




ENDODONTIC AND PERIODONTIC RELATIONSHIP

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INTRODUCTION

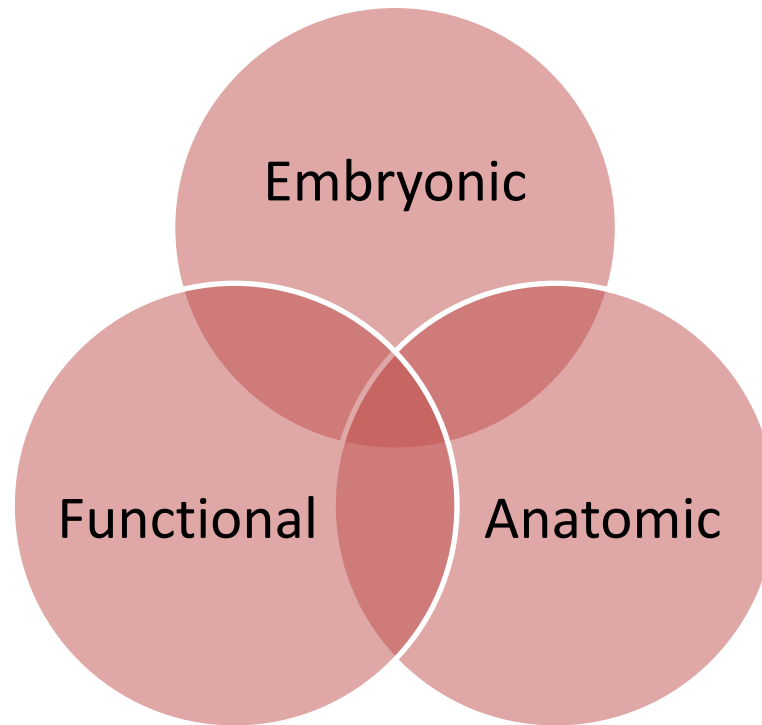
- The interrelationship between the pulp and the periodontal disease primarily occurs by the way of intimate anatomic and vascular connections
- Interrelationships have been traditionally been demonstrated radiographs, histologic and clinical criteria

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- Diagnosis is often challenging because these diseases have been primarily been studied as separate entities and each disease may the clinical characteristics of the other
 - Chen et al in 1997 suggested that pulpal and periodontal problem (b/w pulp and PD) are responsible for > 50% of tooth mortality.
 - An important article was written by Dr. Harry B Johnson and Dr. Balint Orban in 1948 in Journal Of Endodontia
 - This article remains the classical introduction to endodontic – periodontal relationship

- The closeness of the two prompted Franklin. S. Weine to go to the extent of stating that: “The close relationship between endodontics and periodontics is finely established; endodontics may be thought of as periapical periodontics”.

Pulpal and periodontal inter-relationship

- The pulp and periodontium \longrightarrow inter-relationship

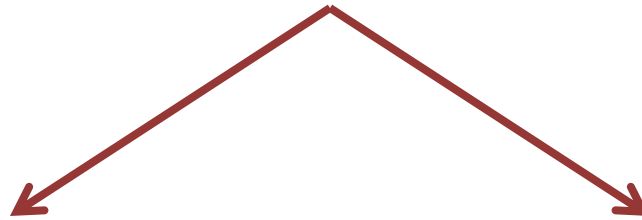


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Ectomesenchymal in origin



Cells proliferate



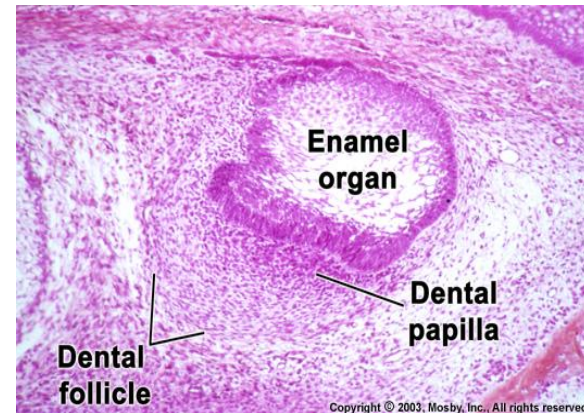
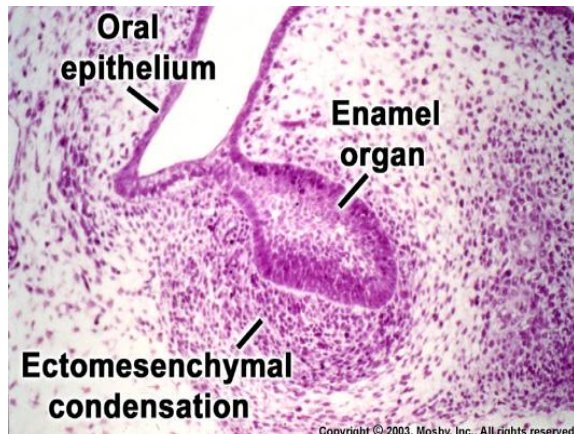
dental papilla

(precursors of the pulp)


dental follicle

(precursors of the periodontium)

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- These are separated by the formation and development of the tooth bud from overlying ectoderm into enamel and dentine.
- The embryonic development gives rise to anatomical connections which remain throughout the life of the tooth



Intercommunication between pulpal and periodontal tissue

- Several possible channels of communication exists between the pulp and the periodontium
- The most important being

Dentinal tubules

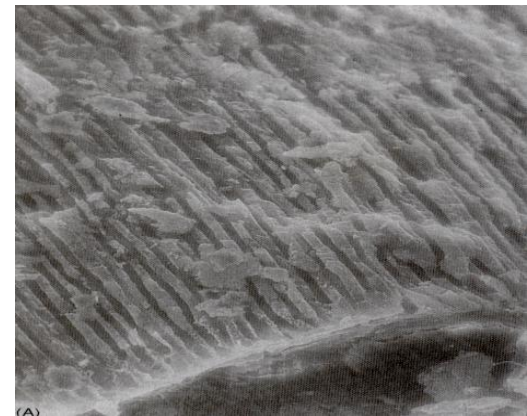
Accessory canals

Apical Foramen

DENTINAL TUBULES

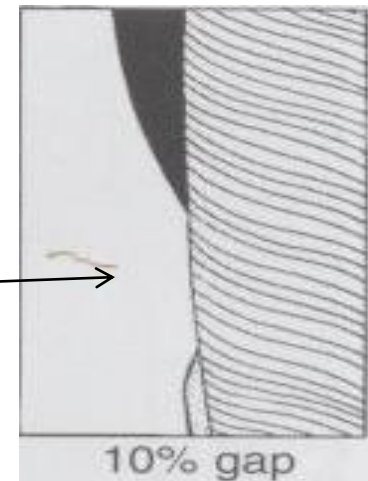
- In the root, dentinal tubules extend from the intermediate dentin just inside the cementum- dentin junction to the pulp- predentin junction.
- Tubules range in size from about 1 to 3 μm in diameter
- Approximately 1 μm CDJ and 2.5 μm near pulp- predentin junction.
(*Brannstrom; Arch Oral Biol 1976*)
- The number of dentinal tubules per sq mm varies from 8,000 to 57,000 at the surface and upto 15,000 / mm^2 at CDJ

SEM of patent dentinal tubules in radicular dentin



- This anatomic variance provides a possible route of spread of bacterial toxins and the bacteria provided cemental layer is absent or denuded or discontinuous
- Attributed to developmental defects, disease process , trauma or surgical procedures involving root surface
- When cementum and enamel do not meet at CEJ these tubules remains exposed creating pathways

Cemento enamel junction



ACCESSORY CANALS



- Considerable speculations exists about the role accessory canals may play in the spread of infection from the pulp to the periodontium and vice versa.
- May be present anywhere on the root surface.
- Majority are found in the apical region
- Overall it is estimated that 80%-40% of teeth have accessory canals

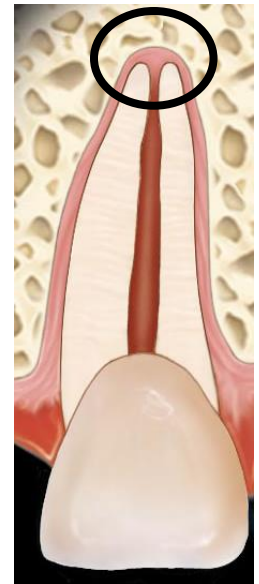
- *Gutmann; J Perio 1978, Vertucci & Williams; OOO 1974, De Deus; JOE 1975* suggested that
 - 1.6% teeth have lateral canals in coronal 1/3 of root.
 - 8.8% in middle 1/3.
 - 17% in apical 1/3.
- Incidence of periodontal disease associated with lateral canals caused by irritants in the dental pulp seems to be low.
- Kirkham 1975 studying 1000 human teeth with extensive periodontal disease, found only 2% of lateral canals associated with the involved periodontal pocket.
- The incidence of lateral or furcal canals in the furcation region of molars is approximately 30%- 50%.

- Accessory canals in the furcation of molars may also be a direct pathway of communication between the pulp and the periodontium
(Lowman JV 1973; Gutmann JL. 1978)
- The incidence of accessory canals may vary from 23% to 76%
(Burch JG et al 1974; De Deus QD 1975; Goldberg F et al 1987)
- Contain connective tissue and blood vessels → connect the circulatory system of the pulp with that of the periodontium.
- However, not all these canals extend the full length from the pulp chamber to the floor of the furcation

- Seltzer et al reported that pulpal inflammation may cause inflammatory reaction in the interradicular periodontal tissues.
- The presence of patent accessory canals is a potential pathway for the spread of microorganisms and their toxic byproducts from the pulp to the periodontal ligament and vice versa, resulting in an inflammatory process in the involved tissues

APICAL FORAMEN

- Main pathway of communication
- Irritants from the pulp permeate radially from the apical foramina resulting in periapical pathosis
- May also act as portal of entry of irritants from deep periodontal pockets to pulp



Other pathways of communication

- Lingual grooves
- Cemental agenesis
- Root or tooth fractures
- Iatrogenic factors
 - Perforations
 - Improper seal of apex

Bacterial transfer via:

Healthy Pulp

Infected Periodontium

Apical foramina,
vertical root fracture

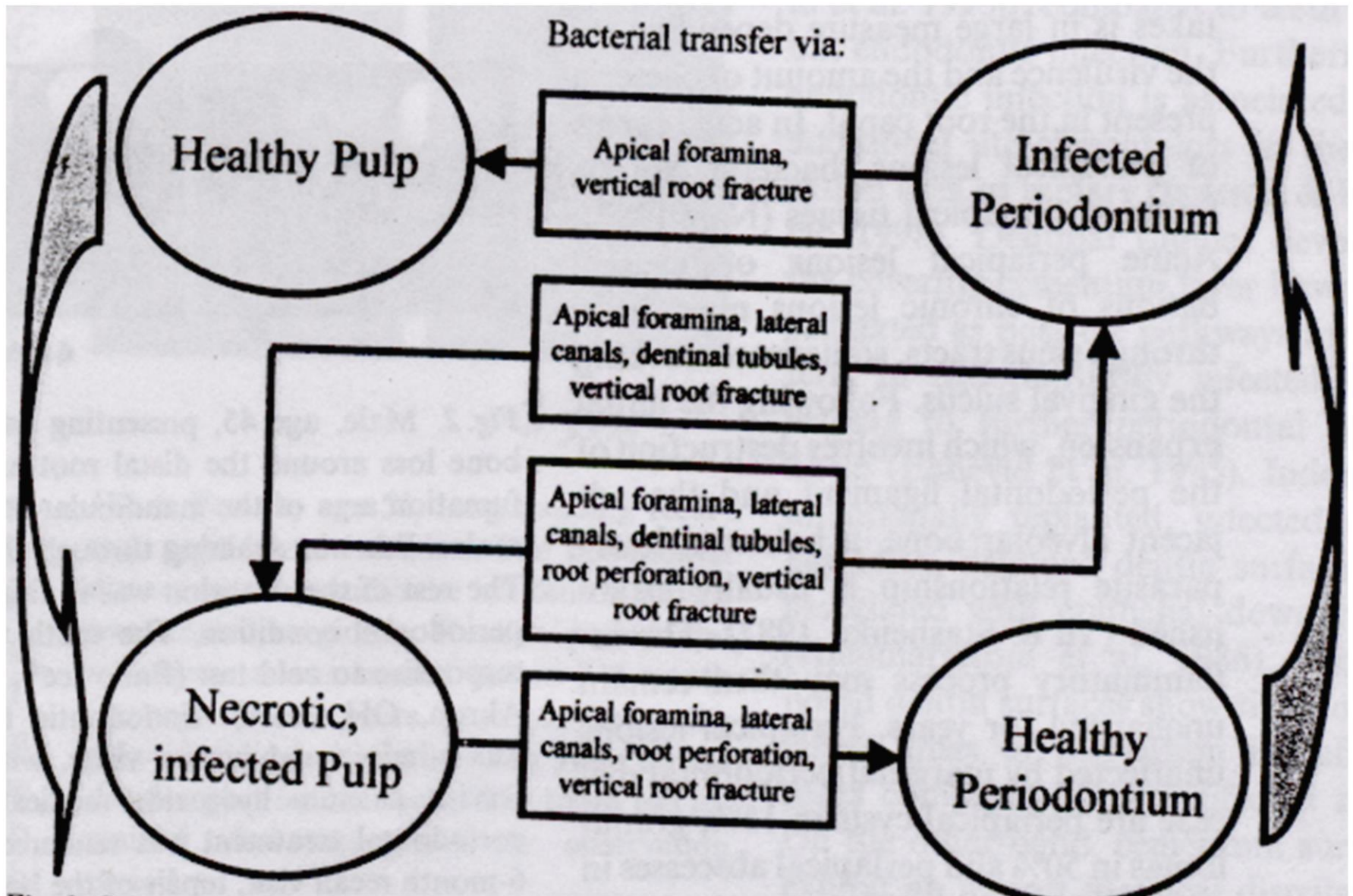
Apical foramina, lateral
canals, dentinal tubules,
vertical root fracture

Apical foramina, lateral
canals, dentinal tubules,
root perforation, vertical
root fracture

Necrotic,
infected Pulp

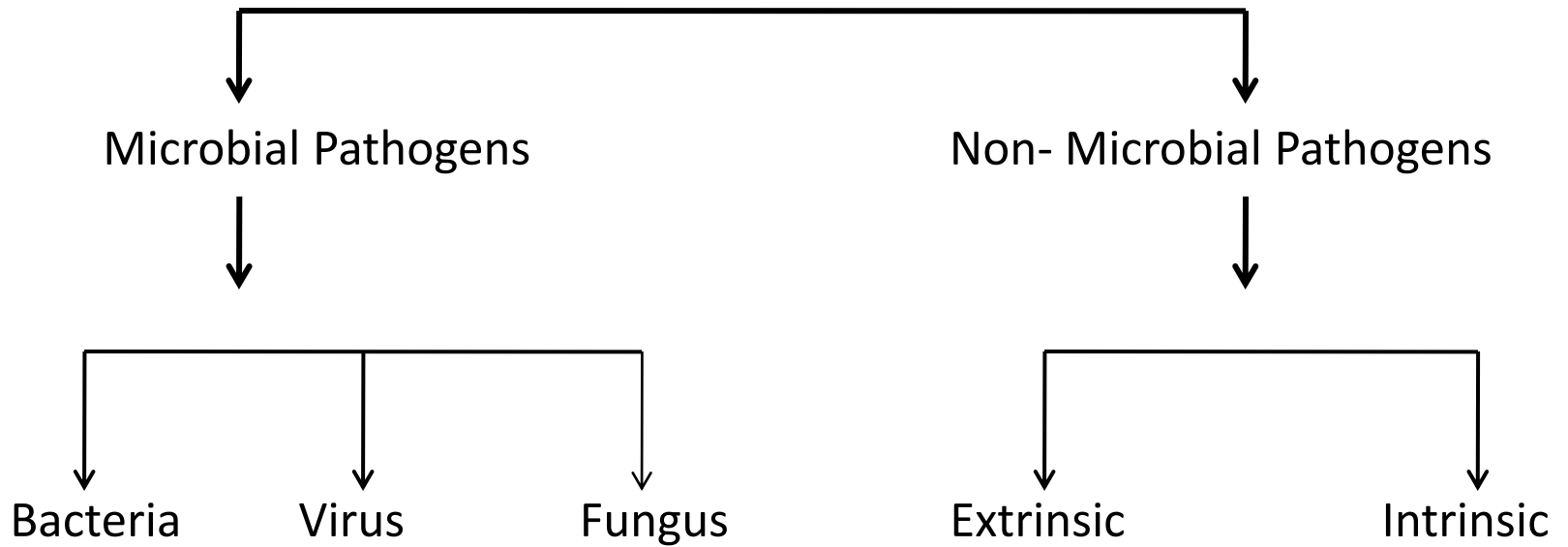
Healthy
Periodontium

Apical foramina, lateral
canals, root perforation,
vertical root fracture



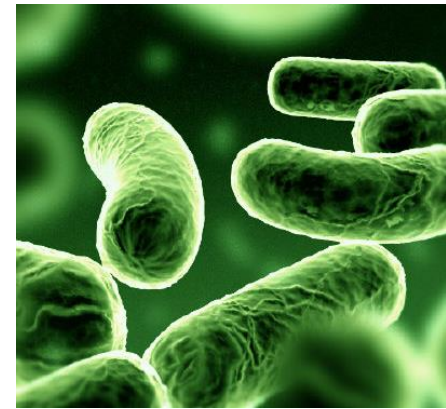
Etiological Factors

- Various etiological factors are considered




I. MICROBIOLOGICAL FACTORS

Bacteria




- Plays a critical role in both endodontic and periodontal disease
- Periapical tissues become involved when bacteria invade the pulp, causing either partial or total necrosis.
- Kakehashi et al in 1965. demonstrated the relationship between the presence of bacteria and the pulp and periapical diseases in a classic work
- Moller et al. (1981) confirmed these findings in monkeys.

- 
- Proteolytic bacteria predominate the root canal flora, which changes over time to a more anaerobic microbiota

(Fabricius L, 1982; Sundqvist G1992)

- Rupf et al studied the profiles of periodontal pathogens in pulpal and periodontal diseases associated with the same tooth
- These pathogens were found in all endodontic samples and the same pathogens were found in teeth with chronic apical periodontitis and chronic adult periodontitis.
- Therefore he concluded that periodontal pathogens accompany endodontic infections and that endodontic – periodontal interrelationships are a critical pathway for both diseases.

- 
- Spirochetes are another type of microorganism associated with both endodontic and periodontal diseases.
 - found more frequently in the subgingival plaque but the presence in the root canal system is well documented
 - Other organisms : Actinobacillus actinomycetemcomitans, Bacteroides forsythus, Eikenella corrodens, Fusobacterium nucleatum, Porphyromonas gingivalis, Prevotella intermedia, and Treponema denticola.

The background is a complex, abstract composition. It features a dark, almost black, textured surface. Overlaid on this are numerous thin, glowing lines in shades of red and white. These lines are mostly curved and appear to be part of a larger, intricate structure. In the lower-left quadrant, there is a prominent, semi-transparent sphere with a bright red glow emanating from its center. The overall effect is one of dynamic energy and interconnectedness.

ENDODONTIC AND PERIODONTIC RELATIONSHIP



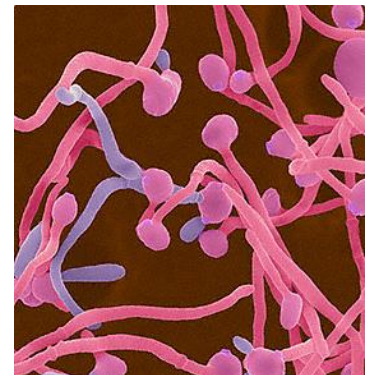
Fungi

- The presence and prevalence of fungi associated with endodontic infections are well documented

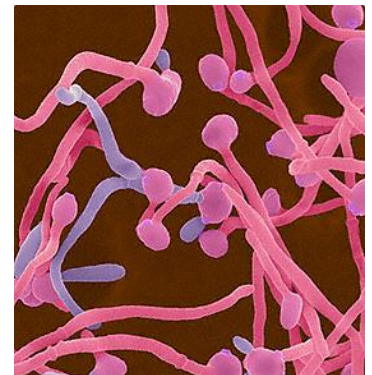
(Waltimo Tet al 2005; Siqueira JF 2004)

- Yeast colonization demonstrated in (associated with periradicular pathosis)
 - untreated root caries *(Jackson FL et al, 1963; Wilson MI et al 1968)*
 - dentinal tubules *(Kinirons MJ1983 ; Damm DD, 1988; Sen BH et al1995)*
 - failed root canal treatments *(Nair PNR1990 ; Molander A, et al 1998; Sundqvist G et al 1998 ;Peciuliene V et al)*
 - asymptomatic apical periodontitis *(Lomicali G 1996)*
 - in periapical tissues *(Tronstad 1987)*

- Prevalence of fungi in infected root canal systems have been reported to vary from
 - 0.5% to 26% in untreated root canals
 - 3.7% to 33% in previously treated canals.
- The majority of the recovered fungi were *Candida albicans* 21%
- Other species detected → *C. glabrata*, *C. guilliermondii* and *C. incospicua* and *Rodotorula mucilaginosa*



- Has been found that approximately 20% of adult periodontitis patients also harbor subgingival yeasts
- *C. albicans* → most common species isolated (as in endodontic infections)

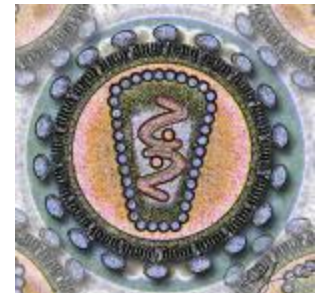




Virus

- There is increasing evidence suggesting that viruses play an important role in the pathogenesis of both endodontic and periodontal disease.
- In patients with periodontal disease, the herpes simplex virus was frequently detected in gingival crevicular fluid and in gingival biopsies of periodontal lesions.
- Human cytomegalovirus was observed in about 65% of periodontal pocket samples and in about 85% of gingival tissue samples (100).
- Epstein–Barr virus type I was observed in more than 40% of pocket samples and in about 80% of the gingival tissue samples

- The presence of viruses in the dental pulp was first reported in a patient with AIDS (103).
- However, it has not been established that HIV virus can directly cause pulpal disease
- More research is needed to demonstrate a causal relationship of viral infections with both pulpal and periodontal disease processes





II. NON - MICROBIOLOGICAL FACTORS

EXTRINSIC FACTORS

- Although endodontic and periodontal diseases are primarily associated with the presence of microorganisms, the presence of certain foreign substances in situ may explain the emergence or persistence of some apical pathoses,
- Substances → dentin and cementum chips , root canal filling materials, cellulose fibers , gingival retraction cords, leguminous foods , and calculus-like deposits

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- Foreign bodies

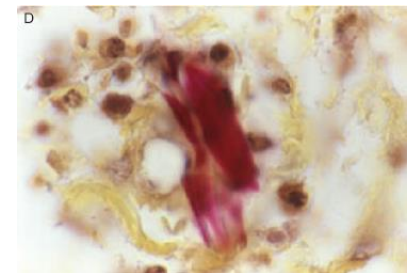
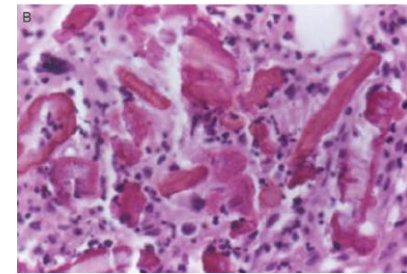
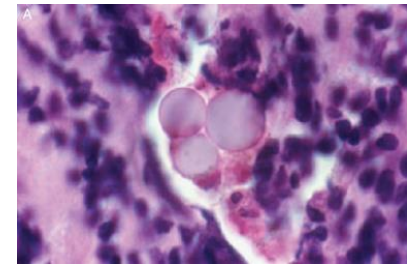
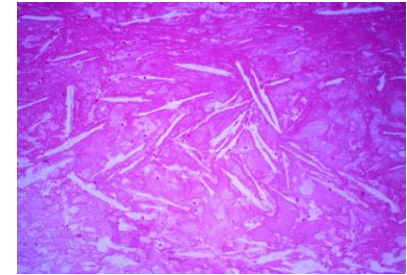


Inflammatory process of the periradicular tissues (multinucleated giant cells surrounding the foreign material in a chronic inflammatory infiltrate)

II. NON - MICROBIOLOGICAL FACTORS

Intrinsic factors

- Epithelial rests of Malassez
- Cholesterol
- Russell bodies
- Rushton hyaline bodies
- Charcot leiden crystals



CONTRIBUTING FACTORS TO ENDODONTIC LESIONS IN THE PERIODONTIUM

Inadequate endodontic treatment

- Proper endodontic procedures and techniques are key factors for treatment success.
- It is imperative to completely clean, shape, and obturate the canal system well in order to enhance successful outcomes.
- Poor endodontic treatment allows canal re-infection, which may often lead to treatment failure



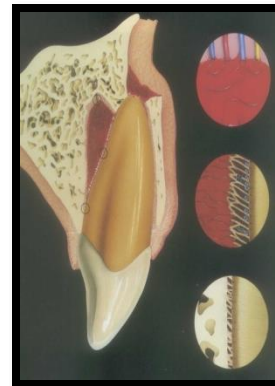
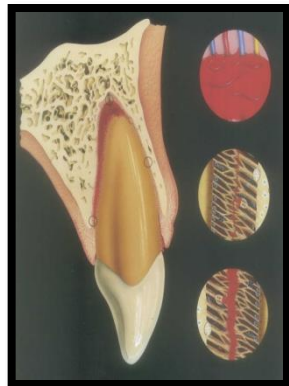
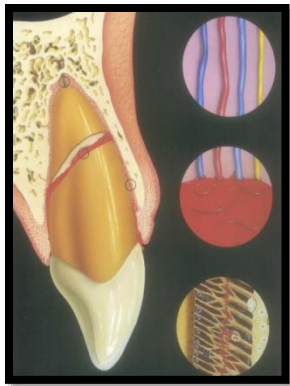


Coronal leakage

- Term used to designate leakage of bacterial elements from the oral environment along restoration margins to the endodontic filling.
- Important cause of endodontic treatment failure
- Root canals may become re-contaminated by microorganisms due to delay in placement of a coronal restoration and fracture of the coronal restoration and/or the tooth
- Coronal restoration is the primary barrier against coronal leakage and bacterial contamination of the root canal treatment.
- Lack of coronal coverage following endodontic treatment can significantly compromise tooth prognosis
- Therefore, it is essential that the root canal system be protected by good endodontic obturation and a well-sealed coronal restoration.

Trauma

- Trauma to teeth and alveolar bone may involve the pulp and the periodontal ligament.
- Both tissues can be affected either directly or indirectly.
- Dental injuries may involve the tooth to varying extent



- Treatment of traumatic dental injuries varies depending on the type of injury and it will determine pulpal and periodontal ligament healing prognosis



Resorptions

- Root resorption is a condition associated with either a physiologic or a pathologic process resulting in a loss of dentin, cementum, and/or bone
- Types of resorption

- ▶ Non-infective root resorption (result of a tissue response to non-microbial stimuli)



Transient

Pressure-induced

Chemical-induced


Replacement

- ▶ Infective root resorption.

Perforations

- Root perforations are undesirable clinical complications that may lead to periodontal lesions.
- When root perforation occurs, communications between the root canal system and either peri-radicular tissues or the oral cavity may often reduce the prognosis of treatment.
- Root perforations may result from extensive carious lesions, resorption, or from operator error (during root canal instrumentation or post preparation)



- 
- Treatment prognosis of root perforations depends on the size, location, time of diagnosis and treatment, degree of periodontal damage as well as the sealing ability and biocompatibility of the repair material
 - It has been recognized that treatment success depends mainly on immediate sealing of the perforation and appropriate infection control


Developmental malformations

- Invagination or a vertical developmental radicular groove.
- Such conditions can lead to an untreatable periodontal condition.
- These grooves usually begin in the central fossa of maxillary central and lateral incisors crossing over the cingulum, and continuing apically down the root for varying distances.



Radicular groove

- Probably the result of an attempt of the tooth germ to form another root.
- As long as the epithelial attachment remains intact, the periodontium remains healthy
- However, once this attachment is breached and the groove becomes contaminated, a self-sustaining infrabony pocket can be formed along its entire length.
- This fissure-like channel provides a nidus for accumulation of bacterial biofilm and an avenue for the progression of periodontal disease that may also affect the pulp.
- Radiographically, the area of bone destruction follows the course of the groove.

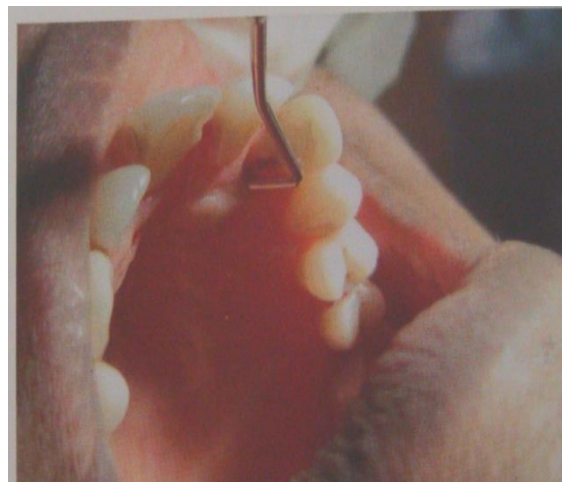
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- The prognosis of root canal treatment in such cases is guarded, depending upon the apical extent of the groove.
 - Although the acute nature of the problem may be alleviated initially, the source of the chronic or acute inflammation must be eradicated by a surgical approach.
 - Occasionally, the tooth needs to be extracted due to poor prognosis.

Salvaging a tooth with a deep palatogingival groove : an endo perio treatment

IEJ 2007 , 34, 5 54 – 561, 2001



42 yr old female presented with the complaint of discharge of pus and mobility in relation to 22 for the preceding 3 months



On clinical examination

- Pus discharge observed through palatal sulcus
- Deep palatogingival groove in relation to 22
- 10 mm probing defect
- Grade III mobility
- Oral hygiene fair



- Radiograph revealed
 - Periapical lesion with an advanced bony defect extending upto apical third of the root
 - Gutta percha tracing into the sinus tract and periodontal pocket revealed communication with periapical region
- Vitality test with 22 → negative response

Diagnosis : Endo Perio Lesion



- Treatment strategy

- Supra and sub gingival scaling along with root debridement
- Composite splint to stabilize 22
- Root canal treatment
- Periodontal surgery for pocket elimination and groove repair
- Hydroxyapatite graft material placed in the deep bony defect



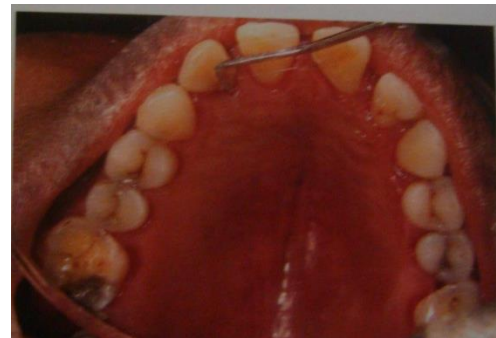
Post operative radiograph
after 3 months
Probing depth 5mm





Post operative radiograph
after 6 months
Probing depth 4mm

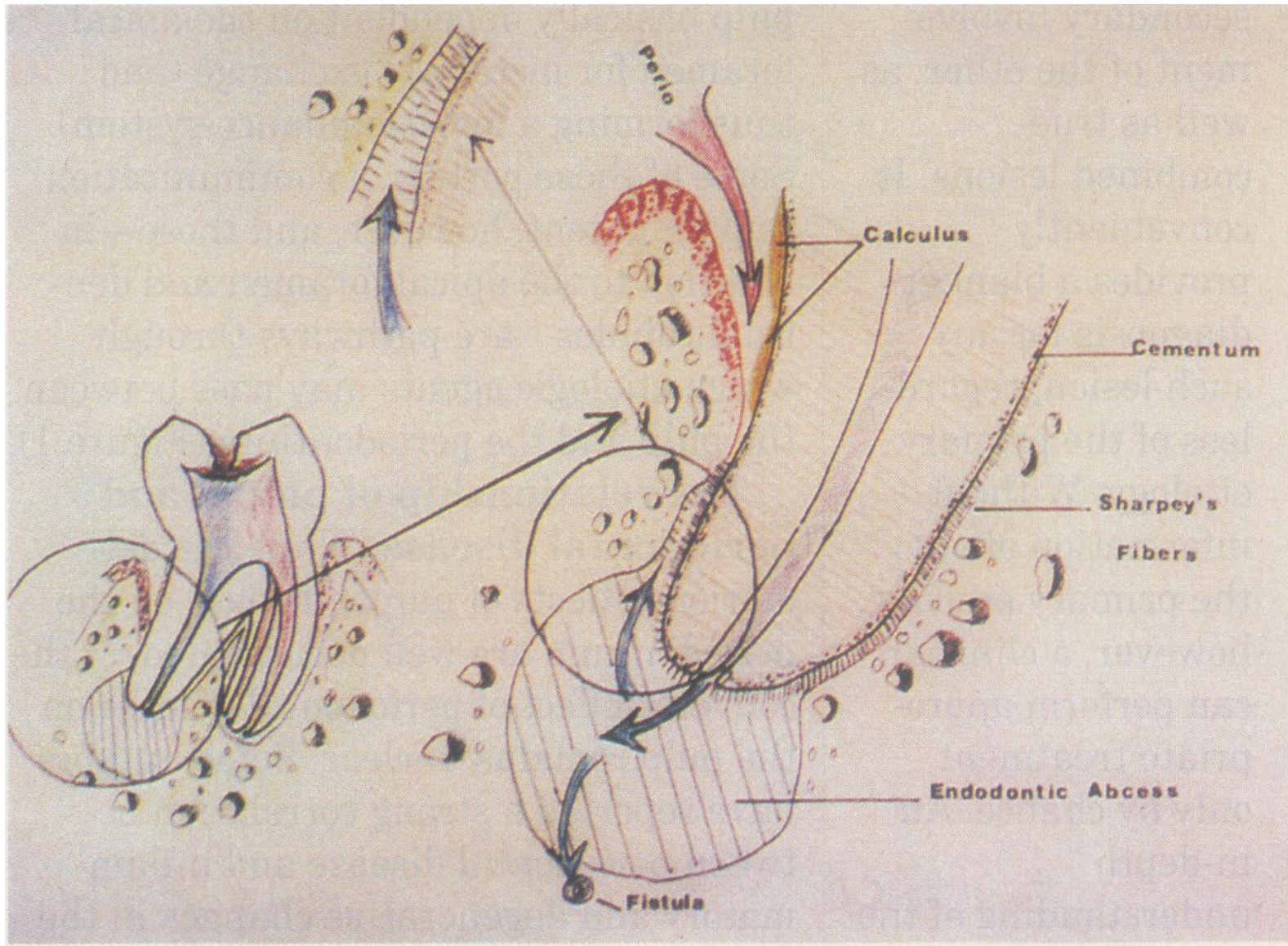


Post operative radiograph and
after 18 months
Probing depth 4mm


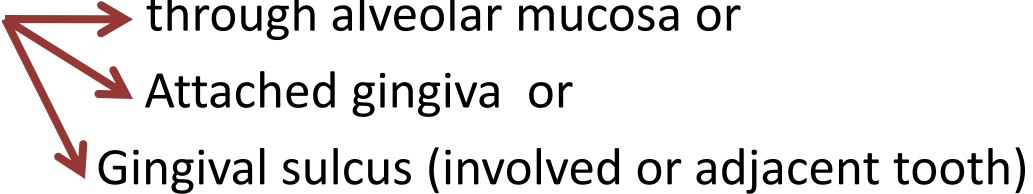



Pulpal – Periodontal Interrelationship


- Pulp becomes degeneration  necrotic debris, bacterial byproducts, toxins

inflammatory response and destruction in periodontium
- Termed as retrograde periodontitis



Depiction of a retrograde periodontitis, a lesion that progresses in the opposite direction of a marginal periodontitis and has none of the basic characteristics of periodontal disease.

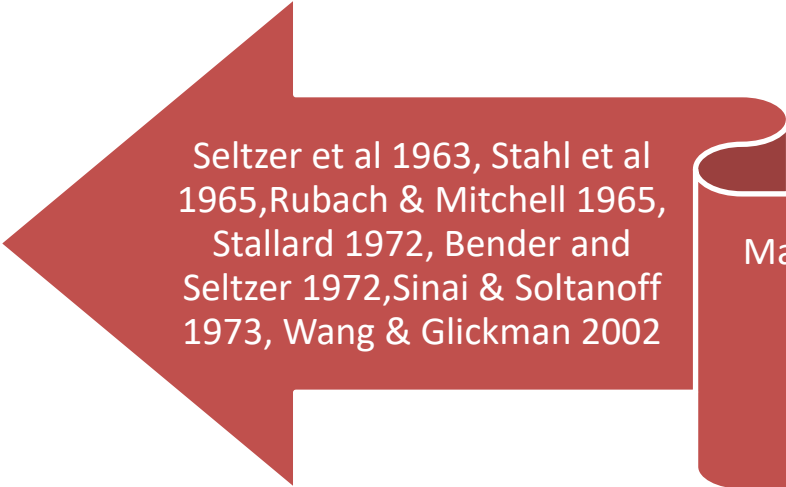
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- Effect ranges in extend from minimal inflammation confined to the PDL to extensive destruction of PDL , tooth socket, and surrounding structures
 - Lesion may result in localized or diffused swelling , occasionally may involve attached gingiva
 - Occasionally sinus tract 
 - through alveolar mucosa or
 - Attached gingiva or
 - Gingival sulcus (involved or adjacent tooth)

- 
- Endodontic infection has been regarded as local modifying risk factor for periodontitis progression if left untreated
 - Its believed that unresolved periapical infection could sustain endodontic pathogen growth and encourage osteoclastic activity
 - Extend of periodontal destruction depends on factors like
 - virulence of irritating stimuli
 - duration of disease
 - host defense mechanism

- 
- Although endodontic infections have been highly correlated with deeper periodontal pockets and furcal involvement , the causal relationship between the two pathosis has not yet been established
 - It has been suggested that endodontic treatment should occur before the treatment of furcation lesion to ensure successful results
 - Extensive evidence is lacking to prove this hypothesis
 - However it is of general agreement that with proper endodontic treatment periodontal disease of pulpal origin should heal

Periodontal - Pulpal Interrelationship


- Effect of periodontal inflammation on pulp more controversial



Seltzer et al 1963, Stahl et al 1965, Rubach & Mitchell 1965, Stallard 1972, Bender and Seltzer 1972, Sinai & Soltanoff 1973, Wang & Glickman 2002



Masur & Massler 1964, Hattler et al 1977, Ross & Thomson 1978, Bergenholtz & Nyman 1984, Torebinejad & Kiger 1985, Harrington et al 2002




Studies supporting the effect of periodontal disease on the pulp

Studies supporting the effect of periodontal disease on the pulp



- It appears clinically that pulp is not effected by the periodontal disease until the defect has an accessory canal to the oral environment
- Presence of cemental layer is important for the protection of pulp from the toxic elements of plaque
- Hence periodontal disease and treatments are considered as a potential cause of pulpitis and pulpal necrosis
- Pathogens pass through these defects into pulp and may cause localized inflammatory reaction that could be followed by pulpal necrosis

- 
- Pulp of teeth with long standing periodontal disease develops fibrosis and various forms of mineralization
 - Also reported to have narrower canals (thought to be caused due to reparative process than an inflammatory one)

(Bender and Seltzer 1972)

- When pathological changes occur in the pulp as a result of periodontal disease pulp usually

(Langeland K, Rodrigues h, Dowden W ; 1972)



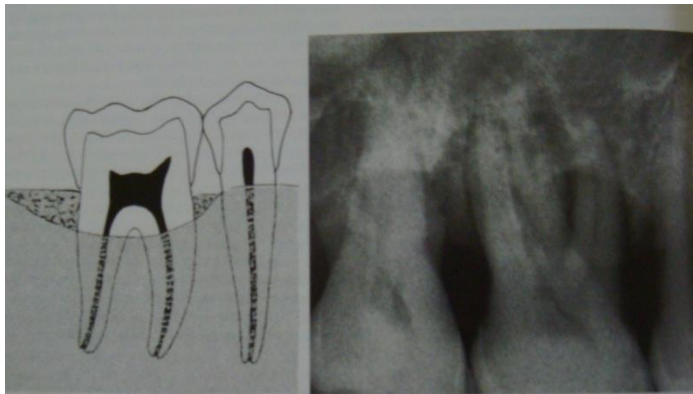
- Thus it seems plausible to assume periodontal disease rarely jeopardizes the vital function of the pulp
- As long as the blood supply through the apical foramen remains intact the pulp is usually capable of withstanding physiological insults induced by the periodontal disease

Clinical diagnostic procedure

- The exact diagnosis of an endodontic periodontal condition is difficult; if not impossible.
- Because the treatment plan with different Endo- Perio conditions changes with regards to more urgent emphasis on the site of origin (whether endodontic or perio) CORRECT DIAGNOSIS IS MUST.
- The clinician must be able to correctly judge the primary disease and determine whether or not root canal treatment has the potential to resolve the lesion and establish a predictable prognosis.

Radiographic findings

- Proximal crestal bone and its position relation to CEJ and its relation; at the coronal level of superimposition; to the trabecular pattern over the root area.



Clear definition of the root and root canal space indicates bone loss on one side of the tooth to the level of the superimposed trabecular pattern

- However when bone is seen to be extending from the crest of alveolus till the apex; the radiograph does not lend itself to interpretation with regard to the cause of the condition
- All we can know is the level of bone loss and nothing more; only by looking at the radiograph.
- Discrete periapical or lateral lesions.
- Lateral canals (as seen as notches on root surface)





Endodontic lesion



Periodontal lesion



Pulp Vitality

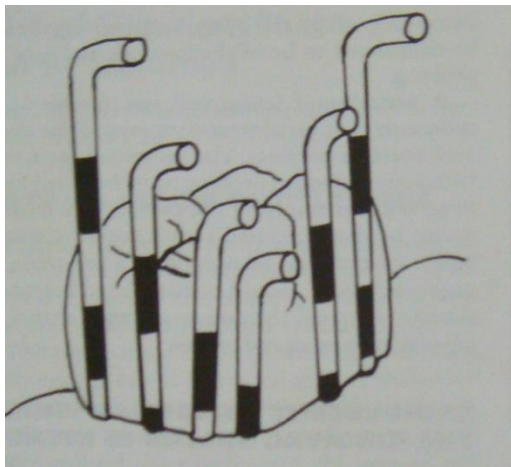
- The absence/ presence of a vital neural supply to tooth does not indicate with surety the true condition of pulp.
- No response – non vital pulp
- Quick painful response – reversible pulpitis
- Lingering painful response – irreversible pulpitis
- In case of periodontal conditions vitality tests would give a positive result as long as the vascular bundle is intact at the apical foramen



Periodontal Probing

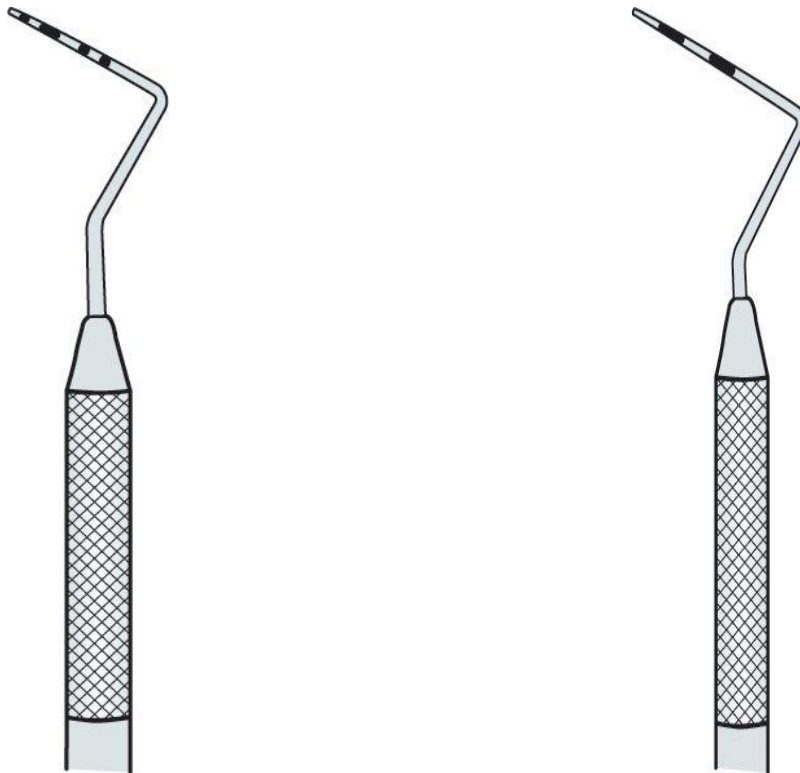
- Considering the limitations in the diagnostic armamentarium, appreciation of “perio-endo” lesions is made primarily on the basis of critical examination of the area by means of a periodontal probe
- Tactile discrimination is used to determine the nature and cause of the lesion
- Determination is made by identifying the physical characteristics of the lesion itself
- Careful and accurate probing all around the external surface of the tooth is required

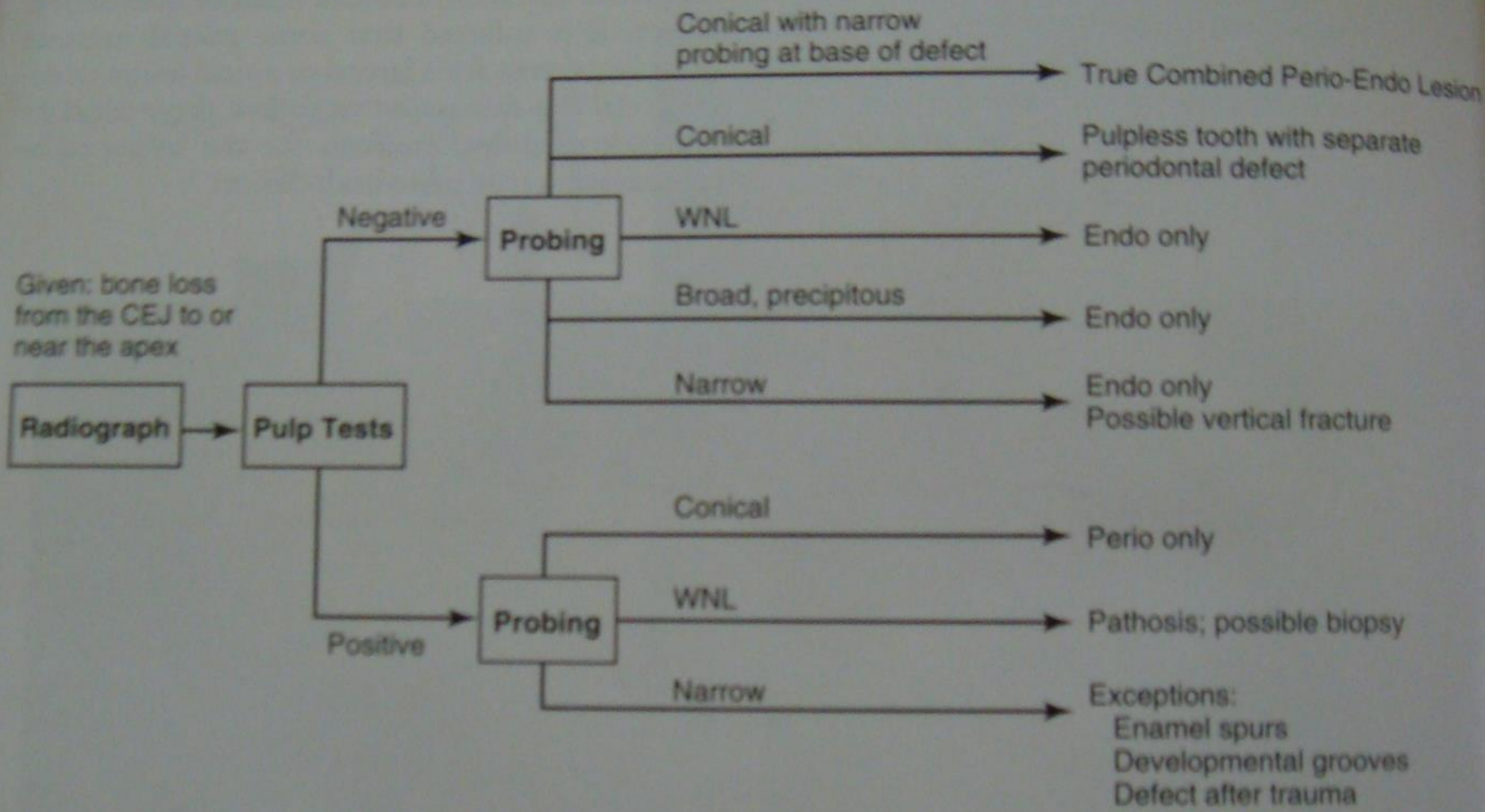
- Probing : tactile discrimination of the epithelial attachment through the use of a periodontal probe
- Sounding : penetrating through the epithelial attachment to define the most coronal level of the alveolar bone
- Probing checks for the integrity of the attachment apparatus while sounding checks for the level of alveolar bone.
- Generally probing gives us a fair picture of “what is the state of affairs” in the periodontium; and is thus preferred



Probing in atypical periodontal lesion demonstrating conical characteristics of the defect

- Most commonly used is **WILLIAMS GRADUATED PROBE**
- However for constraints due to thickness of the Williams probe a much thinner **MARQUIS PERIODONTAL PROBE** can also be used.





Definition

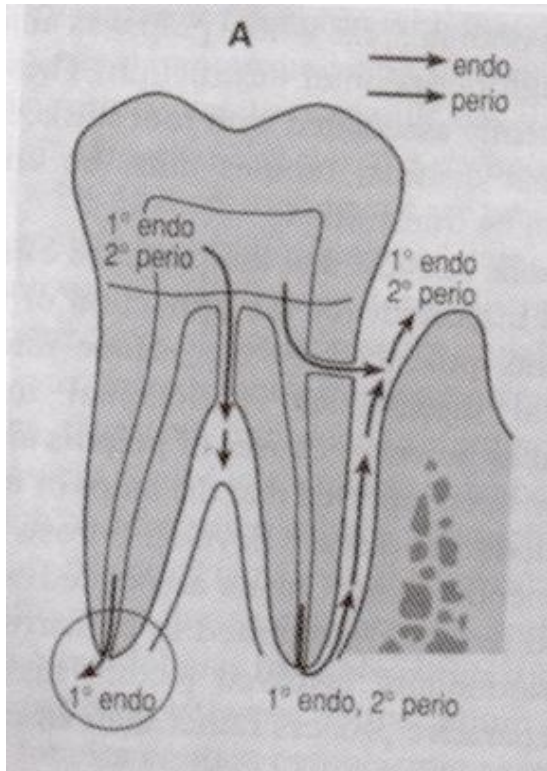
A endo-perio lesion is defined as follows

1. The tooth involved must be pulp-less.
2. There must be destruction of the periodontal attachment apparatus from the gingival sulcus to either the apex of the tooth or to the area of an involved lateral canal. There should be a defect in the attachment that can be probed
3. Both root canal treatment & periodontal therapy are required to resolve the entirety of the lesion

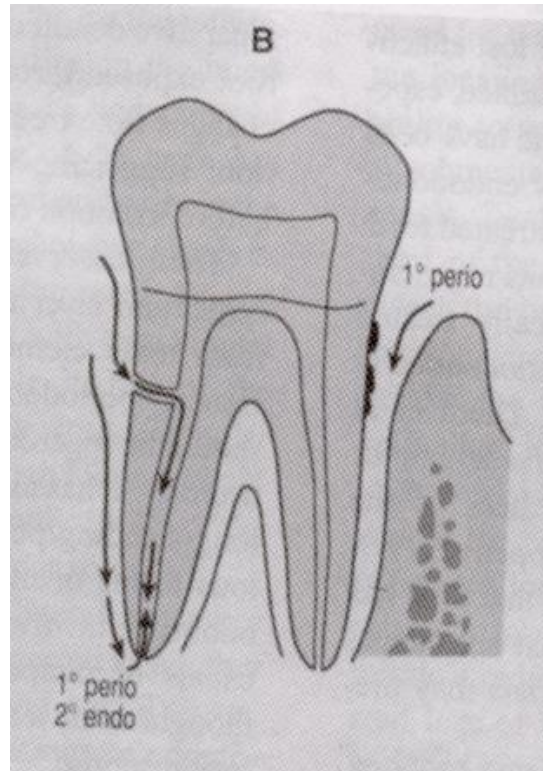
*Principles & Practice of Endodontics 3rd edition
by Walton Torbinejad*

Classification

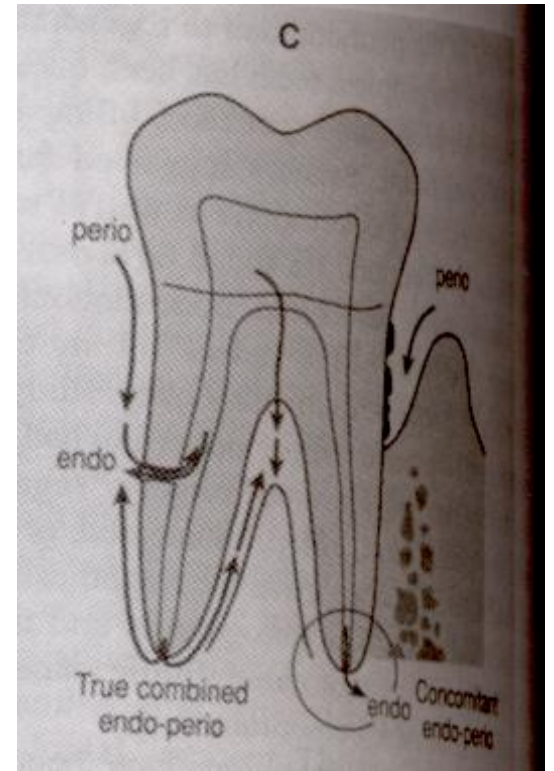
- They can also be classified by treatment depending on whether endodontic, periodontal, or combined treatment modalities are necessary. They include:
 - primary endodontic diseases,
 - primary periodontal diseases,
 - combined diseases.
 - primary endodontic disease with secondary periodontal involvement
 - primary periodontal disease with secondary endodontic involvement,
 - true combined diseases.



Primary endodontic lesion



Primary periodontal lesion



True Combined lesion

Classification of perio-endo lesions according to Mhairi R Walker

There are four types of perio-endo lesions and they are classified due to their pathogenesis.

1. Endodontic lesions -an inflammatory process in the periodontal tissues resulting from noxious agents present in the root canal system of the tooth.
2. Periodontal lesions - an inflammatory process in the pulpal tissues resulting from accumulation of dental plaque on the external root surfaces.
3. True-combined lesions -both an endodontic and periodontal lesion developing independently and progressing concurrently which meet and merge at a point along the root surface.
4. Iatrogenic lesions - Usually endodontic lesions produced as a result of treatment modalities.



According to Ian Chapple and Philip J Lumley

- The earlier classification attempted to identify the primary source of infection which seems irrelevant to the management of the lesion in question
- It is more important to determine the status of the pulp and the periodontal complex at the time of presentation because the vitality of the pulp and / or presence or absence of a progressing periodontal lesion dictates the nature of the treatment
- Hence the classification system suggested is

Endodontic Lesion

Periodontal Lesion

Combined Lesion



According to Weine

Based on the etiology of the disease ,which determines the type of therapy required & probable prognosis , the types are :

Class I – tooth in which symptoms clinically & radiographically stimulate periodontal disease but are in fact due to pulpal inflammation & or necrosis

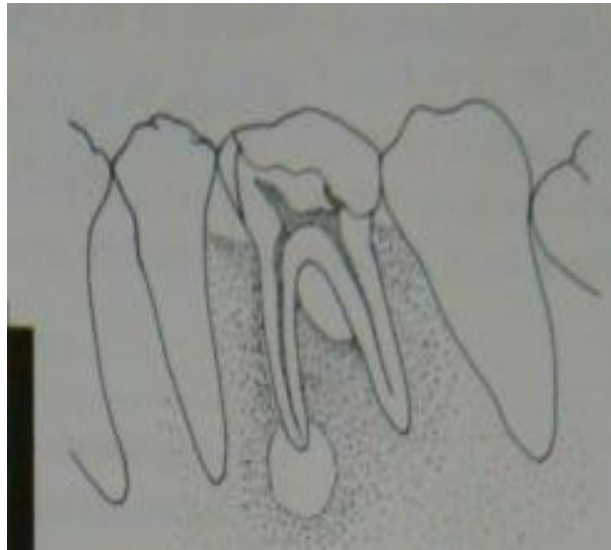
Class II -- tooth that has both pulpal or periapical disease& periodontal disease concomitantly.


Class III – tooth that has no pulpal problem but requires endodontic therapy plus root canal amputation to gain periodontal healing.

Class IV – tooth that clinically & radiographically simulates pulpal or periapical disease but in fact has periodontal problems.

PRIMARY ENDODONTIC DISEASES

- Disease processes of the pulp frequently involves inflammatory changes
- Pulpal inflammation and necrosis are initiated by dental caries, restorative procedures, trauma, chemical irritation and severe thermal stimulation.



- 
- Damage associated → cause local collapse of the venous part of the local microvasculature



- Local tissue hypoxia and anoxia resulting in localized necrosis, the chemical mediators of which cause further localized oedema, completing the cycle

- An increased intrapulpal pressure may cause toxic agents to be expressed through patent channels, such as the apical foramen, lateral and accessory canals and dentinal tubules,



- cause a clinically detectable inflammatory lesion in the surrounding periodontal ligament

- Typically endodontic lesion resorbs bone apically and laterally and destroys attachment apparatus adjacent to the nonvital tooth
- Inflammatory process in the periodontium localized to apex but may spread to lateral aspects of the tooth



- Abscess formation follows periodontal inflammation which spreads through the periodontium.
- The abscess may drain through a fistula or via the periodontal ligament, with ligament and adjacent bone destruction, which can involve the entire root length.
- Drainage may tract along the periodontal ligament and into the gingival sulcus or in multirrooted teeth into the furcation.
- A periapical lesion may perforate the cortical bone close to the apex, elevate the periosteum and overlying soft tissues and drain into the gingival sulcus.
- These form pseudopockets that simulate periodontal disease without necessarily permanently damaging the cementum and its fibres.

- Clinical signs pain
tenderness to pressure and percussion,
increased tooth mobility,
swelling
- Pulp vitality test reveals necrotic pulp or in cases of multirouted teeth at
least abnormal response
- Sinus tract through PDL or patent canals → narrow opening
- Traced with GP or a periodontal probe





Treatment

- For primary endodontic lesions conventional endodontic therapy alone will resolve the lesion.
- A review 4-6 months post-operatively should show healing of the periodontal pocket and bony repair.
- Surgical endodontic therapy has been shown to be unnecessary even in the presence of large periradicular radiolucencies and periodontal abscesses.
- Invasive periodontal procedures should be avoided as this may cause further injury to the attachment - possibly delaying healing.
- If primary endodontic lesions persist despite extensive endodontic treatment it should arouse suspicions of an incorrect diagnosis.
- The lesion may have secondary periodontal involvement or be a true-combined lesion



Lesion of pulpal origin showing long term inflammation by recurrent decay



Root canal treatment done



Post and core placed



Restoration completed



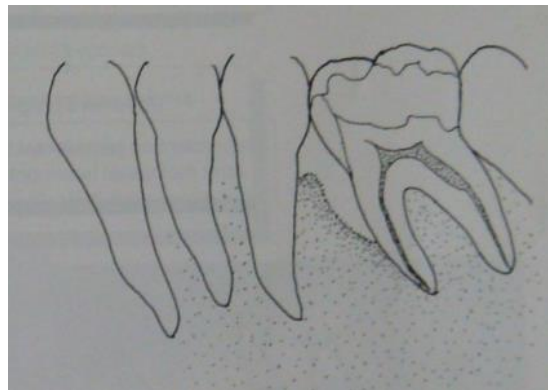
At 1 yr recall healing is complete



PRIMARY PERIODONTAL DISEASES

- Periodontal lesions are caused primarily by periodontal pathogens.
- Lesions initiated by deposits of plaque and calculus.
- Inflammatory mediators cause destruction of gingival connective tissue, periodontal ligament and alveolar bone.
- Alteration of the root surface occurs by loss of the outer cementoblast layer and results in shallow resorptive lesions of cementum.
- Endotoxins produced by plaque bacteria also have an irritant effect on overlying soft tissue, preventing repair.

- Progressive in nature → begins at the sulcus and progresses apically along the root surface.
- Causes loss of surrounding alveolar bone and periodontal soft tissue
- Although periodontal disease has been shown to have a cumulative damaging effect on the pulp tissue, total disintegration of the pulp is only a certainty if bacterial plaque involves the main apical foramina, compromising the vascular supply



Features

- Accumulation of plaque and calculus
- Pockets are broad based and wide
- Soft tissue inflammation
- Mobility
- Bleeding on probing
- In most cases, pulp-tests indicate a clinically normal pulpal reaction
- Radiographic appearance of generalized bone loss



Treatment

- Primary periodontal lesions are treated by hygiene phase therapy in the first instance
- The prognosis depends upon the stage of periodontal disease and the efficacy of periodontal treatment
- Treatment depends on the extend of periodontitis and the ability of the patient to comply with potential long term treatment and maintenance therapy.
- Subsequently poor restorations and developmental grooves that are involved in the lesion are removed as these are difficult areas to treat successfully.
- Periodontal surgery is performed after the completion of hygiene phase therapy if deemed necessary.



Difference between pulpal and periodontal disease

CLINICAL

	PULPAL	PERIODONTAL
ETIOLOGY	Pulp infection	Periodontal infection
VITALITY	Non vital	vital
RESTORATIVE	Deep or extensive	Not related
PLAQUE CALCULUS	Not related	Primary cause
INFLAMMATION	acute	chronic
POCKET	Single narrow	Multiple , wide coronally
TRAUMA	Primary/secondary	Contributing factor
MICROBIAL	Few	Complex

RADIOGRAPHIC FEATURES

	PULPAL	PERIODONTAL
PATTERN	Localized	Generalised
BONE LOSS	Wider apically	Wider coronally
PERIAPICAL AREA	Radiolucent	Not often related
VERTICAL BONE LOSS	Not present	Present

HISTOPATHOLOGY

	Pulpal	Periodontal
JUNCTIONAL EPITHELIUM	No apical migration	Apical migration
GRANULATION TISSUE	Apical (minimal)	Coronal (larger)
GINGIVAL	normal	recession

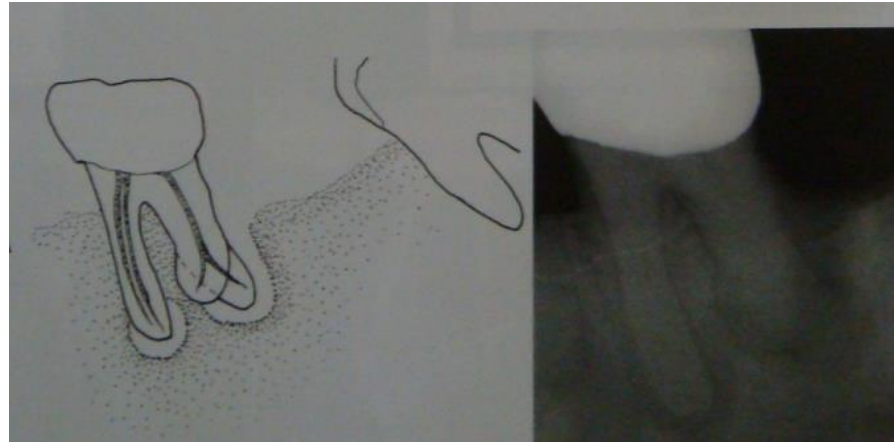
TREATMENT

	Pulpal	Periodontal
TREATMENT	Root canal therapy	Periodontal treatment

PRIMARY ENDODONTIC DISEASE WITH SECONDARY PERIODONTAL INVOLVEMENT

- When lesion of endodontic origin not treated → pathosis continues
↓
destruction of periapical and inter radicular bone
and cause breakdown of hard and soft tissue
- Drainage through gingival sulcus
- Accumulation of plaque and calculus at the gingival margin of the sinus tract → marginal periodontitis and further apical migration of attachment

- Primary endodontic lesions with secondary periodontal involvement may also occur as a result of root perforation during root canal treatment, or where pins or posts have been misplaced during coronal restoration.
- Root fractures may also present as primary endodontic lesions with secondary periodontal involvement.
- These typically occur on root-treated teeth often with post and crowns.





Features

- Pulpal inflammation or necrotic root canal
- Plaque or calculus deposition
- Periodontal disease with angular bone loss at initial site of endodontic involvement
- Root Perforation :
 - Symptoms may be acute, with periodontal abscess formation associated with pain, swelling, pus exudate, pocket formation, and tooth mobility.
 - A more chronic response may sometimes occur without pain, and involves the sudden appearance of a pocket with bleeding on probing or exudation of pus.


- Root fractures that present as primary endodontic lesions with secondary periodontal involvement show signs may range from a local deepening of a periodontal pocket, to more acute periodontal abscess formation




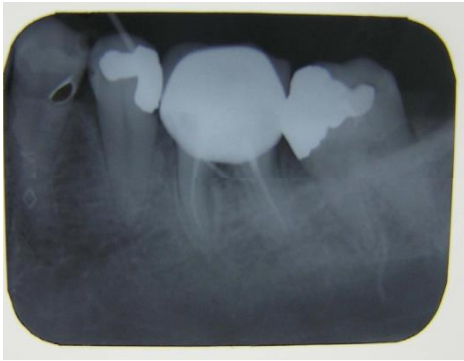


Treatment

- Tooth requires both endodontic and periodontal treatments.
- If the endodontic treatment is adequate, the prognosis depends on the severity of the marginal periodontal damage and the efficacy of periodontal treatment.
- With endodontic treatment alone, only part of the lesion will heal to the level of the secondary periodontal lesion.
- In general, healing of the tissues damaged by suppuration from the pulp can be anticipated.
- Primary endodontic lesions with secondary periodontal involvement will not completely resolve with endodontic treatment alone.

- 
- Root/re-root canal treatment is instituted immediately and the cleaned and shaped root canal filled with calcium hydroxide
 - bactericidal, anti-inflammatory and proteolytic it inhibits resorption and favors repair.
 - inhibits periodontal contamination of instrumented canals via patent channels connecting the pulp and periodontium before periodontal treatment removes the contaminants
 - The canals are eventually filled with a conventional obturation when there is clinical evidence of improvement

- 
- Hygiene phase therapy should be initiated immediately although deep scaling and periodontal surgery to resolve the part of the lesion sustained by periodontal disease should be postponed until the part of the lesion sustained by pulpal infection has had time to resolve and a conventional obturation is in place, again to prevent possible delays in healing.



- ▶ 36 had a full crown restoration and on its lingual aspect a deep probable pocket with active purulent drainage was evident.
- ▶ Radiographically, tooth had gone under RCT five years ago.
- ▶ A radiolucency could be seen in the furcal area.
- ▶ A diagnosis of primary endo- secondary perio lesion was made.



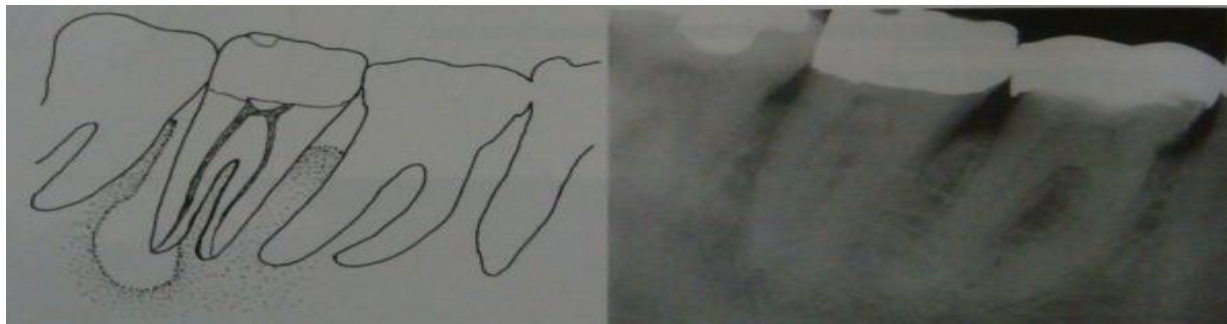
- ▶ With a probable diagnosis of untreated lateral canals in
- ▶ the distal furcation area, it was decided to retreat the distal canal. The
- ▶ pocket was curetted deeply and irrigated precisely




- ▶ A week later, the lingual pocket had healed.
- ▶ The distal canal was obturated
- ▶ The patient was recalled 2 months later.
- ▶ During this period no evidence of lingual abscess was seen, the lucency at the furcal area seemed to be healing.

PRIMARY PERIODONTAL DISEASE WITH SECONDARY ENDODONTIC INVOLVEMENT

- The apical progression of a periodontal pocket may continue until the apical tissues are involved.
- In this case, the pulp may become necrotic as a result of infection entering via lateral canals or the apical foramen.



Extensive deep periodontal pocket that has extended to the depth of the root apex

- 
- Differs from primary endodontic lesion with secondary periodontal involvement only by the temporal sequence of disease progression
 - The treatment of periodontal disease can also lead to secondary endodontic involvement.
 - Lateral canals and dentinal tubules may be opened to the oral environment or blood vessel within a lateral canal to be severed by curettage, scaling, or surgical flap procedures , thus resulting in pulp inflammation and necrosis



Features

- Deep pockets (> 6mm)
- History of extensive periodontal disease and possibly past treatment
- When pulp gets involved → accentuated pain and clinical signs of pulpal diseases



Treatment

- Early stage periodontal lesions with secondary endodontic involvement where involvement may be limited to reversible pulpal hypersensitivity may be treated purely by periodontal therapy.
- Periodontal treatment removes the noxious stimuli and secondary mineralisation of dentinal tubules allows the resolution of pulpal hypersensitivity.
- If pulpal inflammation is irreversible root/re-root treatment is carried out followed by periodontal treatment -in some cases surgical intervention may be required
- In single rooted teeth, the prognosis is usually poor.
- In molar teeth, the prognosis may be better as not all the roots may undergo the same loss of supporting tissues, root resection can be considered as a treatment alternative.

TRUE COMBINED DISEASES

- True combined endodontic–periodontal disease occurs with less frequency.
- Pulpal and periodontal disease exists around same tooth



- Endodontic disease progressing coronally when joins with the infected periodontal pocket progressing apically → clinically indistinguishable

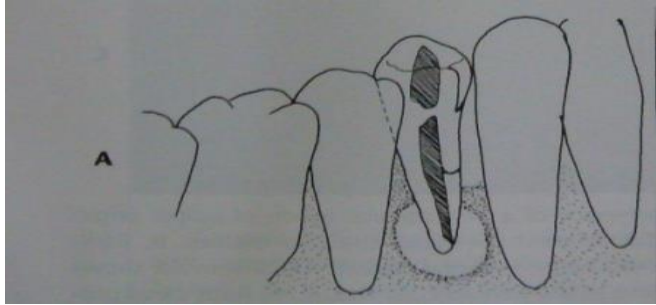
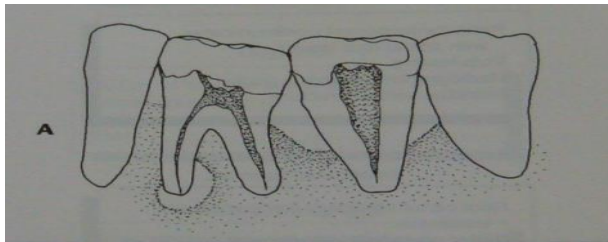


Diagram shows the presence of periodontal bone loss showing lateral canal at the depth of the pocket and pulp necrosis



Radiograph shows characteristic combined endo – perio lesion




Independent presence of periradicular lesion of pulpal origin and periodontal disease





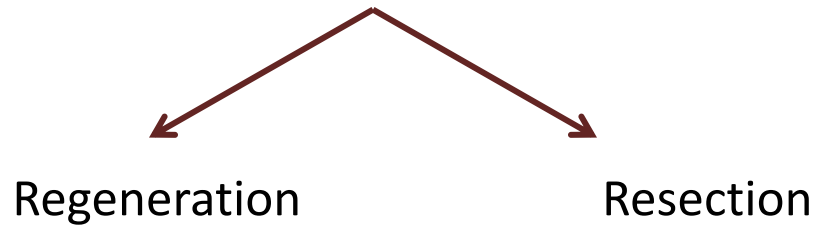
Treatment

- True-combined lesions are treated initially as for primary endodontic lesions with secondary periodontal involvement.
- Periodontal surgical procedures are almost always called for.
- The prognosis of a true-combined perioendo lesion is often poor or even hopeless, especially when periodontal lesions are chronic with extensive loss of attachment
- This is particularly true in single-rooted teeth

- 
- In molar teeth, root resection can be considered as a treatment alternative if not all roots are severely involved
 - Root amputation, hemisection or separation may allow the root configuration to be changed sufficiently for part of the root structure to be saved.
 - Prior to surgery, palliative periodontal therapy should be completed and root canal treatment carried out on the roots to be saved
 - The prognosis of an affected tooth can also be improved by increasing bony support which can be achieved by bone grafting and guided tissue regeneration.
 - This is due to the most critical determinant of prognosis being a loss of periodontal support.

ALTERNATIVE TREATMENTS

- When traditional endodontic and periodontal treatments prove insufficient to stabilize the effected tooth → treatment alternatives
- Alternative treatment consists of



- Regenerative approach : aims at restoring the lost biological structures
- Resection : eliminating diseased roots or teeth

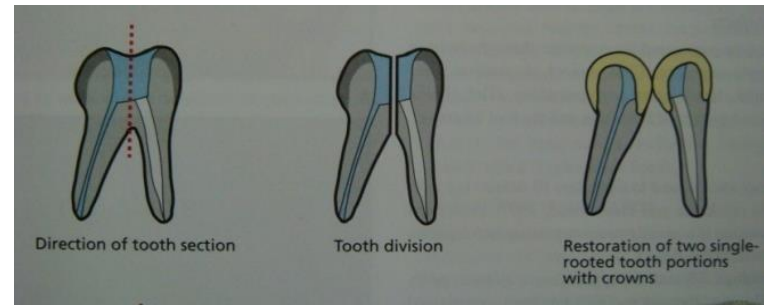
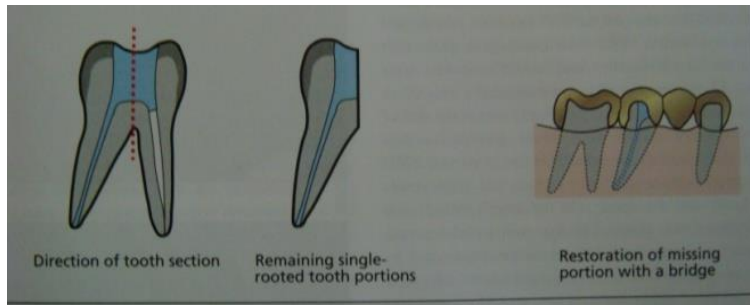


ROOT RESECTION

- Root resection implies the horizontal to angled cut to remove the root from the cervix of the tooth
- When done for a root with severe periodontal disease a soft tissue flap will often not be necessary but when used for roots with perforations or fracture of endodontically inoperable a tissue flap or flaps are necessary
- Removal of the root accompanied by odontoplasty
- Indications
 - Root fractures
 - Perforation
 - Root caries
 - Dehiscence and fenestration
 - Ext. root resorption (1 root)
 - Severe periodontitis affecting 1 root
 - Severe grade II or III furcation

TOOTH RESECTION

- Also called hemisection, bicuspidization, bisection, odontosection
- Performed on both maxillary and mandibular posterior teeth
- During this procedure the crown portion over the resected root is also cut which eliminates any abnormal occlusal forces in that area when the resected portion is extracted and provides a separate crown for restorative purposes when root is retained




Indication –

- Grade II and Grade III furcation involvement
- In case of molar (mandibular) – If it exhibit proper anatomic feature & stability
- Ideal candidate, molars with long, divergent roots & bone loss restricted to furcal area



GUIDED TISSUE REGENERATION (GTR)

- New concept → Used to promote bone healing after endo surgery
- The principle of GTR was promulgated in the classic 1982 article by Nyman and colleagues for treatment of osseous defects in human periodontitis.
- GTR, as defined by the American Academy of Periodontology in its Glossary of Periodontal Terms, is the “regeneration of periodontal attachment through differential tissue responses
- GTR barriers prevents contact of CT with osseous walls of the defect protecting underlying blood clot and stabilizing the wound.

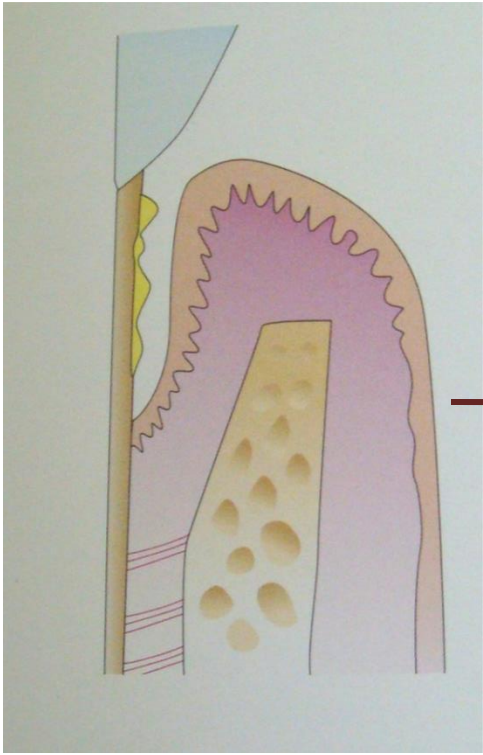
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- Melcher postulated that the cells that repopulate the exposed root surface determine the nature of attachment that will form

epithelium → long junctional epithelium

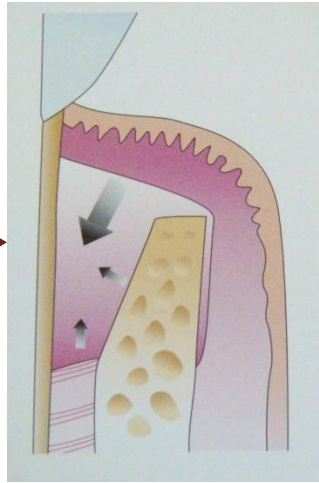
gingival connective tissue → root resorption

bone → ankylosis

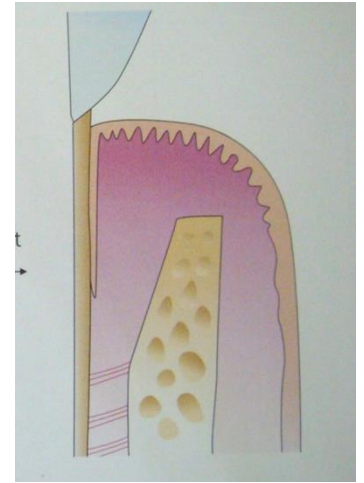
- However if cell of the periodontal ligament populate the root surface first ideal new connective tissue attachment develops



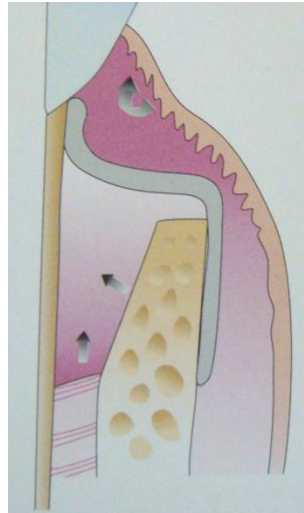
Flap
curettage



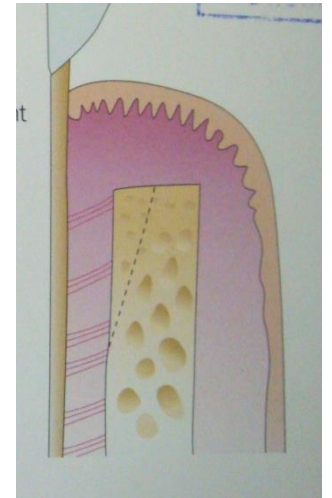
Epithelial
attachment



GTR




New
attachment



- Varieties of GTR membranes are available –



- Non resorbable – Poly tetra fluoroethylene membrane.
- Resorbable
 - Rat Collagen
 - Bovine collagen
 - Cargile membrane derived from caecum of an ox.
 - Polylactic acid
 - Vycill
 - Synthetic skin


- 
- Logical to use bio resorbable collagen and polymer membranes because there is no need for 2nd surgery to retrieve the membrane.
 - Equal success rate has been reported for both resorbable and non resorbable barriers
 - This procedure has shown promising results.
 - Further studies are required to explore its true benefit of this combination treatment approach

Conclusion

- A endo - perio lesion can have a varied pathogenesis which ranges from quite simple to relatively complex.
- A knowledge of these disease processes is essential in coming to the correct diagnosis.
- This enables the construction of a suitable treatment plan where unnecessary, prolonged or even detrimental treatment is avoided.

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THANK YOU