

INTERRELATIONSHIP OF ENDODONTIC -PERIODONTAL LESIONS - AN OVERVIEW

Abstract

Periodontium is anatomically interrelated with the dental pulp by virtue of apical foramina, and lateral canals create pathways for exchange of noxious agents between the two tissue compartments when either or both surfaces are diseased. Therefore, pathologic changes in one tissue can affect the other. The involvement of both endodontium and periodontium is defined as Combined Endodontic-Periodontal lesions. There are several signs and symptoms of pulpal and periodontal lesions that allow them to be distinguished. The simultaneous existence of pulpal problems and inflammatory periodontal disease can complicate diagnosis and treatment planning and affect the sequence of care to be performed. Correct diagnosis and proper treatment plays a very important role for the success of the treatment. The main factors to consider for treatment decision-making are pulp vitality, type and extent of the periodontal defect. For the endodontic-periodontal lesions to be treated successfully, an accurate diagnosis is mandatory that must cover both the endodontic and the periodontal component of the lesion. This review focuses on the relationship of several aspects of endo-perio lesions.

Key Words

Endodontic-Periodontal Lesion, Etiology, Combined Lesions, Classification, Periodontal Diseases.

- ¹ Sujatha Gopal
- ² Kalwa Pavan kumar
- ³ Krishna Prasad Shetty
- ⁴ Vikas Jindal
- ⁵ Saritha M

¹ Vice Principal & Associate Professor,
Department of Conservative & Endodontics

² Senior Lecturer, Department of Periodontics
M.N.R. Dental College & Hospital, (Post)
SANGA REDDY (Dist) Medak - 502294,
Andhra Pradesh, INDIA.

³ Professor, Department of Conservative & Endodontics,
Navodaya Dental College & Hospital, Navodaya Nagar,
Raichur - 584103, Karnataka, INDIA.

⁴ Director-Professor, Department of Periodontics,
Himachal Dental College, (Post) Sunder Nagar,
(Dist) Mandi, Himachal Pradesh, INDIA.

⁵ Dental Surgeon, Ambadi Dental Clinic,
Teekays Towers, (Post) Tiruvali, (Via) Manjeri,
(Dist) Manappuram-679340, Kerala (INDIA)

Address For Correspondence:

Dr. Kalwa Pavan kumar
Mob : +919705645566
Email : drpavankumarmds@gmail.com

Date of Submission : 30/12/2010

Date of Acceptance : 24/01/2011

INTRODUCTION

The pulp and periodontium are intimately related, and have close embryonic, anatomic and functional inter relationship. The pulp originates from the dental papilla and the periodontal ligament from the dental follicle and is separated by Hertwig's epithelial root sheath.

The relationship between periodontal and endodontic disease was first described by Simring and Goldberg in 1964. Periodontium is anatomically interrelated with the dental pulp by virtue of apical foramina, and lateral canals create pathways for exchange of noxious agents between the two tissue compartments when either or both surfaces are diseased. Therefore, Pathologic changes in one tissue can affect the other.

Etiologic factors such as bacteria, fungi, and viruses as well as various contributing factors such as trauma, root resorption, perforations, and dental malformations play an important role in the development and progression of such lesions. The simultaneous existence of pulpal problems and inflammatory periodontal disease can

complicate diagnosis and treatment planning and affect the sequence of care to be performed.

Endodontic lesion: Denotes an inflammatory process resulting from noxious agents present in the root canal system of the tooth.

Periodontal lesion: Denotes inflammatory process resulting from accumulation of dental plaque on the external tooth surfaces.

Endodontic- periodontal lesion: If an endodontic and a periodontal lesion affects the same tooth simultaneously and presents as a single lesion. True endodontic - periodontal lesion implies that the lesion either is the result of, or the cause of, the other, or the lesion may represent two separate processes i.e. an endodontic and a periodontal which have developed independently.

PATHWAYS OF COMMUNICATION BETWEEN PULP AND PERIODONTIU

Classified into 3 categories:

- Developmental
- Pathological and

- Iatrogenic
Extension of infection and inflammation from pulp to periodontium or vice versa can occur through any of these pathways of communication.

I. Developmental origin

- a. Apical foramen
- b. Accessory canals and lateral canals.
- c. Congenital absence of cementum exposing the dentinal tubules at the cervical region of teeth.
- d. Permeability of cementum
- e. Developmental grooves
- f. Enamel projection and enamel pearls at the cervical area.

II. Pathological origin

- a. Empty spaces on the root created by destruction of Sharpey's fibers.
- b. Vertical fibers.
- c. Idiopathic resorption – internal and external.
- d. Loss of cementum due to external irritants.

III. Iatrogenic origin.

- a. Exposure of dentinal tubules following root

- planning.
- b. Accidental lateral perforation during endodontic procedure.
- c. Root fracture due to endodontic procedure.

CLASSIFICATION OF ENDO-PERIO LESIONS

I. Simon's classification (1972): Based on etiology diagnosis, prognosis and treatment. Classified endodontic-periodontal lesions into 5 groups.

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

II. Franklin. S. Weine (1972): Based on the etiology and treatment required.

Class I: Tooth that clinically and radiographically simulate periodontal involvement but is truly due to pulpal inflammation and/or necrosis.

Class II: Tooth with both no pulpal and periodontal disease concomitantly

Class III: Tooth that has no pulpal problems but requires endodontic therapy with root amputation to achieve periodontal healing.

Class IV: Tooth that clinically and radiographically simulate pulpal or periapical disease but in fact has periodontal disease.

III. Louis I Grossman (1991)

Classified pulpo- periodontal lesions based on therapy into 3 groups,

1. Teeth that require endodontic therapy alone,
2. Teeth that require periodontal therapy alone &
3. Teeth that require endodontic as well as periodontal treatment.

EFFECTS OF PULPAL DISEASE ON THE PERIODONTIUM

As long as the pulp remains vital it is unlikely that significant changes will occur in the periodontium. Necrosis of pulp can result in bone resorption. The lesion that results may be an acute apical lesion or a chronic periradicular lesion associated with lateral or accessory canal.

The periapical lesion may remain small or expand sufficiently to destroy a substantial amount of tooth and communicate with the lesion of periodontitis.

- **Classification of periradicular lesions:**

- Acute apical periodontitis
- Chronic apical periodontitis
- Condensing osteitis
- Acute apical abscess
- Chronic apical abscess

Histopathology of periapical inflammatory lesion:

1. Highly vascular granulation tissue infiltrated by inflammatory cells
2. Neutrophils may be seen near the apical foramen
3. Macrophages, Plasma cells, lymphocytes and fibroblasts are increased in the periphery of the lesion.

Manifestations of endodontic lesions in the marginal periodontium from lateral canals:

Inflammatory processes in the periodontium occurring as a result of root canal infection may not only be localized at the apex, but may also appear along the lateral aspects of the root and in furcation areas of multirooted teeth. In such instances the inflammatory process can be induced and maintained by bacterial products which reach the periodontium through the lateral canal.

If there is an existing periodontal lesion, the two soft tissue lesions may merge and radiographically appear as one lesion. And, clinically one may be able to bring a probe through both lesions. It is important from a therapeutic point of view to understand that the coronal part is directed towards an infection in the marginal periodontium, and the apical part to an infection emanating from the root canal system.

Lateral canals normally harbor connective tissue and vessels which connect the circulatory system of the pulp with that of the periodontal ligament. Such anastomoses are formed during the early phases of tooth development. During the completion of root formation, several anastomoses become blocked and reduced in width by continuous deposition of dentin and root cementum. This may explain why endodontic lesions seldom are seen in furcal areas of the adult dentition. Lateral canals can be observed in all groups of teeth. The majority is found in the apical portion of the root.

Radiographically, it is seldom possible to identify lateral canals unless they have been filled with a contrasting root-filling material.

A lateral radiolucency associated with a tooth with a necrotic and infected pulp may indicate the presence of a lateral canal. The clinical significance of lateral canals in the dissemination of infectious elements from a

necrotic pulp to the periodontium is not well established.

It is conceivable that the wider the lateral canal, the greater the likelihood for a juxt radicular lesion to develop. Even if there is passage of both bacterial and their components, an intact outer layer of cementum evidently acts as an effective barrier against such penetration.

EFFECT OF PERIODONTITIS ON THE DENTAL PULP

Although the effects of pulpal disease on the periodontium are well documented, a clear cut relationship between periodontitis and pulpal involvement is less evident. One may postulate that actual and the inflammatory products of periodontitis could gain access to the pulp via.

- a. Accessory canals
- b. Apical foramina
- c. Dentinal tubules.

In this process, the reverse of the effects of a necrotic pulp on the periodontal ligament, has been referred to as retrograde pulpitis.

Although inflammatory changes have been reported adjacent to accessory canals exposed by periodontitis, it rarely produces significant changes in the dental pulp. It has been suggested that the presence of an intact layer of cementum may protect the pulp from injurious elements of the plaque.

Severe breakdown of the pulp apparently does not occur until periodontitis has reached a terminal state that is when bacterial plaque has involved the apical foramina. (Pulp has a good capacity for defense as long as the blood supply is maintained).

Influence of periodontal disease on the condition of the dental pulp:

The formation of bacterial plaque on the root surfaces following periodontal disease has the potential to induce pathologic changes in the pulp along the very same pathways as an endodontic infection can affect the periodontium in the opposite direction.

Inflammatory alterations as well as localized necrosis of pulp tissue have been observed adjacent to lateral canals in teeth exposed by periodontal disease. It has been reported that pulps of teeth with long standing periodontal disease develops fibrosis and various forms of mineralization. Intact cementum layer is important for the protection of the pulp from injurious elements produced by plaque microbiota.

Apparently as long as the blood supply through the apical foramen remains intact, the pulp is capable of withstanding the

injurious elements released by the periodontal disease.

COMBINED LESIONS (PERIO-ENDO)

The combined lesion results from the development and extension of an endodontic lesion into an existing periodontal lesion (pocket). Such lesions may present characteristics of both diseases. This lesion can complicate diagnosis and treatment sequencing. A careful history clinical & radiographic examination is required.

Usually a developing periapical lesion extends coronally to connect with the preexisting pocket. On rare occasions, a developing periodontal lesion associated with a developmental groove, may extend apically to connect with an apical or lateral endodontic lesion. If periodontitis progresses to involve a lateral canal or the apex of the tooth, then the secondary pulpal infection which is induced is referred as retrograde pulpitis.

DIAGNOSIS

There are several signs and symptoms of pulpal and periodontal lesions that allow them to be distinguished. They include pain, swelling periodontal probing, tooth mobility, percussion & palpation, pulp tests, including thermal electric and preparation of test cavity and radiographic interpretation.

Pain of endodontic origin is usually acute to onset and severe. It can occur spontaneously during the early stages of pulpal inflammation when there is poor localization and the pain may be referred to other sites. Pain intensifies and localizes once the inflammation spreads to the periodontal and surrounding osseous structures.

Pain of periodontal origin is chronic and usually mild or moderate, responding to mild analgesics. If an acute flare up occurs, creating a periodontal abscess, pain can be severe; which often regresses following drainage.

Combined pulpal -periodontal infections usually exhibit minimal pain. Enough periodontal tissue loss occurs to open way of drainage through the gingival sulcus, thereby minimizing pressure and pain.

Swelling: Caused by endodontic infection often occurs in the mucobuccal fold or spreads to the facial planes. Muscle attachments and root length determine the route of drainage. Swelling associated with periodontal problems is characteristically found in the attached gingiva and rarely spread beyond the mucogingival line, and

most often no facial swelling is involved.

Probing: Presence of a sinus tract often allows a diagnosis of the problem. A radiograph taken with a gutta percha point or fine wire threaded into the orifice of the fistula reveals the source; when tracing goes to the apex, the fistula is of endodontic origin. When the traced fistula goes to the mid root, furcation, or any other portion of the tooth, a lateral canal or periodontal problem is diagnosed.

Endodontic – narrow single tract.

Periodontal – Progressive bone loss from margin to apex.

Creates periodontal ligament loss and allows probing to the apex.

Mobility: If present around an isolated tooth, the source can be either endodontic or periodontal. Acute lesion is usually of endodontic origin. Generalized mobility involving many teeth suggests a probably periodontal or occlusal origin.

Tests:

a. Percussion and palpation: Negative in an individual tooth with and periodontal problem. When periodontal abscess is present, these clinical entities may be positive; however other tests indicate a vital pulp. Tooth with endodontic problem produces a definite tenderness and pain on percussion and palpation.

b. Cold: Normal response of healthy pulp is immediate and disappears when stimulus is removed. If there is no response or the pain lingers once the stimulus is removed, the pulp, is necrotic or if irreversibly inflamed, it will respond again. Dichloro difluormethane (Fridigent) should be used because it creates rapid fluid movement in the dentinal tubules better than any cold substance.

c. Electric: Test is viewed as a yes or no response; there is vitality or no vitality. It does not indicate the status of the pulp. If no response, pulp is necrotic and root canal therapy is required.

d. Heat: Normal response of healthy pulp is pain that increases in intensity until the stimulus is removed. Once heat is removed, the pain disappears immediately. Lingering pain indicates an irreversibly inflamed pulp. When pain persists after removal of heat from a periodontally involved tooth, pulpitis should be suspected.

Test Cavity: Done without anesthesia. Access is made through a crown or through the enamel to determine whether vitality is present in the pulp. No response indicates necrosis of the pulp. Test gives no information as to status of pulp other than whether or not it is vital.

TREATMENT CONSIDERATIONS OF ENDO-PERIO LESIONS

Correct diagnosis and proper treatment plays a very important role for the success of the treatment. The main factors to consider for treatment decision-making are pulp vitality, type and extent of the periodontal defect. A primary endodontic lesion draining through the attachment apparatus should be treated initially by endodontic therapy after confirmation by accurate diagnostic tests. On the other hand, primary periodontal disease should only be treated by periodontal therapy. Primary periodontal lesions with secondary endodontic should first be treated with endodontic therapy. Treatment results should be evaluated in 2–3 months and only then periodontal treatment should be initiated. This sequence of treatment allows sufficient time for initial tissue healing and better assessment of the periodontal condition. The potential risk of introducing bacteria and their byproducts during the initial phase of healing is also reduced.

The prognosis of a true combined endodontic-periodontal lesion is often poor or even hopeless, especially when periodontal lesions are chronic, with extensive loss of attachment. Treatment of periodontally diseased, multi-rooted teeth may involve root amputation, hemisection or bicuspidization. As a rule, endodontic treatment of the root to be retained should be performed prior to surgery. This rule should be followed for both vital and non vital teeth.

Root resection (Root amputation): The typical indication for root amputation is a severe periodontal defect around one root of a multi-rooted tooth while the other roots have healthy root support. When a multi-rooted tooth cannot be treated by either conservative or surgical endodontic treatment, one line of treatment which is often successful is: the resection of one root, while the other root (or roots) is filled. This technique is most commonly used for the elimination of furcation involvements, primarily of periodontal origin, but also those which arise from endodontic infections and do not respond to conservative treatment.

Root resection is more applicable for maxillary molars, whereas in mandibular molars hemisection: either accompanied by removal of one half of the tooth, or conversion to two premolars (bicuspidization), tends to be the method of choice.

Bicuspidization: Elimination of the furcation and conversion of a lower molar to two premolars. It is a sound technique for dealing with the problem of plaque control in furcal, periodontal, infra-bony pockets. Ultimate success of this technique depends also on the mesio-distal width of the furcation, i.e. the degree of separation of the roots. It is important that both roots should have canals which are suitable for root treatment. Therefore, after definitive periodontal treatment, the canals are prepared and filled.

Hemisection followed by removal of one root is indicated for the following conditions:

- Perforation of a root, or bifurcation, by a drill or endodontic instrument.
 - Internal or external resorption of one root (when conservative treatment fails).
 - An irremovable fractured instrument in a canal, associated with a periapical area and giving rise to symptoms.
 - Inability to locate or negotiate canals in a root with a periapical lesion.
 - A deep infra-bony pocket around one root or in the furcation.
 - Deep caries or a fracture through the crown, involving the bifurcation.
 - A radiolucent area around the root, which is increasing in size despite root canal therapy, and where it is impossible to remove the root filling
 - Roots which are to be retained should possess sufficient length of canal to allow preparation for a post-retained crown.
- The root canals of molars are sometimes difficult to prepare, in particular when the tooth has been exposed to longstanding periodontal disease. Such teeth can harbor dystrophic calcifications. In multi-rooted teeth with advanced periodontal destruction, it is not always possible to decide before surgery which roots can be preserved.

As an alternative to permanent filling of all root canals in such teeth, pulpectomy can be performed and the canals temporarily filled with calcium hydroxide. Each of the canal openings is sealed with temporary cement. Root separation can then be performed without bacterial contamination of the root canals. Permanent root filling of the roots retained is performed after surgery.

DISCUSSION

The relationship between periodontal and endodontic disease was first described by Simring and Goldberg in 1964. Pulpal and Periodontal problems are responsible for

more than 50% of tooth mortality. The relationship between the pulp and the attachment apparatus of a tooth has been widely documented. Periodontal defects that communicate with periapical lesions may have a favorable prognosis if they are diagnosed correctly on time. The main factors to consider for treatment decision-making are pulp vitality, type and extent of the periodontal defect. Most of the time periodontal inflammation due to pulp space toxins occur in the apical region and thus can readily be distinguished from a periodontal pocket. However, occasionally necrotic infected tissue by-products move through accessory or furcal canals, producing inflammation that is indistinguishable from periodontal disease. The amount of tissue destruction is directly correlated with the total microbial content in the root canal system and to the length of time these tissues are exposed to the infecting organism.

Prognosis and treatment of each endodontic-periodontal disease type varies. A primary endodontic lesion draining through the attachment apparatus should be treated initially by endodontic therapy after confirmation by accurate diagnostic tests. On the other hand, primary periodontal disease should only be treated by periodontal therapy. Primary periodontal lesions with secondary endodontic should first be treated with endodontic therapy. Treatment results should be evaluated in 2-3 months and only then periodontal treatment should be initiated. This sequence of treatment allows sufficient time for initial tissue healing and better assessment of the periodontal condition. The potential risk of introducing bacteria and their byproducts during the initial phase of healing is also reduced.

CONCLUSION

For the endodontic-periodontal lesions to be treated successfully, an accurate diagnosis is mandatory that must cover both the endodontic and the periodontal component of the lesion. However the success of endodontic therapy is dependent on the completion of periodontal therapy. The complete treatment of both aspects of endodontic-periodontal lesions is essential for successful long-term results.

REFERENCES

- 1) Paul BF, Hutter JW. The endodontic-periodontal continuum revisited: new insights into etiology, diagnosis and treatment. *J Am Dent Assoc* 1997; 128:1541-1548.

- 2) Simring M, Goldberg M. The pulpal pocket approach: retrograde periodontitis. *J Periodontol* 1964; 35:22-48.
- 3) Zehnder M, Gold SI, Hasselgren G. Pathologic interactions in pulpal and periodontal tissues. *J Clin Periodontol* 2002; 29: 663-71.
- 4) De Deus QD. Frequency, location, and direction of the lateral, secondary, and accessory canals. *Journal of Endodontics* 1975; 20, 361-6.
- 5) Lowman, J. V. Burke, R. S. & Pelleu, G. B. Patent accessory canals: Incidence in molar furcation region. *Oral Surgery, Oral Medicine, Oral Pathology* 1973; 36, 580-584.
- 6) BF Paul and JW Hutter. The endodontic-periodontal continuum revisited: new insights into etiology, diagnosis and treatment. *J Am Dent Assoc* 1997; 128; 1541-1548.
- 7) Gutmann, J. L. Prevalence, location, and patency of accessory canals in the furcation region of permanent molars. *Journal of Periodontology* 1978; 49, 21-26.
- 8) Jan Lindhe. *Clinical Periodontology and Implant Dentistry*, 4th edition, Blackwell Munksgard Publication, 2003.
- 9) Gunnar Bernholtz. Interactions between pulpal and Periodontal disease conditions: introduction. *Endodontic Topics* 2006, 13, 1-2.
- 10) Shanthi Priya Reddy. *Essentials of Clinical Periodontology and Periodontics*, 2nd edition, Jaypee Brothers Publishers, 2008.
- 11) Seltzer S, Bender, I, B. & Ziontz, M. The interrelationship of pulp and periodontal disease. *Oral Surgery, Oral Medicine, Oral Pathology* 1963; 16, 1474-1490.
- 12) Bender, L B. & Seltzer S. The effect of periodontal disease on the pulp. *Oral Surgery, Oral Medicine, Oral Pathology* 1972; 33, 458-474.
- 13) Ilan Rotstein & James H.S. Simon. Diagnosis, prognosis & decision-making in the treatment of combined periodontal-endodontic lesions. *Periodontology* 2000, vol. 34, 2004, 165-203.
- 14) Chapple I, Lumley P. The periodontal

endodontic interface. Dent update 1999; 26:331-334.

15) Korzen BH, Krakow AA, Green DB. Pulpal and periapical tissue responses in conventional and monoinfected gnotobiotic rats. Oral Surg Oral Med Oral Pathol 1974;37: 783-802.

16) Chen SY, Wang HI, Clickman GN. The influence of endodontic treatment upon periodontal wound healing. J Clin Periodontal 1997; 24: 449-456.

17) Bystrom A, Happonen RP, Sjogren U, Sundqvist G. Healing of periapical lesions of pulpless teeth after endodontic treatment with controlled asepsis. Endo Dent Traumatol 1987; 3: 5863.

18) Simon JHS, Glick DH, Frank AL. The relationship of endodontic-periodontic lesions. J Periodontol 1972; 43:202-8.