the Journal of CONTEMPORARY DENTAL PRACTICE at www.thejcdp.com
Volume 6 Number 2 May 15, 2005 Spring Issue

Management of Periodontitis Associated with Endodontically Involved Teeth: A Case Series

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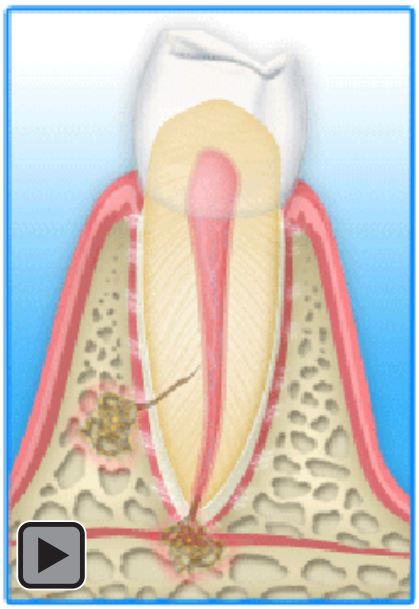


Abstract

The pulp and the periodontal attachment are the two components that enable a tooth to function in the oral cavity. Lesions of the periodontal ligament and adjacent alveolar bone may originate from infections of the periodontium or tissues of the dental pulp. The simultaneous existence of pulpal problems and inflammatory periodontal disease can complicate diagnosis and treatment planning. The function of the tooth is severely compromised when either one of these is involved in the disease process. Treatment of disease conditions involving both of these structures can be challenging and frequently requires combining both endodontic and periodontal treatment procedures. This article presents cases of periodontitis associated with endodontic lesions managed by both endodontic and periodontal therapy.

Keywords: Endodontic-periodontic, periodontitis, pulp, periapical periodontitis, combined lesions

Citation: Anand PS, Nandakumar K. Management of Periodontitis Associated with Endodontically Involved Teeth: A Case Series. J Contemp Dent Pract 2005 May;(6)2:118-129.

Introduction

It has long been recognized that an intimate relationship exists between the pulp of a tooth and the surrounding periodontium.[1] Much of the focus has been on the possible pathways for the spread of inflammation and infection from one component to the other. The periodontium communicates with pulp tissues through many channels or pathways. These channels may be involved in extending pulpal infections to the periodontium and vice versa. Thus, lesions of the periodontal ligament and adjacent alveolar bone may originate from infections of the periodontium or tissues of the dental pulp. The simultaneous existence of endodontic and inflammatory periodontal lesions can complicate diagnosis and treatment planning processes. It can also affect the sequence of treatment to be performed.[2]

Etiology

It has been proved unequivocally the primary etiologic agent in periodontitis is bacterial plaque adhering to the teeth and other hard surfaces in the oral cavity. Besides this primary factor, there is a wide array of secondary factors that contribute to the disease process either by increasing the chance of plaque accumulation or by accelerating the disease process by altering the response of the host to bacterial plaque.[3]

It is also accepted irreversible pulpal disease occurs when trauma inflicted on the pulpal tissues exceeds their reparative capacity.[4] Such a pathological insult can occur through the invasion of bacteria or biochemical toxins in deep carious lesions, or by direct trauma to the pulp during restorative therapy.[5, 6]

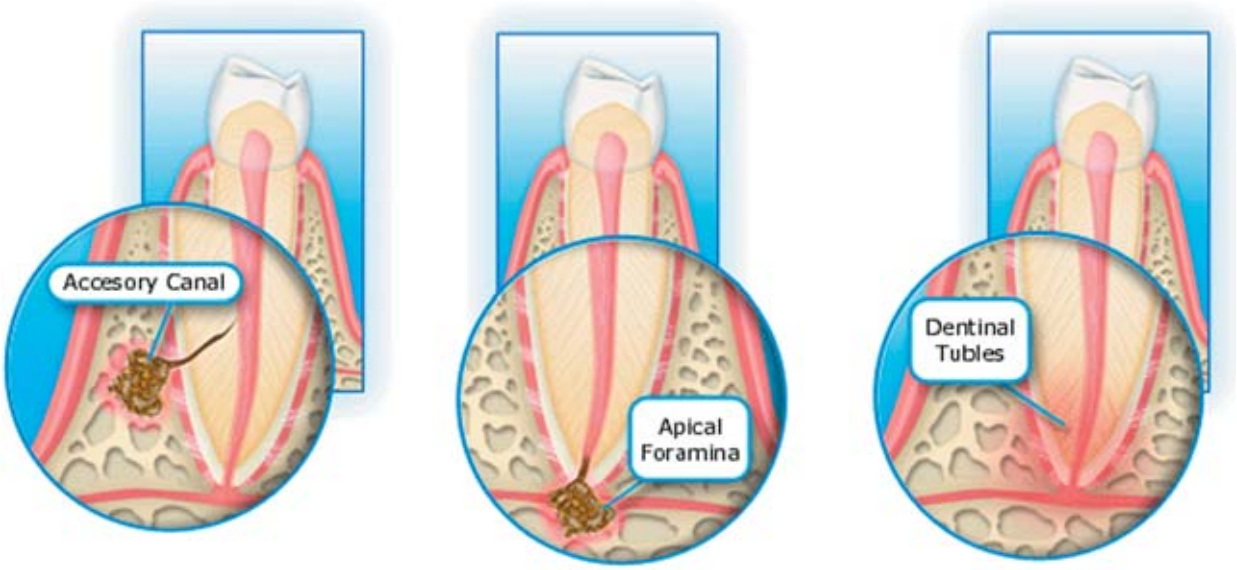
Impact of Pulpal Disease on the Periodontal Tissues

Pulpal infection may cause a tissue-destructive process that proceeds from the apical region of a tooth toward the gingival margin. The term "retrograde periodontitis" was suggested in order to differentiate this condition from marginal periodontitis, where the infection spreads from the gingival margin toward the apical portion of the root.[7, 8]

Even in the presence of significant inflammation, pulpal tissue may not affect the periodontium.[2] This is true so long as the pulp is vital. But necrosis of the pulp tissue can result in bone resorption at the root apex, furcation regions, or anywhere along the length of the root, which may be observed on the dental radiographs as radiolucent lesions.[9, 10] These lesions may be a peri-radicular abscess, cyst, or a granuloma. When the infection spreads through the lateral canals, the lesion may develop along the lateral surface of the root. These lateral canals are more common in the posterior teeth and more in the apical portion of the root.[11] Although evidence exists for such channels of communication, a mechanism for the direct transmission of periodontal infection into the pulpal tissues is not yet clear, and only a weak explanation for pulpal pathology resulting in periodontal attachment loss has been established.[3] Nevertheless, based on existing evidence, it is reasonable to believe endodontic lesions can induce a loss of periodontal attachment.

Impact of Periodontal Pathoses on Pulp Tissue

The pathogenic bacteria and inflammatory products of periodontal disease may gain access to the dental pulp through accessory canals, apical foramina, or dentinal tubules.[2] This process is referred to as "retrograde pulpitis."[7] Histologic studies of teeth extracted due to severe periodontal disease suggest periodontitis seldom produces significant changes in the dental pulp.[12, 13] Irreversible pulpitis or pulpal necrosis has not been consistently found in such teeth. But pathological changes in the pulp



may occur once the periodontal disease reaches a terminal stage-when the bacterial plaque involves the apical foramina.[13] Since the pulp has good capacity for defense, retrograde pulpitis, even if it occurs, is rare.[14]

Classification

Various classifications have been put forward for classifying periodontitis associated with endodontic lesions. Simon et al. have classified the lesions based on the primary source of infection.[10] It is as follows:

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

A true combined lesion is said to be present when an endodontic lesion extends and communicates with a pre-existing periodontal lesion.[2]

Diagnosis

Diagnosis of combined periodontal-endodontic lesions can prove difficult and frustrating. They are often characterized by extensive loss of periodontal attachment and alveolar bone, and their successful management depends on careful clinical evaluation, accurate diagnosis, and a structured approach to treatment planning for both the periodontic and endodontic components. First, the endodontic status of the involved tooth should be determined.[3] The techniques commonly employed for diagnosis include radiographic examination, diagnostic probing, and vitality testing.[15]

According to Harrington, lesions that are purely endodontic and draining through the sulcus should be apparent by careful tactile probing.[16] Vitality testing is the most widely used test in endodontics.[17] These tests measure the neural response providing little information regarding the vascularity of the pulp. These tests are advantageous when it indicates a necrotic pulp, which assures the clinician the pulpal disease is contributing to the periodontal breakdown and endodontic therapy is indicated.

Recent advances in diagnosis include the use of Doppler devices, pulse oximetry, and magnetic resonance imaging.[18, 19]

Laser Doppler Flowmetry is a non-invasive, electro-optical technique which allows the semi-quantitative recording of pulpal blood flow.[20] Over the past decade, this technology has been used experimentally to monitor the blood flow of dental pulp in humans and animals.[21, 22] It has been reported Laser Doppler Flowmetry is more reliable than other pulp vitality tests and could be used as an exclusive and reliable tool to assess tooth vitality.[23] In a recent study assessing the use of Laser Doppler Flowmetry in detecting short- and long-term changes of pulpal blood flow values of luxated permanent maxillary central incisors after repositioning and splinting,

it was found this technique may be useful in the detection of ischemic episodes.[24]

The pulse oximeter is a non-invasive oxygen saturation-monitoring device widely used in medical practice for recording blood oxygen saturation levels during the administration of intra-venous anesthesia. The device is currently under investigation in dental practice to detect pulpal blood circulation by virtue of its non-invasive and atraumatic nature. Schnettler and Wallace compared the pulse oximeter with thermal and electrical pulp tests to evaluate the vitality of maxillary central incisors in 49 adults and reported the pulse oximeter indicated a pulse rate and oxygen saturation reading for the vital teeth and no readings for the teeth previously endodontically treated. This suggests the pulse oximeter has a high degree of accuracy in evaluating pulp vitality.[25]

Magnetic resonance imaging is another method of assessing pulpal perfusion and pulp vitality. Lockhart et al. compared the magnetic resonance imaging with routine Hematoxylin and Eosin histology on a cross sectional view of a molar tooth and found there was a close correlation between the magnetic resonance imaging and the low power Hematoxylin and Eosin appearance of pulp tissue.[26] Magnetic resonance imaging has also been used to assess the reperfusion of transplanted teeth with incomplete root formation.[27]

Management

Management of periodontitis associated with endodontic lesions depends on the determination of the primary cause of the disease. Such lesions often require a combined endodontic and periodontal treatment. Usually endodontic treatment is performed first followed by periodontal treatment.

The following are three clinical situations of periodontitis associated with endodontic lesion that were managed with a combined approach:

Case 1

This report describes a situation in which a lesion of primary endodontic origin with secondary periodontal involvement was treated by a combined approach. A 17-year old female patient presented with complaints of pain and swelling in relation to an upper anterior tooth. There was a history of trauma two years back with avulsion and replantation of tooth 23. There was grade I mobility of this tooth. Radiographic examination revealed a large radiolucency in relation to tooth 23 involving the entire length of the distal aspect of the tooth and root resorption on the mesial aspect at the coronal third of the root (Figures 1 and 2).

Figure 1: Abscess in relation to tooth 23.

Figure 2: Initial radiograph showing radioluscency in relation to 23.

Figure 3: Flap reflected; curettage done.

Figure 4: Bone graft placed.

Figure 5: Radiograph after surgery.

Figure 6: Post-treatment view after augmentation of tooth 23 with composite.

The patient was referred for endodontic consultation. The treatment included endodontic therapy of 23 followed by flap surgery with a bone replacement graft on the same visit the root canal was obturated (Figures 3, 4, 5, and 6).

The graft material used was an alloplastic material (Trade Name-Periobone G, synthetic hydroxyapatite, particle size range 0.15-0.35 mm, manufactured by Sri Chitra Institute of Medical Sciences & Technology, Trivandrum, Kerala State, India). The graft material was selected based on the evidence supporting its use in periodontal therapy and also on account of the ease of procurement of the graft material. Composite augmentation of the tooth was done 3 months after surgery, and the patient was reviewed for up to 9 months after surgery. The tooth was asymptomatic during the 9 month review period.

Case 2

This report describes a situation in which a lesion of primary periodontal origin with secondary pulpal involvement was treated by a combined approach. A 25-year old female patient presented with the complaint of pain and mobility of the right lower posterior teeth. Clinical examination revealed a grade II mobility of tooth 44, a probing pocket depth of 8 mm, and a loss of clinical attachment of 10 mm in relation to the disto-buccal aspect of 44 (Figure 7). Tooth 44 was also found to be non-vital.

Radiographic examination revealed angular bone loss extending up to the apex on the distal aspect of 44 (Figure 8).

The treatment included endodontic therapy on tooth 44 followed by flap surgery with bone graft (Periobone G, synthetic Hydroxyapatite) (Figures 9, 10, 11, and 12).

Figure 7: Pre-operative photograph.

Figure 8: Radiograph showing bone loss up to apex of 44.

Figure 9: Flap reflected; curettage done.

Figure 10: Bone graft placed.

Figure 11: Post-operative photograph taken after 9 months.

Figure 12: Post-operative radiograph taken after 9 months.

Case 3

This report describes a true combined periodontal-endodontic lesion. A 25-year old patient presented with the complaint of pain and swelling in relation to an upper anterior tooth. The patient had a history of trauma. Clinical examination revealed the patient had generalized aggressive periodontitis with generalized attachment loss ranging from 4 to 8 mm, grade II mobility of tooth 21, a probing pocket depth of 5 mm, and a clinical attachment loss of 8 mm in relation to 21 (Figure 13). Tooth 21 was found to be non-vital as determined by electric pulp testing. Radiographic examination revealed a periapical radioluscency and angular bone loss extending up to the middle one-third of the root of 21 (Figure 14).

Figure 13: Pre-operative photograph.

Figure 15: Flap reflected; curettage done.

Figure 17: Post-operative photograph taken after 6 months.

The treatment included temporary splinting of tooth 21 prior to surgery, endodontic treatment with root canal obturation done with gutta percha by the lateral condensation technique, followed by periodontal surgery with bone replacement graft (Periobone G, synthetic Hydroxyapatite) (Figures 15, 16, 17, and 18).

The splint was removed six weeks after the surgery. Six months after treatment, there was

Figure 14: Radiograph showing horizontal periodontal bone loss and periapical radiolucency in relation to tooth 21.

Figure 16: Bone graft placed.

Figure 18: Post-operative radiograph taken after 6 months.

an improvement in the overall periodontal status of the patient. The oral hygiene maintenance by the patient was good. Tooth 21, which was the main source of complaint for the patient, was asymptomatic. There was a probing pocket depth reduction of 3 mm and the tooth was not mobile.

Conclusion

It is quite evident the presence of endodontic lesions may be a risk factor for loss of periodontal attachment. Available data also supports the concept advanced periodontal lesions may have a deleterious effect on the pulp tissue. In the treatment of these lesions appropriate diagnosis, identification of the primary cause, and proper sequencing and performance of the treatment is critical. The prognosis and treatment of each endodontic-periodontal disease type varies. Primary periodontal disease with secondary endodontic involvement and true combined endodontic-periodontal diseases require both endodontic and periodontal therapies. The prognosis of these cases depends upon the severity of the periodontal disease and the response to periodontal treatment. It has been shown endodontic infection tends to promote epithelial down growth along a denuded dentin surface, while non-infected teeth showed 10% more connective tissue coverage than infected teeth.[28, 29] It has also been shown endodontic therapy adversely affects periodontal healing[30, 31], but there is sufficient evidence supporting the combined approach in the management of these cases.[32, 33] In general, with adequate endodontic therapy, the healing of the endodontic component will occur, and the prognosis depends on the efficacy of periodontal therapy. Once this is achieved, it can significantly improve the life and function of teeth which have lost the health of both their pulp and the periodontal attachment.

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