-vital tooth;

How to differentiate radiographically between vital & non vital tooth?

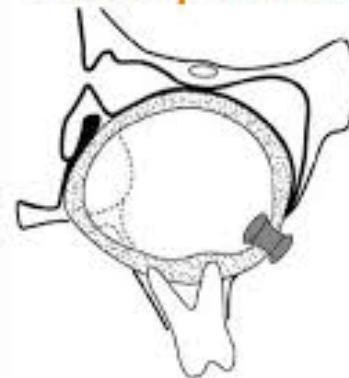
6. Management:

1. Tooth extraction
2. Endodontic therapy
3. Surgical removal or marsupialization

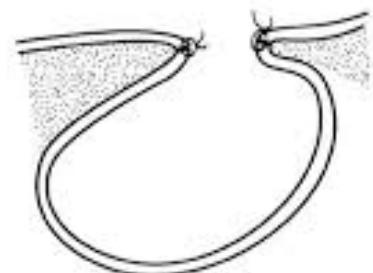
7. Recurrence:

Rare or unlikely if cyst has been removed completely.

Decompression



Marsupialization



8. Pathogenesis:

Three phases:

1. the phase of initiation,
2. the phase of cyst formation and
3. the phase of enlargement.

The phase of initiation

- **Endotoxins** and **inflammatory cytokines** that are the main stimulators of the epithelial proliferation
- The epithelial cell rests are initiated to proliferate by inflammation as a result of necrotic debris and bacterial antigens (endotoxins) derived from the dead pulp.
- Endotoxins from ***Actinobacillus actinomycetemcomitans***, ***Porphyromonas gingivalis*** and ***Escherichia coli*** could directly stimulate epithelial proliferation in a dose-dependent manner.
- Both humoral and cell-mediated reactions have been implicated in the pathogenesis.
- Inflammatory cytokines in the proliferation of epithelial cell rests (mainly IgGs)

The phase of initiation (cont'd)

- Complement activation may also occur directly under the influence of endotoxins.
- T cells predominated and that helper cells predominated over cytotoxic/suppressor cells in most periapical granulomas and cysts.
- In cysts, however, they found increased numbers of plasma cells suggesting that humoral immune reactions may take on a more important role in cysts.
- Studies confirmed that the epithelial lining of radicular cysts may synthesize cytokines that are known to be important in bone resorption.

Phase of cyst formation

- Two possibilities , both are feasible and may operate independently of one another.
- ***First:*** epithelium proliferates and covers the bare connective tissue surface of an abscess cavity or a cavity which may occur as a result of connective tissue breakdown by proteolytic enzyme activity .
- ***The other,*** “more widely supported theory ”, postulates that a cyst cavity forms within a proliferating epithelial mass in an apical granuloma by degeneration and death of cells in the center.
- MMP-13 may have a role in the pathogenesis of cysts by facilitating epithelial cell proliferation and invasion of the granulation tissue.

Phase of enlargement:

- Osmosis makes a contribution to the increase in the size of cysts with absence or inadequate lymphatic drainage
- Lytic products of the epithelial and inflammatory cells in the cyst cavity provided the greater numbers of smaller molecules which raised the osmotic pressure of the cyst fluid.
- Intra-cystic pressure in the cyst is inversely correlated to the cyst size. Therefore , increased pressure played a pivotal part in early cyst growth.

Cyst Lining:

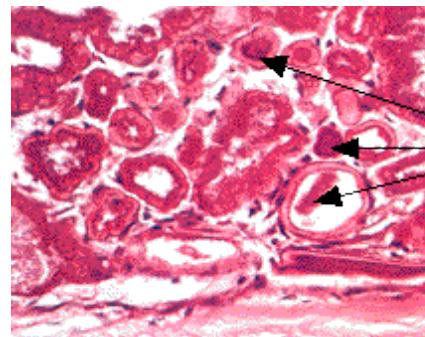
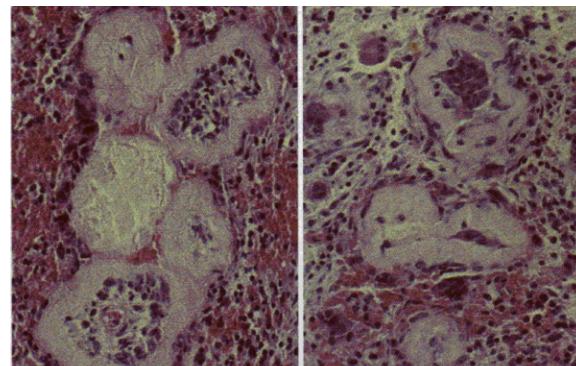
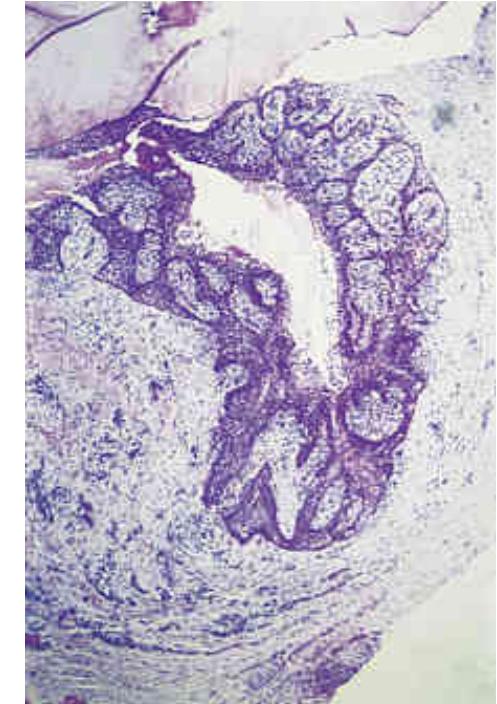
In newly formed cysts the epithelial lining is:

- **Irregular** and may vary in thickness .
- **Hyperplasia** is a prominent feature resulting in **long anastomosing cords** of epithelium forming **complex arcades** extending into the surrounding capsule.
- The **capsule** is **richly vascular and diffusely infiltrated by inflammatory cells**.

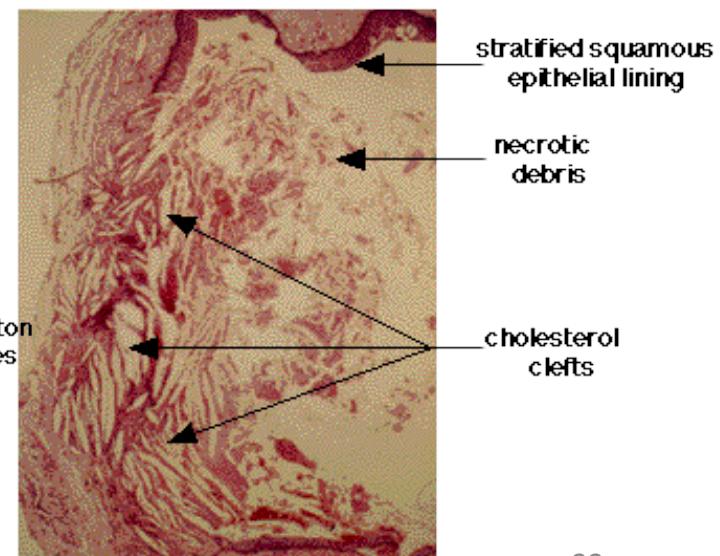
In established cysts the epithelial lining is:

- **More regular** in appearance and of fairly even thickness .
- **Metaplasia** of the epithelial lining may give rise to **mucous cells**, found in about 40 % of radicular cyst linings
- In approximately **10 %** of cases the lining contains hyaline **eosinophilic bodies - Rushton bodies** - of varying size and shape .

They appear to **have no clinical or diagnostic** significance and their origin is unknown, but they represent a secretory product of odontogenic epithelium

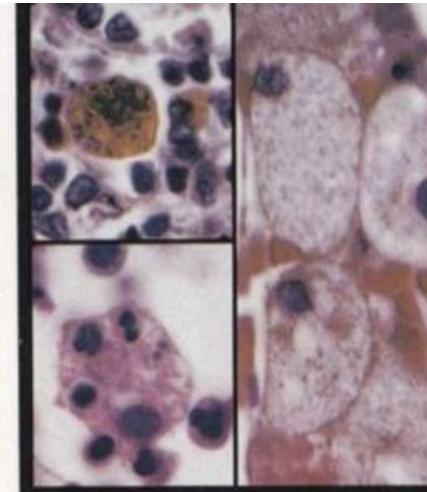
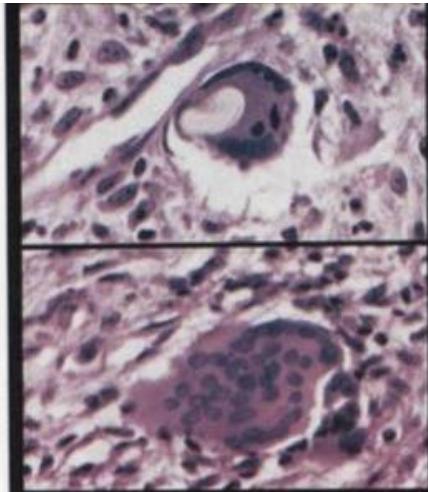
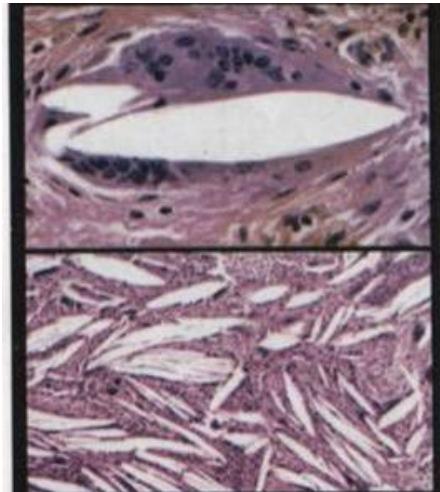
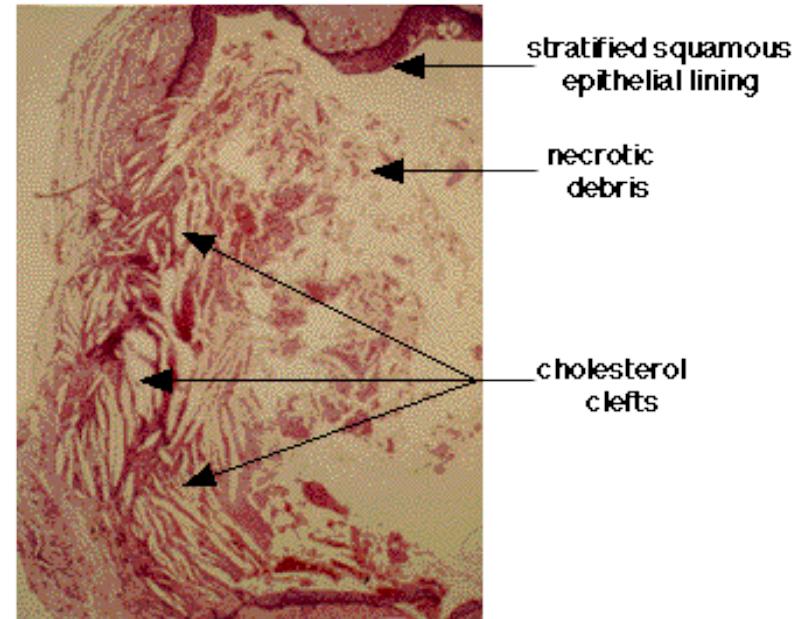


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Cyst Lining:

- Deposits of cholesterol crystals are common within the capsules of many radicular cysts.
- Mural cholesterol clefts are associated with **foreign-body giant cells**.
- As in periapical granulomas the cholesterol is probably derived from the **breakdown of red blood cells as a result of haemorrhage into the cyst capsule**, and deposits of haemosiderin are commonly associated with the clefts .



Cyst contents:

It varies from a **watery-straw colored fluid** through a **semi-solid brownish materials** of paste-like consistency.

It is **hypertonic compared** with serum & contains:

- ***Breakdown products of degenerating epithelia & inflammatory cells & C.T components.***
- ***Serum proteins , derived from inflammatory exudates & contains high levels of immunoglobulins due to local production from plasma cells in the capsule.***
- ***Water & electrolytes.***



Cyst expansion:

Once cyst is formed, it tends to continue to expand equally in all directions like a **balloon**.

The rate of expansion is governed by:

- a- **Rate of local bone resorption.**
- b- **Hydrostatic pressure of the cyst content.**

Cyst lining release **bone resorbing factors** that stimulate **osteoclastic activity** (like prostaglandins PGE2, PGF2 & PGI) which probably derived from fibroblasts in the cyst capsule.

Bone matrix degradation is by the action of various proteinase (**collagenase**) which may also synthesized by capsule's fibroblasts.

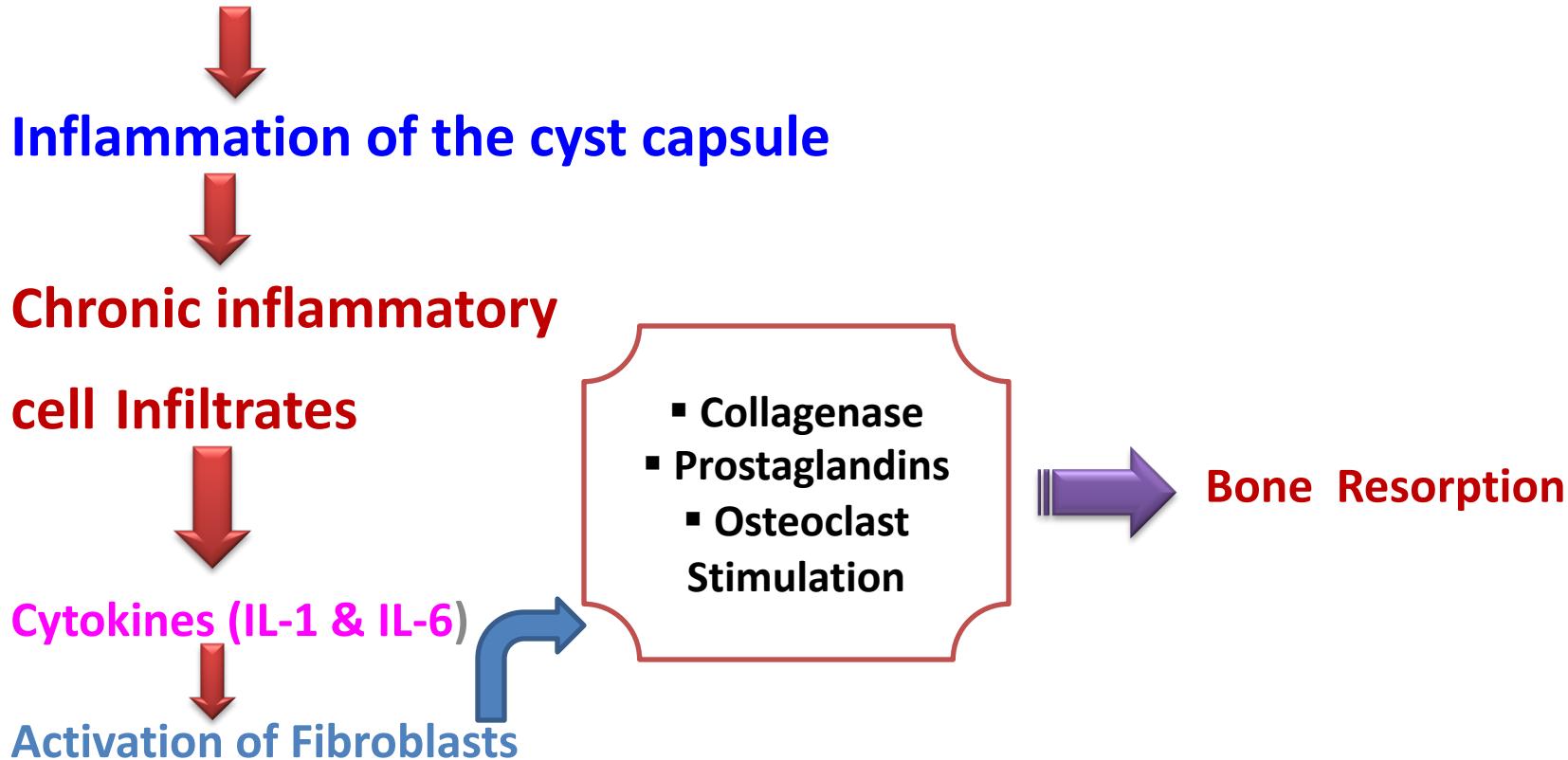
- Both prostaglandins & collagenases are **increased by** the action of various cytokines generated locally like **(IL-1 & IL-6)** synthesized by epithelial lining of cyst & the macrophages in the capsule.
- Because of large number of osmotically active molecules in cyst fluid, the cyst contents are **hypertonic** compared with serum.
- **Cyst wall** acts as a **semipermeable membrane**, **freely allowing the passage of water & crystalloid** but **restraining the passage of colloids**.

- As a result, osmotically active molecules are retained within the cyst lumen.
- The high osmolality of the cyst contents & the semipermeable nature of the wall results in the movement of the fluid from the tissue into the lumen along the osmotic gradient.

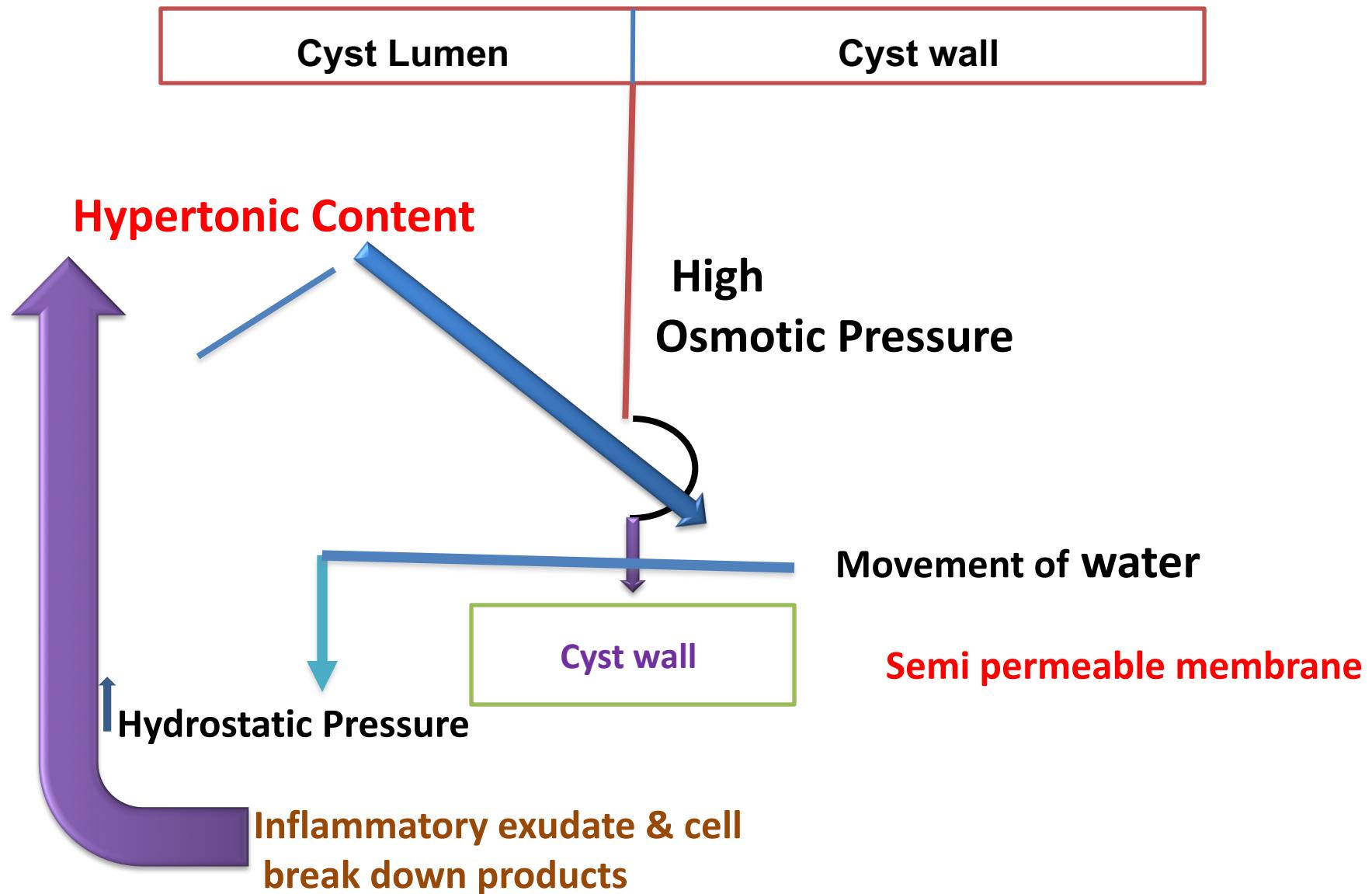
This movement of fluid increases the hydrostatic pressure within the cyst causing it to expand in a unicentric ballooning pattern.

Possible Mechanism of bone resorption in Radicular cyst

Bacterial antigens & other irritants from necrotic pulp



Possible mechanism involved in cyst expansion:

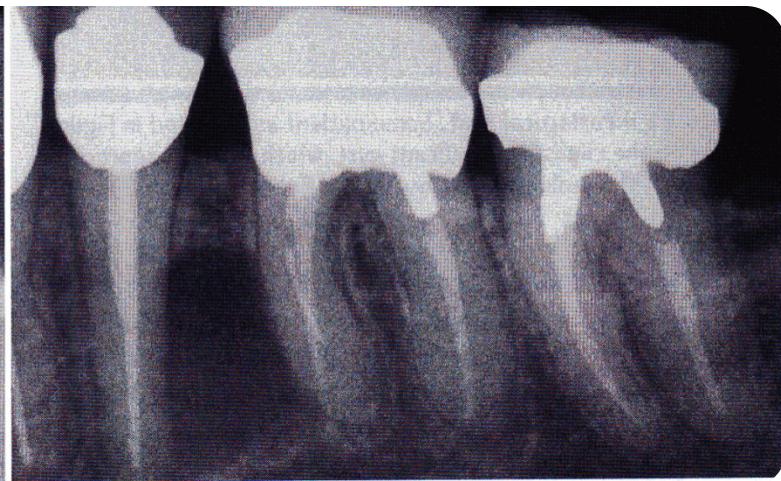
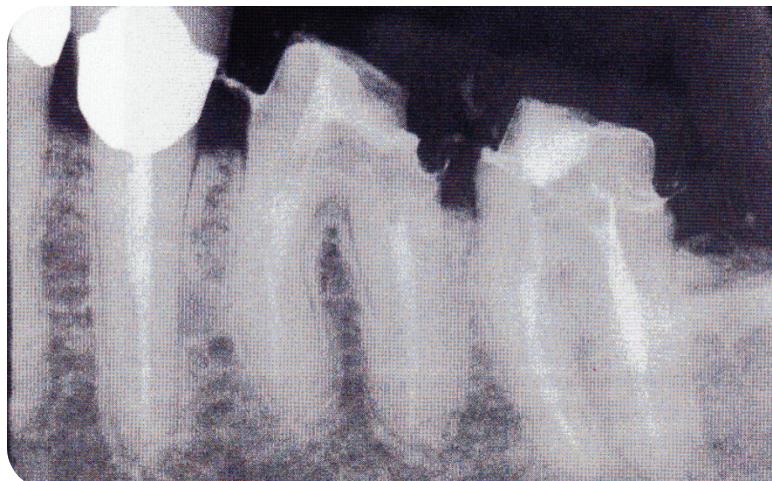
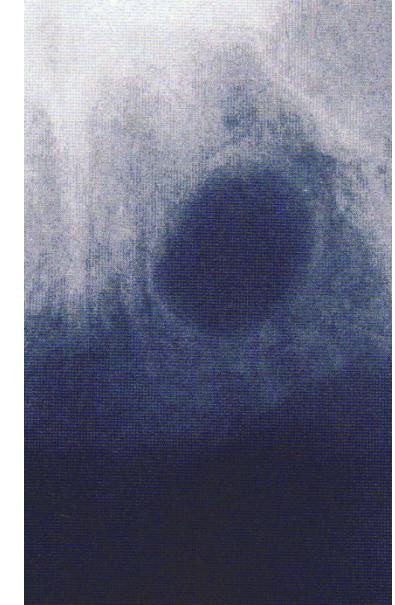


RESIDUAL CYST:

It is a radicular cyst that has remained in the jaw & failed to resolve following extraction of the involved tooth. 20% of radicular cysts are of residual variety.

LATERAL RADICULAR CYST:

It is very uncommon & arises as a result of extension of inflammation from the pulp into the lateral periodontium along a lateral root canal.



Inflammatory Collateral Cyst

Synonyms: Paradental cyst or Mandibular infected buccal cyst or buccal bifurcation cyst

Disease Mechanism:

- Derived from ep. Cell rests in pdl of buccal bifurcation of mand. Molars.



Clinical features

- Found near the cervical margin on the lateral root surface of a *vital* tooth
- Develops subsequent to periodontitis or pericoronitis (cf partially erupted third molar)
- Age of detection: within third decade.



Radiographic appearance

Location:

- in association with mand molars.
- Occasionally bilateral

Periphery & shape:

- Circular shape with well –defined cortical border

Internal structure:

Radiolucent

Effects on surrounding structures:

Striking diagnostic characteristic:

- " tipping of the involved root tips into lingual cortical plate & the occlusal surface toward buccal aspect of the mandible"(Occlusal proj.)
- Lingual cusp tip positioned higher than buccal tips (OPG).

Differential Diagnosis

- Developmental lateral periodontal cyst,
- Inflammatory lateral radicular cyst
- Odontogenic keratocyst

Management:

- Removed by conservative curettage
- Involved molar should not be removed
- It does not recur.

Inflammatory Collateral Cyst

Histopathology

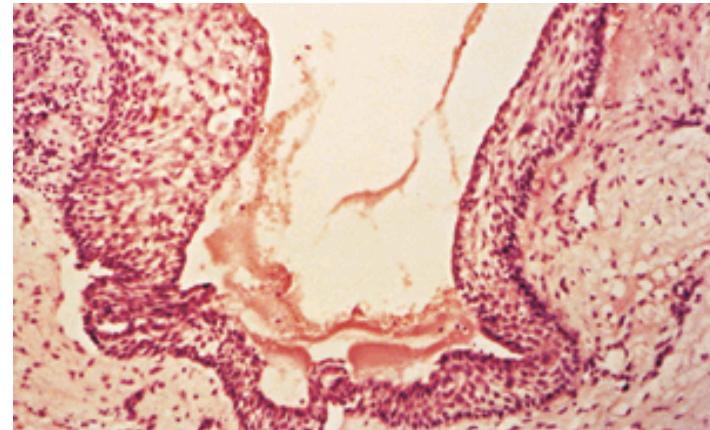
- Similar histopathologic features to radicular cyst
- Non-keratinised squamous epithelium with fibrous CT capsule that is commonly inflamed

Histogenesis

- Epithelium derived from rests of Malassez in superficial periodontium or REE in the case of partially erupted molar teeth

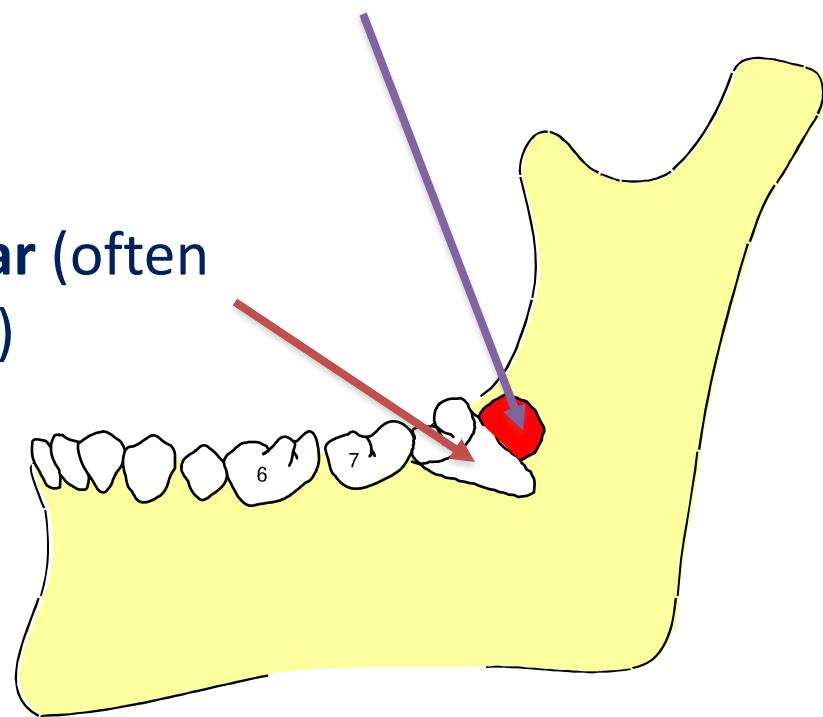
Treatment

- Extraction &/or curettage



Inflammatory Collateral/Paradental Cyst

Partially erupted third molar (often with history of pericoronitis)



DENTIGEROUS CYST:

Synonyms: Follicular cyst

Disease Mechanism:

- Formed around the crown of unerupted tooth.
- Begins with fluid accumulation in the layers of REE or between the epith. and the crown of the unerupted tooth.
- Asymptomatic
- 5% of DC associated with supernumerary teeth, mostly with mesiodens.

Radiographic Features:

Location:

- Just above the crown of the involved tooth.
- Mostly, mand or max M3 or Max canine.
- Dx feature: cyst attach at CEJ.
- Some DC are eccentric (beside the crown) instead of above the crown.
- May grow into maxillary sinus , attain large size before discovered. (associated with which tooth?)
- May extend into considerable distance into ramus.



Periphery & shape:

- Well defined cortex with a curved or circular outline
- If infected: the cortex may be missing.



Internal structure:

- Completely RL.

Effects on surrounding structures:

- Displace & resorb adjacent teeth
- Displace the associated tooth in an apical direction
- Max Canine & Max 3: Involved tooth may be pushed to the floor of the orbit.
- Mand M3: May be moved to condylar or coronoid region or to the inferior cortex of the mandible.
- May invaginate the antrum or may displace the IAN canal inferiorly.

Differential diagnosis:

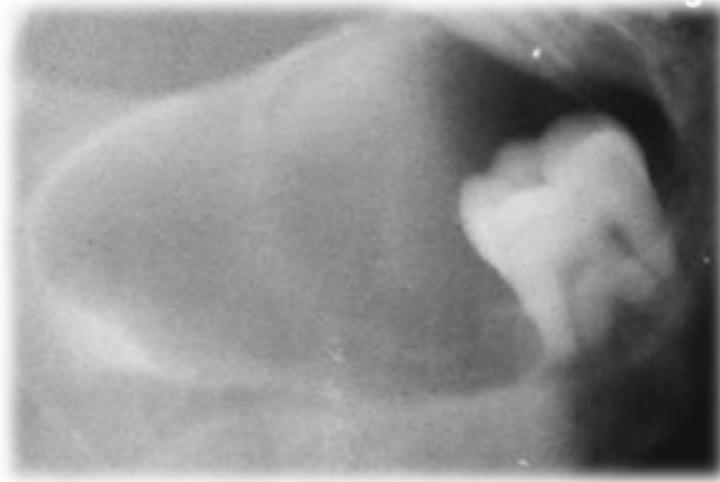
- Hyperplastic tooth follicle. (cf. displacement, bone expansion)
- OKC (degree of expansion is less, tooth resorption, more apically)
- Cystic Ameloblastoma (biopsy to confirm)
- Adenomatoid odontogenic tumor (to be discussed later)

Discussion:

- Size of follicular space vs. size of small DC?

Management:

- Surgical removal which include the tooth as well.
- Large cyst: Marsupulization before removal.
- Cyst lining should be submitted to histo exam why?



Histological Features:

The cyst **is attached to the CEJ**. The crown of the associated tooth is related to the cyst in one of three ways:

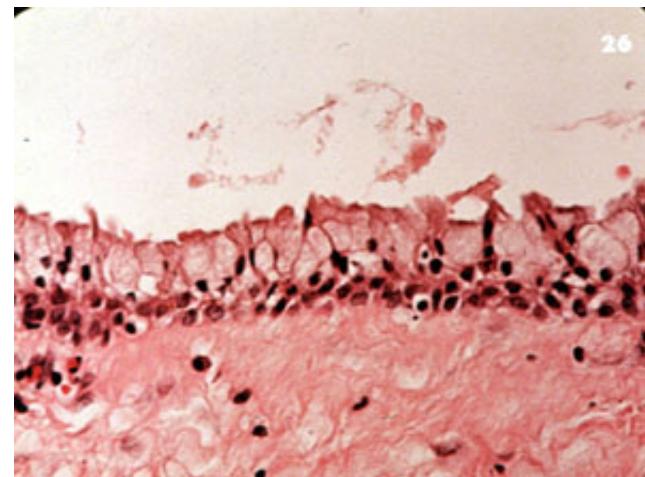
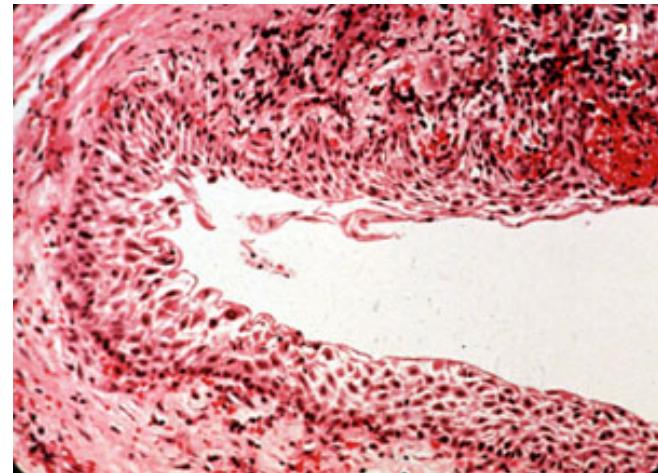
- **Central type:** The most common type, in which cyst is completely surrounds the crown of the tooth.
- **Lateral type:** The cyst projects laterally from the side of tooth & does not completely enclose the crown.
- **Circumferential type:** Cystic changes occurs in a band around the circumference of CEJ producing a doughnut-shaped lesion (rare).



Micropscopically:

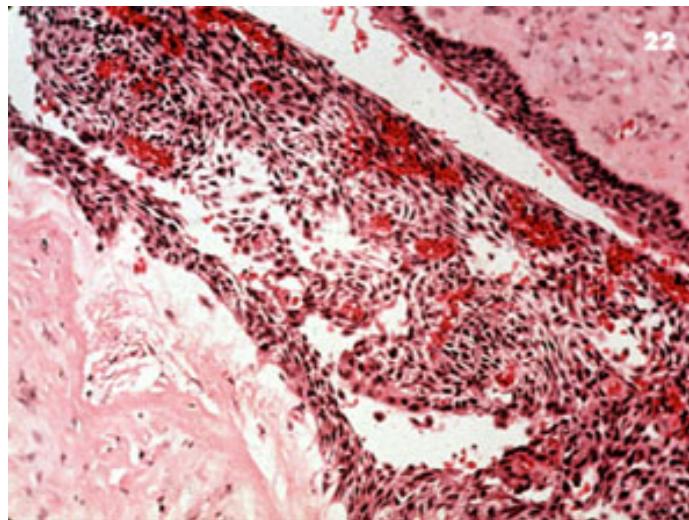
- **Cyst Lining:** Uniform layer of non-keratinized stratified squamous epith. (2-10 cells thick.) , atrophic or ulcerated if inflamed.
- **Cyst Wall:** Composed of dense fibrous C.T free from inflammatory cells unless secondarily infected.
- **Cyst Content:** Proteinaceous, yellow fluid & cholesterol crystals.

• Long standing dentigerous cyst will occasionally exhibit areas of keratinization or premalignant (dysplastic) changes of their epith. Lining with mucous cell metaplasia.



Prognosis:

**Although infrequent, epithelial neoplasm such as:
Ameloblastoma, Mucoepidermoid carcinoma &
squamous cell carcinoma can arise in dentigerous
cyst.**



Pathogenesis & Expansion of Dentigerous cyst:

It develops from follicular tissue by unknown stimulus.

Proposed mechanisms of cyst development:

- **Compression of the follicle by a potentially erupting, but impacted tooth obstructs the venous outflow, thereby increasing venous pressure & inducing transudation across capillary walls.**

The increased hydrostatic pressure of this pooling transudate separates the follicle from the crown resulting in cyst formation.

- **Alternative hypothesis, suggests that cyst arise by proliferation of outer layer of REE & subsequent clefting within epith., accumulation of inflammatory exudates leading to cyst formation.**

Cyst Expansion:

- The mechanism is **similar** to that of radicular cyst & it is dependent on **bone resorption & hydrostatic pressure.**
- The contents are hypertonic compared with serum & bone resorbing factors including PGE2, PGF2 & IL-1 are produced by dentigerous cysts.
- The rate of cyst expansion may be rapid in children than adults.

ERUPTION CYST

- An odontogenic cyst with the histologic features of dentigerous cyst that surrounds a tooth's crown that has erupted through bone but **not soft tissue** & is clinically visible as a **soft fluctuant mass on the alveolar ridge**. It may involve both the deciduous & permanent dentition.
- Mastication will occasionally induce hemorrhage in an eruption cyst, giving rise to the term "Eruption Hematoma" for this cyst.
- Most of these cysts require **no treatment**, because they spontaneously rupture & become exteriorized as a result of normal mastication. Otherwise, surgical exposure of the crown of tooth is done to allow its eruption.





THANK YOU