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Endodontic periodontal lesions

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Dentistry
in Partial Fulfillment of the requirement for the B.D.S. degree

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Certification of the Supervisor

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Dedication

*To my parents, who never stop giving of themselves in
countless ways To my second family in college,*

*and to my supervisor for his guidance, encouragement, help &
support, I made this project.*

Hind saad

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1. Introduction

There are a relationship between endodontic and periodontal structures. Clinically, this relationship promotes the spread of infection, resulting in typical manifestations of endo-perio lesions. These lesions often remain free of symptoms for long periods, until it starts acute symptoms of inflammation and/or increased pain. **(H. Haueisen, D. Heidemann,2002)** The differential diagnosis of endodontic and periodontal diseases can be challenged but a correct diagnosis has a vital importance so that appropriate treatment can be provided. **(H. Aksel, A. Serper,2014)** The endo-perio lesions have been characterized by the involvement of pulp and periodontal disease in the same tooth. Infection in pulp tissue may lead to secondary infection or periodontal tissue breakdown. In contrary, severe periodontal disease may initiate or exacerbate inflammatory changes in pulp tissue. **(R. Jivoinovici, I. Suciú et al,2014)** There are some difficulties in endo-perio lesions treatment, especially when a severe loss of periodontal attachment and osseous structure occurs. **(L. Yu, B. Xu, B. Wu,2003)**

2. Definitions

endodontic lesion : the term endodontic lesion is used to denote an inflammatory process in the periodontal tissues resulting from noxious agents present in the root canal system of the tooth, usually a root canal infection.

periodontal lesion : the term periodontal lesion is used to denote an inflammatory process in the periodontal tissues resulting from accumulation of dental plaque on the external tooth surfaces. **(Jan Lindhe, Niklaus Peter Lang et al,2003)**

endo-perio lesion : is one where both pulp and periodontal tissues are affected by the disease progress. (Nisha Garg, Amit Garg,2019)

3.Pathways of Communication between Pulp and Periodontium

3.1 Physiological Pathways

3.1.1 Apical Foramen: The pulp and periodontal tissues are derived from highly vascular mesenchymal tissues of the tooth germ. The blood supply maintains a connection between these tissues via the apical foramen and lateral canals throughout the development of the tooth. The apical foramen is the principal and most direct route of communication between the periodontium and the pulp. Although periodontal disease has been shown to have a cumulative damaging effect on the pulp tissue, total disintegration of the pulp is only a certainty if bacterial plaque involves the main apical foramen, compromising the vascular supply. Following necrosis of the pulp, various bacterial products like enzymes, metabolites, antigens etc. reach the periodontium through the apical foramen, initiating and perpetuating an inflammatory response there. This results in destruction of periodontal tissue fibers and resorption of the adjacent alveolar bone. External resorption of the cementum can also occur concurrently.(**Raja Sunitha V, Pamela Emmadi et al, 2008**)

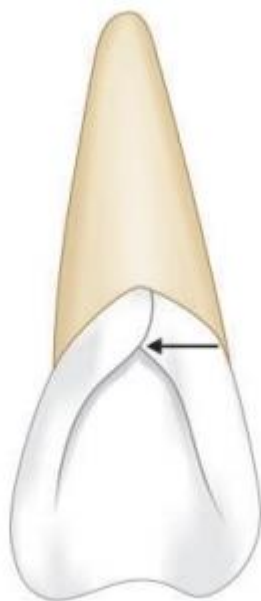
3.1.2 Lateral and accessory canals

Accessory or lateral canals from the dental pulp may be formed during formation of the root sheath. A break develops in the continuity of the sheath, producing a small gap, which results in a small “accessory” canal between the dental sac and the pulp.

Accessory and lateral canals can be seen anywhere along the root, creating a potential perio-endo pathway of communication (**Gutmann JL ,1978**). Majority of lateral or accessory canals are found in apical third and furcation area of the root. As periodontal disease progresses down the root surface, accessory and lateral canals get exposed to oral cavity. It is difficult to identify lateral canals on radiographs. These can be identified by isolated defects on the lateral surface of roots or by postobturation radiographs showing sealer puffs.

3.1.3 Palatogingival Groove

It is developmental anomaly commonly seen in maxillary lateral incisor. Groove begins in the central fossa, crosses the cingulum and extends apically at varying distance.



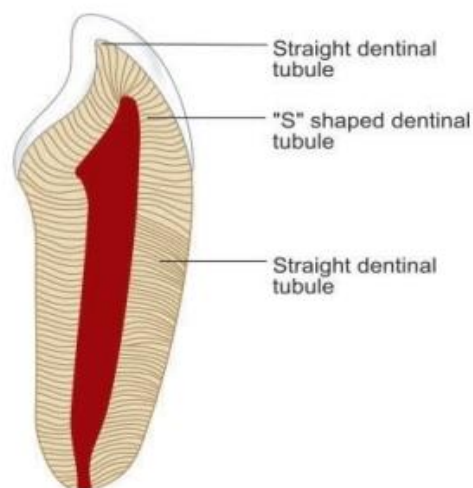
Palatogingival Groove in maxillary lateral incisor figure (1)

3.1.4 Cervical Enamel Projections

These are flat, ectopic extensions of enamel that extend beyond normal contours of cemento-enamel junction (CEJ). They interfere with the attachment apparatus and are important in initiating the periodontal lesions. (Nisha Garg, Amit Garg, 2019)

3.1.5 dentinal tubules

As periodontitis gradually destroys the periodontal ligament between the cementum and bone, cementum becomes exposed to the oral environment via periodontal pockets and through gingiva recession. Destruction of Sharpey's fibers leaves a sieve-like surface on the cementum, full of canals which may be contaminated by bacteria and their toxins that may transverse the protective cemental layer into the patent dentinal tubules. Furthermore, iatrogenic removal of cementum during periodontal treatment, various developmental fissures, grooves and incomplete calcifications on cementum may all permit penetration by bacteria into the underlying dentinal tubules (Hiatt WH, 1977).



pattern of dentinal tubules figure (2)

3.2 Pathological Pathways (Parolia A, Gait TC et al,2013)

- 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.

3.3 Pathways of iatrogenic origin (Parolia A, Gait TC et al,2013)

- Exposure of dentinal tubules following root planning
- Accidental lateral root perforation during endodontic procedures
- Root fractures during endodontic procedures.

4. Etiology of Endodontic– Periodontal Lesions

The main etiological factors for endo-perio lesions are living (bacteria, fungi and viruses) and nonliving pathogens. Along with these, many contributing factors such as trauma, root resorptions, perforations, and dental malformations also play an important role in the development and progression of such lesions (Sunitha VR, Emmadi P et al,2008) . The condition of the pulp is an important factor in susceptibility to microbial invasion. A vital pulp is very resistant to microbial invasion. Penetration of the surface of a healthy pulp by oral bacteria is relatively slow or may be blocked entirely.

In contrast, a necrotic pulp is rapidly invaded and colonized by bacteria. When the pulp becomes necrotic, inflammatory byproducts of pulpal origin may leach out through these pathways and initiate/trigger an inflammatory vascular response in the periodontium, cause destruction of periodontal tissue fibers, resorption of adjacent alveolar bone and cementum. Nature and extent of periodontal destruction depends on various factors such as virulence of microorganisms, duration of the disease and the host defense mechanism. Similarly, the reverse of the effect of a necrotic pulp on the periodontal ligament, has been referred to as retrograde pulpitis (**Rotstein I, Simon JH,2004**) .

5. Contributing factors to perio-endo lesions

5.1 Inadequate endodontic treatment

The primary aim of endodontic treatment is to disinfect the root canal system through chemo-mechanical debridement and cleaning so that the canal space can be freed of infected organic materials and obturated with an inert material (**Tabassum S, Khan FR ,2016**). Endodontic failures are caused by inadequate disinfection of the root canal system or reinfection of the root canal system due to failure to obtain a hermetic seal .(**Claus Löst,2006**) Endodontic infection may spread to the periodontium leading to perio-endo pathologies.

5.2 Poor restorations

Poor restorations can be a major culprit for periodontal conditions and endodontic failure. Poor contours due to overhanging restorations, which impinge upon and thus violate the biological width, can contribute to localized periodontal defects .(**Albandar JM, Buischi YA et al,1995**)

5.3 Perforations

Root perforation is a mechanical or pathological, communication between the root canal system and the external tooth surface .(**Juan G. Robledo, Pablo A. Rodríguez,2015**) Misalignment of instruments during endodontic access, negotiation and preparation of the root canals, and preparation of post space can cause iatrogenic perforations. Pathological root perforation, on the other hand, is caused by root resorption and/or caries.

In perforations, bacterial infections emanating from either the root canal or periodontal tissues, or both, could prevent healing and bring about inflammation. Down-growth of the gingival epithelium to the perforation site can follow, resulting in accelerated periodontal breakdown .

(**Tsesis I, Rosen E et al,2006**)

5.4 Developmental malformations

Developmental malformations both affect the periodontium and complicate conventional RCT. One of the most common dental malformations seen is the palatal-radicular groove, which has a reported prevalence of 4.6% appearing in maxillary incisors (**Kogon SL,1986**). Its presence is a locus of plaque accumulation and provides potential pathway for microorganisms to penetrate into deeper parts of the periodontium, causing local inflammation and subsequent periodontal breakdown. Attachment loss may extend apically until it adversely affects the viability of the pulp, which is typical of the pathogenesis of a primary periodontal lesion with secondary endodontic involvement. RCT may be needed first if the patient complains of toothache.

This may then be followed by periodontal surgical debridement or regenerative periodontal therapy when indicated (**Cho YD, Lee JE,2017**).

Cemental tear is a rare periodontal condition characterized by partial or total separation of the cementum. The detachment normally happens at the cementum-dentin junction predisposing the tooth to plaque-induced periodontitis. Clinically, a cemental tear may present as a localized deep periodontal pocket, with or without other symptoms such as a sinus tract or pain. Probing at the affected site may detect root surface roughness or an obstruction, different to the expected typical tactile sense of calculus (**Xie C, Wang L,2017**). Treatment of cemental tear includes conventional periodontal therapy, combined periodontal and endodontic treatment when pulpal status of the affected tooth is compromised and/or surgery to remove the tear.

Cervical enamel projections and enamel pearls are development anomalies presenting as ectopic globules of enamel on the root surface. Enamel projections are small continuous or discontinuous extensions of enamel that occur in the molar furcations while enamel pearls are larger masses of enamel that have a predilection for molars (**Matthews DC, Tabesh M,2004**). It has been reported that 82.5% of molars with furcation attachment loss exhibited cervical enamel projections (**Hou GL, Tsai CC,1987**) .

Enamel pearls are a rarity and occur mostly on permanent molars with an incidence rate of 1.1–9.7%. (**Moskow BS, Canut PM,1990**) Cervical enamel projections and enamel pearls predispose to periodontitis because Sharpey's fiber insertion is not developmentally possible, allowing only a hemidesmosomal attachment, which may be less resistant to periodontal breakdown. Both entities may also prevent effective oral hygiene procedures when exposed to the oral environment and may serve as a nidus for periodonto-pathogenic bacteria to grow and populate their surface (**Matthews DC, Tabesh M,2004**) .

In longstanding conditions, down-growth of epithelial attachment may cause a perio-endo lesion, especially if exposed accessory canals in the furcation area allow bacteria invasion into the pulp (**Shambarger S, Johnson D et al,2015**) .

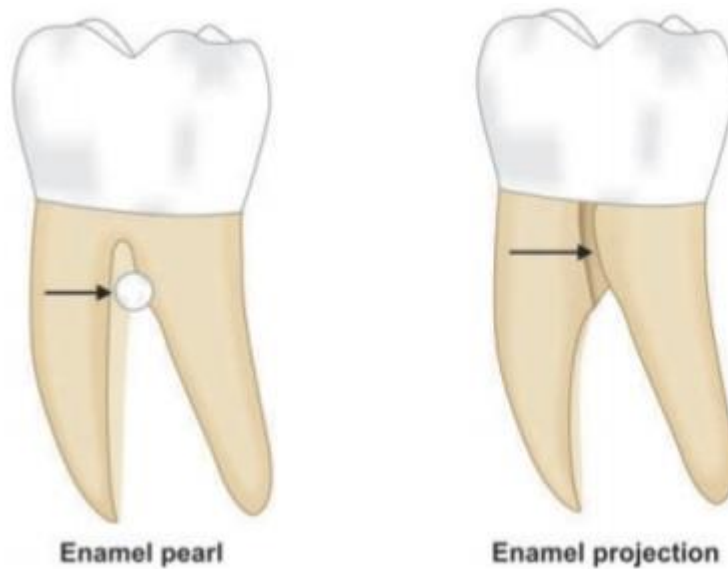


Figure (3)

5.5 Resorptions

Dental resorption is the loss of dental hard tissues as a result of resorptive activities by clastic cells (aptly known as odontoclasts) . (**Arana-Chavez VE, Bradaschia-Correa V,2009**) Root resorption may occur as a physiologic or pathologic phenomenon. Root resorption is classified into two types, external and internal.

5.5.1 External inflammatory resorption

External inflammatory resorption (EIR) is often a result of root avulsion injuries (**Andreasen FM, Pedersen BV,1985**).

5.5.2 External cervical resorption

External cervical resorption (ECR) is a form of root resorption that originates on the external root surface but may invade root dentin in any direction and to varying degrees. ECR generally develops immediately apical to the epithelial attachment to the tooth. However, in teeth that have developed gingival recession and lost periodontal support and/or have developed a long junctional epithelium, the resorptive defect may arise at a more apical location (**Heithersay GS,1999**) .

5.6 Vertical root fractures

A vertical root fracture (VRF) is a longitudinally oriented complete or incomplete fracture initiated in the root at any level and is usually directed buccolingually .(**Liao WC, Tsai YL et al,2017**) Over time, the pocket along the fracture line, which was initially tight and narrow, may become wider and easier to detect. When the fracture line propagates coronally, extending to the cervical root area, bacteria may penetrate and biofilm can attach along the fracture line, triggering local host immune response which destroys the local periodontium. The fracture line allows the leakage of oral bacteria into the clean and previously sealed root canal system causing contamination (**Tamse A, Fuss Z et al,1999**).

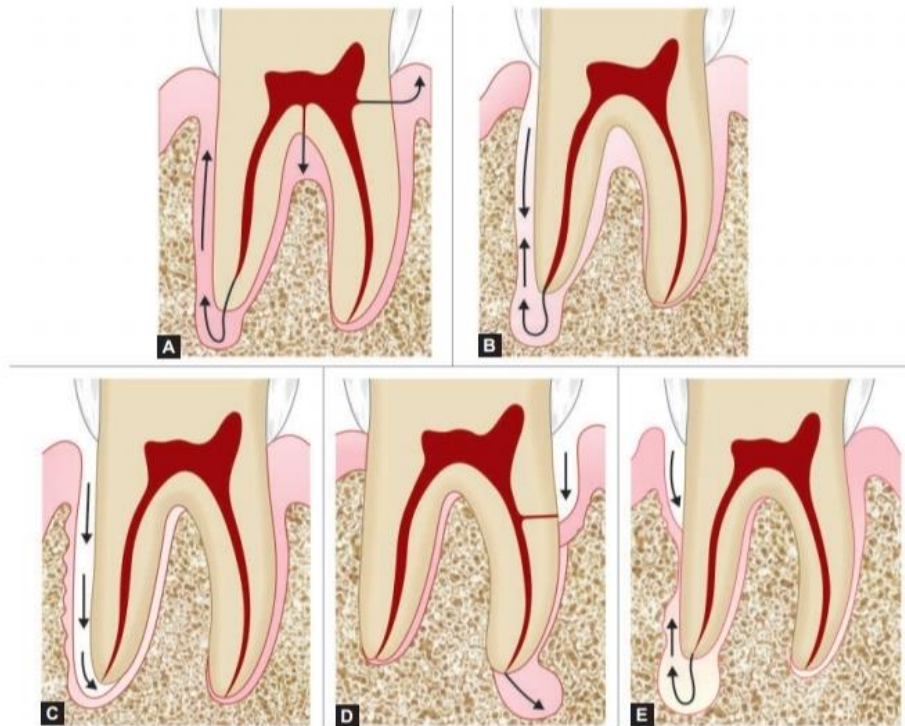
5.7 Advanced periodontal disease

Untreated periodontal disease may progress and cause extensive damage to the tooth supporting structures. As the disease extends along the root surface, infection and/or inflammation can spread through the various communications between the pulp and the periodontium (**Rotstein I,2017**) until periodontal disease progression reaches the apical foramen leading to a primary periodontal lesion with secondary endodontic involvement (**Simon JH, Glick DH et al,1972**).

6. Classification of endo-perio lesion

6.1 The periodontal-endodontic lesions have received several classifications, among which is the classification of Simon et al (**Simon JH, Glick DH et al,1972**).separating lesions involving both periodontal and pulpal tissues into the following groups:

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



(A) Primary endodontic lesions (B) Primary endodontic lesions with secondary periodontal involvement (C) Primary periodontal lesions

(D) Primary periodontal lesions with secondary endodontic involvement (E) True combined lesions. Figure (4)

6.1.1 PRIMARY ENDODONTIC LESION

The etiology of a primary endodontic lesion is a necrotic and infected pulp. Although primary endodontic lesions may mimic the appearance of vertical root fractures, one of the signs of a vertical root fracture is that the tooth will have been previously endodontically treated. If the tooth has not been previously endodontically treated, the clinician should perform pulp sensitivity testing. A deep periodontal pocket combined with a diagnosis of pulpal necrosis would indicate a primary endodontic lesion (Herrera D, Retamal-Valdes B et al,2018).

6.1.2 PRIMARY ENDODONTIC LESION WITH SECONDARY PERIODONTAL INVOLVEMENT

As the name implies, the etiology of a primary endodontic lesion with secondary periodontal involvement is endodontic; however, the sulcular sinus tract has been patent for sufficient time for biofilm and calculus to form on the root surface (**Simon JH, Glick DH et al,1972**).

6.1.3 PRIMARY PERIODONTAL LESION

The etiology of a primary periodontal lesion is radicular biofilm and calculus. In these types of lesions, periodontal pockets tend to be wider and more generalized, and calculus is typically visualized on the root. However, unless the periodontal pocket has reached the apex, the pulps of these teeth will almost always remain vital (**Langeland K, Rodrigues H et al,1974**) (**Ricucci D, Siqueira et al,2021**).

6.1.4 PRIMARY PERIODONTAL LESION WITH SECONDARY ENDODONTIC INVOLVEMENT

A primary periodontal lesion with secondary endodontic involvement arises when a periodontal pocket reaches the apex of the tooth, and the pulp becomes necrotic(**Langeland K, Rodrigues H et al,1974**) (**Ricucci D, Siqueira et al,2021**). The etiology of these lesions can either be from advanced periodontal disease or congenital defects, such as a longitudinal groove or invagination on a tooth root . When present, these types of deep grooves or invaginations can act as a route for bacteria to reach the apex (**Simon JH, Glick DH et al,1972**).

6.1.5 TRUE COMBINED LESION

The true combined lesion is rare. It occurs when an apical lesion that is expanding coronally merges with a periodontal pocket that is progressing apically (**Simon JH, Glick DH et al,1972**).

6.2 From the point of view of treating these cases efficaciously, another clinical classification was provided by Torabinejad and Trope in 1996 , (**M. Torabinejad and M. Trope,1996**) based on the origin of the periodontal pocket:

- Endodontic origin
- Periodontal origin
- Combined endo-perio lesions
- Separate endodontic and periodontal lesions
- Lesions with communication
- Lesions with no communication

6.3 Another classification was recommended by the world workshop for classification of periodontal diseases (1999) (**G. C. Armitage,1999**) ,Periodontitis Associated with Endodontic Disease:

- Endodontic-periodontal lesion
- Periodontal-endodontic lesion
- Combined lesion

7. Diagnosis

Nomenclature distinguishes between lesions caused by periodontal pathogens, as seen in chronic periodontitis, and lesions of the apical periodontal tissues associated with endodontic pathology. When the location is distinct and the lesion is discrete, the two are easy to differentiate. When they simultaneously affect the marginal and apical areas of the periodontium, thus making it essential to ascertain their true cause through differential diagnosis (**Edoardo F,2011**). If a patient has been monitored over a period of time diagnosis of primary endodontic disease and primary periodontal disease usually can be easily done; once the lesions progress to their final stage, they usually give similar clinical and radiographic appearance and the differential diagnosis becomes more challenging. For example, a similar in clinical and radiographic features will be seen with both, a growing periapical lesion with secondary involvement of periodontal tissues and a longstanding periodontal lesion that has progressed to the apex. It is easier to determine the origin of the lesion when a pulp vitality test is positive because this will rule out an endodontic etiology. However, pulp tests may not be always reliable. This consideration is particularly relevant when challenges to pulpal status arise from periodontal diseases such as partial necrosis of a pulp in a multirooted tooth due to long standing periodontal lesions. If pulpal necrosis is associated with inflammatory involvement of the periodontal tissue, it presents a greater diagnostic problem. In this situation, the location of these pulpal lesions is most often at the apex of the tooth, but they may also occur at any site where lateral and furcal canals exit into the periodontium. (**Meng HX,1999**) Therefore, accurate diagnosis can be made by careful history taking, thorough oral hard and soft tissue examination, the use of pulp testing procedures and periodontal probing. (**Harrington GW, Steiner DR,2002**)

Table 1 Diagnostic procedures used to identify the endo-perio lesion (Parolia A, Gait TC et al, 2013)

Examination	Primary endodontic lesion	Primary periodontal lesion	Primary endodontic secondary periodontal	Primary periodontal secondary endodontic	True combined lesion
Visual	-Soft tissue presence of sinus opening -Tooth presence of decay /large restoration/fractured restoration or tooth/erosions /abrasion/cracks/discoloration/poor RCT	-Inflamed gingiva/gingival recession around multiple teeth -Accumulation of plaque and subgingival calculus around multiple teeth -Intact teeth -Presence of swelling indicating periodontal abscess	-Plaque forms at the gingival margin of the sinus tract and leads to inflammation of marginal gingiva -Exudate -Root perforation/fracture/misplaced post	-Presence of plaque, subgingival calculus and swelling around multiple teeth -Presence of pus, exudate -Presence of localized/generalized gingival recession and exposure of root	-Plaque, calculus and periodontitis will be present in varying degrees - swelling around single or multiple teeth - presence of pus, exudate
Pain	Sharp	Usually dull ache sharp only in acute condition	Usually sharp shooting dull ache in chronic condition	Usually dull ache sharp only in acute periodontal abscess	Dull ache usually only in acute conditions it is severe
Palpation (a positive response to palpation may indicate active peri - radicular inflammatory process)	It does not indicate whether the inflammatory process is of endodontic or periodontal origin	Pain on palpation	Pain on palpation	Pain on palpation	Pain on palpation

Percussion (it indicate the presence of a peri-radicular inflammation that may be either from pulpal or PDL origin)	Normally tender to percussion	The sensitivity of the proprioceptive fibers in an inflamed periodontal ligament will help identify the location of the pain	Tender on percussion	Tender on percussion	Tender on percussion
Mobility (tooth mobility is directly proportional to the integrity of the attachment apparatus or to the extent of inflammation in the PDL ligament)	Fractured roots and recently traumatized teeth often present high mobility	Localized to generalized mobility of teeth	Localized mobility	Generalized mobility	Generalized mobility with higher grade of mobility related to the involved tooth
Pulp vitality using cold test, electric test, blood flow test, and cavity test(an abnormal response may indicate degenerative changes in the pulp)	-A lingering response – irreversible Pulpitis - no response- necrotic pulp	The pulp is vital and responsive to testing	Pulp vitality tests negative	Pulp vitality may be positive in multirooted teeth	Usually negative because of non –vital pulp.vitality test may give a positive response in multirooted teeth

Pocket probing	A deep narrow solitary pocket in the absence of periodontal disease may indicate the presence of a lesion of endodontic origin or a vertical root fracture	Multiple wide and deep pockets	Presence of solitary wide pocket but if periodontal lesion is due to fracture of root then solitary deep narrow pocket (mainly localized)	Presence of multiple wide and deep periodontal pockets	Probing reveal the typical conical periodontal type of probing with the exception that at the base of the periodontal lesion, the probe will abruptly drop further down the lateral root surface and may even extend to the apex of the tooth
Sinus tracing (by inserting a semi rigid radiopaque material into the sinus tract until resistance is met)	A radiograph with gutta percha points to apex of or furcation area in molars	Sinus tract mainly at the lateral aspect of the root	Sinus tract mainly at the apex or furcation area	Sinus tract mainly at the lateral aspect of the root	Difficult to trace out the origin of the lesion, if a sinus tract is present , it may be necessary to raise a flap to determine the etiology of the lesion

Radiographs	<p>Presence of deep carious lesion/extensive or defective restorations/previous poor RCT/possible mishaps/root fractures/root resorption with periapical radiolucency</p> <p>Often the initial phases of periradicular bone resorption from endodontic origin is confined only to cancellous bone. therefore it cannot be detected unless the cortical bone is also affected</p>	<p>Vertical bone loss and more generalized than to lesions of endodontic origin bone loss wider coronally</p>	<p>Presence of deep carious lesion/extensive or defective restorations/previous poor RCT/diminution of the pup canal space/possible mishaps/root fractures/root resorption with a wide base radiolucency around the apex of the root</p>	<p>Angular bone loss in multiple teeth with a wide base coronally and narrow at the apex of the root</p>	<p>The radiographic appearance of combined lesion may be similar to that of a vertically fractured tooth</p>
Cracked tooth testing using tran - sillumination wedging staining	<p>Painful response to the patient at the time of chewing, especialy on releasing the biting pressure</p>	<p>No symptoms</p>	<p>Painful response to the patient at the time of chewing, especialy on releasing the biting pressure</p>	<p>No symptoms</p>	<p>Painful response to the patient at the time of chewing, especialy on releasing the biting pressure</p>

8. Treatment and prognosis

8.1 Treating primary endodontic lesions

Primary endodontic diseases usually heal following root canal treatment. The sinus tract extending into the gingival sulcus or furcation area disappears at an early stage once the affected pulp has been removed and the root canals well cleaned, shaped, and obturated. A review of patient, 4-6 months post-operatively should show healing of the periodontal pocket and bony repair. (**Stock CJ,1985**) Surgical endodontic therapy has been shown to be unnecessary even in the presence of large periradicular radiolucencies and periodontal abscesses. (**Whyman RA,1988**) Invasive periodontal procedures should be avoided as this may cause further injury to the attachment, possibly delaying healing. Primary endodontic lesions with secondary periodontal involvement will not completely resolve with endodontic treatment alone. Root/re-root canal treatment is instituted immediately and the cleaned and shaped root canal filled with calcium hydroxide paste. As it is bactericidal, anti-inflammatory and proteolytic, it inhibits resorption and favors repair. It also inhibits periodontal contamination from instrumented canals via patent channels connecting the pulp and periodontium before periodontal treatment removes the contaminants. The canals are eventually filled with a conventional obturation when there is clinical evidence of improvement (**Solomon C, Chalfin H et al,1995**). The prognosis for primary endodontic lesions is good but worsens in the advanced stages of secondary periodontal involvement.

8.2 Treating primary periodontal lesions

Determining the prognosis depends upon the stage of periodontal disease and the efficacy of periodontal treatment. Primary periodontal lesions are treated by hygiene phase therapy in the first instance. Subsequently, poor restorations and developmental grooves that are involved in the lesion are removed as these are difficult areas to treat successfully. Periodontal surgery is performed after the completion of hygiene phase therapy if deemed necessary. Periodontal treatment removes the noxious stimuli and secondary mineralization of dentinal tubules allows the resolution of pulpal hypersensitivity (**Whyman RA,1988**) . If pulpal inflammation is irreversible root/re-root treatment is carried out followed by periodontal treatment; in some cases surgical intervention is advantageous. (**Stock CJ,1985**) The prognosis of periodontal lesions is poorer than that of endodontic lesions and is dependent on the apical extension of the lesion. As the lesion advances, the prognosis approaches that of a true-combined lesion.

8.3 Treating true combined lesions

Primary endodontic lesions with secondary periodontal involvement may also occur as a result of root perforation during root canal treatment, or where pins or posts have been misplaced during coronal restoration. Symptoms may be acute, with periodontal abscess formation associated with pain, swelling, pus exudate, pocket formation, and tooth mobility. A more chronic response may sometimes occur without pain, and involves the sudden appearance of a pocket with bleeding on probing or exudation of pus.

True-combined lesions are treated initially as primary endodontic lesions with secondary periodontal involvement. The prognosis of a true-combined perio-endo lesion is often poor or even hopeless, especially when periodontal lesions are chronic with extensive loss of attachment. (**Adriaens PA, De Boever JA et al,1988**) Root amputation, hemisection or separation may allow the root configuration to be changed sufficiently for part of the root structure to be saved. The prognosis of an affected tooth can also be improved by increasing bony support which can be achieved by bone grafting (**Zubery Y, Kozlovsky A,1993**) and guided tissue regeneration. (**Tseng CC, Harn WM et al,1996**) This is due to the most critical determinant of prognosis being a loss of periodontal support. Cases of true combined disease usually have a more guarded prognosis than the other types of endodontic–periodontal problems Thus, the prognosis of combined diseases rests with the efficacy of periodontal therapy. (**Roane JB, Benenati FW,1987**), (**Dazey S, Senia ES,1990**)

8.4 Primary endodontic with secondary periodontal lesions

The treatment and prognosis of the tooth with these lesions are different from those of teeth involved with only primary endodontic disease. The prognosis for treatment of primary endodontic disease with secondary periodontal involvement depends primarily on the severity of periodontal involvement. Tooth with these lesions should first be treated with endodontic and simple hygiene phase therapy. In this case, multi-visit endodontics should be practiced and the placement of intracanal medicament was found to be very useful in reducing inflammation and favoring repair.(**Carrotte P,2004**) Treatment results should be evaluated in 2-3 months and only then further periodontal treatment should be considered.

This sequence of treatment allows sufficient time for initial tissue healing and better assessment of the periodontal condition. (**Paul BF, Hutter JW,1997**), (**Chapple IL, Lumley PJ,1999**) It also reduces the potential risk of introducing bacteria and their byproducts during the initial phase of periodontal healing. In this regard, it has been suggested that aggressive removal of the periodontal ligament and underlying cementum during interim endodontic therapy may adversely affect periodontal healing, therefore, should be avoided. (**Blomlöf L, Lindskog S et al,1988**) But in cases where healing with only endodontic therapy does not occur then both endodontic and periodontal treatments should be carried out since with endodontic treatment alone, only part of the lesion may heal up to the level of the secondary periodontal lesion. If the endodontic treatment is adequate, the prognosis depends on the severity of the marginal periodontal damage and the efficacy of periodontal treatment. Primary endodontic lesions with secondary periodontal involvement may also occur as a result of iatrogenic damage such as root perforation or fracture during root canal treatment or placement of pins or posts. Root perforations are treated according to their aetiology. The outcome of the treatment of root perforations depends on the size, location, time of diagnosis and treatment, degree of periodontal damage as well as the sealing ability and biocompatibility of the sealer. It has been recognized that the success of the treatment depends mainly on immediate sealing of the perforation and appropriate infection control.

Several materials such as mineral trioxide aggregate, reinforced zinc oxide-eugenol cementglass ionomer cements and Vitremer have been recommended to seal root perforations (**Parolia A, Gait TC et al,2013**).

Root fractures may also present as primary endodontic lesions with secondary periodontal involvement. These typically occur on root-treated teeth, often with post and crowns. Treatment depends on the tooth type, extent, duration and location of fracture, for example, single rooted tooth with lesions caused by vertical root fracture has a hopeless prognosis and should be extracted **(Solomon C, Chalfin H et al,1995)** while molars can be treated by root resection or hemisection.**(Moule AJ, Kahler B,1999)** However, many case reports are described in literature where many innovative techniques to treat and retain anterior teeth have been attempted with varying success. Clinician have either removed the fractured segment or attempted to bond the root using a biocompatible material. Therefore, before considering any complex or extensive restructure treatment, the desirability for retention of the tooth root should be carefully weighed up against extraction and replacement with a denture, bridge or implant **(Parolia A, Gait TC et al,2013)**.

8.5 Primary periodontal secondary endodontic lesion

When pulp sensitivity testing confirms a diagnosis of pulpal necrosis, root canal treatment should be performed. However, because the primary etiology is periodontal in origin, the tooth will also require periodontal therapy. As before, the prognosis hinges on the success of the periodontal therapy **(Simon JH, Glick DH et al,1972)**.

9. Discussion

It is known that both the pulp and the periodontium are closely linked to each other, through the apical foramen, accessory canals, and dentinal tubules of the root, and one can interfere on the integrity of the other. Although there is existence of these communication routes, the mechanism of direct transmission of the periodontal infection to the pulp is still controversial. Some authors such as Rubach and Mitchell (**Rubach WC, Mitchell DF,1965**) affirmed that the periodontal disease may affect the pulp when there is exposure of the accessory canals through the apical foramina and the canaliculi in the furcation. Adriaens et al. (**Adriaens PA, De Boever JA et al,1988**) reported that the bacteria coming from the periodontal pockets may contaminate the pulp through the dentinal tubules that would be exposed during root planning and scaling, serving as a microorganism reservoir resulting in the recolonization of the treated root surface. Some studies (**Seltzer S, Bender IB et al,1963**),(**Seltzer S, Bender IB et al,1967**) have contradicted this idea, because even with the removal of the cementum during the periodontal therapy in vital teeth, the pulp tissue will be protected against the harmful agents through forming reparative dentin. Moreover, the dentinal fluids move towards the exterior, thereby reducing the diffusion of the harmful products of the bacteria on the exposed dentin. On the other hand, Langeland et al. (**Langeland K, Rodrigues H et al,1974**) affirmed that only pulp would be affected by the periodontal disease if the apical foramen is involved.

The differential diagnosis of endodontic and periodontal diseases can sometimes be difficult but it is of vital importance to make a correct diagnosis so that the appropriate treatment can be provided.

Endodontic-periodontal lesions present challenges to the clinician as far as diagnosis and prognosis of the involved teeth are concerned.

Etiologic factors such as bacteria, fungi, and viruses as well as other various contributing factors such as trauma, root resorptions, perforations, and dental malformations also play an important role in the development and progression of such lesions.

The endo-perio lesion is a condition characterized by the association of periodontal and pulpal disease in the same dental element. This highlights the importance of taking the complete clinical history and making the right diagnosis to ensure correct prognosis and treatment. Taking into consideration all these factors and the divergences regarding the origin and direction that these infections developed, the new modified classification of these lesions has been justified. **(Khalid S. Al-Fouzan,2014)**

10. Conclusion

A perio-endo lesion can have a varied pathogenesis which ranges from quite simple to relatively complex one. Having enough knowledge of these disease processes is essential in coming to the correct diagnosis. It is important to remember that the recognition of pulp vitality is essential for a differential diagnosis and for the selection of primary measures for treatment of inflammatory lesions in the marginal and apical periodontium. Diagnosis of teeth with necrotic pulps can be difficult to establish. The entire dentition should be examined for possible causes of pain before commencing treatment. Some periodontal lesions of endodontic origin can heal following root canal treatment alone **(Koyess E, Fares M,2006)**.

The endodontic treatment can be completed before periodontal treatment is provided when there is no communication between the disease processes. However, when there is a communication between the lesions of the two diseases, then the root canals should be medicated until the periodontal treatment has been completed and the overall prognosis of the tooth has been reassessed as being favorable. The use of non-toxic intracanal therapeutic medicaments is essential to destroy bacteria and to help encourage tissue repair **(Abbott PV, Salgado JC,2009)**.

Because the primary aetiology is infection, endodontic treatment is directed at control and elimination of the root canal flora by working in a sterile way. Based on current knowledge, the best available method for obtaining clean, microbe-free root canals is instrumentation with antimicrobial irrigation reinforced by an intracanal dressing with calcium hydroxide **(Figdor D, Sundqvist G.,2007)**.

The presence of a combined endodontic-periodontal lesion will always result in a compromised situation following treatment. Even with apparently successful treatment, the tooth will still be compromised as there is likely to be some gingival recession and loss of periodontal attachment and bone support. It is of utmost importance that the patient maintains good oral hygiene and obtains regular professional care for this region. The tooth anatomy and the etiology of endodontic-periodontal lesions offer a strong base for establishing a correct diagnosis. Due to the complexity of these affections, an interdisciplinary approach with a good collaboration between endodontists, periodontologists and microbiologists, is recommended **(Parolia A, Gait TC et al,2013)**.

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