Periradicular Diseases and Management

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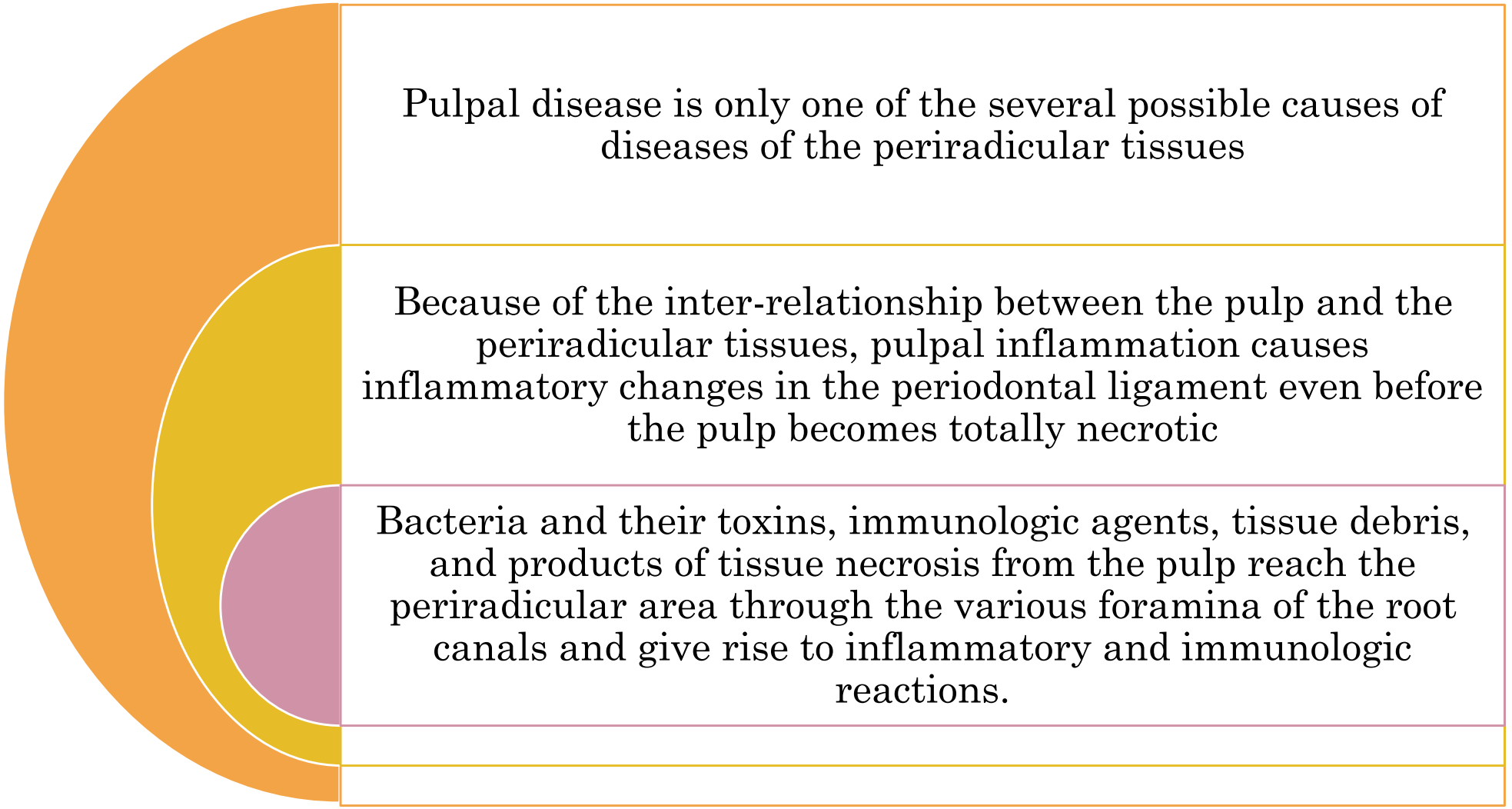

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Etiology

BACTERIAL

- Root canal is unique, stringent ecological niche for bacterial growth because of lack of oxygen
- Primary nutrient source for root canal biota is host tissues and tissue fluids
- Microorganisms in chronically infected root canals are mainly anaerobic and Gram-negative type

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Etiology

BACTERIAL

Most common microorganisms seen in periradicular diseases	Black-pigmented microorganisms
Streptococcus	Porphyromonas
Peptostreptococcus	Enterococcus
Prevotella	Campylobacter
	Fusobacterium
	Eubacterium

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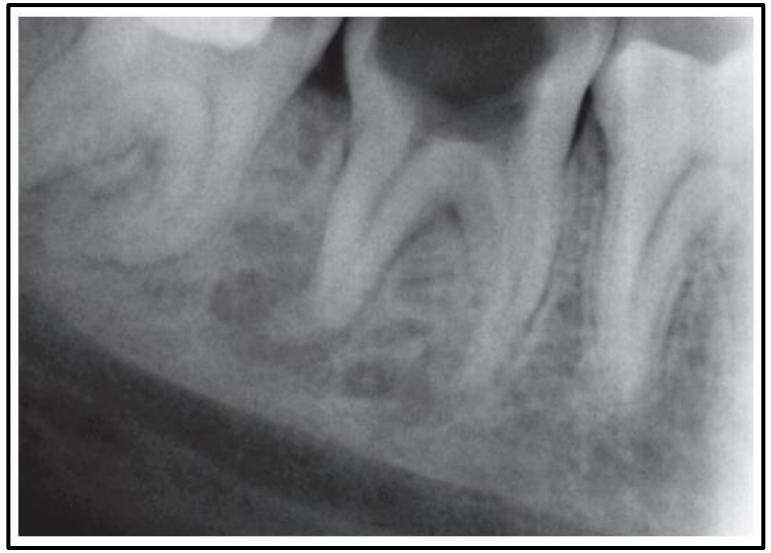
Etiology

ROUTES

- Untreated pulpal infection leads to total pulp necrosis and further periapical infection
- Anachoresis
- Invasion of microorganisms into pulp from periodontal pocket and accessory canals resulting in formation of lesion of endodontic origin



Radiograph showing untreated caries in mandibular second molar resulting in periapical pathology

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Etiology

Trauma

- Severe trauma to tooth and heat production during tooth preparation causes immediate interruption of blood supply resulting in pulp necrosis even though it is not infected
- Persistent periapical tissue compression from traumatic occlusion may lead to apical inflammatory response

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Etiology

FACTORS RELATED TO ROOT CANAL PROCEDURE

- Using strong or excessive amounts of intracanal medicaments between appointments may induce periapical inflammation
- Improper manipulation of instruments within root canal or overinstrumentation can force dentinal debris, irrigating solution, and toxic components of necrotic tissue in the periapex

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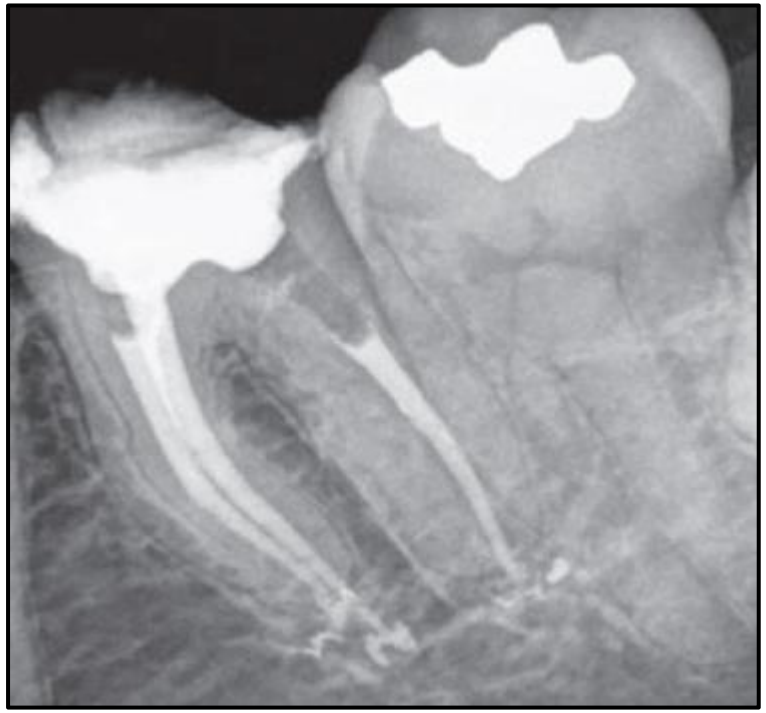
Etiology

- Overextended endodontic filling material may induce periapical inflammation by directly inducing foreign body reaction which is characterized by presence of leukocyte infiltration, macrophages, and other chronic inflammatory cells



Overextended obturating material may cause periradicular inflammation

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Classification: According to Grossman (Clinical classification)

1. Symptomatic periradicular diseases

(a) Primary symptomatic apical periodontitis (previously known as acute apical periodontitis)

(b) Secondary symptomatic apical periodontitis (acute exacerbation of asymptomatic apical periodontitis or phoenix abscess)

(c) Symptomatic (acute) alveolar abscess

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Classification: According to Grossman (Clinical classification)

2. Asymptomatic periradicular diseases

(a) Asymptomatic apical periodontitis (previously known as chronic apical periodontitis)

(b) Asymptomatic (chronic) alveolar abscess

(c) Condensing osteitis

3. Persistent apical periodontitis

4. External root resorption

5. Diseases of the periradicular tissues of nonendodontic origin

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Classification: According to Grossman (Histopathologic classification)

1. Apical granuloma
2. Apical abscess
3. Apical cyst

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Classification: WHO Classification

1. K 04.4 — Acute apical periodontitis
2. K 04.5 — Chronic apical periodontitis (apical granuloma)
3. K 04.6 — Periapical abscess with sinus
4. K 04.60 — Periapical abscess with sinus to maxillary antrum
5. K 04.61 — Periapical abscess with sinus to nasal cavity
6. K 04.62 — Periapical abscess with sinus to oral cavity

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Classification: WHO Classification

7. K 04.63 — Periapical abscess with sinus to skin
8. K 04.7 — Periapical abscess without sinus
9. K 04.8 — Radicular cyst (periapical cyst)
10. K 04.80 — Apical and lateral cyst
11. K 04.81 — Residual cyst
12. K04.82 — Inflammatory paradental cyst

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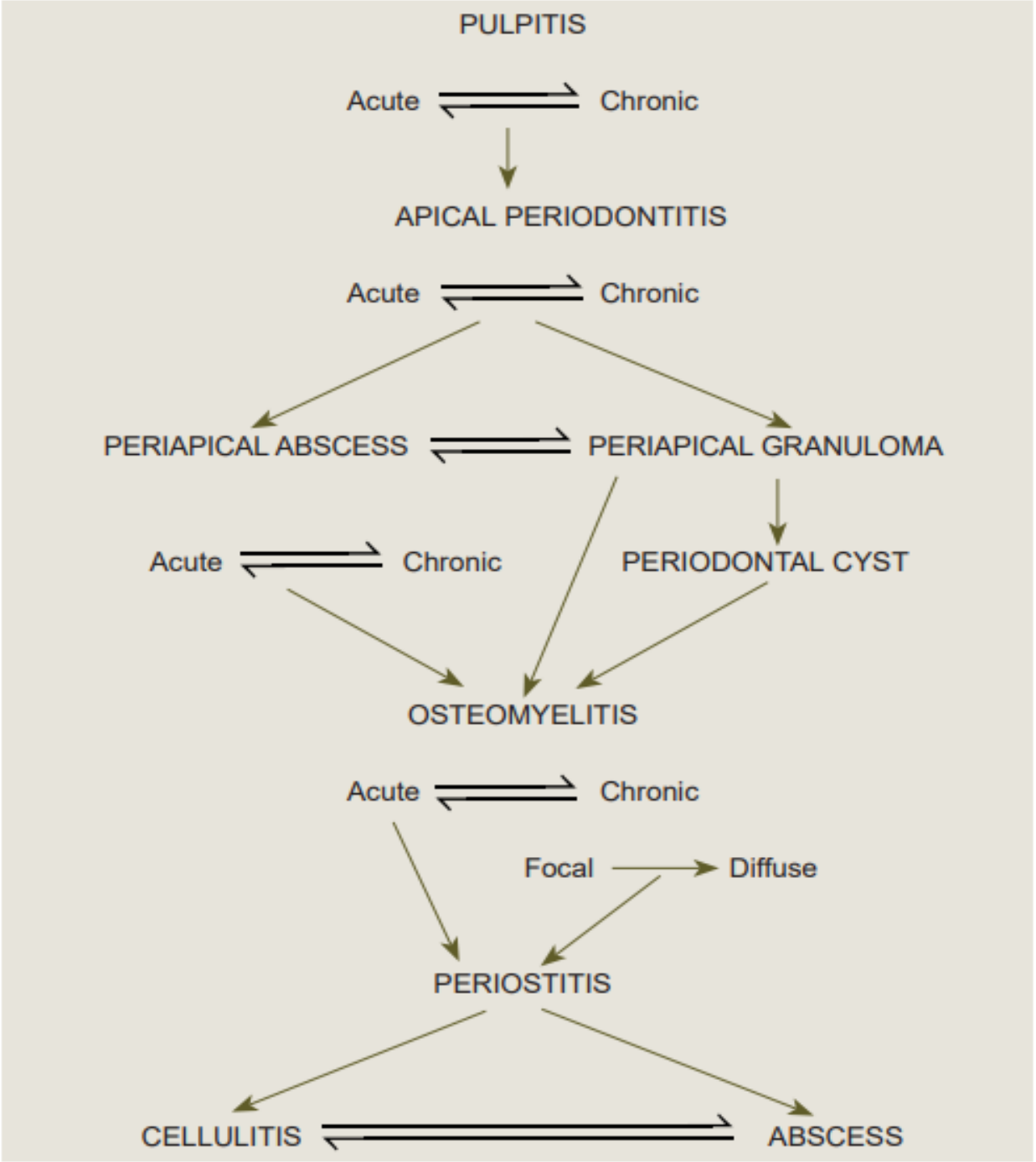
Interrelationships of Periapical Infection



Shafer's Textbook of ORAL PATHOLOGY
Seventh Edition Pg. No. 482

I. SYMPTOMATIC PERIRADICULAR DISEASES

- These disorders include symptomatic apical periodontitis, acute alveolar abscess, and acute exacerbation of a chronic lesion (phoenix abscess).

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1. Primary Symptomatic Apical Periodontitis (Previously known as Acute Apical Periodontitis)

- Primary symptomatic apical periodontitis is a painful inflammation of the periodontium as a result of trauma, irritation, or infection through the root canal, regardless of whether the pulp is vital or non-vital, producing clinical symptoms including painful response to biting and percussion

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CAUSES

1. **In Vital Tooth:**

- Abnormal occlusal contacts
- Recently inserted restoration extending beyond the occlusal plane
- Wedging of a foreign object between the teeth
- Traumatic blow to the teeth

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2. **In Non-Vital Tooth:**

- Sequelae of pulpal diseases, i.e., the diffusion of bacteria and noxious products from an inflamed or necrotic pulp
- Iatrogenic causes that include the following:

a. Root canal instrumentation forcing bacteria or debris inadvertently through the apical foramen

b. Forcing of irrigants or medicaments through the apical foramen

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c. Extension of obturating material through the apical foramen to impinge on periradicular tissues

d. Perforation of the root

e. Overinstrumentation during shaping and cleaning of root canals

SYMPTOMS

- Pain and tenderness of the tooth
- Tooth may be slightly sore when percussed / soreness may be severe
- Tooth may feel extruded and the patient may have pain on closure and mastication

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DIAGNOSIS

- Pain on percussion – classical diagnostic feature of primary symptomatic apical periodontitis
- The symptoms are result of irritation originating from endodontic treatment caused by

i. Overinstrumentation,

ii. Medicinal irritants, or

iii. Overfilling, in which case the tooth is non-vital, or the result of noxious stimuli irritating the periodontal ligament, in which case the pulp is vital

Overinstrumentation

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- Radiographic changes are dependent on the pulp vitality status of the involved tooth
- **Nonvital tooth:** A slight widening of the apical periodontal ligament space and loss of the apical lamina dura of the involved tooth
- **Vital tooth:** No radiographic changes are seen with normal periradicular structures

Minimal periradicular radiographic changes in a carious tooth with pulpal involvement showing signs and symptoms of primary symptomatic apical periodontitis.

Normal periradicular tissue in a vital tooth with primary symptomatic apical periodontitis after the placement of a deep restoration with abnormal occlusal contacts

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DIFFERENTIAL DIAGNOSIS:

1. **Secondary Symptomatic Apical Periodontitis** – Differentiated by – Absence of Periradicular Radiolucency (in Symptomatic Apical Periodontitis)
2. **Symptomatic (Acute) Apical Abscess** – Differentiated from Symptomatic Apical Periodontitis – by extreme clinical symptoms of swelling and pain that is associated with the breakdown of periradicular tissue [in Symptomatic (Acute) Apical Abscess]

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PATHOLOGICAL PROGRESSION

- An inflammatory reaction occurs in the apical periodontal ligament
- The blood vessels are dilated, polymorphonuclear leukocytes are present, and an accumulation of exudate distends the periodontal ligament and extrudes the tooth slightly
- Continued and severe irritation activates osteoclasts and break down the periradicular bone; the next developmental stage, acute alveolar abscess, may follow.

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TREATMENT

- If cause is irreversible pulpitis or necrotic pulp endodontic treatment is initiated
- If cause is hyperocclusion, occlusion adjustment – for immediate relief
- To control postoperative pain following initial endodontic therapy, analgesics are prescribed
- For non-restorable teeth, extraction is indicated

PROGNOSIS

- Generally favorable.

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2. Secondary Symptomatic Apical Periodontitis (Acute Exacerbation of Asymptomatic Apical Periodontitis or Phoenix Abscess)

- This condition is an acute inflammatory reaction superimposed on an existing asymptomatic apical periodontitis.

SYNONYMS:

1. Acute exacerbation of asymptomatic apical periodontitis
2. Phoenix abscess

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CAUSES

- Chronic periradicular diseases – asymptomatic apical periodontitis, are in a state of equilibrium, the periradicular tissues are asymptomatic
- Noxious stimulus from a diseased pulp causes acute inflammatory response in dormant lesions
- Lowering of body's defenses due to influx of bacterial toxins from the root canal leads to acute inflammatory response
- Irritation during root canal instrumentation may also trigger acute inflammatory response in a previously asymptomatic tooth

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SYMPTOMS

- The tooth may be tender on palpation initially
- As inflammation progresses, the tooth gets elevated from its socket and becomes sensitive
- The mucosa over the radicular area may appear red and swollen and is sensitive to palpation

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DIAGNOSIS

- Exacerbation of a chronic lesion – most commonly associated with the initiation of root canal therapy in a completely asymptomatic tooth with a well-defined periradicular lesion
- History of trauma that leads to discoloring of the tooth over a period of time or a postoperative pain that had subsided
- Lack of response to vitality tests diagnoses a necrotic pulp
- On rare occasions, a tooth may respond to the electric pulp test because of fluid in the root canal or in case of a multi-rooted tooth

Well-defined periradicular lesion evident in a case of secondary symptomatic apical periodontitis.

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DIFFERENTIAL DIAGNOSIS

1. **Symptomatic (Acute) Alveolar Abscess**

- Distinct periradicular radiographic changes – Secondary Symptomatic Apical Periodontitis
- Widening of the periodontal ligament space is the only radiographic change seen - Symptomatic (Acute) Alveolar Abscess

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HISTOPATHOLOGY

- Areas of liquefaction necrosis with disintegrating polymorphonuclear neutrophils and cellular debris (pus) are observed
- These areas are surrounded by infiltration of macrophages and some lymphocytes and plasma

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TREATMENT

- Establishment of drainage
- Once symptoms subside—complete root canal treatment

PROGNOSIS

- The prognosis for the tooth is good once the symptoms have subsided

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3. Symptomatic (Acute) Apical Abscess

A symptomatic (acute) apical abscess is an inflammatory reaction to pulpal infection and necrosis characterized by rapid onset, spontaneous pain, tenderness of the tooth to pressure, pus formation, and eventual swelling of associated tissues.

Synonyms:

1. Acute abscess
2. Acute alveolar abscess
3. Acute dentoalveolar abscess
4. Acute periapical abscess
5. Acute radicular abscess

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CAUSES

- Trauma or of chemical or mechanical irritation, the immediate cause is generally bacterial invasion of dead pulp tissue
- Pulp tissue is solidly enclosed, no drainage is possible and the infection continues to extend in the direction of least resistance, i.e., through the apical foramen, and thereby involves the periodontal ligament and the periradicular bone

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SYMPTOMS

- First symptom – mere tenderness of the tooth – relieved by continued slight pressure on the extruded tooth
- Later, the patient has severe, throbbing pain, with swelling of the overlying soft tissue.
- As the infection progresses, the swelling becomes more pronounced and extends beyond the original site.
- The tooth becomes more painful, elongated, and mobile.

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The pain may subside or cease entirely while the adjacent tissue continues to swell

If left unattended – infection progresses to asymptomatic (chronic) apical abscess wherein the contained pus may break through to form a sinus tract – opening in the labial or buccal mucosa.

When swelling becomes extensive, the resulting cellulitis may distort the patient's appearance grotesquely.

Such swelling extends beyond the immediate vicinity of the diseased periradicular tissues.

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- The tissue at the surface of the swelling appears taut and inflamed; pus starts to form beneath it.
- The surface tissues become distended from the pressure of the underlying pus and finally rupture from this pressure and lack of resistance caused by continued liquefaction.
- The pus may extrude through a tiny opening, which becomes larger with time, or form two or more openings, depending on the degree of softening of the tissues and on the amount of pressure from the contained pus.
- This process is the beginning of an asymptomatic (chronic) alveolar abscess.

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- The sinus tract ultimately heals by granulation after the elimination of the infection in the root canal
- In addition to the localized symptoms of a symptomatic (acute) alveolar abscess, **a general systemic reaction of greater or lesser severity may occur**
- The patient may appear pale, irritable, and weakened from pain and loss of sleep, as well as from absorption of septic products
- Patients with mild cases may have only a slight rise in temperature (99–100°F), whereas in those with severe cases, the temperature may reach several degrees above normal (102–103°F).

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- The fever is often preceded or accompanied by chills

Extraoral swelling in symptomatic (acute) alveolar abscess.

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DIAGNOSIS

- Generally made from the clinical examination and from the subjective history given by the patient
- In the early stages – difficult to locate the tooth – absence of clinical signs and the presence of diffuse, annoying pain.
- The tooth is easily located when the infection has progressed to the point of periodontitis and extrusion of the tooth

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DIAGNOSIS

Early radiographic changes seen in a mandibular molar with symptomatic (acute) alveolar abscess.

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- Diagnosis confirmed by means of the electric pulp test and by thermal tests.
- The affected pulp is necrotic and does not respond to electric current or to application of cold
- The tooth is tender to percussion, or the patient complains of pain on mastication
- The apical mucosa is tender to palpation, and the tooth may be mobile and extruded.

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DIFFERENTIAL DIAGNOSIS

1. **Periodontal Abscess** - A periodontal abscess is an accumulation of pus along the root surface of a tooth

Acute Alveolar Abscess

Phoenix Abscess

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- Associated with a periodontal pocket and is manifested by swelling and mild pain.
- On pressure, pus may exude through the sulcus.
- The swelling is usually located opposite the midsection of the root and gingival border, rather than opposite the root apex or beyond it
- Associated with vital teeth, in contrast to an acute alveolar abscess
- Tests for pulp vitality are useful in establishing a correct diagnosis.

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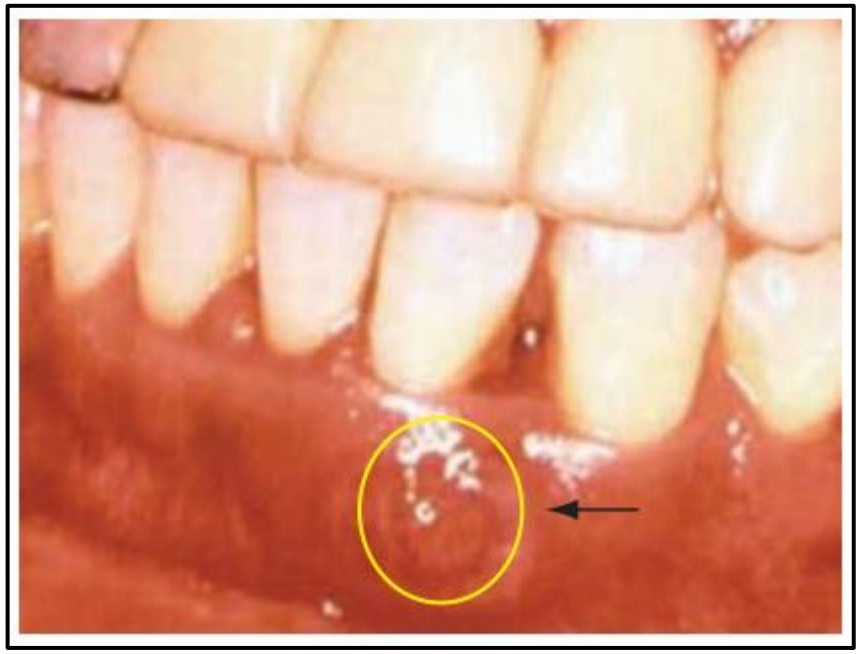
DIFFERENTIAL DIAGNOSIS



Periodontal abscess between the lateral incisor, and the cuspid

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DIFFERENTIAL DIAGNOSIS

2. **Asymptomatic (Chronic) alveolar abscess** – The diagnostic feature of an Asymptomatic (chronic) apical abscess is the presence of a sinus opening that allows the acute symptoms to subside due to drainage of the pus

BACTERIOLOGY

In an abscess, streptococci and staphylococci are generally recovered, but if the purulent material is collected as it drains out of the root canal, it may be sterile because it will consist chiefly of dead leukocytes and dead bacteria.

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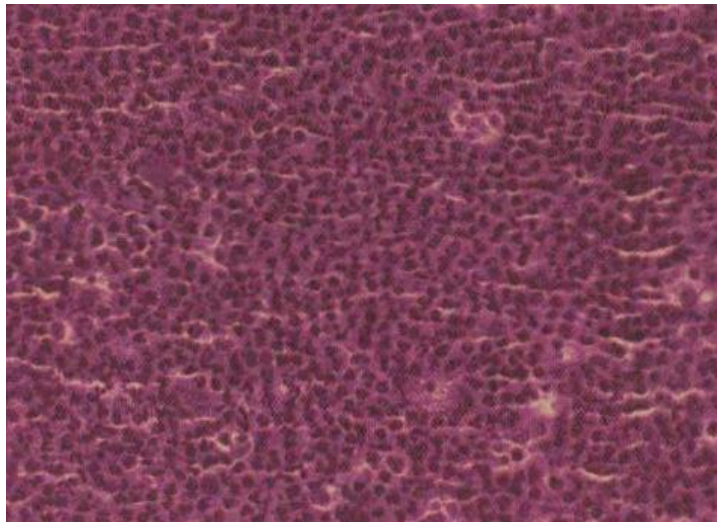
HISTOPATHOLOGY

- Marked infiltration of polymorphonuclear leukocytes and the rapid accumulation of inflammatory exudate in response to an active infection distend the periodontal ligament and thereby elongate the tooth.



Sheet of polymorphonuclear leukocytes intermixed with scattered histiocytes

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HISTOPATHOLOGY

- If the process continues, the periodontal fibers separate and the tooth becomes mobile.
- Bony tissue in the region of the root apex is resorbed, and as more and more of the polymorphonuclear leukocytes die in their battle with the microorganisms, pus is formed.

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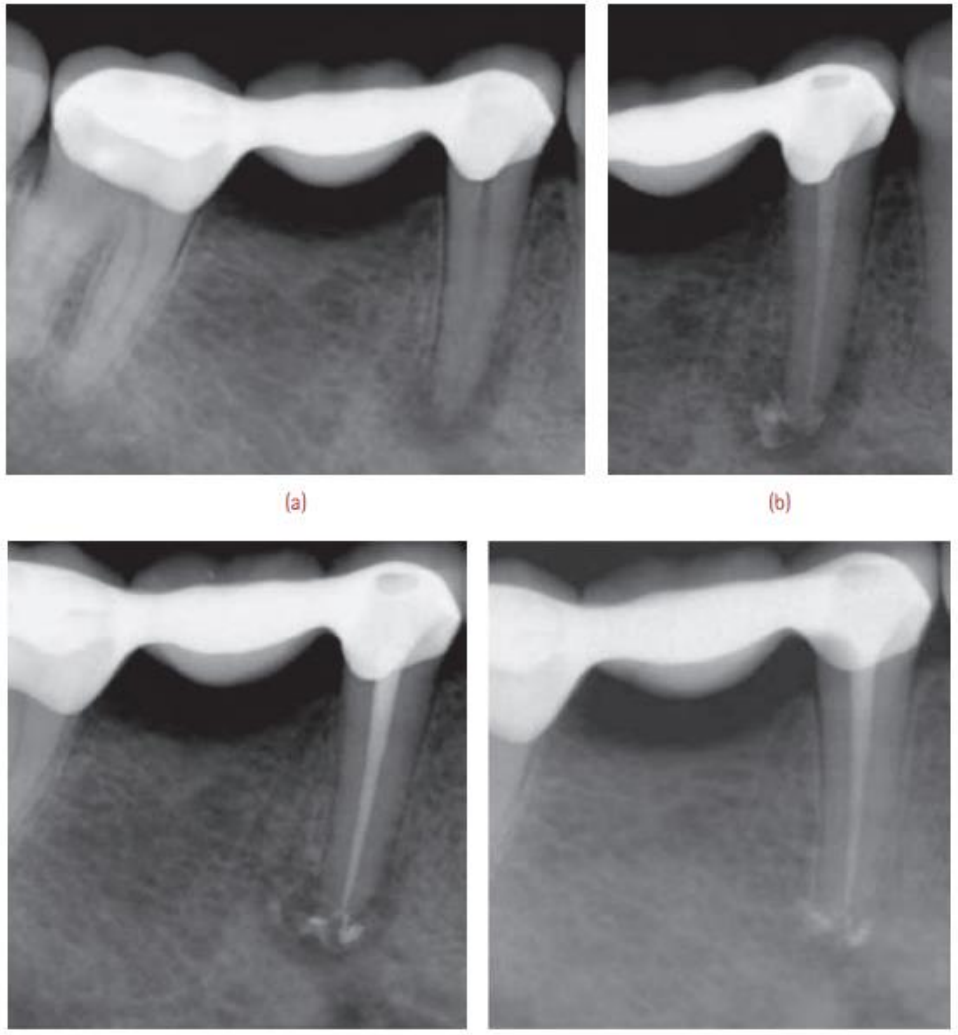
TREATMENT

The immediate treatment consists of establishing drainage and controlling the systemic reaction followed by root canal therapy



(a) Symptomatic (acute) alveolar abscess in relation to a mandibular premolar which is an abutment for a fixed partial denture. (b) Canal irrigated and intracanal calcium hydroxide placed for a period of 2 weeks. (c) Root canal obturation after thorough cleaning and shaping. (d) Two-year follow-up showing healing of the periradicular tissues.

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PROGNOSIS

- The **prognosis is generally favorable**, depending on the degree of local involvement and the amount of tissue destruction.
- In selected cases, combined periodontal and endodontic treatment will restore the tooth to functional health.

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Periradicular Diseases and Management

- Dr. Manjiri Raje

II-MDS

II. ASYMPTOMATIC PERIRADICULAR DISEASES

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ASYMPTOMATIC (CHRONIC) APICAL PERIODONTITIS

- Chronic Apical periodontitis may be preceded by Acute Apical Periodontitis or by an Apical Abscess

- General term that represents different histological conditions of the periapical disease process

- Lesion develops and enlarges without any subjective signs and symptoms

- Causes: Inadequate root canal treatment

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SYMPTOMS

- Varies in clinical presentation

- Patients unaware of any symptoms associated with these lesions

- Often noted as incidental findings during a routine radiographic examination

Ingle's Endodontics 5th Edition Pg. No. 179
Abbott PV. Classification, diagnosis and clinical manifestations of apical periodontitis. Endodontic topics. 2004 Jul;8(1):36-54.

CLINICAL AND RADIOGRAPHIC FINDINGS

- No response to pulp sensibility tests
- Tooth not tender to percussion or palpation
- Tooth may feel ‘different’ to these tests
- Slightly mobile
- Radiograph will show a periapical radiolucent changes

Chronic apical periodontitis w.r.t. upper right first premolar

Abbott PV. Classification, diagnosis and clinical manifestations of apical periodontitis. Endodontic topics. 2004 Jul;8(1):36-54.

- Radiolucent changes range from:
- Thickening of the periodontal ligament and resorption of the lamina dura to destruction of apical bone resulting in a well-demarcated radiolucency

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- Chronic apical periodontitis has traditionally been classified histologically as

1. **Periapical granuloma**
2. **Periapical cyst**

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PERIAPICAL GRANULOMA

- Most common chronic periapical condition
- Diagnosis is based on the radiographic appearance of a periapical radiolucency
- Can only be accurately diagnosed via a surgical biopsy and a histological examination

Abbott PV. Classification, diagnosis and clinical manifestations of apical periodontitis. Endodontic topics. 2004 Jul;8(1):36-54.

Symptoms, Clinical and Radiographic Findings

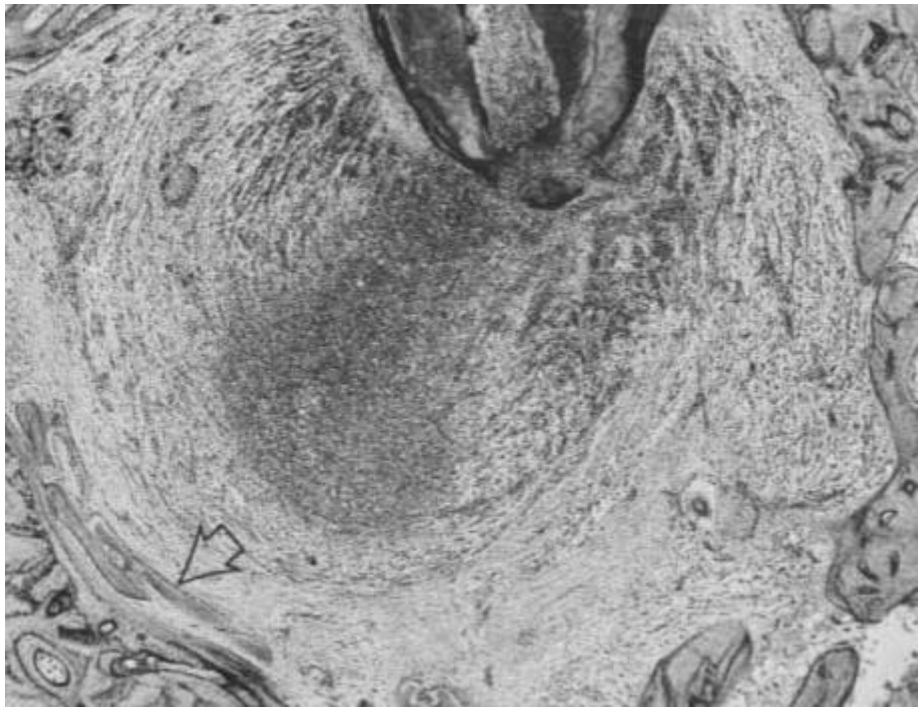
- No symptoms
- Mild awareness of the tooth feeling different when pressure applied to it
- Radiographically: Radiolucency surrounding the apex of the involved tooth with loss of the lamina dura
- No response to pulp sensibility tests

Abbott PV. Classification, diagnosis and clinical manifestations of apical periodontitis. Endodontic topics. 2004 Jul;8(1):36-54.

HISTOLOGY

- Consists predominantly of granulation inflammatory tissue

- This tissue replaces the periodontal ligament and apical bone



Granuloma: The central zone is dense with round cells (plasma cells and small lymphocytes). Beyond is a circular layer of fibrous capsule. Limited bone regeneration (arrow) can be clearly seen at outer margin of capsule

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PERIAPICAL CYST

- Inflammatory lesion with closed pathological cavity, lined by an epithelium that contains a liquid or semisolid material
- No symptoms
- Clinical diagnosis based on radiographic findings
- Final diagnosis can only be made by histological examination of a biopsy that includes the root apex

Abbott PV. Classification, diagnosis and clinical manifestations of apical periodontitis. Endodontic topics. 2004 Jul;8(1):36-54.
Ramachandran Nair PN. Non-microbial etiology: periapical cysts sustain post-treatment apical periodontitis. Endodontic topics. 2003 Nov;6(1):96-113.

INCIDENCE

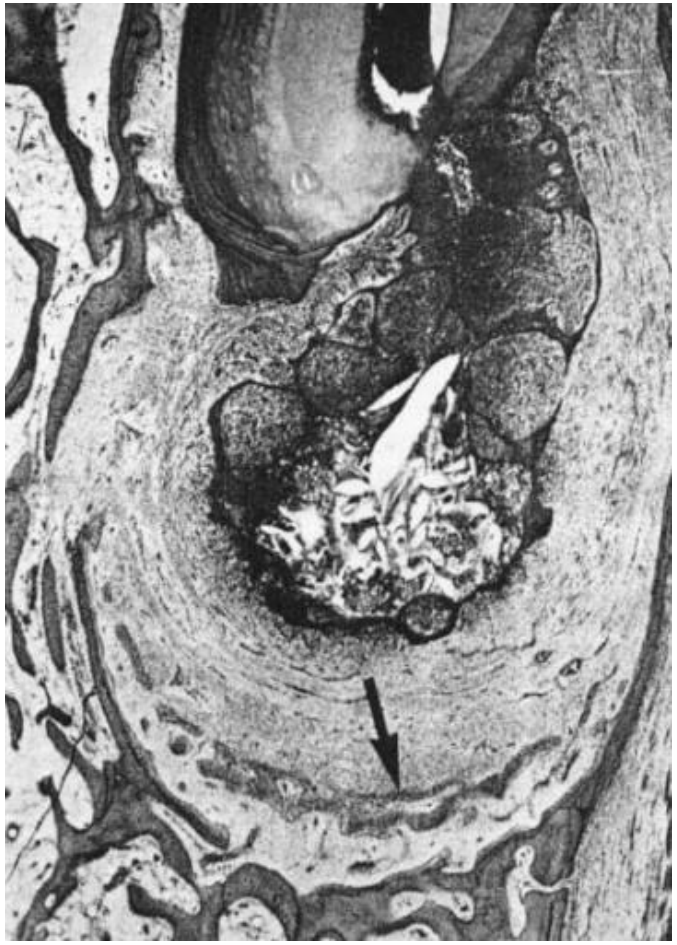
- Most common of all jaw cysts
- Cysts (apical periodontitis lesions) varies from 6% to 55%
- Prevalence is highest in third decade of life
- Maxillary 75% > mandibular teeth 25%
- Maxilla – Anterior region
- Mandible – Premolar region

Ramachandran Nair PN. Non-microbial etiology: periapical cysts sustain post-treatment apical periodontitis. Endodontic topics. 2003 Nov;6(1):96-113.

HISTOLOGY

- Central cavity lined by stratified squamous epithelium

- Lumen contains pale eosinophilic fluid and cellular debris



Apical cyst with marked inflammatory overlay. Round cells permeate both the epithelium and the connective tissue immediately deep to it. Spaces indicate where crystalline cholesterol has formed within the cyst. Bone formation is evident (arrow).

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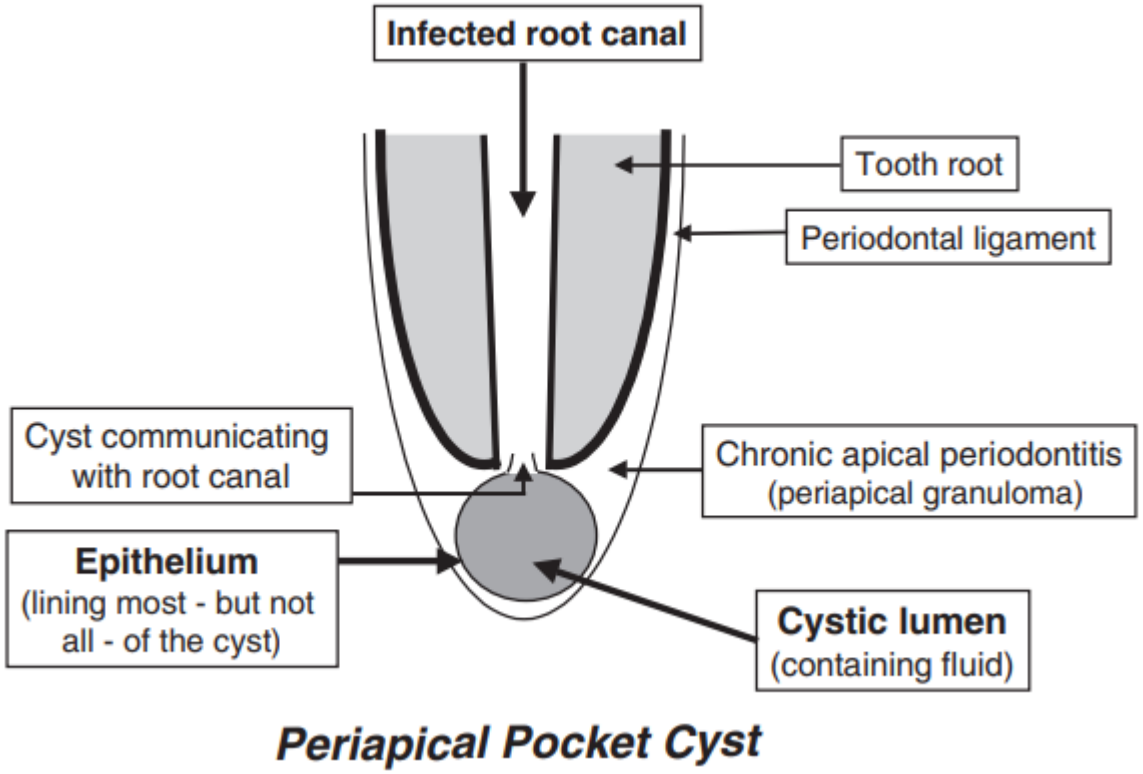
Two types of periapical cysts (Nair et al. 2003):

1. Periapical pocket cysts
2. Periapical true cysts

Abbott PV. Classification, diagnosis and clinical manifestations of apical periodontitis. Endodontic topics. 2004 Jul;8(1):36-54.
Ramachandran Nair PN. Non-microbial etiology: periapical cysts sustain post-treatment apical periodontitis. Endodontic topics. 2003 Nov;6(1):96-113.

1. **A periapical pocket cyst:** Sac-like epithelium-lined cavity that is open to, and continuous with, the root canal



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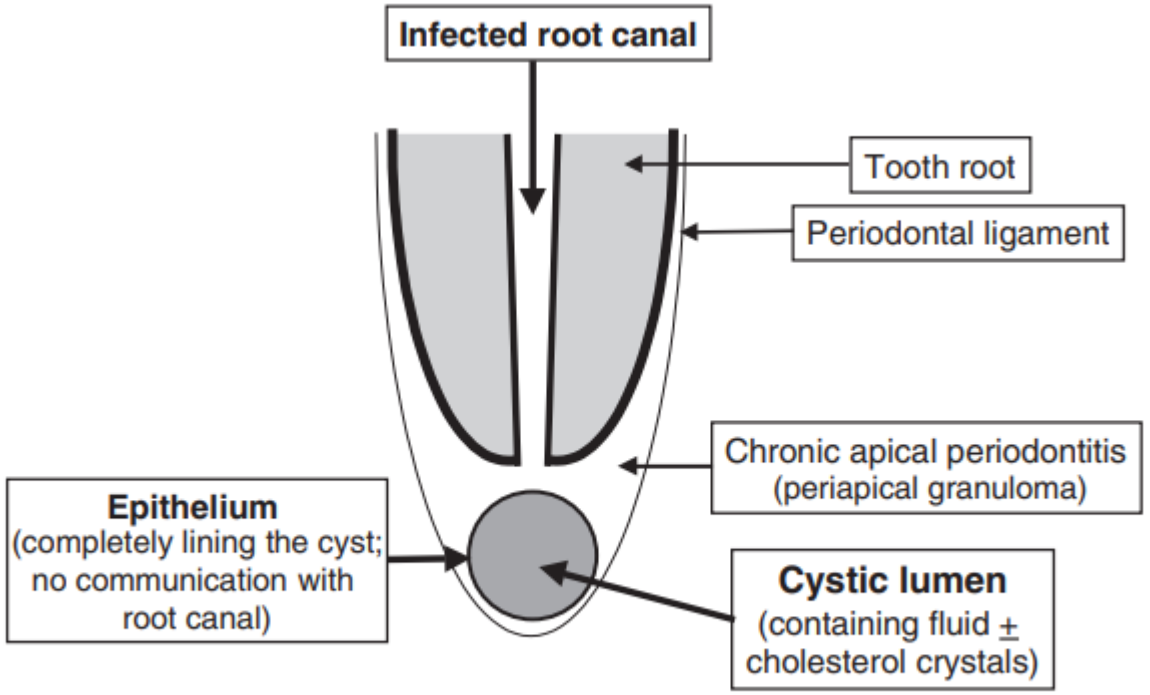
Ramachandran Nair PN. Non-microbial etiology: periapical cysts sustain post-treatment apical periodontitis. Endodontic topics. 2003 Nov;6(1):96-113.

2. **Periapical true cyst:** Completely enclosed by the epithelial lining with no communication to the root canal



Periapical True Cyst

Abbott PV. Classification, diagnosis and clinical manifestations of apical periodontitis. Endodontic topics. 2004 Jul;8(1):36-54.
Ramachandran Nair PN. Non-microbial etiology: periapical cysts sustain post-treatment apical periodontitis. Endodontic topics. 2003 Nov;6(1):96-113.

PATHOGENESIS

Described in three phases

First phase: Dormant cell rests of Malassez proliferate as a direct effect of inflammation under the influence of

1. Bacterial antigens
2. Epidermal growth factors
3. Cell mediators and metabolites – released by various cells residing in the periapical lesion

Ramachandran Nair PN. Non-microbial etiology: periapical cysts sustain post-treatment apical periodontitis. Endodontic topics. 2003 Nov;6(1):96-113.

Second phase: An epithelium-lined cavity comes into existence

- Two main theories regarding the formation of the cyst cavity

1. **'Nutritional Deficiency Theory':**

- Central cells of the epithelial strands become removed from their source of nutrition and undergo necrosis and liquefactive degeneration
- Accumulating products attract neutrophilic granulocytes into the necrotic area
- Such micro-cavities – coalesce to form the cyst cavity lined by stratified epithelium

Ramachandran Nair PN. Non-microbial etiology: periapical cysts sustain post-treatment apical periodontitis. Endodontic topics. 2003 Nov;6(1):96-113.

2. **‘Abscess Theory’:**

- Proliferating epithelium lines an abscess cavity formed by tissue necrosis and lysis because of the innate nature of the epithelial cells to cover exposed connective tissue surfaces

Ramachandran Nair PN. Non-microbial etiology: periapical cysts sustain post-treatment apical periodontitis. Endodontic topics. 2003 Nov;6(1):96-113.

Third phase

- Cyst grows in size, exact mechanism still unknown
- Believed to be by osmosis
- Presence of necrotic tissue in the cyst lumen attracts neutrophilic granulocytes, which extravasate and transmigrate through the epithelial lining into the cyst cavity where they perish
- Lytic products of the dying cells in the cyst lumen release a greater number of molecules
- Osmotic pressure of the cyst fluid rises to a level higher than that of the tissue fluid

Ramachandran Nair PN. Non-microbial etiology: periapical cysts sustain post-treatment apical periodontitis. Endodontic topics. 2003 Nov;6(1):96-113.

Differential Diagnosis and Treatment

- Granuloma and Radicular cysts are difficult to differentially diagnose
- **It is now accepted that:**
- Well-defined border – indicates a long-standing lesion (slowly increasing in size)
- Diffuse border – indicates rapidly expanding lesion
- Size of the radiolucency also irrelevant to the histological state of the tissue
- Initial treatment for both – Endodontic treatment

Abbott PV. Classification, diagnosis and clinical manifestations of apical periodontitis. Endodontic topics. 2004 Jul;8(1):36-54.

CONDENSING OSTEITIS

- Inflammation of periradicular tissues stimulate concurrent osteoclastic and osteoblastic activities

- Condensing osteitis – associated with predominant osteoblastic activity

- Radiographic variant of chronic apical periodontitis – characterized as a localized overproduction of apical bone

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Symptoms, Clinical and Radiographic Features

- Asymptomatic or sensitive to stimuli
- May or may not respond to electrical and thermal stimuli
- Radiographically: Well-circumscribed radiopaque area around root

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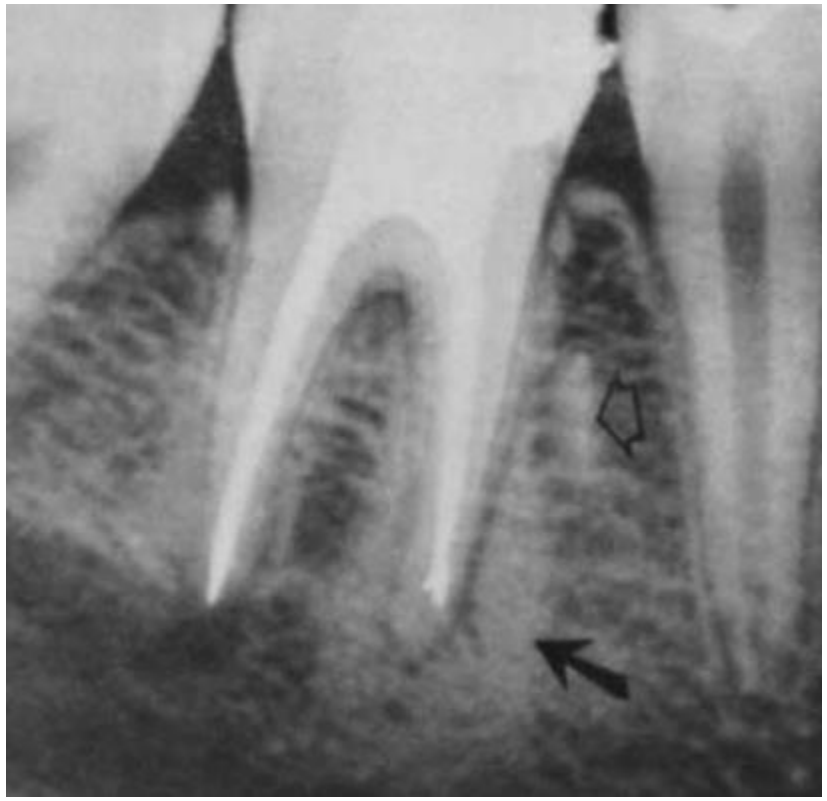
The radiopaque periradicular changes return to normal after successful root canal therapy



Condensing osteitis
Endodontic treatment has just been completed.
Obvious condensation of alveolar bone (black arrow) is noticeable around the mesial root of the first molar.
Resolution (arrow) of apical condensing osteitis

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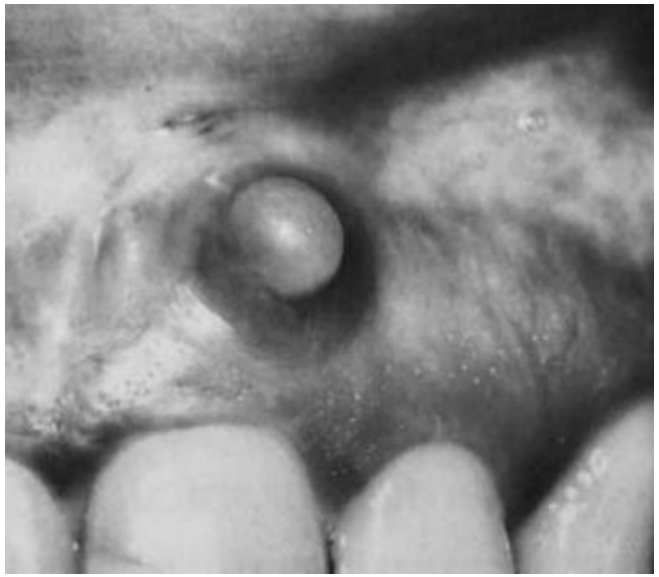
CHRONIC PERIAPICAL ABSCESS

- Associated with a gradual egress of irritants from the root canal system into the periradicular tissues and formation of an exudate



- Characterized by – presence of a draining sinus on the oral mucosa or occasionally on the facial skin

- Exudate may also drain through the gingival sulcus of the involved tooth, mimicking a periodontal lesion with a pocket

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Abbott PV. Classification, diagnosis and clinical manifestations of apical periodontitis. Endodontic topics. 2004 Jul;8(1):36-54.

SYMPTOMS

- Associated with little discomfort
- Sinus tract drainage blocked – varying levels of pain and swelling experienced
- Clinical examination – sensitivity to percussion and palpation
- Vitality tests are negative
- Radiographically: Presence of bone loss at the apex

Chronic Apical Abscess

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- Gutta percha point placed into the draining sinus – tooth identified easily
- Usefulness depends on the draining sinus tract being patent at the time of examination


(A)

(A) A gutta percha (GP) point has been placed into the draining sinus in order to trace its origin. (B) The radiograph taken with the GP point in the sinus shows that it tracks from the periapical region of the upper left central incisor, which has a chronic apical abscess. The lateral incisor also has an infected root canal system and chronic apical periodontitis but this tooth is not associated with the draining sinus

Abbott PV. Classification, diagnosis and clinical manifestations of apical periodontitis. Endodontic topics. 2004 Jul;8(1):36-54.

- Chronic apical abscess can revert back to granuloma – no further production of pus

- It can become an acute apical abscess if drainage is inhibited and pressure builds up within the lesion

- Transform to become a cyst, which can revert back to being an abscess if bacteria enter the lesion with formation and collection of pus in the lumen

Abbott PV. Classification, diagnosis and clinical manifestations of apical periodontitis. Endodontic topics. 2004 Jul;8(1):36-54.

EXTERNAL ROOT RESORPTION

- External root resorption occurs when the cementoblastic layer or other tooth tissue on the root surface are either damaged or removed
- **Classification of External Root Resorption (According to Andreasen 1985)**

1. Surface resorption
2. Inflammatory resorption
3. Replacement (ankylosis) resorption

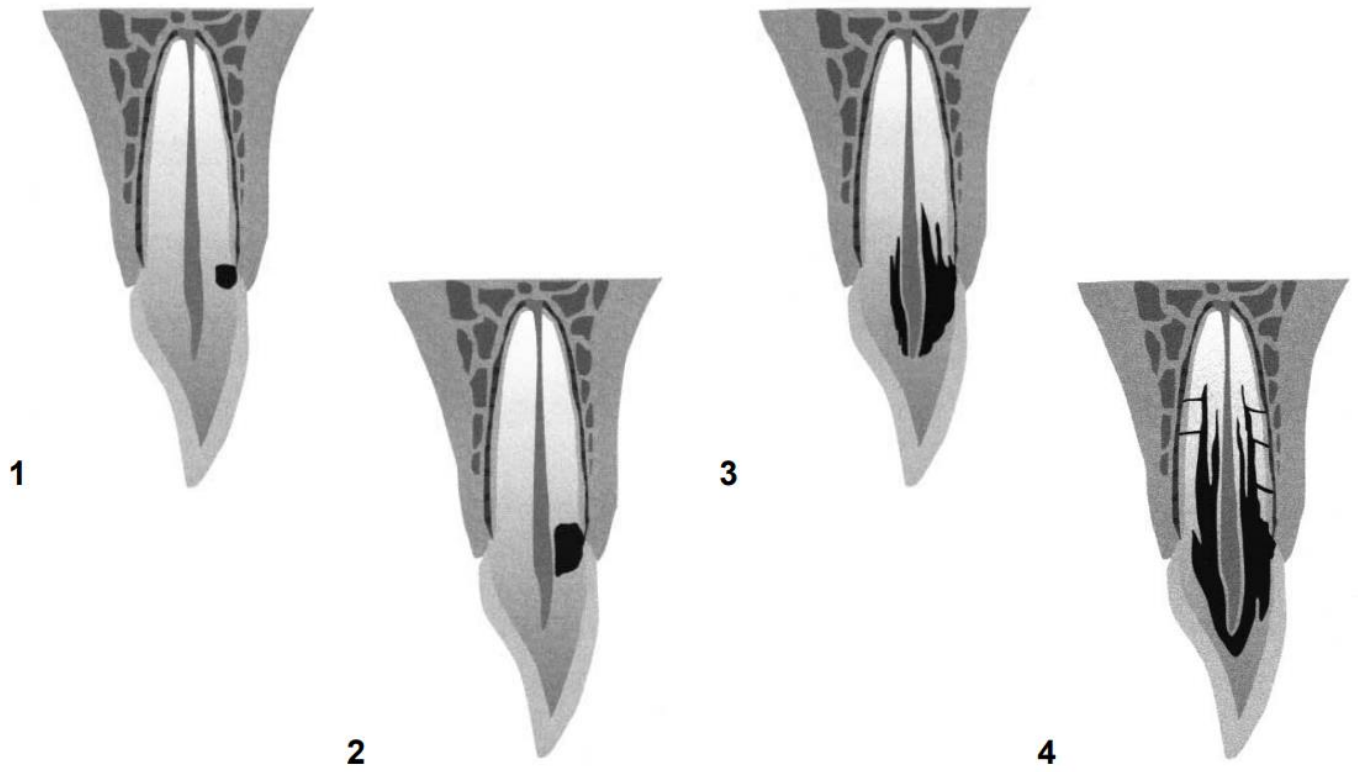
Ahangari Z, Nasser M, Mahdian M, Fedorowicz Z, Marchesan MA. Interventions for the management of external root resorption. Cochrane database of systematic reviews. 2015(11).

- **Classification of External Root Resorption (According to Heithersay 2007)**

1. Surface resorption
2. Inflammatory resorption
3. Replacement (ankylosis) resorption
4. Invasive cervical resorption
5. Idiopathic resorption

Ahangari Z, Nasser M, Mahdian M, Fedorowicz Z, Marchesan MA.
Interventions for the management of external root resorption.
Cochrane database of systematic reviews. 2015(11).

- **Classification of External Root Resorption (According to Heithersay 2007)**



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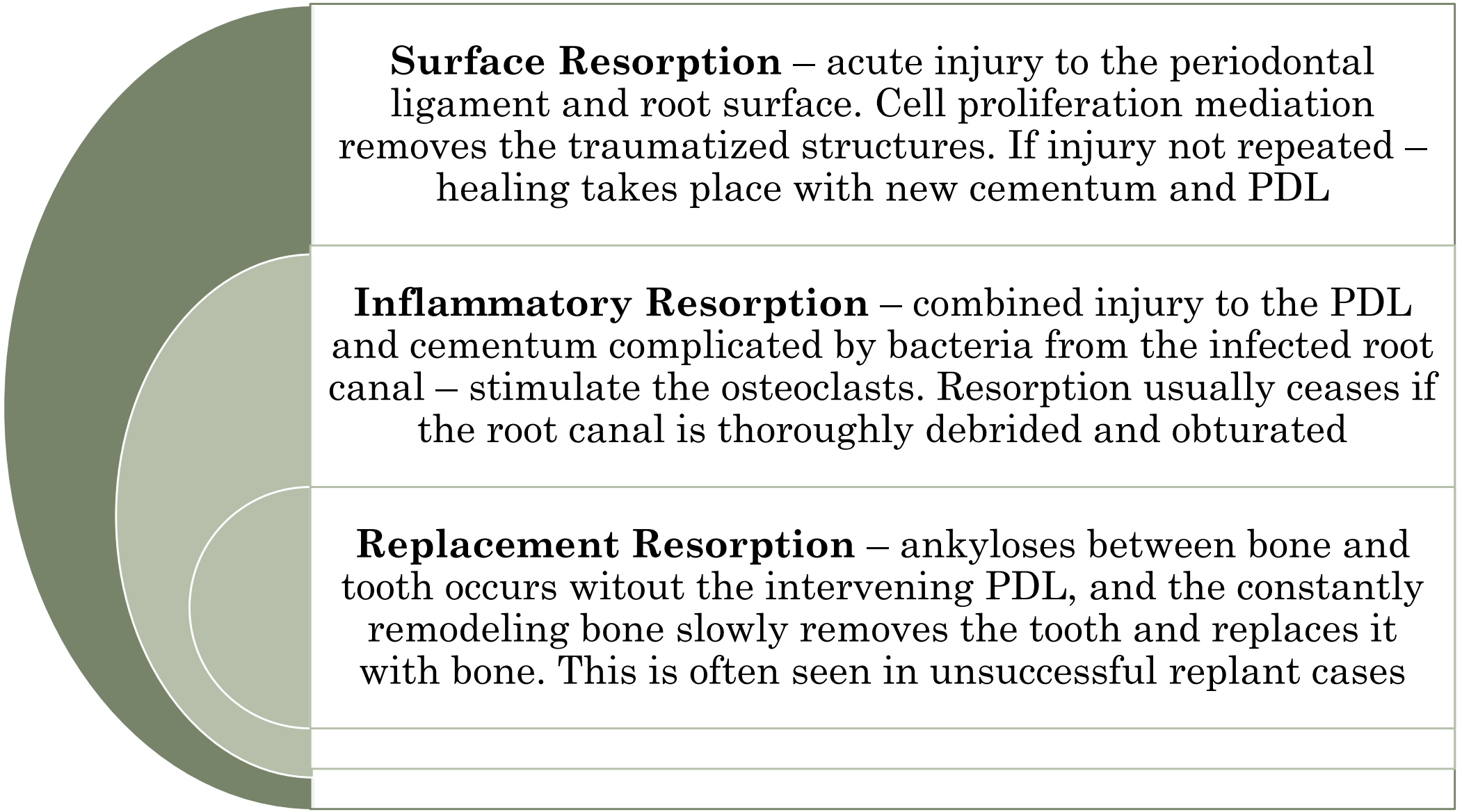
Heithersay's clinical classification of invasive cervical resorption:
Class l: A small invasive resorptive lesion near the cervical area with shallow penetration into the dentin.
Class 2: A well-defined invasive resorptive lesion that has penetrated close to the coronal pulp chamber but shows little or no extension into the radicular dentin.
Class 3: A deeper invasion of dentin by resorbing tissue, not only involving the coronal dentin but also extending at least to the coronal third of the root.
Class 4: A large invasive resorptive process that has extended beyond the coronal third of the root canal.



Surface Resorption – acute injury to the periodontal ligament and root surface. Cell proliferation mediation removes the traumatized structures. If injury not repeated – healing takes place with new cementum and PDL

Inflammatory Resorption – combined injury to the PDL and cementum complicated by bacteria from the infected root canal – stimulate the osteoclasts. Resorption usually ceases if the root canal is thoroughly debrided and obturated

Replacement Resorption – ankyloses between bone and tooth occurs witout the intervening PDL, and the constantly remodeling bone slowly removes the tooth and replaces it with bone. This is often seen in unsuccessful replant cases

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CAUSES

1. Trauma
2. Previous periodontal surgery
3. Pressure from adjacent unerupted teeth
4. Tooth re-implantation
5. Pathological conditions such as tumours
6. Orthodontic tooth movement (where the forces applied to induce tooth movement are not controlled)

Ahangari Z, Nasser M, Mahdian M, Fedorowicz Z, Marchesan MA. Interventions for the management of external root resorption. Cochrane database of systematic reviews. 2015(11).

DIAGNOSIS

- Based on a combination of radiographic and clinical examination
- Radiographs of the lesion show an uneven root surface outline
- Radiographs obtained at different angles – useful to determine which surface is affected

Ahangari Z, Nasser M, Mahdian M, Fedorowicz Z, Marchesan MA.
Interventions for the management of external root resorption.
Cochrane database of systematic reviews. 2015(11).

External surface resorption

External inflammatory root resorption

External replacement resorption or ankylosis

TREATMENT

- Symptomatic treatment for relief of pain and swelling and the stabilization of mobile teeth

- Pulpal involvement – endodontic therapy with surgery to remove the granulation tissue and filling of the resorptive defect

- MTA is used to arrest the resorptive process and provide seal

Ahangari Z, Nasser M, Mahdian M, Fedorowicz Z, Marchesan MA.
Interventions for the management of external root resorption.
Cochrane database of systematic reviews. 2015(11).

- If the root resorption is extensive and involves cervical margin – treatment complicated – extraction may be the only option

- If the cause is pressure from an unerupted tooth or orthodontic forces – removal of the tooth or pressure will usually stop further root resorption

- Invasive cervical resorption – total removal or inactivation of the resorptive tissue via surgical approach

Ahangari Z, Nasser M, Mahdian M, Fedorowicz Z, Marchesan MA. Interventions for the management of external root resorption. Cochrane database of systematic reviews. 2015(11).

DIFFERENTIAL DIAGNOSIS OF PERIRADICULAR DISEASES

DISEASE	DIFFERENTIAL DIAGNOSIS	DIFFERENTIATING FEATURE
Primary Symptomatic Apical Periodontitis	1. Secondary Symptomatic Apical Periodontitis	Absence of Periradicular Radiolucency
	2. Symptomatic (Acute) Apical Abscess	Extreme clinical symptoms of swelling and pain in Apical Abscess
Secondary Symptomatic Apical Periodontitis	Symptomatic (Acute) Apical Abscess	Distinct periradicular radiographic changes
Symptomatic (Acute) Apical Abscess	1. Periodontal Abscess	Associated with vital teeth, in contrast to an acute abscess
	2. Asymptomatic (Chronic) Apical Abscess	Presence of a sinus opening

DISEASE	DIFFERENTIAL DIAGNOSIS	DIFFERENTIATING FEATURE
Asymptomatic Apical Periodontitis	Symptomatic Apical Periodontitis	Distinct periradicular radiographic changes
Asymptomatic Chronic Apical Abscess	Symptomatic (Acute) Apical Abscess	Presence of a sinus opening
External Root Resorption	Internal Root Resorption	1. Ragged area, a “scooped-out” area on the side of the root 2. Root canal with a well-demarcated, enlarged “ballooning” area of resorption

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THANK YOU!