Dental cysts and apical granulomata

A cyst is defined as: a pathological cavity, often fluid filled, which may be lined by epithelium. Cysts are the most common cause of chronic swellings in the jaws. Cysts are most common in the jaws than any other bone due to the many rests of odontogenic epithelium. The most common by far is the dental cyst, also known as the radicular or periodontal cyst.

DEFINITION: DENTAL CYST
Classification: Epithelial - Inflammatory:
Cyst of inflammatory origin that is preceded by a chronic periapical granuloma and stimulation of cell rests of Malassez present in the periodontal membrane. They are epithelial lined and related to apices of non-vital teeth.

DEFINITION: APICAL GRANULOMA
Modified granulation tissue containing elements of chronic inflammation located adjacent to the root apex of a tooth with infected necrotic pulp. Conversely to the dental cyst - minimal epithelial proliferation and no central cavity formation.

AETIOLOGY
A dental cyst may develop from physical, chemical or bacterial injury resulting in death of pulp followed by stimulation of epithelial cell rests of Malassez which are present normally in the periodontal ligament.

EPIDEMIOLOGY
Most common jaw cyst. 70% of all cysts. Predominantly males. Wide age range, most commonly 20-60. Most commonly anterior & maxillary.

CLINICAL PRESENTATION
Associated tooth non-vital. Inflammatory cyst therefore can be painful with swelling. Increasing pain and swelling may indicate infection - accelerates swelling. May be asymptomatic with gradual swelling until infected or large in size.

May exhibit ‘egg shell’ cracking if expansion rate exceeds deposition of bone. May appear bluish and fluctuant if corticated bone has resorbed entirely or perforated.

APPROPRIATE SPECIAL INVESTIGATIONS
Vitality test - to confirm tooth is non-vital Mobility - rarely absorbs root, but decreases supporting alveolar bone. Palpate for expansion / egg shell cracking - represents thin corticated bone. Radiograph – select according to area. IOPA. Often discovered on OPT. Histopathology

PATHOGENESIS
Caries or trauma facilitates communication of the pulp with bacteria from the oral cavity. The pulp becomes infected and necrotic. Pulpal necrotic tissue +/- infection seeps out the apical foramina. This causes periapical inflammation / acute inflammatory response to toxins of necrotic pulp and bacteria.

Apical granuloma forms (granulation tissue, fibrous scar tissue, inflammatory cells) Inflammation activates cell rests of Malassez (remnant of Hertwig’s Epithelial Root Sheath), which then proliferate.

Central necrotic cavity forms (cells become deprived of nourishment become necrotic and liquify). This cavity fills with fluid and enlarges by hydrostatic expansion, which may enlarge quickly if infected.

Expansion: cysts fluid is largely inflammatory exudate with high concentration of proteins, this exerts osmotic pressure. Hydrostatic pressure = 70 cm of water (higher than blood capillary pressure).


HISTOLOGY
Irregular lining of stratified squamous epithelium Abundant granulation tissue Variable inflammatory cell infiltrate Thick wall of dense fibrous tissue CONTENTS: Fluid, pus if infected High level of soluble protein (>5mg/100ml) Cholesterol crystals common Variable amounts of inflammatory cell infiltrate (pus if infected – mostly neutrophils) Thick dense wall of fibrous tissue Cholesterol crystals in wall

TREATMENT
Resolve cause – full pulpectomy (RCT) or extraction of tooth confirmed as non-vital.

Enucleate cyst – extract or RCT tooth with apicectomy.
1. Raise mucoperiosteal flap
2. Open window into bone to give adequate access
3. Carefully remove complete cyst and lining
4. Smooth edges of bony cavity
5. Primary closure / secondary intention and pack with BIPP (Bismuth Iodoform Paraffin Paste)

Marsupialisation – usually only if very large or adjacent to vital anatomy. Aims to reduce size of cyst.
1. Access as above
2. Suture cyst epithelial lining to surrounding mucoperiosteum of opening
3. Pack with ribbon gauze

Related cyst: Residual cyst
Dental cyst which fails to resolve after extraction. Common cause of swelling of jaw in older persons. May interfere with dentures.

Figure A. Causative tooth extracted, cyst left in situ.
Figure B. Thin bulging perosteal bone may exhibit ‘egg shell’ cracking on palpation.
APICAL GRANULOMA vs DENTAL CYST

Without a microscopic diagnosis, a clinician is frequently unable to differentiate between a periapical granuloma, a radicular cyst, and an apical abscess. Radiographic examination is inadequate in making a specific diagnosis. Various factors such as the host’s resistance and the virulence of the bacteria affect the local inflammatory response in the periapical area. A granuloma is formed from the successful attempt of the periapical tissues to neutralize and confine the irritating toxic products escaping from the root canal.

This low grade inflammation in the tissues continues to induce the proliferation of vascular granulation tissue. A granuloma may evolve into a radicular cyst or an apical abscess. Clinically, the lesion is usually asymptomatic but may sometimes exhibit mild pain and sensitivity to percussion. The affected tooth is non-vital. Radiographically granulomas form small well-defined radiolucencies. They are the most common periapical lesions and constitute approximately 50% of all periapical radiolucent lesions.

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<thead>
<tr>
<th>Apical granuloma</th>
<th>Dental (radicular) cyst</th>
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<tr>
<td><strong>DEFINITION</strong></td>
<td>Mass of fibrous/granulation tissue related to apex of non vital tooth.</td>
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<td><strong>RADIOGRAPHY</strong></td>
<td>Often incidental finding</td>
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<td>Similar radiological findings to dental cyst but smaller</td>
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<td>( ≤ 10mm)</td>
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<td>Rarely cause expansion of bone</td>
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<td>Usually asymptomatic but may sometimes exhibit pain and sensitivity to percussion. The affected tooth is non-vital.</td>
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<td><strong>EPIDEMIOLOGY</strong></td>
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<td><strong>CLINICAL</strong></td>
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<td>1) A history of painful pulpitis leading to the death of the pulp.</td>
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<td>2) A non-vital reaction to electric pulp testing. In a multirooted tooth where only one root is associated with the pulpo-periapical pathosis, the tooth will frequently give a vital reaction.</td>
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<td>3) Presence of a deep carious lesion exposing the pulp or a restoration close to the pulp, or a fractured tooth and/or a discolored crown.</td>
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<td>Usually asymptomatic but may sometimes exhibit pain and sensitivity to percussion. The affected tooth is non-vital.</td>
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<td><strong>PATHOGENESIS</strong></td>
<td>Pathogenesis as in dental cyst but less inflammation.</td>
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<td>Minimal epithelial proliferation.</td>
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<td>No central cavity formation.</td>
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**Periapical Cyst – Pathogenesis (SUMMARY)**

1. **CARIES, TRAUMA, PERIODONTAL DISEASE**
2. **PULPAL NECROSIS** (Death of Dental Pulp)
3. Necrotic debris is Inflammatory Stimulus
   - **PERIAPICAL INFLAMMATION**
   - **PERIAPICAL GRANULOMA**
     - Composed of granulation tissue, necro-inflammatory cells
     - PROVIDE RICH VASCULAR AREA TO RESTS OF MALASEZZ
       - RESTS OF MALASEZZ PROLIFERATE
         - FORM LARGE MASS OF CELLS
       - INNER CELLS OF MASS UNPROVIDED OF NOURISHMENT
         - UNDERGO LIQUEFACTION NECROSIS
       - FORMATION OF A CAVITY IN THE CENTRE OF GRANULOMA
         - **RADICULAR CYST / PERIAPICAL CYST**
           - Cyst wall separates pulpal irritation from bone

**References**


http://www.exodontia.info/
http://www.pathologyoutlines.com/topic/mandiblemaxilladentalgranuloma.html