



The Pathway of Endo Perio Relationship

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ABSTRACT

There is an intimate inter-relationship of the dental pulp and the periodontium. Anatomically there is a pathway between the pulp and the periodontium, via the apical foramina, dentinal tubules, and lateral or accessory canals. Understanding this endodontic – periodontic relationship is essential because it frequently dictates the plan of

treatment.

KEYWORDS :

Introduction

There is an intimate inter-relationship of the dental pulp and the periodontium. Anatomically there is a pathway between the pulp and the periodontium, via the apical foramina, dentinal tubules, and lateral or accessory canals. Because of the inter-relationship between the pulp and the peri-radicular tissues, pulpal inflammation causes inflammatory changes in the periodontal ligament even before the pulp becomes totally necrotic. Infective organism and their toxins, tissue debris, and products of tissue necrosis from the pulp reach the periapical area through the various foramina of the root canals and give rise to inflammatory and immunologic reactions.¹

Proper diagnosis of various disorders affecting the pulp and periodontal tissues is important in order to prevent unnecessary and even detrimental treatment. The close inter-relationship between pulp and the periodontium has caused much confusion and controversy. Understanding the endodontic – periodontic relationships is essential because it frequently dictates the plan of treatment.

Experimental traumatological studies clearly demonstrate a spreading pathway through lateral / accessory canals and dentinal tubules to the periodontium. Although other pathways exist, such as open dentinal tubules, root perforations or exposed apical foramina, the uncovered lateral canal may be a likely cause of periodontal disease progressing into pulpoperiodontal disease. In addition, it has been found that an endodontic infection promotes the formation of a long junctional epithelium. Thus, studies carried out so far indicate that an endodontic infection may aggravate a marginal periodontal inflammation resulting in the proliferation of marginal epithelium with the infected root canal serving as a reservoir of bacteria.^{2,3,4,5}

Pulpal disease can undoubtedly lead to periodontal disease, however, the concept that periodontal disease can cause pulpal disease remains controversial.^{1,6}

Predisposing factors leading to combined lesions¹

A. Atypical anatomic factors

- i. Mal-alignment of a tooth, a predisposing factor to trauma: examples are food impaction and occlusal trauma.
- ii. Presence of a multirooted tooth in a position usually occupied by a single rooted tooth, or additional roots, separate or fused in multirooted teeth.
- iii. Presence of additional canals, with resultant changes in root morphology in single and multirooted teeth.
- iv. Cervical enamel projections into the furcation of multirooted teeth.
- v. Large lateral (accessory) canals in coronal and middle sections of roots.

B. Trauma

- i. Combined with gingival inflammation, trauma can lead to deep periodontal pockets or, in multirooted teeth, furcation exposure. If large lateral canals exist in the pocket area, the pulp will usually be exposed to the oral environment, and in addition to the periodontal problem, an irreversible pulpitis may occur.
- ii. Possible cause of crown fracture, root fracture, or root displacement, resulting in irreversible pulpitis, necrosis, or periapical disease.
- iii. Possible involvement of the pulp and disturbance of the periodontal membrane, with the resultant sinus tract draining through the periradicular tissue and existing through the gingival crevice; a newly found "pathway of least resistance" that differs from the usual sinus tract which drains through the labial or buccal mucosa.
- iv. Possible cellular changes in the pulp or periodontium leading to internal or external resorption associated with root perforation. Trauma to a tooth can originate from an accidental blow, cavity preparation and other restorative procedures, tooth separation, orthodontic treatment, malocclusion and detrimental habits. Trauma appears to be a major etiologic factor in the formation of an endodontic – periodontic lesion.

C. Miscellaneous factors

- i. Iatrogenic errors, such as perforation into the furcation of multi-rooted teeth during root canal therapy, root perforation during instrumentation or post-preparation.
- ii. Possibly, systemic factors, such as systemic disease as a cause of the combined lesion (eg. Diabetes mellitus).

Pathways of communication

Cahn (1927)⁷ and Sicher (1936)⁸ were the people who first described the presence of communicating channels between the pulp and periodontal ligament.

Direct communication between the pulp and periodontal ligament exists by way of the dentinal tubules, the lateral and/or accessory canals and the apical foramina.

These pathways of communication may be divided into 3 categories.

1. Developmental
 - Apical foramina
 - Lateral/accessory canals
 - Developmental grooves
2. Pathological
 - Empty spaces created by destroyed Sharpey's fibres
 - Root fracture following trauma/endodontic therapy
 - Idiopathic resorption - Internal/ external
3. Iatrogenic
 - Exposure of dentinal tubules following root planning.
 - Accidental lateral perforation during endodontic therapy.

Classification of Endo Perio Lesion^{9, 10}

They classified these lesions into 5 categories.

1. Primary endodontic lesion
2. Primary endodontic lesion with secondary periodontal involvement
3. Primary periodontal lesion
4. Primary periodontal lesion with secondary endodontic involvement
5. True - combined lesions

Diagnosis

A perio-endo lesion will be defined-by the following criteria.

1. The tooth involved must be pulpless
2. There must be destruction of the periodontal attachment apparatus from the crevices to either periapical area or the area of an involved lateral/accessory canal.
3. Both endodontic and periodontic therapy must be required in order to resolve the lesion.

These criteria form the basis for the diagnostic approach of the endo-perio lesion. To obtain a correct diagnosis, the dentist must utilize the full spectrum of pulpal and periodontal testing procedures. Since differential diagnosis is not always easy to make, several factors need to be considered when determining the etiology. There are several signs and symptoms of pulpal and periodontal lesions that allow them to be distinguished. These include type of pain, swelling, periodontal probing tooth mobility, percussion, palpation vitality of pulp and radiologic evaluation of periodontal destruction.

Microbiology

It is well known that bacteria play an important role in the pathogenesis of both periodontal and pulpal disease. A few studies have directly compared the micro flora of the root, canal and periodontal pocket in the same patient. Kipiotti et al (1984)¹¹ found large similarities in these floras. Kerekes and Oslen (1990)¹² in their review provided some example of similarities in the micro flora of these adjacent oral sites. This supports the idea that infection spreads from one site to the other. They also found that the organisms most often involved are bacteroides, fusobacteria, Eubacteria, spirochetes, veillonella, campylobacter and peptostreptococci. The important qualities of cross infecting organisms may be the ability to survive in highly reduced environments and motility.

Differential diagnosis

	Pulpal	Periodontal
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Etiology	Pulp infection	Periodontal infection
Pulp test	Non-vital	Vital
Microbial	Few organisms	Complex microbial plaque
Trauma (Occlusion)	May be primary or secondary	May be primary cause of a wide periodontal space or secondary cause in pocket formation
Inflammation pH	Acute Usually acid	Chronic Usually alkaline
Root surface Pockets	No calculus Narrow, one surface, often facial	Wide coronally, narrow apically, usually interproximal and part of a generalized disease.
Bone loss	One surface, often facial, wider apically, narrow coronally	Multiple surfaces, usually interproximal wider coronally, often intrabony
X-ray	Funnel shaped, wider at apex but often Superimposed over the root in facial pocket	Generalized bone loss coronally not involving periapical regions.
Restorative	Deep restorations	Caries or deep restorations not related
Histopathology		
i) Epithelium	No down growth	Proliferation and down growth
ii) Connective tissue	Fiber residue on root surface, minimal granulation tissue in pocket	No fibers except apical portion, large quantity of granulation in pocket.
Gingiva	Little or no recession	Gingival recession in chronic disease
Therapy	Pocket closure with endodontic treatment or with simple additional periodontal procedures	Regeneration possible only with advanced periodontal treatment, except in pockets of recent origin from acute inflammation

Management^{13, 14, 15}

Both pulpal and periodontal lesions of short duration are often reversed when the cause is eliminated. Also, periodontal lesions of short duration from pulpal infection often close following endodontic, and even those of longer duration which do not close following endodontic treatment will often heal with minimum periodontal treatment.

When the pulpal periodontal lesion is from periodontal disease of long duration, endodontic therapy, while necessary, will not correct the periodontal lesion. In such cases, periodontal management usually requires surgical correction in addition to controlling the cause of the disease. While periodontal furcation lesions of short duration secondary to pulpal disease may be successfully managed by endodontic therapy, most often the cause is periodontal disease and the management is difficult.

Hemi section or root amputation may either simplify the configuration for cleaning or make regenerative periodontal therapy possible by increasing the osseous surface ratio to tooth surface in the area of the periodontal problem.

Treatment sequence¹⁶

In treating pulp – periodontal disease, it is important to determine the origin of the lesion and the duration of the disease.¹⁷ But sometimes it is difficult or impossible to determine the nature and chronology of the lesion. A good rule in establishing the differential diagnosis for this situation is to consider the lesion endodontic in origin for treatment planning procedures.¹⁸ The sequence of treatment is a controversial aspect and it is suggested that the endodontic treatment should precede periodontal therapy regardless of the cause of the disease.¹⁷

In general, when primary disease of one tissue (pulp or periodontium) is present and secondary disease is just starting in the other, treatment of the primary disease will cure the secondary. When the secondary disease is established and chronic, both primary and secondary disease must be treated.

Lesions of endodontic origin with secondary periodontal involvement should first be treated endodontically to take advantage of the normally excellent healing potential of an endodontic lesion. Residual periodontal lesions can then be treated after the response to endodontic therapy is evaluated combined periodontal – endodontic lesions should also undergo endodontic therapy first. When in doubt as to whether the lesion is endodontic or periodontal in origin, endodontic therapy should generally be performed first because of its significantly better prognosis and minimal post – treatment squeal.

Treatment of primary endodontic lesion:

In this condition, only endodontic treatment is indicated. Complete resolution is usually anticipated after routine endodontic treatment. A fistulous tract usually heals following instrumentation and irrigation of root canals. No root planning should be done when the fistulous tract is along the periodontal ligament. It is important to preserve these fibres so that reattachment can occur. If root planning and curettage are performed, the prognosis may be greatly reduced. The prognosis is excellent in these cases. Healing is usually completed within 3 to 6 months.¹⁹

Treatment of primary endodontic lesion with secondary periodontal involvement:

In this condition, both periodontal and endodontic therapies are indicated. Endodontic therapy should be performed before the periodontal therapy. Prognosis of the lesion depends on the periodontal therapy. One can expect the healing of bone loss due to endodontic lesion following conventional root canal therapy. Periodontal therapy should not be initiated until complete debridement of root canal system has been performed to allow for maximum reattachment. Any remaining probing depth can be treated periodontally later.²⁰

Treatment of primary periodontal lesion:

Only periodontal therapy is indicated since the pulpal tissue is vital. Treatment depends on the extent of periodontal disease and on the patient's ability to complete the possible long term treatment and maintenance; Prognosis of these lesions depends entirely on the efficacy of periodontal therapy that is based on the duration of the disease process and extent of bone loss. The prognosis of the pulp is usually good, unless lateral canals are exposed to oral environment.²¹

Treatment of primary periodontal lesion with secondary endodontic involvement:²²

The treatment of periodontal lesion with secondary pulpal involvement should be first directed to the most acute component of the condition. Frequently this is the endodontic problem which must be then followed by periodontal therapy.

Prognosis of such lesion depends mainly on the extent of the periodontal condition and the outcome of periodontal therapy. It is important to evaluate the restorability of the tooth before beginning endodontic and periodontal treatment.

Treatment of combined endo-perio lesion:^{22, 23, 24}

Treatment of combined lesion is more complicated than treatment of primary lesions. Both endodontic and periodontal treatment must be coordinated for optimal results.

Periodontal treatment may be done prior to, during or after the endodontic therapy, depending on the lesion. But usually endodontic treatment should be provided first with the view to eliminate all bacteria and antigens from the infected root canal system. The use of intracanal calcium hydroxide has been advocated in pulpo-periodontal problem for many reasons. After combined therapy, patient has to maintain an impeccable level of oral hygiene. This may be virtually impossible when bifurcation or trifurcation bone loss exists. Other reasons include, a localized periodontal defect, inability to perform adequate root canal therapy or an iatrogenic problem which makes the clinician to think about other treatment options. These include root amputation and hemi section.

Prognosis of true combined lesions:^{23, 24}

Prognosis of a combined endo-perio lesion is usually moderate to poor considering the chronic nature of the lesion and the amount of alveolar bone loss. As with the other combined lesions, the endodontic aspect heals with adequate root canal therapy and the prognosis ultimately depends on the success of periodontal therapy. The prognosis is poorer for a long standing combined lesion.

Conclusion

It is essential to understand that in perio-endo lesions, the endodontic treatment is the more predictable of the two. However the success of endodontic therapy is dependent on the completion of periodontal therapy. The complete treatment of both aspects of perio-endo lesions is essential for successful long-term results.

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