

Endo-perio continuum: A review from cause to cure

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Abstract

Two most common conditions that can independently lead to tooth mortality are periodontal and pulpal diseases. To maintain the natural dentition and also to restore the lost periodontium are the goal of endodontic and periodontal therapy. There are several reviews in literature where authors have given wide information about the etiology, pathogenesis, classification, diagnosis, and treatment planning, and lot of literature about the recent advances pertaining to aspects of endo-perio lesions are also available, but reviews compiling all major aspects are relatively less and this review aims to brief the etiology, various classifications, diagnosis, and management of endodontic-periodontic lesions. Successful treatment of periodontic-endodontic lesions depends on all contributing lesions being treated. Lesions with combined etiology will require both endodontic and periodontal therapy. Endodontic therapy should be completed first. The clinical experience and acumen of the dentist must be of the highest degree to enable choosing the procedure that will bring healing with the appropriate intervention.

Introduction

Two most common conditions that can independently lead to tooth mortality are periodontal and pulpal diseases.^[1] To maintain the natural dentition and also to restore the lost periodontium are the goal of endodontic and periodontal therapy.^[2]

Simring and Goldberg, in 1964, first described the relationship between pulpal and periodontal diseases. Several means of communication between the pulp and periodontal complex. To maintain the natural dentition and also to restore the lost periodontium are the goal of endodontic and periodontal therapy.^[2] Tissues of dental pulp and periodontium are interlinked from the embryonic stage. The dental papilla (precursor of dental pulp) and dental sac (precursor of PDL) are of a common mesodermal origin. At the late bell stage, epithelial root sheath separates the dental papilla and dental follicle except at the base the future apical foramen. Therefore, it is natural to expect that any part of periodontium can get affected by pulpal inflammation and vice versa.^[3]

There are several reviews in literature where authors have given wide information about the etiology, pathogenesis, classification, diagnosis, and treatment planning and lot of literature about the recent advances pertaining to aspects of endo-perio lesions are also available, but reviews compiling all major aspects are relatively less and this review aims to brief the

etiology, various classifications, diagnosis, and management of endodontic-periodontic lesions.

Classification of endodontic-periodontal lesions

Simon et al. (1972)^[4]

- Primary endodontic lesions
- Primary endodontic lesions with secondary periodontal involvement
- Primary periodontal lesions
- Primary periodontal lesions with secondary endodontic involvement
- True combined lesions.

Grossman I (1991)^[5]

Based on therapy into three 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.

Torabinejad and Trope (1996)^[6]

Based on the origin of the periodontal pocket,

1. Endodontic origin
2. Periodontal origin
3. Combined endo-perio lesion
4. Separate endodontic and periodontal lesions

5. Lesions with communication
6. Lesions with no communication.

World workshop for classification of periodontal diseases (1999)^[7]

Periodontitis associated with endodontic disease:

1. Endodontic-periodontal lesion
2. Periodontal-endodontic lesion
3. Combined lesion.

von Arx and Cochran proposed a classification of endo-perio lesion based on the clinical treatment with the employment of a membrane (2001)^[8]

- Class I: Lesion with bone defect in the apex which may invade the buccal/labial and lingual cortex.
- Class II: Apical lesion with the concomitant marginal involvement also referred as a combined periodontal-endodontic lesion, with great periodontal pocket deepness around the affected tooth.
- Class III: Furcation lesion coming from the accessory canals or from iatrogenic perforation and the marginal lesion may or may not occur.

Kim and Kratchman (2006)^[9]

- a. Absence of periradicular lesion, no mobility, normal pocket depth, but unresolved symptoms after non-surgical therapies have been exhausted.
- b. Presence of a small periradicular lesion in the apical quarter, clinical symptoms such as discomfort/sensitivity to percussion as sinus tract, normal periodontal probing depths, and no mobility.
- c. Large periradicular lesions progressing coronally but without periodontal pockets and/or mobility.
- d. Clinically similar to those in Class C but with periodontal pockets >4 mm and no communication of the pocket and the endodontic lesion.
- e. Deep periradicular lesions with endodontic-periodontal communication to the apex, but no obvious fracture.
- f. Apical lesion and complete denudement of the buccal plate but no mobility.

New classification based on the primary disease with its secondary effect: Rotstein and Simon (2006)^[10]

1. Retrograde periodontal disease: It could be of two types
 - a. Primary endodontic lesion with drainage through the PDL
 - b. Primary endodontic lesion with secondary periodontal involvement.
2. Primary periodontal lesion.
3. Primary periodontal lesion with secondary endodontic involvement
4. Combined endodontic-periodontal lesion
5. Iatrogenic periodontal lesions.
 - a. Root perforations
 - b. Coronal leakage
 - c. Dental injuries or trauma
 - d. Chemicals used in dentistry
 - e. Vertical root fractures.

Etiological factors leading to pulpoperiodontal problems^[11]

1. Live pathogens
 - Bacteria.
 - Fungi (yeasts).
 - Viruses.
2. Non-living etiologic agents
 - Extrinsic agents.
 - Intrinsic agents.

Contributing factors leading to pulpoperiodontal problems^[12,13]

1. Poor endodontic treatment
2. Poor restorations
3. Trauma: Crown fracture without pulp involvement, crown fracture with pulp involvement, crown-root fractures, root fractures, concussion, subluxation, extrusive luxations, intrusive luxations, and avulsion.
4. Resorptions: External, replacement, and internal
5. Perforations
6. Developmental malformations.

Diagnosis^[14]

It is incumbent to collect all relevant information through history and examination. Later, it has to be correlated with appropriate diagnostic aids. It also helps to differentiate between various conditions and to arrive at the correct diagnosis.

History

A through history of the onset, duration, and progress of the problem should be noted. This should include sign and symptoms relating to present or past pulpal or periodontal disease and also a history of trauma to the tooth. The chief complaint itself may establish the diagnosis. Usually, pulpal problems are of acute onset, whereas periodontal problems are chronic in nature.

Clinical examination

Visual examination

Visual examination includes the examination for the presence of inflammation ulcerations or sinus tract in alveolar mucosa and attached gingiva. The necrotic pulp is associated with sinus tract. Periodontal pathology is indicated by changes in color, texture, and architecture of the gingival tissues. Teeth aberrations must be assessed in detail.

Pain

Several aspects of pain should be considered when differentiating between pulpal and periodontal pathosis. They include the type, intensity, frequency, duration, and activators of pain. Questions such as the following should be answered by the patient:

- Is the pain sharp or dull, throbbing, or steady? (Type)
- Is the pain mild, moderate, or severe? (Intensity)
- Is the pain constant or intermittent? (Frequency)
- Does heat, cold, or both stimuli cause pain?

- Is the pain related to biting? (Activators of pain)
- Is the pain felt only in one tooth? (Location)

Swelling

Swelling caused by pulpal infections often occurs in the mucobuccal folds or spreads to the facial planes. Muscle attachments and root length determine the route of drainage. Swelling caused by periodontal infection is usually found in the attached gingival and rarely spreads beyond the mucogingival junction and usually does not cause facial swelling.

Suppuration or abscess formation

Suppuration can occur with either pulpal or periodontal pathosis. If associated with periodontal disorders, it may be linked with an acute periodontal abscess, a chronic periodontal disease, or an acute exacerbation of a chronic disorder.

Suppuration associated with pulpal pathosis may be with either an acute or chronic condition such as an acute alveolar abscess or a chronic alveolar abscess draining through a fistula.

Probing

Diagnosis is easy in the presence of a sinus tract as a radiograph taken with a gutta-percha point or a fine wire inserted into the orifice of the fistula reveals the source. If the gutta-percha point goes to the apex of the tooth, then the fistula is endodontic in origin. In case of periapical abscess, due to pulpal involvement, the drainage is through the fistula, so the conventional periodontal probing cannot determine the origin of the sinus tract as no pocket is present. If the gutta-percha point goes to the midroot, furcation, or any other portion of the tooth, a lateral canal or periodontal involvement is diagnosed.

Mobility

Mobility can be checked by various methods, out of one is with two ends of blunt instrument and other is through finger and a blunt instrument, and in both cases, the pressure of application is in both horizontal and vertical component and score is assigned. Integrity of the attachment apparatus is directly proportional to the tooth mobility.

Tests

Percussion

This test is not useful to detect the pulpal condition as it shows the presence or absence of inflammation. Finger or blunt instrument can be used by tapping on the tooth surfaces.

Palpation

On the mucosa covering roots and apices, pressure is applied with either finger or blunt end of instrument. Doing the above process, we can detect the peri radicular abnormalities which further indicate active peri radicular inflammatory process.

Pulp vitality testing

They check the pulpal response on application of stimuli. It also helps to differentiate between pulpal or periodontal origin. It can be interpreted based on the response obtained.

Cold test

Eicesticks, ethyl Chloride, carbon dioxide, dichlorodifluoromethane are the agents used for this purpose.

Electric pulp test

Electric stimulus is applied to tooth with the help of special pulp tester device. Most of the available devices work on similar principal and they are effective. Stimulation of the sensory nerve fibers of the pulp to produce a response is the purpose of the test. Intact pulp is elicited by positive response and pulp necrosis through negative response.

Heat test

The normal response of a healthy pulp to heat is pain that increases in intensity and decreases immediately once the heat is removed. Lingering pain indicates an irreversible inflamed pulp. In case of periodontally involved teeth, persistence of pain even after removal of stimulus indicates an endodontic involvement.

Blood flow test

Determination of the vitality of pulp through measuring blood flow is the purpose of the test. Oxyhemoglobin is measured through different systems such as dual wavelength spectrophotometry, pulse oximetry, and laser Doppler. These are relatively new tests which are not commonly practiced and are non-invasive and painless.

Test cavity

Test cavity is considered to be the most reliable test in determination of pulp. It involves making a cavity without anesthesia. Vital pulp tissue shows a positive response; pulp necrosis is indicated by negative response. Endodontic treatment is initiated by extending the cavity when the pulp shows no response.

Fistula tracking

Oral mucosa let some inflammatory exudates to open through it. In vestibule or on attached gingiva, the opening is visible intraorally. Face and neck region are the area of extraoral fistula.

Radiographic examination

Carious lesions, extensive or defective restorations, pulp tomies, previous root canal treatment and possible mishaps, canal obliteration, root resorption, root fractures, and periradicular radiolucencies are all determined by radiographic examination.

Cracked tooth testing

- Transillumination
- Wedging
- Staining.

Selective anesthesia test

This test specifies the area of pain when the source is not so clear. It is observed that area of pain disappears when appropriate side block is given. This test has limited use in differentiating the pulpal and periodontal disease.

Treatment of endodontic-periodontal lesions^[15]

Primary endodontic disease

After a root canal treatment, generally, the disease heals. After removal of affected pulp, the sinus tract disappears in early stages and later is well cleaned and obturated. Sometimes, due to lesion being chronic manifests as periodontal abscess, therefore, careful evaluation is necessary for the appropriate treatment.

Primary periodontal diseases

Any periodontal disease precedes with hygienic phase which involves proper scaling and root planing and removal of poorly contoured restorations and developmental grooves making it accessible for better maintenance and to treat successfully. Periodontal treatment is then advocated, but the outcome is not so predictable and poorer than the endodontic lesions and extends of lesion and efficacy of periodontal treatment also determines the success of treatment.

True combined diseases

They may be the result of mishaps in endodontic treatment or due to misplaced posts or coronal restoration. They are first treated as primary endodontic lesions with secondary periodontal involvement, but their prognosis of them is poorer or hopeless in some extensive periodontal lesions. Sometimes, regeneration procedures are to be advocated to improve the outcomes; hence, the prognosis of the combined lies in efficacy of periodontal therapy.

Treating iatrogenic lesions

The first priority is to close the iatrogenic communication. Root perforations are treated according to their etiology. Palatal perforations are difficult to manage, even surgically and may frequently lead to extraction. The successful treatment of root perforations depends on early detection and sealing. The prognosis seems poor. Teeth with lesions caused by vertical root fractures have hopeless prognosis and should be extracted.

Conclusion

The periodontal role focuses on the preservation or restoration of the periodontium. Whereas the root canal therapy is cleaning and shaping of the root canal space followed by its three dimensional obturation to restore or maintain the apical periodontium to a biologically acceptable state. Successful treatment of periodontic-endodontic lesions depends on all contributing lesions being treated. Lesions with combined

etiology will require both endodontic and periodontal therapy. Endodontic therapy should be completed first. The clinical experience and acumen of the dentist must be of the highest degree to enable choosing the procedure that will bring healing with the appropriate intervention.

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