

REVIEW



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Endo-perio lesions: diagnosis and interdisciplinary treatment options.

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Abstract

About 50% of tooth loss is caused by either endodontic infection, periodontal disease or the combination of the two in the form on endo-perio lesions (EPL). Combined EPL develop due to the intimate anatomic and functional relation between endodontic and periodontal tissues. Both the pulp and periodontium share the same embryologic and anatomic origin. The various pathways connecting the two, added up to the extremely alike microorganisms in both illnesses' etiology, create a complex condition in which interdisciplinary approach is required. Despite numerous decades of literature describing these lesions, they remain a continuous challenge for practitioners in both diagnosing and managing. The purpose of this article is to present a comprehensive review of various aspects of the combined EPL and to emphasize the importance of making a correct diagnosis and adopting the appropriate treatment method in the management of these challenging situations.

Keywords: endo-perio lesions, periodontal disease, diagnosis, treatment.

Introduction

The complexity of endo-perio lesions (EPL) reflects the close interrelationship between the periodontium and the endodontic system. A review of current literature was commenced in order to debate the intricacy of the endo-periodontal anatomic and pathologic communication avenues. PubMed online research was conducted in order to identify articles regarding this subject using the keywords "endo-perio lesion", "endodontic infection" and "periodontal disease". Manual searches of published articles and related reviews were performed as well for completing the research necessary in writing this paper.

The „EPL” term was first introduced in the American Association of Endodontics' Glossary of Endodontic Terms in 1998, followed closely by the American Academy of Periodontology, which defined the lesion to be a localized infection original from the periodontal or pulp tissue [1]. Both endodontic and periodontal lesions are polymicrobial anaerobic infections. The combined EPL disease is caused by simultaneous inflammation in varying degrees of the endodontic system and periodontium. Etiologic components of predominantly bacterial origin, as well as other factors such as dental malformations, history of trauma,

iatrogenic perforations, and external or internal root resorptions have their part in the progression of EPL [2]. The presence of active carious lesions, furcation involvement, anatomical grooves, and porcelain fused to metal crowns are considered risk factors in the occurrence of EPL. In patients presenting with periodontitis, EPL usually shows no evident symptoms and has slow, chronic progression [3].

Pathways

The strong connection between the endodontic system and the periodontium has always been known to be the main cause of combined EPL. There are many pathways that benefit the exchange of infectious elements from the pulp to the periodontium and vice versa. These, combined with the existence of mixed anaerobic microbiota, lead to the development of EPL [4]. The anatomic, embryologic and functional relation amongst the two distinct anatomical areas has been widely researched as it is difficult to make a differential diagnosis between periodontal and endodontic diseases more so when the lesion combines both etiologies [5].

Anatomically, the periodontal tissue and the endodontic system are connected by the apical foramina and lateral canals. These two types of tissues can connect through the

apical foramen particularly if the periodontal socket is so deep that it reaches beyond the apical third of the tooth. Lateral canals, on the other hand, serve as a more accessible path for microorganism to migrate from one tissue to another, as they can be found all along the root surface, unlike the apical foramina. Their presence ensures a better vascular exchange than the blood vessels passing through the apical foramina. Therefore, exchange of nutrients, inflammation byproducts and bacteria are possible through these small accessory canals. The mesodermal origin of both pulpal and periodontal tissues ensures the anatomical bond between the two [6, 7].

As far as the functional relation of the two systems is concerned, an endodontic infection can discharge through the periodontal ligament and worsen the periodontal disease by raising the pocket's depth. An endodontic infection can also cause periodontal tissue destruction in the apical region which can likely migrate upwards reaching the gingival margin [8]. This lesion was termed as a retrograde periodontitis which is different from marginal periodontitis as the last-mentioned proceeds from the gingival margin towards the apical region. Reversely, microorganisms and other toxic irritants can enter the endodontic system through dentinal tubules after the gradual loss of the periodontal attachment. Given that in both endodontic and periodontal disease, the live pathogens encountered are similar (*Campylobacter rectus*, *Actinobacillus actinomycetemcomitans*, *Tanarella forsythensis*, *Eikenella corodens*, *Fusobacterium nucleatum*, *Porphyromonas gingivalis*, *Prevotella intermedia* and *Treponema denticola*), the common etiology of endo-periodontal lesions is explained [9, 10].

Iatrogenic pathways which can cause combined EPL include accidental perforations of the root during endodontic treatment, root cracks as a result of extreme forces applied when cleaning and shaping the root canals, carious lesions affecting the external root surface below the cemento-enamel junction, and incorrectly adapted coronal restorations [11].

Classification system

According to the latest classification of periodontal conditions, combined EPL are included in the "periodontal manifestations of systemic diseases and developmental and acquired conditions" section and "other periodontal conditions" subsection [12]. EPL are classified after their etiology and diagnosis. Simon et al introduced the first classification which describes five types of existing EPLs:

1. Primary endodontic lesions
2. Primary endodontic lesions with secondary periodontal involvement
3. Primary periodontal lesions
4. Primary periodontal lesions with secondary endodontic involvement
5. True combined lesions [13]

Primary endodontic lesions are described as acute exacerbation of chronic apical lesions with continuous necrotic discharge into the gingival sulcus through the periodontal ligament [14]. These teeth usually present some sort of restorative fillings, caries or trauma in their history. They do not respond to vitality tests and radiolucency can be observed in the apical region. Also, the symptoms such as pain, swelling, tenderness to percussion, and tooth mobility indicate a pulpal illness rather than a periodontal abscess, especially when a sinus tract appears. For the differential diagnosis, a gutta-percha point introduced in the opening of the sinus tract can be helpful [15]. Furthermore, primary endodontic lesions usually heal after a thorough endodontic treatment unlike EPL which require both endodontic and periodontal therapy.

Primary periodontal lesions are the result of progressive marginal periodontitis. The periodontal disease initiates at the marginal gingiva and may advance to the supportive periodontal tissue when its management is delayed. In severe cases, when both soft and hard supportive tissues are destroyed, periodontal abscess can occur, resembling the symptoms of a pulpal disease. Occlusal trauma can worsen the clinical picture by increasing the probing depth around the damaged tooth. Primary periodontal lesions only require periodontal treatment as in most cases, the tooth still responds to vitality tests. The positive outcome of the treatment is

lower than the success rate of endodontic treatment on primary endodontic lesions, revolving around several factors such as the severity of the periodontal disease, the efficiency of the treatment, and the patient's response to the therapy [16].

True combined lesions are the concomitance of a pulpal necrosis and periodontal disease which begin independently on the same tooth. According to current knowledge, these kinds of lesions occur less frequently than other endodontic or periodontal illnesses. The necrotic pulp which causes an apical periodontitis is slowly progressing apically where it joins the existing bone resorption caused by the existence of a periodontal pocket [17]. The radiographic aspect of these lesions can simulate a root fracture in which cases differential diagnosis is important so the management method can be chosen correctly.

Diagnosis

As far as primary endodontic and periodontal lesions are concerned, the diagnosis is simple. In primary endodontic diseases, the tooth does not respond to vitality tests as it is infected and nonvital while in primary periodontal lesions, the pulp is responsive to thermal and electric tests. Nonetheless, true combined lesions or primary endodontic lesions with secondary periodontal involvement, or primary periodontal lesions with secondary endodontic involvement are similar both clinically and radiographically. A proper diagnosis can be made by meticulous clinical examination followed by tests such as radiographs, pulp vitality testing, pocket probing, fistula tracking, and cracked tooth testing as described in Table 1 [18, 19].

Table 1. Diagnostic examinations used to classify EPL adapted from Parolia et al 2013

Test	Primary endodontic lesion	Primary periodontal lesion	Primary endodontic secondary periodontal	Primary periodontal secondary endodontic	True combined lesions
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 Puss + exudate	Periodontitis around single or multiple teeth Puss + exudate
Pain	Sharp	Usually dull ache	Usually sharp	Usually dull ache	Usually dull ache, sharp only in 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 traumatized teeth	Localized/ generalized mobility	Localized mobility	Generalized mobility	Generalized Higher grade mobility on involved tooth
Pulp vitality	Lingering or no response	Positive	Negative	Positive	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	Radiograph with gutta-percha points to	At lateral aspect of the root	Mainly at the apex/ furcation area	At lateral aspect of the root	Difficult to trace

	apex/furcation				
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

Treatment options

The chosen management method and prognostic of EPL are based upon correct diagnosis. The most important factors which should be taken into consideration when selecting a treatment technique are the vitality of the pulp and extent of the periodontal defect.

Primary endodontic lesions usually heal after a correct endodontic treatment. The prognosis is generally a good one especially if during cleaning and shaping of the root canals, the irrigation protocol was thoroughly performed [20]. The sinus tract will retract in the early stages of the root canal treatment, after the infected pulp is removed. Intracanal medicaments based on calcium-hydroxide are a crucial step of the endodontic treatment, especially in case of large periapical lesions due to its bactericidal and disinfecting properties.

Primary periodontal lesions only require periodontal therapy. Treatment options include etiologic therapy by eliminating all factors which can induce or promote epithelial downgrowth followed by surgical periodontics [21].

True combined lesions demand both endodontic and periodontal regenerative procedures. Without this interdisciplinary treatment method, there will be no satisfactory prognosis, with the success rate dropping to 27-37% as the study conducted by Oh et al reported [22]. As a first step, true combined lesions should be addressed with an endodontic treatment. Before any periodontal surgical procedure, etiologic therapy should be initiated as the prognostic of these combined lesions is closely related to the efficiency of the periodontal management [23]. However, apical resection, root amputation or even hemisection of the molar teeth may allow enough change in the configuration of the roots in order for part of the root structure to

be saved. The clinician must contemplate on multiple factors such as dental restorability, recovery of bone support around the remaining, healthy root, and last but not least, the patient's consent. Prognosis of an affected tooth can also be improved by increasing bone support around the denuded cement surface, achieved through bone grafting and guided tissue regeneration (GTR). These regenerative treatment techniques, performed by using the operating microscope, have reported a success rate of 77.5% as Kim et al established [24, 25].

Conclusions

EPL can be a challenge to doctors as interdisciplinary collaboration is needed in order to obtain a favourable outcome. Due to the lack of current literature documenting these multi-factorial illnesses, the first step of diagnosis can be challenging. Thus, this review's purpose is to highlight the current diagnostic and treatment planning strategies. As this paper shows, the diagnostic should be conducted by conscientiously following all clinical examination tests in order to correctly classify the lesion. Only by careful diagnosis can the most effective therapy method be selected and the success rate increased. The guidelines to a precise treatment method are straightforward once the lesion is categorized properly.

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