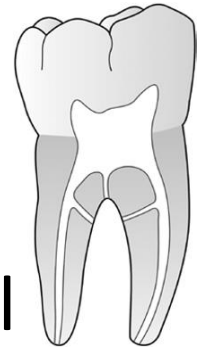
Endodontic-Periodontic Lesions

Dr. Zeyad Nazar Majeed
Department of Periodontics
College of Dentistry/University of Babylon

Pathways of Communication

- The possible pathways for ingress of bacteria and their products into these tissues can broadly be divided into:



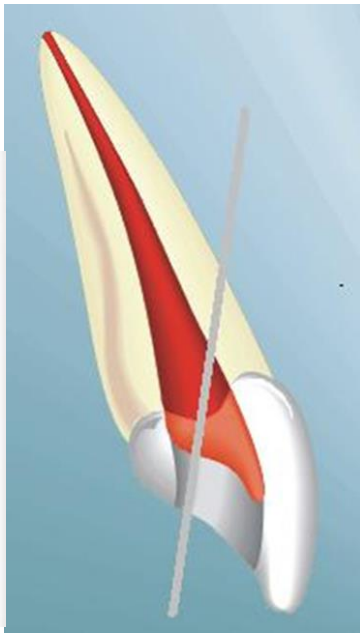
✓ **Anatomical Pathways**

- Apical foramen
- Lateral and accessory canal
- Dentinal tubules

✓ **Non-anatomical Pathways**

- Root canal perforation

- Vertical root fracture

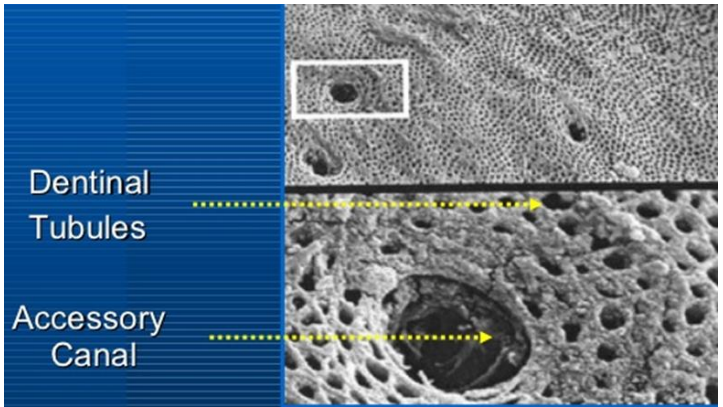


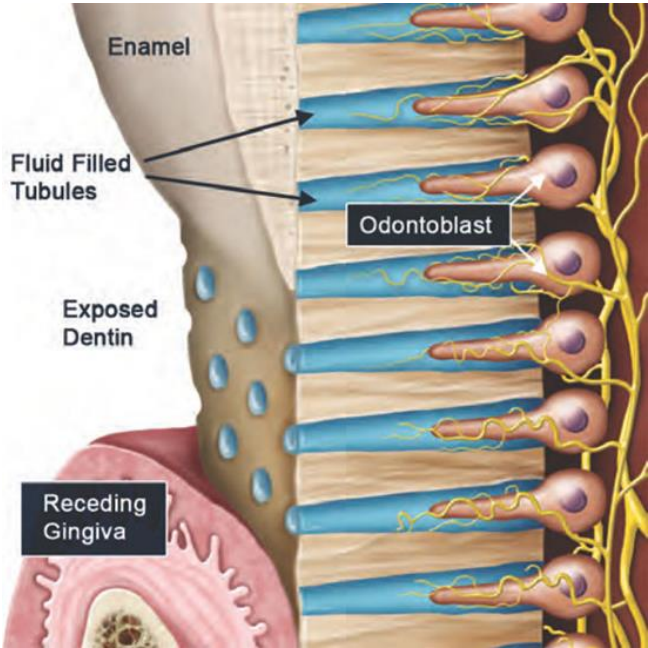
Dentinal tubules

- Dentinal tubules contain odontoblastic processes that extend from the odontoblasts at the pulp dentin border to the dentino - enamel junction (DEJ)/cemento - dentinal junction(CDJ)

- Exposed dentinal tubules in areas devoid of cementum serve as communication pathways between the pulp and the periodontium

- This can occur due to periodontal disease, surgical procedures or developmentally when the cementum and enamel don't meet at the CEJ





Root canal perforation

- **Perforation of the root creates a communication between the root canal system and periodontal ligament**

- **Due to over instrumentation during endodontic procedures, internal or external root resorption or caries invading through the floor of the pulp chamber**

- **Prognosis is determined by :-**

1-the location of the perforation,
2-time left unsealed,
3-ability to seal perforation,
4-the chance of building new attachments and
5-accessibility of the remaining canals.

<u>Perforations in middle/apical 3rd of root have the greatest chance of healing</u>

Vertical root fracture

Caused by trauma

- Incidence is higher in:-

✓Teeth that have been filled with lateral condensation technique

✓Teeth restored with intracanal posts

Vertical root fracture

2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions

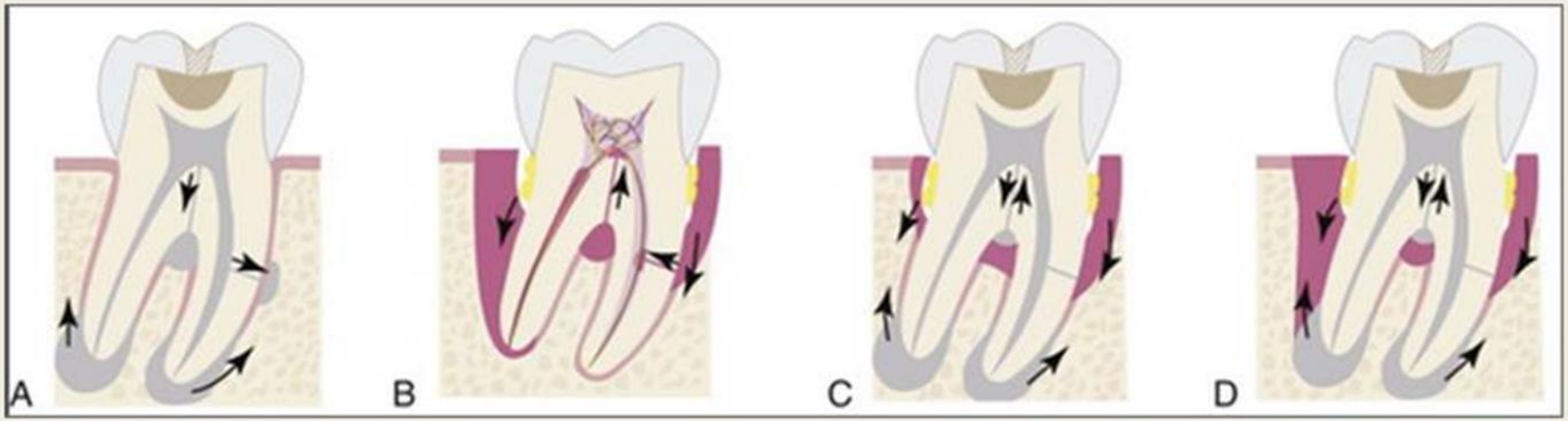
Classifications of Endodontic-Periodontal Lesions

Endo-periodontal lesion with root damage	Root fracture or cracking	
	Root canal or pulp chamber perforation	
	External root resorption	
Endo-periodontal lesion without root damage	Endo-periodontal lesion in periodontitis patients	*Grade 1* – narrow deep periodontal pocket in 1 tooth surface
		Grade 2 – wide deep periodontal pocket in 1 tooth surface
		Grade 3 – deep periodontal pockets in > 1 tooth surface
	Endo-periodontal lesion in non-periodontitis patients	*Grade 1* – narrow deep periodontal pocket in 1 tooth surface
		Grade 2 – wide deep periodontal pocket in 1 tooth surface
		Grade 3 – deep periodontal pockets in > 1 tooth surface

Papapanou PN, Sanz M, et al.Periodontitis: Consensus report of Workgroup 2 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. *J Clin Periodontol*.2018;45(Suppl 20):S162–S170.

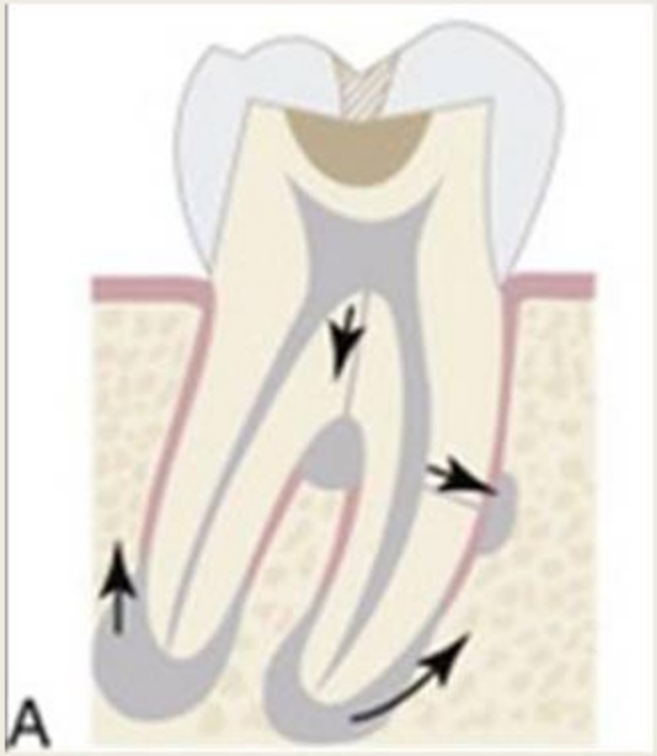
Anatomic Considerations of the Pulpal and Periodontal Disease Continuum

Classifications of endodontic-periodontic lesions:



Classifications of Endodontic-Periodontaic Lesions (1999)
A-Primary Pulpal Infection
B-Primary Periodontal Infection
C-Independent endodontic-periodontic Lesion
D-Combined endodontic-periodontic Lesion

A-Primary Pulpal Lesion



A. Primary pulpal infection can lead to chronic periradicular periodontitis by which a periapical radiolucency (PARL) can develop and migrate cervically. Mandibular molars can also have accessory canals in lateral orientation or in the furcation area. These accessory canals can allow migration of the primary pulpal infection and cause secondary breakdown of the periodontium at their respected loci.

B-Primary Periodontal Lesion

B. Primary periodontal infection can lead to extensive breakdown of alveolar crest bone that migrates from the cervical area to the apex. In these lesions, one would find generalized bone loss around a single tooth or often involving multiple adjacent teeth. Because of the pulpal-periodontal continuum through main root canal foramina or through accessory canals, extensive periodontal infection can cause irritation in the pulp tissues.

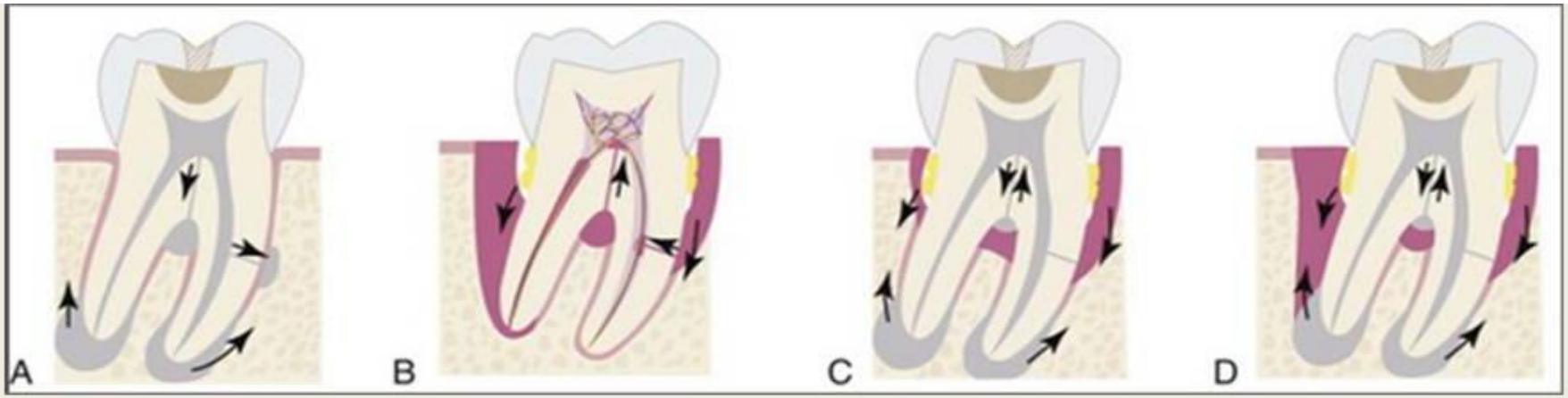
C-Independent endodontic-periodontic Lesion

C. Both primary pulpal and primary periodontal infection can occur simultaneously in an "independent" endodontic-periodontic lesion, exhibiting the characteristics of both.

D-Combined endodontic-periodontic Lesion

D. Primary pulpal and primary periodontal infections can occur extensively in this "combined" endodontic-periodontic lesion.

Retrograde And Orthograde Periodontitis

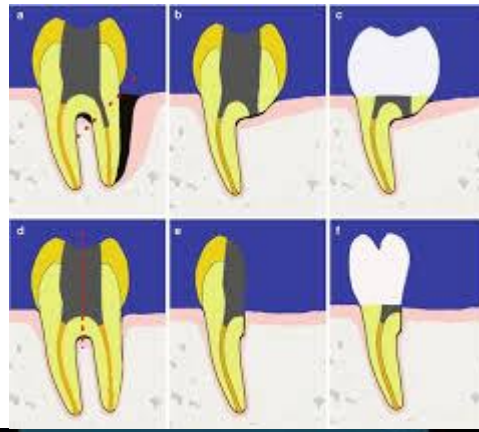


Advanced pulpitis will lead to pulp necrosis, which often is accompanied by inflammatory bone resorption at the root apex, as found in cases of apical periodontitis or an apical abscess. This is also known as retrograde periodontitis because it represents the periodontal tissue breakdown from an apical to a cervical direction and is the opposite of orthograde periodontitis that results from a sulcular infection. This is typically identified as a periapical radiolucency (PARL).

CLASSIFICATION Grossman - 1988

Type I Lesions requiring endodontic treatment only :-

- Tooth with necrotic pulp reaching apical periodontium
- Root perforations
- Root fractures
- Chronic periapical abcess with sinus tract
- Teeth requiring hemisection



CLASSIFICATION Grossman - 1988

Type II Lesions that require periodontal treatment only

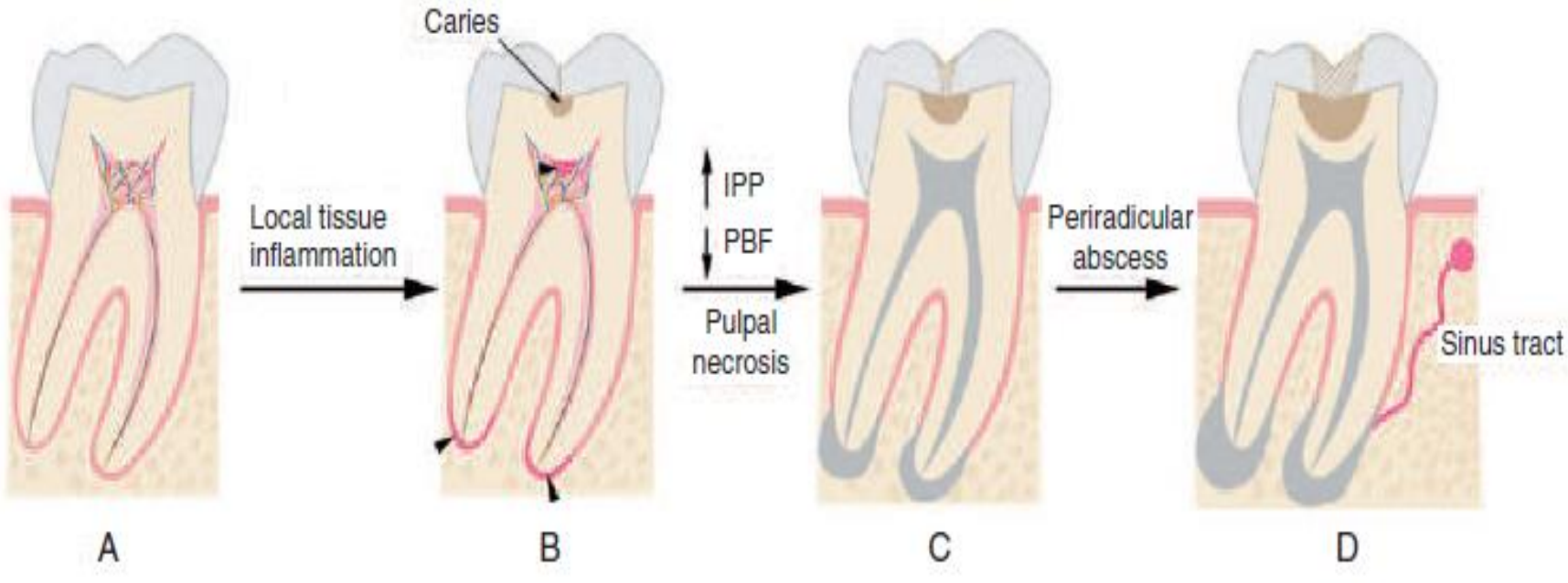
- Occlusal trauma causing reversible pulpitis
- Supra/infra bony pockets caused during periodontal treatment resulting in pulpal inflammation
- Occlusal trauma and gingival inflammation resulting in pocket formation

Type III Lesions that require combined endodontic & periodontal treatment

- Any lesion of type I which result in irreversible reaction to periodontium requiring periodontal treatment
- Any lesion of type II which results in irreversible damage to pulp tissue requiring endodontic therapy Type III

Progression of the pulpal and periradicular pathosis.

(A) Normal tooth without any pulpal pathosis is richly vascularized and innervated. (B) With microbial challenges such as caries, local tissue inflammation can occur in the pulp adjacent to the site of carious lesions, as well as in the apical regions (arrowheads). (C) Pulpal inflammation can lead to reduction in pulpal blood flow (PBF) caused by an increase in intrapulpal pressure (IPP), causing pulpal necrosis (shown in gray). (D) Pulpal necrosis, if left untreated, can cause chronic inflammation of periradicular tissues and abscess formation, leading to a draining sinus tract



Anatomic Considerations of the Pulpal and Periodontal Disease Continuum

Retrograde periodontitis is the most common example of pulpal diseases leading to secondary periodontal breakdown.

A. Large periapical lesion extending around the periapex of tooth #31. No visible fractures were detected on the mesial or distal marginal ridges. The tooth tested nonvital. A sinus tract was visible on the buccal gingiva.

B. Endodontic therapy was completed in two visits, and the canals were obturated.

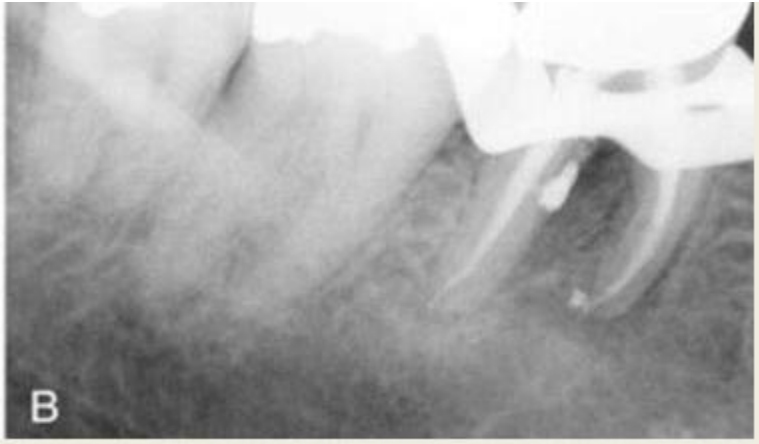
C. Healing of the periradicular bone is evident at 6 months, and a crown providing complete coverage has been placed.

Available documentation suggests that the vital functions of the pulp are rarely threatened by periodontal disease influences.

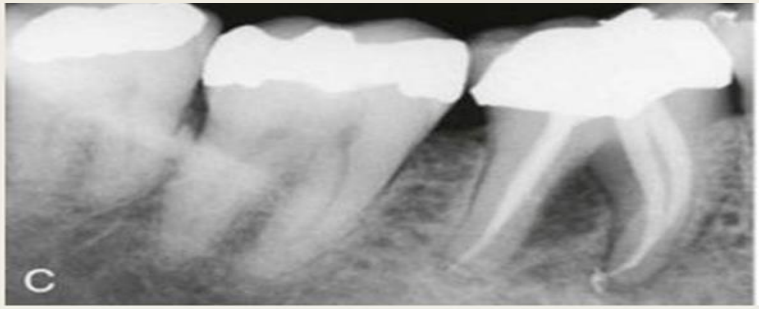
In teeth with moderate breakdown of the attachment apparatus,the pulp usually remains functional and healthy.

Breakdown of the pulp presumably does not occur until the periodontal disease process has reached a terminal stage, that is when plaque and the periodontal inflammatory process have progressed to the main apical foramina, whereby a retrograde destructive inflammatory pulpal lesion is initiated Consequently, as long as the neurovascular supply through the main apical foramina remains intact, the pulp is usually capable of withstanding injurious elements released by the lesion in the periodontium.

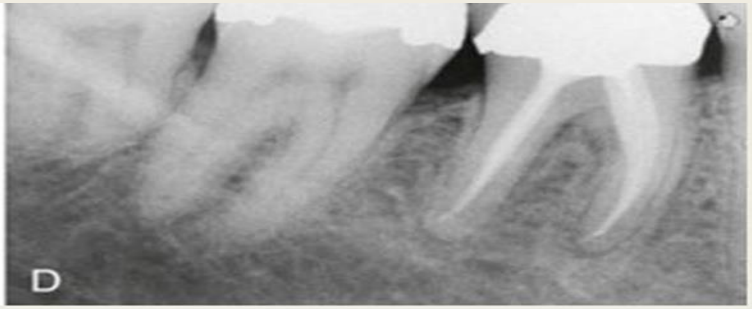
A. Bone loss is present in the furcation with sinus tract present on the buccal mucosa. Tooth #30 tested nonvital.



B. During condensation, a large amount of sealer was expressed through a large lateral canal in the distal root.

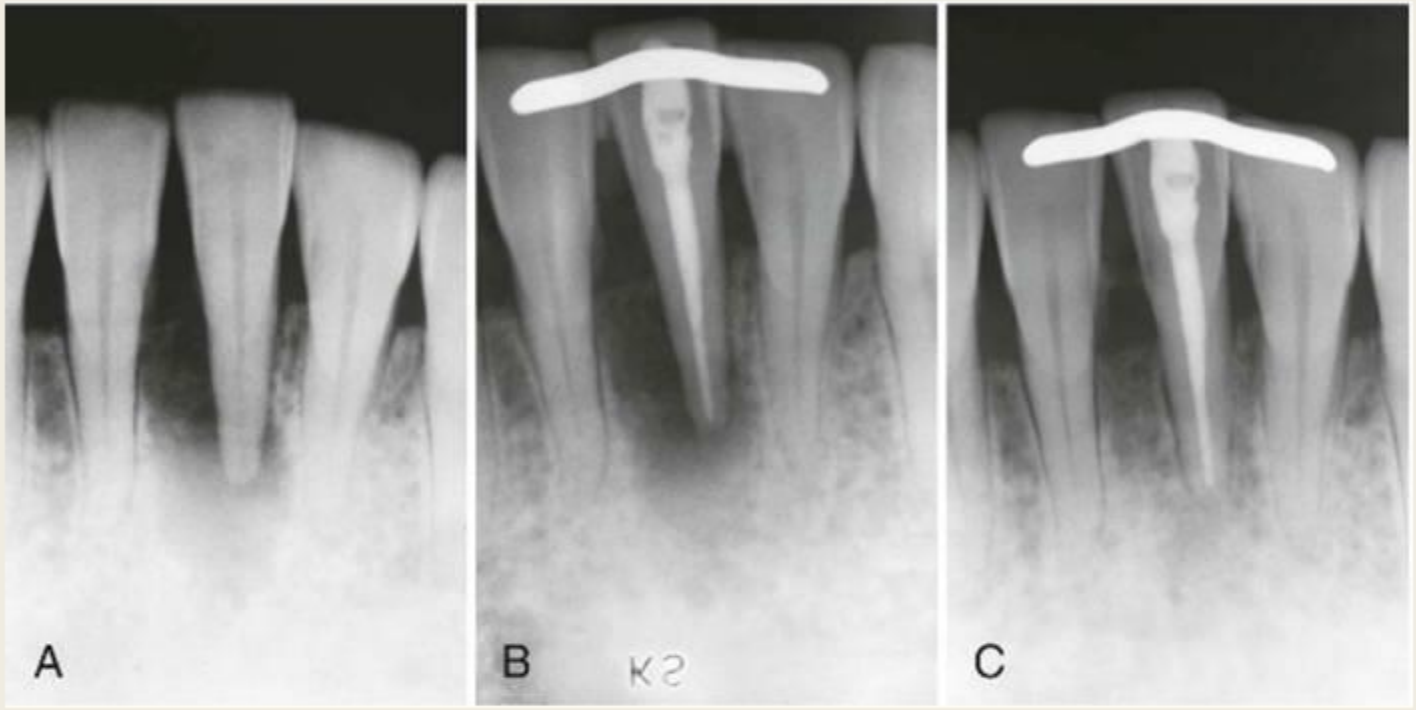


C. Sealer was removed after obturation by curettage of the furcation and irrigation with anesthetic solution



D. Healing at 12 months demonstrates complete repair of periradicular bone.

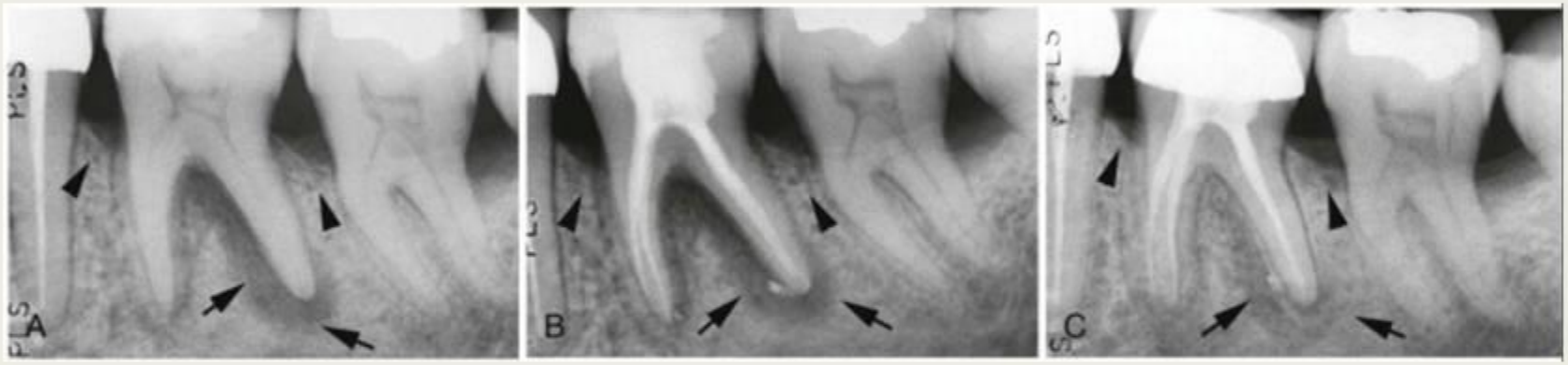
Biologic Effects of Pulpal Infection and Periodontal Tissues



A. Previously traumatized tooth #25. The tooth was Class III mobile and tested nonvital to both CO_2 and electric pulp testing.
B. After obturation of the tooth with gutta-percha, a cast gold splint was bonded to the lingual surface to stabilize the tooth.
C. Thirteen-month recall demonstrates repair of the periradicular bone and no mobility as a result of the placement of stabilization and splint.

Treatment Considerations of Endodontic-Periodontic Lesions

Primary pulpal lesions combined with *secondary* periodontal defects would completely resolve by conventional root canal therapy (RCT) alone.

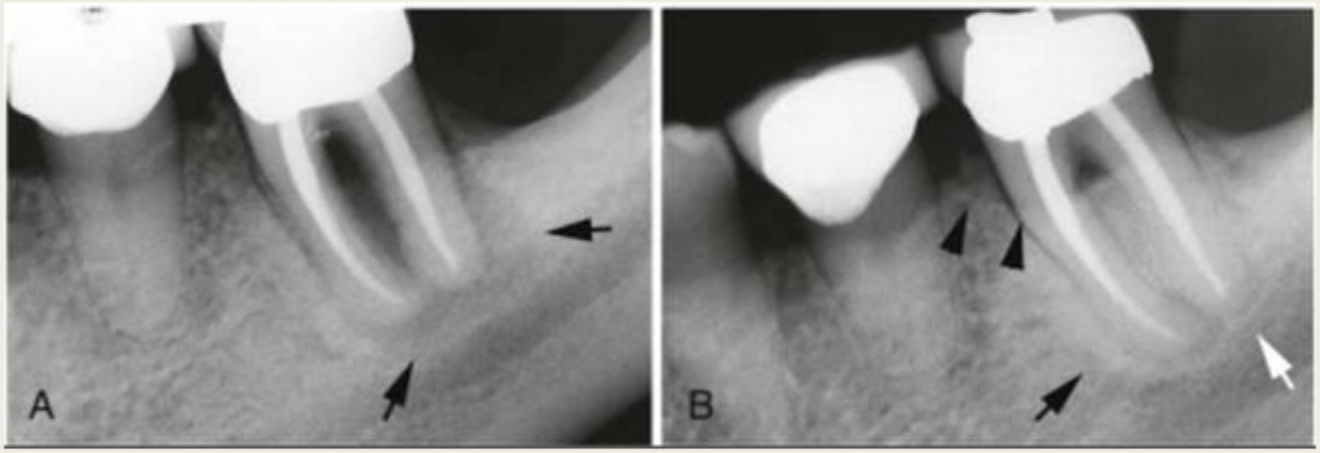


"Independent" endodontic-periodontic lesion:

A. "Truly separate" endodontic-periodontic lesions. Vertical periodontal bone loss can be seen at the mesial surface of both teeth #18 and #19. A large endodontic lesion extends around the apex and into the bifurcation. An apical and furcal defect is evident radiographically.
B. Final condensation film 2 weeks after initiating treatment.
C. Nearly complete healing of the endodontic lesion at 6 months and restoration of the tooth with a PFM crown. The areas of vertical bone loss from the periodontal lesions are still present.

Treatment Considerations of Endodontic-Periodontic Lesions

A "combined" endodontic-periodontic lesion will show incomplete healing even after successful endodontic therapy alone. This finding presumes that the unhealed defect originates from a primary periodontal infection.



"Combined" endodontic-periodontic lesion:

A. Nonvital tooth with a narrow 9-mm probing defect in the bifurcation of tooth #19 and a large periapical lesion. Normal probing depths were found on the remaining tooth surfaces.

B. 9-month healing demonstrates significant bone repair in the furcation and periapical areas. A small amount of bone loss in the furcation still remains because of a persistent periodontal defect.

Influence of periodontal treatment measures

Pocket/root debridement in periodontal therapy by hand instrumentation [scaling and root planing (SRP)] or ultrasonics is indispensable in the treatment of periodontal disease. However, this treatment is associated with a number of undesired side effects.

Except for recession of gingival tissues resulting in exposure of root surfaces, the instrumentation per se may also inadvertently remove root cementum and the superficial parts of dentin. → Thereby a large number of dentinal tubules will become exposed to the oral environment as treated root surfaces are normally left unprotected.

↓

Subsequent contact with microbial elements in the oral cavity is potentially harmful to the pulp and bacterial invasion of the exposed dentinal tubules may occur .Yet, root dentin hypersensitivity may follow such treatment measures, causing an uncomfortable problem that is difficult to manage

Classification of Pulpal and Apical Disease

TABLE 43-3 Different Characteristics of Pulpal and Periodontal Lesions*

	Primary Pulpal	Primary Periodontal	Independent Endodontic-Periodontic	Combined Endodontic-Periodontic
Patient symptom	Varies†	Mild discomfort	Varies†	Varies†
Coronal integrity	Compromised	Intact	Compromised	Compromised
Radiographic lesions	PARL	Crestal bone loss	Separate PARL and crestal lesions	Continuous bony lesions from alveolar crest to apex
Vitality	Nonvital	Vital	Nonvital	Nonvital
Periodontal probing	Narrow probing to apex‡	Generalized bone loss	Generalized bone loss	Generalized bone loss with narrow probing to apex

PARL, Periapical radiolucency.

Treatment Considerations of Endontic-Periodontic Lesions

Endodontic-periodontic lesions require both endodontic and periodontal therapies for complete healing to occur. This is true whether the endodontic-periodontic lesions are independent or combined.

One important consideration is the sequence of therapies:

- Endodontic lesions are often associated with more pronounced symptoms than periodontal lesions.
- Some periodontal defects will resolve on completion of the endodontic treatment, whereas the opposite would not be the case.
- After resolution of the secondary periodontal defect stemming from a primary pulpal infection, the residual periodontal disease may be more accurately and predictably managed.
- These considerations indicate that combined endodontic-periodontic lesions are best treated by **first** performing the necessary endodontic treatment followed by periodontal therapy.

Effect on the Periodontium of Endodontic Procedural Complications and Dental Anomalies

Vertical Root Fractures:

A. Patient whose chief complaint is pain from bite pressure irritation, bleeding, and redness on the lingual marginal tissues. The radiograph reveals a slight loss of bone on the distal surface of tooth #13 and a short screw post. A lingual periodontal pocket probing 6 mm was present. A diagnosis of vertical root fracture was made.
B. After extraction of the tooth, a vertical root fracture extending two-thirds of the root is evident.
C. Lower molar previously diagnosed with an incomplete fracture tested vital and was referred back to the dentist for restoration with a full crown. The tooth was restored with an onlay, and an endodontic procedure was needed less than a year later because of pulpal necrosis. Initial healing was observed at 6 months, but the tooth required extraction 18 months later. This photograph shows the extension of the vertical fracture apically.
D. A cross-sectional view at the cementoenamel junction demonstrates the presence of both a mesiodistal, as well as a lingual, fracture.

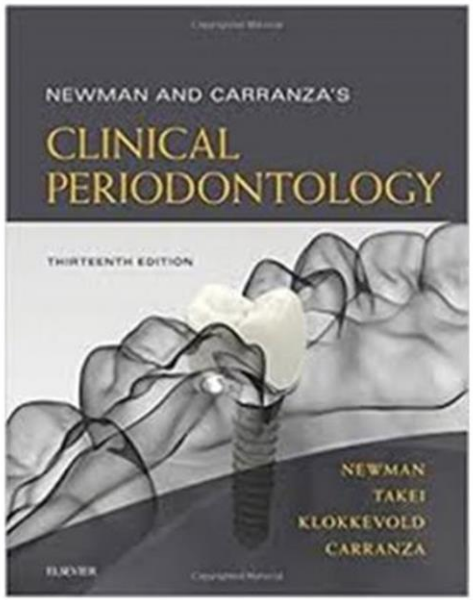
Effect on the Periodontium of Endodontic Procedural Complications and Dental Anomalies

Resorption Defects:

A. Radiograph of tooth #19 after obturation of the canals. The shortened distal root is the result of apical inflammatory root resorption. A large radiolucent lesion extending into the bifurcation is evident.
B. A 1-year recall radiograph shows complete repair of periradicular bone and some additional resorption of extruded filling material at the root apex.
C. An internal resorptive lesion of relatively large size. The expansion of the canal space is diagnostic of a resorptive defect inside the tooth. However, it is not possible to diagnose the possibility of a possible external perforation from a two-dimensional radiograph.
D. The final obturation film seems to indicate that the lesion and filling material appears to be confined to the canal space.

References

Chapter 46, page 498



Carranza's Clinical Periodontology

13th Edition