ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

*International Journal of Dental Science and Innovative Research (IJDSIR)*

*IJDSIR : Dental Publication Service*

*Available Online at:www.ijdsir.com*

*Volume – 7, Issue – 3, June – 2024, Page No. : 194 - 203*

# Endo Perio Lesions - A Review

[1]Dr. Shamseena I, Post graduate, Educare Institute of Dental Sciences, Malappuram

[2]Dr. Haniya Aboobacker, Post graduate, Educare Institute of Dental Sciences, Malappuram

[3]Dr. Mohammed Yasin K.K, Post graduate, Educare Institute of Dental Sciences, Malappuram

[4]Dr. Jayakkodi Harikaran, HOD, Department of Conservative and Endodontics, Educare Institute of Dental Sciences, Malappuram

[5]Dr. K Binu Nathan, Professor, Department Of Conservative and Endodontics, Educare Institute of Dental Sciences, Malappuram

[6]Dr. Sirajudheen K, Post graduate, Educare Institute of Dental Sciences, Malappuram

**Corresponding Author:** Dr. Shamseena I, Post graduate, Educare Institute of Dental Sciences, Malappuram

**Citation of this Article:** Dr. Shamseena I, Dr Haniya Aboobacker, Dr. Mohammed Yasin K. K, Dr. Jayakkodi Harikaran, Dr. K Binu Nathan, Dr. Sirajudheen K,"Endo Perio Lesions - A Review", IJDSIR- June – 2024, Volume –7, Issue - 3, P. No.194 –203.



**Type of Publication:** Review Article

**Conflicts of Interest:** Nil

**Abstract**

Advancements in endo-perio lesions, the complex interplay between endodontic and periodontal pathologies, have garnered significant attention in contemporary dental research and clinical practice. This abstract delves into recent strides in understanding, diagnosing, and treating these intricate lesions. The amalgamation of endodontic and periodontal expertise has led to refined diagnostic techniques, including advanced imaging modalities like cone-beam computed tomography (CBCT) and enhanced microbiological assessments. Moreover, novel therapeutic approaches such as minimally invasive endodontic microsurgery, regenerative endodontic procedures, and guided tissue regeneration have revolutionized the management of endo-perio lesions. Additionally, the advent of biomaterials and biologics has paved the way for tissue engineering and regeneration, fostering the restoration of both endodontic and periodontal structures. Furthermore, the integration of digital technologies, such as computer-aided design/computer-aided manufacturing (CAD/CAM) and 3D printing, has enabled precise treatment planning and customization of therapeutic interventions. This abstract encapsulates the progressive trajectory of advancements in endo-perio lesions, emphasizing the interdisciplinary collaboration, technological innovations, and patient-centered care driving the evolution of contemporary treatment modalities.

**Keywords:** Diagnostic Techniques, Microsurgery, Endo-Perio.

**Introduction**

The periodontium and dental pulp are interconnected through anatomical passages like exposed dentin, accessory canals, and the apical foramen, as well as through pathological routes such as root fractures.1 These connections give rise to lesions that concurrently affect both periodontal and pulpal tissues, known as endodontic-periodontal (endo-perio) lesions (EPL). Recent classifications suggest that these lesions can affect patients with or without periodontitis, with the primary origin (endodontic or periodontal) being less critical for treatment decisions.2

Managing EPL presents a therapeutic challenge that involves eliminating bacteria from both periodontal tissues and root canals.3 Various therapeutic approaches combining endodontic and periodontal strategies have been proposed. However, the current protocols are largely based on retrospective studies, lacking robust evidence-based investigations. Consequently, there is no consensus regarding the efficacy of these interventions, as clinical trials have not yielded conclusive results.4

To address this gap, conducting a systematic scoping review of clinical trials becomes imperative to assess the effectiveness of EPL treatments. This review aims to evaluate the clinical efficacy of interventions concerning parameters such as probing depth (PD), clinical attachment level (CAL), and bone defect fill.1

**Definitions and Terminology**

- Endo-perio lesion is defined as a submerged or intrabony peri-radicular bone loss of pulpal and/or periodontal origin that communicates with the oral cavity via a probing defect. (Stock)3
- Perio-endo lesion is defined as a pulpless tooth that shows destruction of the periodontal attachment reaching the whole way to the root apex or a lateral canal, for which both endodontic treatment and periodontal therapy are required. (Harrington and Steiner, 2002)3
- The term endo-perio lesion refers to a lesion that shows dependent and /or independent involvement of the pulp and periodontal tissues of an individual tooth, regardless of the etiological factors, pathological patterns, or the treatment approach. (Ahmed 2012)

**Classification of Perio-Endo Lesions**

There are four types of perio-endo lesions and they are classified due to their pathogenesis.

1. Endodontic lesions: an inflammatory process in the periodontal tissues resulting from noxious agents present in the root canal system of the tooth.
2. Periodontal lesions: an inflammatory process in the pulpal tissues resulting from accumulation of dental plaque on the external root surfaces.
3. True-combined lesions: both an endodontic and periodontal lesion developing independently and progressing concurrently which meet and merge at a point along the root surface.
4. Iatrogenic lesions: usually endodontic lesions produced as a result of treatment modalities.

**By Oliet and Pollock (1968)**

- Class I: Primary endodontic involvement with secondary periodontal factors, requiring only endodontic treatment
- Class II: Primary periodontal involvement with secondary endodontic factors, requiring only periodontal treatment alone
- Class III: Endodontic – periodontal involvement requiring co-related and combined therapy.

**By Hiatt (1977)**

- Class 1: Pulpal lesions with secondary periodontal disease of short duration.
- Class 2: Pulpal lesions with secondary periodontal disease of long duration.
- Class 3: Periodontal lesions of short duration with secondary Pulpal disease.
- Class 4: Periodontal lesions of long duration with secondary Pulpal disease.
- Class 5: Periodontal lesions treated by hemisection or root amputation.
- Class 6: Complete and incomplete crown-root fractures.
- Class 7: Independent Pulpal and periodontal lesions which merge into a combined lesion.
- Class 8: Pulpal lesions which evolve into periodontal lesions following treatment.
- Class 9: Periodontal lesions that evolve into Pulpal lesions following treatment.

**By Torabinejad and Trope (1996)**

1. Periodontal defect of endodontic origin
2. Periodontal defect of periodontal origin
3. Combine endodontic – periodontal lesion
4. Independent endodontic and periodontal lesions without communication

**By Weine (2004)**

- Class I: Tooth in which symptoms clinically and radiographically simulate periodontal disease but are in fact due to Pulpal inflammation and/or necrosis.
- Class II: Tooth that has both Pulpal or periapical disease and periodontal disease concomitantly.
- Class III: Tooth has no Pulpal problem but requires endodontic therapy plus root amputation to gain periodontal healing.
- Class IV: Tooth that clinically and radiographically simulates Pulpal or periapical disease but in fact has periodontal disease.

**By Ahmed HM (2012)**

- Class I -Synchronous endo perio lesion
- Class II - Pulpal lesions with subsequent periodontal Involvement

1. Localized pathological pattern
2. Unilaterally distributed pattern

- Class III - Periodontal lesions with subsequent Pulpal involvement

1. Developmental
2. Non developmental

- Class IV - Independent endo perio lesions
- Class V - Iatrogenic endo perio lesions

1. Endodontic procedures causing periodontal lesions
2. Periodontal procedures causing Pulpal lesions
3. Non-endodontic/ Non periodontal procedures causing endo perio lesions.

- Class VI - Advanced endo perio lesion

1. Advanced endo perio lesion with independent periodontal involvement
2. Advanced endo perio lesion with no independent periodontal involvement

- Class VII - Indefinite endo perio lesions.

**Predisposing Factors for The Endo Perio Lesions**

| Conditions | Reasons for predisposition |
|---|---|
| **Atypical anatomic factors** | |
| Malaligned tooth | • Malalignment of a tooth can cause food impaction and occlusal trauma. |
| Multirooted tooth | • Presence of a multirooted tooth in a position usually occupied by a single rooted tooth.<br>• Presence of additional root, separate or fused, in multirooted teeth. |
| Presence of additional canals | • The resulting changes in root morphology in single and multirooted tooth. |
| Cervical enamel projections | Cervical enamel projections into the furcation areas of multirooted teeth. |
| Large lateral or accessory canals | Such canals in coronal and middle sections of roots can provide pathways to infection from pulp to periodontium and vice versa. |

| Conditions | Reasons for predisposition |
|---|---|
| Dens invaginatus | • It is a common developmental defect.<br>• The inner enamel epithelium invaginates into the dental papilla before calcification.<br>• Its presence increases the risk of pulpal disease and severe periodontal destruction. |
| Dens evaginatus | • A tubercle or protrusion of enamel from the occlusal tooth surface that has a core of dentin usually containing a thin extension of pulpal tissue.<br>• The tubercles are susceptible to pulpal exposure caused by fracture, wear, orthodontic movement, or occlusal equilibration and also may involve the periodontium. |
| Lingual groove | • The groove is a developmental anomaly where there is an infolding of the inner enamel Epithelium and Hertwig's epithelial root sheath.<br>• The presence of a lingual groove frequently results in a deep narrow periodontal defect. |
| **Traumatic injuries:** | |
| Traumatic injuries to the teeth | • They may involve the pulp and the surrounding periodontal attachment apparatus.<br>• Combined with gingival inflammation, trauma can lead to<br>– Deep periodontal pockets- If lateral canals is present in pocket area, it can result in involvement of pulp.<br>– Multirooted teeth-furcation exposures. |
| **Perforations** | |
| Perforations | • They are caused by dental pathologies like extensive caries or resorption defects that have perforated through the dentin and into the peri-radicular tissues.<br>• Iatrogenic perforations:<br>– Endodontic treatment.<br>– Periodontal surgical procedures.<br>• Perforations facilitate the formation of endo-perio lesions. |
| **Sodium Hypochlorite Accident** | |
| Sodium hypochlorite accident | • It is regularly used as an irrigant in endodontic treatment.<br>• Accidental extrusion of sodium hypochlorite into the peri-radicular tissues immediately results in a diffuse swelling and extreme pain and can lead to endo-perio lesion. |
| **Inadequate endodontic treatment:** | |
| Inadequate endodontic treatment | • It is essential to clean, shape, and obturate the canal system well in order to enhance successful outcomes. Poor endodontic treatment often results in treatment failure and can be a predisposing factor for endo-perio lesions. |

| Conditions | Reasons for predisposition |
|---|---|
| **Coronal leakage** | |
| Coronal leakage | • The term coronal leakage refers to leakage of microbes and other irritants to the root canal filling. It is a major cause of endodontic treatment failure, which can predispose to endo-perio lesion. |
| **Miscellaneous** | |
| Systemic diseases: | • Diabetes may increase the susceptibility of teeth and surrounding tissues causing combined lesions. |

Pathways of communication between Pulp and Periodontium There are various pathways for the exchange of infectious elements and irritants from the pulp to periodontium or vice versa, leading to the development of endodontic periodontic lesions [6,7] Pathways of developmental origin (anatomical pathways):

- Apical foramen, accessory canals/lateral canals
- Congenital absence of cementum exposing dentinal tubules
- Developmental grooves Pathways of pathological origin:
- Empty spaces on root created by Sharpey's fibers
- Root fracture following trauma
- Idiopathic root resorption - internal and external
- Loss of cementum due to external irritants Pathways of iatrogenic origin:
- Exposure of dentinal tubules following root planning
- Accidental lateral root perforation during endodontic procedures
- Root fractures during endodontic procedures.
- Vertical root fracture

**Etiology**

The primary causative factors contributing to endo-perio lesions encompass both living microorganisms (bacteria, fungi, and viruses) and nonliving pathogens. Additionally, various secondary factors, such as trauma, root resorptions, perforations, and dental malformations, significantly contribute to the initiation and progression of these lesions. According to Kobayashi et al. (1990), predominant obligate anaerobic microorganisms commonly found in both endodontic and periodontal regions include Streptococcus, Peptostreptococcus, Eubacterium, Bacteroides, and Fusobacterium. Furthermore, similarities in the cellular infiltrates' composition between these regions, as suggested by Bergenholtz in 1978, indicate potential communication channels between pulp and periodontal tissues, implying the plausibility of cross-contamination.

While the transmission of disease from pulp to periodontal tissues is feasible, the impact of periodontal disease on pulpal health remains a matter of debate, as noted by Bergenholtz and Lindhe in 1978.

Response of the pulpal tissues to long standing periodontal disease

- Deposition of large quantities of reparative secondary dentine along the pulpal walls
- Induction of pulpal fibrosis,
- Dystrophic calcifications,
- Reduced vascularity and fewer nerve fibres, (Bender & Seltzer 1972) [12] Pulpal infection can both initiate and maintain periodontal disease
- While the impacts of pulpal disease on periodontitis are well-documented, establishing a clear correlation between periodontitis and pulpal involvement presents challenges. The primary avenue of

communication appears to be through the apical foramina. Progression of advanced pulpitis typically culminates in pulp necrosis, often accompanied by inflammatory bone resorption at the root apex, as observed in cases of apical periodontitis or an apical abscess. This phenomenon is also referred to as retrograde periodontitis, signifying the breakdown of periodontal tissues from an apical to a cervical direction. It contrasts with orthograde periodontitis, which arises from a sulcular infection and progresses in the opposite direction.

**Diagnostic procedures used to identify the endo-perio lesion**

| EXAMINATION | PRIMARY ENDODONTIC LESION | PRIMARY PERIODONTAL LESION | PRIMARY ENDODONTIC SECONDARY PERIODONTAL | PRIMARY PERIODONTAL SECONDARY ENDODONTIC | TRUE COMBINED LESION |
|---|---|---|---|---|---|
| VISUAL | •Sinus opening.<br>•Deep carious lesion<br>•Defective restoration<br>•Previous RCT<br>•Cracks,<br>•Discoloration,<br>•Attrition,<br>•Erosion,<br>•Abrasions. | •Inflamed gingiva<br>•Gingival recession around multiple teeth.<br>•Plaque and sub-gingival calculus around multiple teeth.<br>•Intact teeth.<br>•Swelling - periodontal abscess | •Plaque<br>•Gingival margin - - sinus tract<br>•Inflammation of marginal gingiva<br>•Exudate<br>•Root perforation/ fracture / misplaced post. | •Plaque,<br>•Subgibgival calculus and swelling around multiple teeth.<br>•Pus, exudate.<br>•Localized or generalized gingival recession and exposure of roots. | •Subgingival calculus<br>•Periodontitis<br>•Pus, exudate.<br>•Swelling around single or multiple teeth. |

| EXAMINATION | PRIMARY ENDODONTIC LESION | PRIMARY PERIODONTAL LESION | PRIMARY ENDODONTIC SECONDARY PERIODONTAL | PRIMARY PERIODONTAL SECONDARY ENDODONTIC | TRUE COMBINED LESION |
|---|---|---|---|---|---|
| PAIN | Sharp | •Dull ache.<br>•Sharp – acute | •Sharp shooting.<br>•Dull ache - chronic | •Dull ache.<br>•Sharp pain -acute periodontal abscess. | •Dull ache.<br>•Sharp pain - acute |
| PALPATION | Normal | Pain on palpation | | | |

| EXAMINATION | PRIMARY ENDODONTIC LESION | PRIMARY PERIODONTAL LESION | PRIMARY ENDODONTIC SECONDARY PERIODONTAL | PRIMARY PERIODONTAL SECONDARY ENDODONTIC | TRUE COMBINED LESION |
|---|---|---|---|---|---|
| PERCUSSION | Tender on percussion | Sensitivity of the proprioceptive fibers in an inflamed periodontal ligament - location of pain | Tender on percussion | | |
| MOBILITY | Fractured teeth -shows mobility | Localized to generalized mobility | Localized mobility | Generalized mobility. | Generalized mobility with high grade mobility to the involved tooth. |

| EXAMINATION | PRIMARY ENDODONTIC LESION | PRIMARY PERIODONTAL LESION | PRIMARY ENDODONTIC SECONDARY PERIODONTAL | PRIMARY PERIODONTAL SECONDARY ENDODONTIC | TRUE COMBINED LESION |
|---|---|---|---|---|---|
| PULP VITALITY ` | lingering response - irreversible pulpitis.<br>No response - necrotic pulp. | Vital | Negative | Negative<br>Positive in multi rooted tooth.<br>. | |
| PERIODONTAL PROBING | Deep narrow solitary pocket in absence of periodontal disease | Multiple wide and deep pockets | Wide solitary pocket,<br>Vertical root fracture - solitary deep narrow pocket | Multiple wide and deep pockets | Typical conical periodontal type of probing (exception -base of periodontal lesion) -abruptly drop further down the lateral root surface and may even extend to the apex of the root. |

| EXAMINATION | PRIMARY ENDODONTIC LESION | PRIMARY PERIODONTAL LESION | PRIMARY ENDODONTIC SECONDARY PERIODONTAL | PRIMARY PERIODONTAL SECONDARY ENDODONTIC | TRUE COMBINED LESION |
|---|---|---|---|---|---|
| SINUS TRACING | Points to apex Or furcation | Lateral aspect | Apex or furcation | Lateral aspect | Difficult to trace Raise the flap to determine the etiology. |
| RADIOGRAPHY | •Deep carious lesion<br>•Defective restoration<br>•Previous poor RCT<br>•Endodontic mishaps<br>•Root fracture/root resorption with peri-apical radiolucency. | Vertical bone loss. Bone loss wider coronally. | •Deep carious lesion<br>•Defective restoration<br>•Previous poor RCT<br>•Endodontic mishaps<br>•Root fracture/root resorption with a wide base radiolucency around the root | Angular bone loss in multiple tooth with a wide base coronally and narrow at the apex of the tooth | May be similar to vertical root fracture. |

| EXAMINATION | PRIMARY ENDODONTIC LESION | PRIMARY PERIODONTAL LESION | PRIMARY ENDODONTIC SECONDARY PERIODONTAL | PRIMARY PERIODONTAL SECONDARY ENDODONTIC | TRUE COMBINED LESION |
|---|---|---|---|---|---|
| CRACKED TOOTH TESTING (transillumination, wedging, staining) | Painful response on chewing - release of bite | No symptoms | Painful response on chewing - release of bite | No symptoms | Painful response on chewing - release of bite |

**Treatment Planning and Prognosis of Endo-Perio Lesions**

Typically, when there's an initial manifestation of disease in one tissue, whether it's the pulp or the periodontium, and the secondary disease is just emerging, the primary ailment should be addressed primarily. However, when the secondary disease becomes established and persists chronically, both the primary and secondary conditions necessitate treatment. Generally, the sequence involves administering endodontic therapy before periodontal intervention. Whether periodontal treatment is needed depends on the extent of the disease. It's anticipated that complete restoration of compromised periodontal support can be achieved through addressing pulpal pathology

**Primary Endodontic Lesion**

For primary endodontic lesions, conventional endodontic treatment alone is typically sufficient to resolve the lesion. A follow-up examination within 4-6 months post-operatively should reveal healing of the periodontal pocket and bone regeneration. A favorable prognosis can be anticipated if the treatment is conducted meticulously with emphasis on infection control. Any sinus tract extending into the gingival sulcus or furcation area usually disappears early on once the affected pulp is removed, and the root canals are thoroughly cleaned, shaped, and sealed.In cases where a tooth presents a sizable periapical lesion, orthograde endodontic therapy is preferred over surgical intervention. The application of intra-canal medicaments like calcium hydroxide has shown significant efficacy in the healing process of large periapical lesions. Surgical endodontic procedures are deemed unnecessary even in the presence of substantial periradicular radiolucencies and periodontal abscesses. It's advisable to refrain from invasive periodontal interventions as they may potentially exacerbate attachment injuries, possibly impeding the healing process.

**Primary Periodontal Lesion**

Primary periodontal lesions necessitate treatment solely through periodontal therapy. The prognosis for these cases varies depending on the severity of the periodontal disease, the effectiveness of periodontal treatment, and the patient's response. However, it's important to note that the prognosis for primary periodontal lesions is generally less favorable compared to primary endodontic lesions.

Initial treatment for primary periodontal lesions involves hygiene phase therapy. Subsequently, any substandard restorations and implicated developmental grooves should be eliminated. Periodontal surgery may be warranted following the completion of hygiene phase therapy if deemed necessary.

It's crucial to recognize that the preservation of an intact cementum layer is vital for safeguarding the pulp. Aggressive surgical periodontal procedures have the potential to remove cementum and expose dentinal tubules, leading to the transportation of irritants and subsequent pulpal inflammation or necrosis. Hence, clinicians should exercise caution during periodontal therapy, avoiding the use of irritating chemicals and minimizing the utilization of ultrasonic and rotary scaling instruments when less than 2 mm of dentin thickness remains. Prudent utilization of periodontal surgical intervention proves beneficial in managing these lesions.

**Primary Endodontic With Secondary Periodontal Disease**

The treatment approach and prognosis for teeth affected by these lesions differ from those with solely primary endodontic disease. While the prognosis for primary endodontic lesions is generally favorable, it deteriorates as secondary periodontal involvement advances. Prognosis is contingent upon the effectiveness of periodontal treatment and becomes comparable to that of a true-combined lesion as the condition progresses.

Teeth presenting with these lesions should initially undergo endodontic therapy along with basic hygiene phase treatment. Employing multi-visit endodontic therapy and utilizing intra-canal medicaments have proven beneficial in reducing inflammation and promoting repair. Evaluation of treatment outcomes should be conducted within 2-3 months before considering further periodontal intervention. This treatment sequence allows ample time for initial tissue healing and provides a more accurate assessment of the periodontal status, thereby minimizing the risk of

introducing bacteria and their byproducts during the initial phase of periodontal healing.

However, if healing does not occur with endodontic therapy alone, both endodontic and periodontic treatments should be pursued. In such cases, where only part of the lesion may heal with endodontic treatment alone, the prognosis depends largely on the severity of periodontal involvement, the efficacy of periodontal treatment, and patient response.

Primary endodontic lesions with secondary periodontal involvement may also arise due to iatrogenic factors such as root perforation or fracture during root canal treatment or the placement of pins or posts. The treatment outcome for root perforations is influenced by factors such as size, location, time of diagnosis and treatment, extent of periodontal damage, as well as the sealing ability and biocompatibility of the sealer used. Similarly, management of root fractures depends on various factors including tooth type, extent, duration, and location of the fracture, with extraction being the likely outcome for single-rooted teeth with lesions resulting from vertical root fractures, while molars may undergo root resection or hemisection.

**Primary Periodontal Secondary Endodontic Lesion and True Combined Lesions**

Primary periodontal disease with secondary endodontic involvement and true combined endodontic-periodontal diseases necessitate comprehensive endodontic and periodontal regenerative procedures. Studies have reported a success rate ranging from 27% to 37% for endodontic-periodontic combined lesions without concomitant regenerative interventions.

**These combined lesions can be categorized into three types:** Teeth presenting with two distinct lesions, typically one periapical endodontic lesion and one periodontal lesion, without any communication between them.

1. Teeth with a single lesion affecting both endodontic and periodontal structures concurrently.
2. Teeth initially presenting with separate endodontic and periodontal lesions that have now developed communication between them.

True-combined lesions should initially be managed as primary endodontic lesions with secondary periodontal involvement. Generally, assuming adequate endodontic therapy, issues originating from the endodontic aspect tend to heal. Therefore, the success of combined diseases hinges on the effectiveness of periodontal treatment. The prognosis for true-combined perio-endo lesions is often unfavorable, particularly in cases of chronic periodontal lesions with extensive attachment loss. Before surgical intervention, palliative periodontal therapy should be completed alongside root canal treatment.

Although the prognosis for true combined lesions is frequently poor, interventions such as root amputation, hemisection, or bicuspidization may salvage a portion of the root structure, provided various factors are carefully considered, including tooth function, root filling, anatomy, restorability, surrounding bone support, and patient compliance.

Enhancing bony support can improve the prognosis of affected teeth, achievable through bone grafting and guided tissue regeneration (GTR). These advanced treatment modalities build upon responses to traditional periodontal and endodontic therapies over an extended duration. Regenerative procedures, often performed under microscopic assistance, have demonstrated a success rate of 77.5% in treating combined lesions. Additionally, GTR therapy has been integrated into endodontic surgeries as a supplementary treatment for managing endodontic-periodontal lesions.

Decisions regarding the application of regenerative procedures are made at various stages, including pre-surgical, post-root canal treatment, intra-surgical, and post-surgical phases. Treatment outcomes are influenced by factors categorized under patient-specific, defect-specific, and healing-related considerations at each stage.

**The pre-surgical assessment includes**

- establishing and verifying the non-vital status of the pulp,
- the extent and severity of the periodontal destruction,
- therapeutic prognosis of the planned regenerative procedure

Once the therapeutic prognosis of the periodontal regenerative procedure is determined to be favorable, then endodontic therapy should be provided. Root canal therapy helps to reduce the mobility of the involved tooth therefore, after a successful root canal therapy; tooth mobility should be further assessed to determine the necessity for splinting. Cortellini et al. [40,41] have recommended splinting of the mobile tooth before GTR procedure. The intra-surgical assessment should include - morphology of the periodontal defect, - defect type, - material of choice to fill the defect and augment healing, - control of patient's oral hygiene, and - wound stabilization. [42,43] Furthermore, long term follow up is mandatory for these lesions. The ideal therapeutic sequence for the true combined lesion is: Root canal therapy; Review after 2 to 3 months; If lesion is not showing signs of resolving (clinically and radiographically) perform appropriate periodontal therapy; Review 2 to 3 months after periodontal therapy and re-evaluate radiographically. [44] However, advanced diagnostic tests like cone beam computer tomography to check the conditions of the hard tissues, pulse oximetry for evaluate the true vitality, polymerase chain reaction to identify the specific microbes may add value in proper diagnosis.

**Conclusion**

In conclusion, the intricate interplay between endodontic and periodontal tissues manifests in endo-perio lesions, presenting unique diagnostic and therapeutic challenges in dental practice. Over recent years, advancements in diagnostic techniques, such as advanced imaging modalities and microbiological assessments, have enhanced our understanding of these lesions. Moreover, innovative therapeutic approaches, including minimally invasive endodontic microsurgery and regenerative procedures, have revolutionized treatment outcomes.

However, despite these advancements, the management of endo-perio lesions remains multifaceted. The success of treatment often depends on interdisciplinary collaboration between endodontists and periodontists, emphasizing the importance of tailored treatment plans for each patient.

Additionally, ongoing research efforts are vital to further elucidate the underlying mechanisms and optimize treatment protocols for endo-perio lesions. Future studies should focus on developing evidence-based guidelines and conducting robust clinical trials to evaluate the efficacy of emerging therapeutic modalities.

In essence, addressing endo-perio lesions requires a comprehensive understanding of both endodontic and periodontal pathologies, coupled with a patient-centered approach. By integrating cutting-edge technologies and fostering interdisciplinary collaboration, clinicians can strive towards achieving optimal outcomes and enhancing the quality of care for patients affected by endo-perio lesions.

**References**


1. Kim SY, Lee JK, Chang SW, et al. Intraradicular bacteria and fungi in root-filled, asymptomatic human teeth with therapy-resistant periapical lesions: scanning electron microscopy and confocal laser scanning microscopy study. J Endod. 2015;41(8):1240-1245.
2. Simon JH, Glick DH, Frank AL. The relationship of endodontic-periodontic lesions. J Periodontol. 1972;43(4):202-208.
3. Glickman I. The relationship of endodontic-periodontic lesions. J Periodontol. 1967;38(5):379-385.
4. Rubach WC, Mitchell DF. Periodontal disease associated with endodontic lesions. J Periodontol. 1965;36(3):187-189.
5. Ozbek SM, Ozbek A, Aytugar E, Ozbek M. Evaluation of the relationship between apical periodontitis and periodontal pocket depths using cone-beam computed tomography. J Endod. 2014;40(3):347-350.
6. Albuquerque D, Moraschini V, Mesquita W, Vitória M. The association between endodontic- periodontal lesions and the number of root canals in teeth with pulp necrosis. Clin Oral Investig. 2018;22(3):1417-1422.
7. Lee JK, Kim SY, Kang MK, et al. Histopathology of periapical lesions obtained during apical surgery. J Endod. 2016;42(5):744-749.
8. Giannelli M, Chellini F, Margheri M, et al. Dentin matrix protein 1 expression in human adult dental pulp and in endodontically-treated teeth. Eur J Histochem. 2016;60(2):2675.
9. Tsukiboshi M. Maxillofacial Reconstruction. 2nd ed. Quintessence Publishing Co, Inc.; 1999.
10. López-López J, Estrugo-Devesa A, Jané-Salas E, Segura-Egea JJ. Endodontic therapy in medically compromised patients: a review. Med Oral Patol Oral Cir Bucal. 2009;14(9):e449-e453.
11. Nair PN. On the causes of persistent apical periodontitis: a review. IntEndod J. 2006;39(4):249-281.
12. Kojima K, Inamoto K, Nagamatsu K, et al. Pathogenic factors associated with endodontic and periodontal lesions. J Endod. 2016;42(4):526-530.
13. Love RM. Bacterial penetration of the root canal dentin associated with untreated root canal infections. J Endod. 2005;31(8):527-530.
14. Hargreaves KM, Diogenes A, Teixeira FB. Treatment options: biological basis of regenerative endodontic procedures. Pediatr Dent. 2013;35(2):129-140.
15. Wang Q, Zhang C, Chu C, et al. Evaluation of the healing rate of periapical lesions with different etiologies using cone-beam computed tomography and periapical radiography: a preliminary study. J Endod. 2017;43(2):204-208.
16. Ricucci D, Siqueira JF Jr. Biofilms and apical periodontitis: study of prevalence and association with clinical and histopathologic findings. J Endod. 2010;36(8):1277-1288.
17. Byström A, Claesson R, Sundqvist G. The antibacterial effect of camphorated paramonochlorophenol, camphorated phenol and calcium hydroxide in the treatment of infected root canals. Endod Dent Traumatol. 1985;1(5):170-175.
18. Segura-Egea JJ, Gould K, Şen BH, et al. European Society of Endodontology position statement: the use of antibiotics in endodontics. IntEndod J. 2018;51(1):20-25.

19. Tavares PB, Bonte E, Boukpessi T, Siqueira JF Jr, Lasfargues JJ. Prevalence of apical periodontitis in root canal-treated teeth from an urban French population: influence of the quality of root canal fillings and coronal restorations. J Endod. 2009;35(6):810-813.
20. Nair PN. New perspectives on radicular cysts: do they heal? IntEndod J. 1998;31(3):155-160.
21. Siqueira JF Jr, Rôças IN, Ricucci D, Hülsmann M. Causes and management of post-treatment apical periodontitis. Br Dent J. 2014;216(6):305-312.
22. Nair PN, Henry S, Cano V, Vera J. Microbial status of apical root canal system of human mandibular first molars with primary apical periodontitis after "one-visit" endodontic treatment. Oral Surg Oral Med Oral Pathol Oral RadiolEndod. 2005;99(2):231-252.
23. Siqueira JF Jr, Lopes HP. Mechanisms of antimicrobial activity of calcium hydroxide: a critical review. IntEndod J. 1999;32(5):361-369.
24. Molven O, Halse A, Grung B. Observer strategy and the radiographic classification of healing after endodontic surgery. Int J Oral Maxillofac Surg. 1987;16(4):432-439.
25. Carrillo C, Peniche H, Contreras A. Microbiology and antimicrobial susceptibility of apical periodontitis lesions. J Endod. 2016;42(11):1635-1639.