

Endo-Perio Lesions: An Enigma to Endodontists

Abstract:

The connection between endodontic and periodontal issues has been a topic of debate and contention for years. Pulp and periodontal issues contribute significantly to tooth loss, with over 50% of cases attributed to them. Endo-perio lesions can arise from various causes, presenting challenges for clinicians in diagnosis and prognosis. A comprehensive understanding of these lesions' origins, along with the requisite skills for performing restorative, endodontic, or periodontal treatments either individually or in combination, is crucial for accurate diagnosis and effective management. This review article gives an insight on various aspects of endo perio lesions such as etiology, classification, diagnosis, prognosis and the management of these lesions.

Key-words: Endodontic periodontal lesion, interdisciplinary management, primary endo lesions, true combined lesions.

Introduction:

The intimate connection between the pulp and periodontium stems from their close anatomical and vascular links.[1] Pulpal and periodontal issues account for more than half of tooth loss, as highlighted by Simring and Goldberg in 1964.[2] Diagnosis can be challenging due to overlapping clinical features of both diseases.

Periodontal diseases progress from the sulcus towards the apex, driven by plaque and tartar deposition, gradually damaging the attachment apparatus. While these lesions can invade lateral canals or dentinal tubules, the gingival route is typically the path of least resistance. Preservation of vascular supply through the apical foramen generally protects the pulp, though compromised supply can lead to pulpal necrosis and worsening periodontal breakdown.[3]

In contrast to periodontal disease, pulpal disease often presents both chronic and acute phases. In its chronic state, pulpal degeneration typically progresses slowly. Since the pulp is encased in a closed chamber, inflammation within the pulp leads to an increase in intrapulpal pressure. This elevated pressure can force toxic substances through open channels such as the apical foramen, lateral canals, and accessory canals. Over time, these lesions may merge with adjacent

periodontal tissues. Effective endodontic treatment can reverse attachment loss caused by these lesions, but delayed intervention may lead to worsening secondary periodontal involvement and prognosis.[4]

The distinct etiology and pathogenesis of endodontic-periodontal diseases dictate specific treatment plans and affect the prognosis of affected teeth. A comprehensive multidisciplinary approach is crucial for diagnosis and management, ensuring the best chance for optimal treatment outcomes.

Etiology:

Endodontic and periodontal diseases are influenced by various factors including anatomical, genetic, systemic, and

¹FAIZA JAVED, ²HUMA IFTEKHAR,

³R. K. TEWARI , ⁴S. K. MISHRA

Department of Conservative Dentistry & Endodontics

Dr. Ziauddin Ahmad Dental College

Aligarh Muslim University, Aligarh

Address for Correspondence: Dr. Huma Iftekhar

Department of Conservative Dentistry & Endodontics

Dr. Ziauddin Ahmad Dental College

Aligarh Muslim University, Aligarh

Email : huma.iftekhar@yahoo.com

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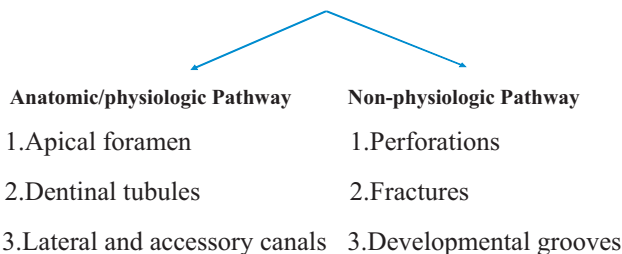
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behavioral aspects, alongside other potential contributors. Despite this complexity, infection plays a central role in the development of both conditions[5,6].

Zehnder et al[7] asserted that while the microbial flora is diverse within the periodontal pocket than that of infected pulp, in instances where severe periodontitis triggers an endodontic infection, every bacterial species identified within the root canals is also evident in the periodontal pocket. This observation aligns with findings by Kerekes and Olsen[8], indicating a potential for infection transfer between these niches. However, other studies suggest fundamental differences in the microflora of infected root canals and periodontal pockets, possibly due to variations in predominant bacterial types [9,10]. Rocas et al. [11] specifically explored the presence of "red complex" bacteria associated with severe periodontitis in root canal infections.

Bacteria organize into intricate biofilm communities, which are specialized ecological niches where they employ diverse mechanisms to adjust their behaviors according to the fluctuating environmental conditions.[12] Consequently, when a specific biofilm encounters a new ecological habitat, such as when an endodontic biofilm interacts with the periodontium, and vice versa, these adaptation processes are activated, resulting in the expansion into each other's niches.

Pathways of Communication Between Endodontic and Periodontal Tissues:



Classification of Endo Perio Lesions:

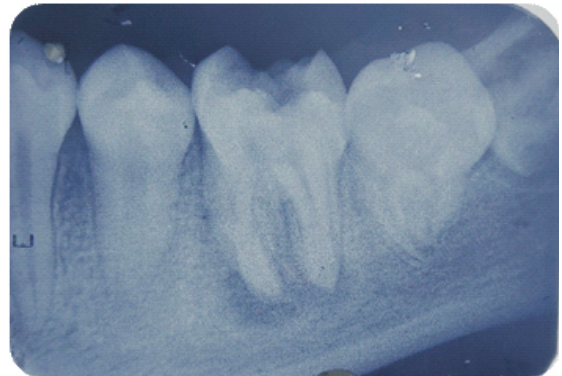
The most common classification which we follow today is the one given by Simon et al[13] which was based on the diagnosis, prognosis and treatment. This includes:

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

1) Primary Endodontic Lesions:

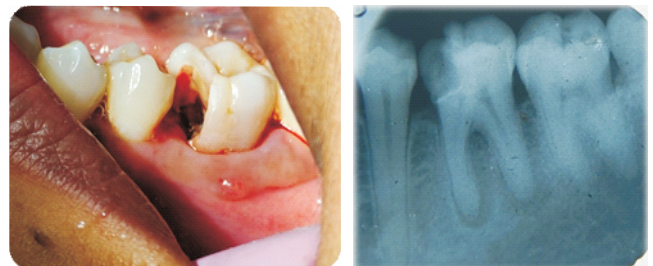
Clinical signs may comprise inflammation and enlargement of the attached gingiva, while a necrotic pulp might lead to a

sinus tract extending from the apex along the root surface to the gingiva. In cases of multi rooted teeth, the sinus tract may communicate with the furcation region.[14]



2) Primary Endo With Secondary Periodontal Involvement:

Accumulation of plaque at the gingival margins initiates marginal periodontitis, and then this primary endodontic disease may become secondarily involved with periodontal destruction. In such cases, both endodontic and periodontal treatments are necessary, and the overall prognosis mainly depends on the effectiveness of the periodontal intervention, given that endodontic procedures are typically considered more reliable.[1,3]



3) Primary Periodontal Lesions:

These lesions arise from periodontitis that extends progressively along the root surface toward the apex. Diagnosis relies on conventional periodontal assessments, including probing depth measurement. The pulp vitality test aims to ascertain the vitality of the pulp. If the pulp remains vital, the prognosis in such cases largely relies on the success of the periodontal treatment.[13,14]

4) Primary Perio with Secondary Endodontic Lesion:

When the periodontal pocket extends towards the apex of the root, the lateral canals and eventually the apical foramen may become exposed to the microorganisms of the periodontal environment, potentially resulting in pulp necrosis. Simon and coworkers noted that these lesions may present a diagnostic challenge as they can resemble primary endodontic lesion with secondary periodontal implications.[15]

5) True Combined Lesions:

This condition arises when an endodontic disease spreading coronally joins an infected periodontal pocket progressing apically. Its clinical and radiographic characteristics pose a notable diagnostic challenge, as they are similar to those of other aforementioned lesion types.[3]

A new classification was suggested by Guldener and Langeland[16] in 1982 based on the pathological relationship: endodontic-periodontal lesion, periodontal-endodontic lesion, and combined lesions.

In 1990, Belk and Gutmann[17] suggested a new classification termed the concomitant periodontal lesion. This classification describes a situation where both endodontic and periodontal diseases manifest in the same tooth, without any apparent influence of one disease on the other.

The Chicago Consensus Conference in 2017 introduced a revised classification system for periodontal and peri-implant diseases and conditions [18], which builds upon the earlier 1994 proposal. It emphasizes categorizing lesions based on their current clinical condition, irrespective of whether the cause is endodontic or periodontal.

Table 1 : Classification of Endoperiodontal Lesions

Endoperiodontal lesion with root damage	Root fracture or cracking Root canal or pulp chamber perforation External root resorption	
Endoperiodontal lesion without root damage	Endoperiodontal lesion in periodontitis patients	Grade I: Narrow deep periodontal pocket in one tooth surface Grade II: Wide deep periodontal pocket in one tooth surface Grade III: Deep periodontal pockets in more than one tooth surface
	Endoperiodontal lesion in non periodontitis patients	Grade I: Narrow deep periodontal pocket in one tooth surface Grade II: Wide deep periodontal pocket in one tooth surface Grade III: Deep periodontal Pockets in more than one tooth surface

Diagnosis of Endo-perio Lesions:

Medical History

It's crucial for clinicians to understand the connection between a patient's medical history and their chief complaint. For instance, individuals with diabetes face a heightened likelihood of experiencing periodontal issues.[19] Similarly, many patients undergoing treatment for cardiovascular conditions may also have elevated cholesterol levels and could be prescribed statins. Over time, this medication regimen can lead to the narrowing of pulp canals, potentially raising the risk of apical periodontitis.[20]

Dental History:

Questions should cover the characteristics of the pain, such as whether it occurs spontaneously or upon stimulation, if it's continuous or intermittent, if there's discomfort while biting, nocturnal pain, and factors that worsen or alleviate it. Additionally, it's important to enquire about any past incidents of dental trauma and prior endodontic procedures.

Clinical Examination:

Extraoral examination should be done to rule out any temporomandibular disorders which can often be confused with toothache.

Intraoral examination includes careful probing of all the teeth to assess the periodontal condition of the patient. Gingival abscesses of periodontal origin generally have large pockets compared to endodontic abscesses, which tend to be narrower.[21]

Percussion:

The tactile sensitivity that persists regardless of where the tooth is tapped (buccal, occlusal, or lingual) is most likely the result of PDL inflammation and apical periodontitis. Isolated areas of tactile sensitivity on the same tooth indicate fracture, tooth decay, or possible occlusal trauma.

Sensibility Testing:

The neural response of a tissue is recorded by sensibility testing. Teeth that are not necrotic generally show an exaggerated and delayed or prolonged response to cold or heat test. A negative thermal test response would indicate pulpal necrosis, particularly if it was also negative to the electrical pulp test (EPT).

TABLE 2: Diagnostic examinations used to classify EPL adapted from Parolia et al 2013[22]

Test	Primary Endodontic lesion	Primary Periodontal lesion	Primary Endodontic Secondary Periodontal lesion	Primary Periodontal Secondary Endodontic lesion	True combined lesion
Visual	Presence of Decay/incorrect Restorations/ erosion/ abrasion	Inflammation/ recession of gingiva Presence of plaque/ calculus intact teeth	Plaque/ calculus at the gingival margin root perforation/ fracture	Plaque/ calculus and swelling around multiple teeth Pus+ exudate	Periodontitis around single or multiple teeth Pus+exudate
Pain	Sharp	Usually dull ache	Usually dull ache	Usually dull ache	Usually dull ache, Sharp only acute condition
Palpation	Not conclusive	Pain on Palpation	Pain on Palpation	Pain on Palpation	Pain on Palpation
Percussion	Normally tender	Tender on Percussion	Tender on Percussion	Tender on Percussion	Tender on Percussion
Mobility	Present only in fractured or traumatised teeth	Localized/ generalized mobility	Localized mobility	Generalized mobility	Generalized Higher grade mobility on involved tooth
Pulp Vitality	Lingering or no response	Positive	Negative	May be positive in multi rooted teeth	Usually negative
Pocket Probing	Solitary narrow pocket	Multiple wide and deep pockets	Solitary wide pocket	Multiple wide and deep pockets	Typical conic periodontal type of probing
Sinus tracing	Radiography with gutta-percha points to apex/furcation	At lateral aspect of the root	Mainly at the apex/furcation area	At lateral aspect of the root	Difficult to trace
X-rays	Periapical radiolucency	Vertical bone loss Wider bone loss coronally	Wide based apical radiolucency	Angular bone loss in multiple teeth	Similar to a vertically fractured tooth
Cracked tooth Testing	Painful when chewing	No symptoms	Painful when chewing	No symptoms	Painful when chewing

Radiographic Examination:

Radiographic examination include periapical, bitewing and 3D CBCT scans.

CBCT scans are more accurate in revealing any abnormalities of the root canal and periapical pathologies.[23,24] The physician should be aware of possible signs of horizontal or vertical bone defects that may indicate periodontitis which is further confirmed by probing. Other aspects that the dentist should consider in relation to X-rays are whether the root canals are visible, calcified, areas of resorption, whether the tooth has been endodontically treated and the condition and type of the tooth .

Treatment Of Endo Perio Lesions:

Typically, endodontic treatment is prioritized over periodontal treatment due to its higher predictability. Depending on the disease stage, periodontal therapy may or may not be required. Following root canal treatment, complete recovery of the affected periodontal support is anticipated. Hence, the treatment strategy should focus on addressing pulpal infection initially. The subsequent phase involves monitoring the periodontal healing post-endodontic treatment.

1) Primary Endodontic Lesions:

The recommended treatment for such lesions involves root canal therapy. Following thorough cleaning and disinfection procedures, the sinus tract typically heals. It's advisable to avoid any invasive periodontal procedures to prevent potential attachment damage and prolonging the healing process. With proper root canal treatment, the prognosis for primary endodontic lesions is generally favorable.[25]

2) Primary Endodontic Lesions With Secondary Periodontal Involvement:

Root canal therapy is instituted with thorough cleaning and shaping of the canals, which are then filled with calcium hydroxide paste. This paste serves as an anti-inflammatory agent, preventing resorption and contamination of the instrumented canals through any viable channels connecting the pulp and periodontium. If the patient shows no clinical symptoms, conventional canal filling is performed, followed by ensuring a proper coronal seal. The success of the treatment ultimately hinges on the severity of periodontitis and the efficacy of subsequent periodontal interventions.[25]

3) Primary Periodontal Lesions:

Initial treatment for primary periodontal lesions involves hygiene phase therapy. Subsequently, any poorly contoured old restorations are recontoured, and developmental grooves are eliminated to address inaccessible areas. Periodontal surgery may be considered later if needed. Following periodontal therapy, efforts are made to remove noxious stimuli and alleviate pulpal hypersensitivity through the secondary mineralization of dentinal tubules. Overall, the prognosis for these lesions tends to be less favorable compared to endodontic lesions.[25]

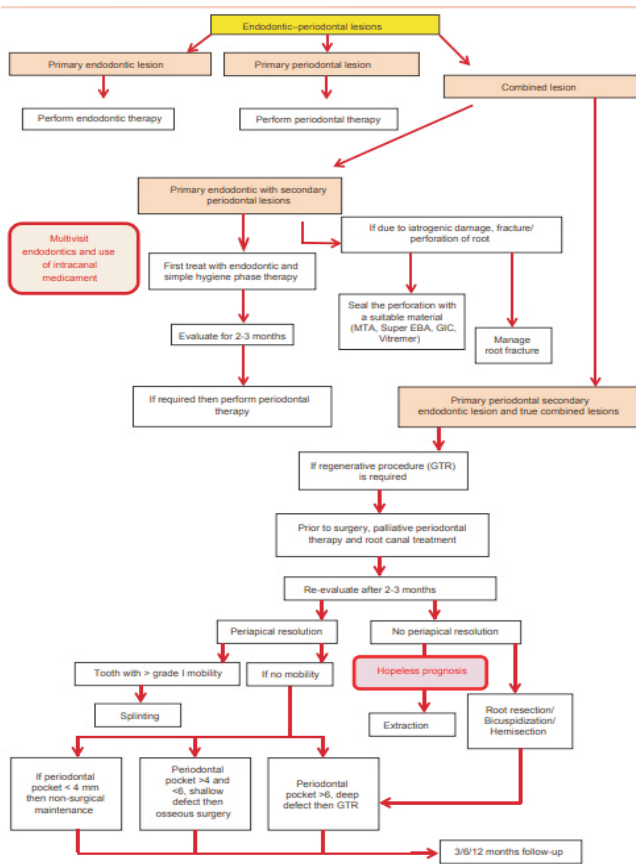
4) Primary Periodontal Lesions With Secondary Endodontic Involvement:

These lesions resemble primary endodontic lesions with secondary periodontal involvement on radiographs. After the completion of endodontic therapy, the prognosis depends upon the success of periodontal treatment.

5) True Combined Lesions:

These lesions necessitate an interdisciplinary approach and are similar to primary endodontic lesions with secondary periodontal involvement. The prognosis for these cases is uncertain and relies heavily on the effectiveness of periodontal treatment due to significant attachment loss. Utilizing guided tissue regeneration (GTR) and bone grafting techniques may help improve bony support to some degree. In cases where saving part of the root structure is essential, root resection or hemisection procedures may be considered

Treatment Map of Endo Perio Lesions:



Parolia A, Gait TC, Porto IC, Mala K. Endo-perio lesion: A dilemma from 19th until 21st century. *J Interdiscip Dentistry* 2013;3: 2-11.

Conclusion:

Clinicians often find endodontic lesions challenging due to the need for collaborative efforts across different disciplines to ensure a positive outcome. Diagnosis hinges on thorough clinical and radiographic examinations to properly categorize the lesion. Only through meticulous diagnosis can the most suitable treatment approach be determined, thus improving the likelihood of success.

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