

# RESEARCH ARTICLE

## A RELATIONSHIP BETWEEN ENDODONTIC AND PERIODONTAL LESION ANALYSIS AND MANAGEMENT DECISION ANALYSIS: AN UPDATE

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## Abstract

..... The relationship between periodontal and endodontic disease has been controversial aspect for more than a century. Differentiating between these periodontal and endodontic disease is very difficult due their developmental, embryonic, anatomic and functional similarities. Nature pain is often considered as the first clue which should be supported by the radiographic and clinical evaluation for the correct diagnosis of the condition.

Aim: The aim of this review was to develop a decision tree for easier and accurate diagnosis of periodontal and endodontic disease. A brief PubMed search was performed on endodontic and periodontal lesion using "MESH" terms "endo-perio lesion", "diagnosis of endoperio lesion"," decision making of endo-perio lesion". In addition some websites and local guidelines were screened. By following the correct and appropriate diagnostics methods, accurate diagnosis of Endodontic -Periodontal disease can be done and the treatment for the particular condition could be achieved.

Conclusion: With a decision tree, the diagnosis and pharmacological management of the pulpal and periapical diseases becomes easier for the dentist in regular clinical practice. A decision tree and a flow chart for daily practice which should be started up as soon as the patient presents with pain or swelling due to pulpal or periodontal periapical pathology. In this aspect active management of the infection can be done with sound knowledge on the endodontic periodontal lesions. Dentists are likely to encounter lesions that have both periodontal and endodontic aetiological components; the so called 'perio-endo lesions'. A thorough examination with appropriate investigations remains pivotal to diagnosing a 'perio-endo lesion'. Correct diagnosis of such lesions is therefore important as it enables the most suitable clinical management to be treatment planned. It is still recommended, that for

the treatment of 'perio-endo lesions', initial endodontic therapy is completed.

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# **Introduction:-**

The inter-face between the periodontium and the tooth has long been an area of interest due to its complex anatomy and physiology. When inflammation presents on a tooth which is associated with both pulpal pathology and the periodontal tissues, it is classed as a perio-endo lesion. With an increasing number of clinicians training in mono-specialties, a greater understanding of multidisciplinary collaboration is needed and should be encouraged between specialists and primary care practitioners.<sup>11</sup>

The perio-endo interface provides this opportunity for teams to work together more closely in order to achieve good clinical results for their patient. Cases of perio-endo lesions, whether primary, secondary or the rarely seen true combined lesion, can provide a level of complexity to challenge the willing clinician and team. Skin and soft tissue infections (SSTIs) have variable etiology and clinical presentation and is commonly seen in both in ambulatory and hospital the interrelation between the pulp and the periodontium are very difficult to understand and also have been a controversial topic over years which could be owed to their developmental, embryonic, anatomic and functional similarities.

Differentiating<sup>3</sup> the disease being a pulpal or periodontal origin presents various challenges due to the complexity in the communicating pathways between the pulp and the periodontium. The endodontic and periodontal lesion is closely interrelated presenting both the signs of pulpal and periodontal involvement which makes their diagnosis quite complex. <sup>5</sup>The disease can be a result of one or other or even can be from two different unrelated processes which gets related with the advancement of disease. Diagnosing the disease is the most challenging aspect of this disease which requires deeper knowledge and insight into subject. <sup>1,10,11,13</sup>

We have numerous highly cited publications on well-designed clinical trials and lab studies. This has provided the right platforms for us to pursue the current study.  $^{7}$ 



**Channels Of Communication** 

Apical foramen – The number of apical foramina can vary from tooth to tooth, but each allows ingress/egress of bacteria.

Lateral canals -- Can involve any part of the root surface including furcation.

Dentinal tubules – The odontoblastic processes can extend from the dentinepulp complex to the root surfaces. Communication is usually established once root surface cementum is lost.

Perforations – These can be in the form of resorption, caries or latrogenic damage. The extent and location of the perforation can affect the prognosis for the tooth.

Fractures – Horizontal fractures are managed depending on where the fracture is located. Vertical fractures deem the tooth unrestorable.

Developmental anomalies – e.g. Palatogingival grooves. Natural variations in the root surface which provide areas for bacterial colonisation.

# Classification

Diagnosis	Origin	Radiographic Appearance	Restoration Status of tooth	Clinical Indicators
Primary Endodontic Lesion	Pulp	A localised apical radiolucency. May appear on the lateral or furcation areas of the root surface where lateral canals are present.	Caries Deep restorations Crowned teeth History of trauma	Tender to percussion (TTP) Negative to vitality testing.
Primary Endodontic Lesion with Secondary Periodontal Involvement	Pulp	As per a primary endodontic lesion but with evidence of interradicular/ interdental bone loss – with a horizontal or vertical pattern.	Caries Deep restorations Crowned teeth History of trauma	TTP Negative to vitality testing. Narrow pocket with or without suppuration. Mobility
Primary Periodontal Lesion	Periodontium	Interdental/interra dicular bone loss with a horizontal or vertical pattern. Areas of radiolucency along the lateral aspects of the root surface but may be visible in the area of furcation	Caries may or may not be present. Tooth may be unrestored or have a small restoration.	Positive to vitality testing. Wider pocket with or without suppuration Pockets more generalised Mobility
Primary Periodontal Lesion with Secondary Endodontic Involvement	Periodontium	Same as for a primary periodontal lesion but the radiolucent area usually extends to the apical region.	Caries may or may not be present.	Negative to vitality testing. Wider pocket with or without suppuration Pockets more generalised Mobility
Combined Lesion	Pulp and Beriodontium	A combination of a endodontic and primary periodontal lesion where areas of radiolucency seem to originate from the interdental/inter- radicular space and the apical area.	Carles may or may Deep restorations Crowned teeth History of trauma	Well localised pain. Negative to vitality testing. TTP Wider pocket with or without suppuration Mobility
Concomitant Pulpal-Periodontal Lesion	Pulp and Periodontium	Appearance of a primary endodontic and primary periodontal lesion where areas of radiolucency do not coalesce and appear separate from each other.	Caries may or may not be present. Deep restorations Crowned teeth History of trauma	Well localised pain Negative to vitality testing. TTP Wider pocket with or without suppuration Mobility

## **Differential Diagnosis**

It can be quite exciting to diagnose the rare perio-endo lesion, or more convenient to assign a common diagnosis which solely requires root canal treatment, non-surgical periodontal treatment or extraction. Accurate diagnosis is essential to ensure correct treatment is undertaken in order to alleviate symptoms the patient is experiencing. The wrong diagnosis, even by the most considerate clinician can adversely affect the clinician-patient relationship, may discourage the patient from seeking help in the future, may lead to a complaint or prove detrimental to the patient's health in the future.<sup>2</sup>At times a diagnosis is achieved by a process of elimination which can help the clinician

maintain an open mind in the investigative process. Some of the following conditions can present with similar characteristics or in the same location as a perio-endo lesion:

#### **Root fractures:**

Due to the presence of a communication between the pulp and periodontal tissues, the cleavage planes of a fracture become an ideal location for bacteria to colonies. Fractures which are not evident clinically should be investigated under magnification using trans illumination and/or methylene blue dye. It should be noted that fractures can be difficult to diagnose and at times may only become evident after accessing the pulp chamber or extracting the tooth.

#### **Periodontal abscess:**

This is an acute infection of a periodontal pocket which can present with a localized swelling. It is differentiated from a perio-endo lesion as there is no endodontic lesion and the tooth remains vital.

#### Lateral periodontal cysts:

These are rare developmental odontogenic cysts suspected to originate from the rest of Malassez. They are usually incidental findings radiographically appearing as well demarcated lesions located on the lateral aspect of the root surface. The tooth itself is usually vital and can often be retained following enucleation of the associated cyst.

#### **Other Conditions:**

Occasionally lesions occur which do not seem to present as either periodontal or endodontic conditions and do not respond to treatment. These will need to be investigated further most likely with cone beam computed tomography (CBCT) or a biopsy to exclude the possibility of systemic diseases. Though very rare, conditions such as scleroderma, metastatic carcinoma and osteosarcomas can have the radiographic appearance of periodontal or endodontic disease and should arise suspicion where a more common cause cannot be determined.

#### Primary endodontic diseases

An acute exacerbation of a chronic apical lesion in a tooth with a necrotic pulp may drain coronal through the periodontal ligament into the gingival sulcus. This condition may mimic clinically the presence of a periodontal abscess. In reality, it is a sinus tract from pulpal origin that opens through the periodontal ligament area. 8

For diagnosis purposes, it is essential for the clinician to insert a gutta-percha cone, or another tracking instrument, into the sinus tract and to take one or more radiographs to determine the origin of the lesion. When the pocket is probed, it is narrow and lacks width. A similar situation occurs where drainage from the apex of a molar tooth extends coronal into the furcation area. This may also occur in the presence of lateral canals extending from a necrotic pulp into the furcation area.

#### 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. Primary periodontal diseases lesions are caused primarily by periodontal pathogens.<sup>6</sup>In this process, chronic marginal periodontitis progresses apically along the root surface. In most cases, pulp-tests indicate a clinically normal pulpal reaction. There is frequently an accumulation of plaque and calculus and the pockets are wider.





#### Diagnosis

History a good patient history remains invaluable to the clinician when forming a diagnosis. The patient's description of their symptoms can help to narrow the area of investigation and in some cases, they may even know what is wrong due to a previous experience or an existing diagnosis. The common features which patients will complain of is pain, swelling, 'wobbly' teeth and maybe even a bad taste. Pain in the case of the combined lesion is usually well localized and in the acute stages, quite severe. The patient and/or dentist may already be aware of active periodontal disease or an endodontic lesion from previous visits, investigations or existing radiographs.

#### **Clinical Examination**

Whilst assessing the patient there may be clinical evidence of disease. Caries (primary or secondary) may be evident on visual examination and require further investigation. The tooth itself may present with signs of periodontal or endodontic disease. The tooth may have recession, a swelling, localized inflammation of the gingival tissues or a discharging sinus. Evidence of parafunction may be observed during the clinical examination in the form of wear facets, or there may be abnormal mobility present warranting further investigation. Part of the clinical examination will include an assessment of the offending tooth and the remaining structure in order to determine restorability. This may only be possible in some cases following the removal of an existing restoration and any associated caries. There is little benefit in considering periodontal and/or endodontic treatment if the tooth is damaged beyond repair. There are multiple indices available which can be used to determine a tooth's restorability. The authors and our colleagues utilize the Tooth Restorability Index (TRI) and the Dental Practicality Index (DPI), which scrutinize the amount of coronal dentine in order to determine how effectively the remaining tooth structure can support a direct/indirect restoration.<sup>9</sup>

#### **Clinical Investigations**

Radiographs are indicated in order to help confirm the diagnosis of a perio-endo lesion. A periapical is the radiograph of choice and is indicated where a recent one is unavailable. The radiograph will show areas of radiolucency which seem to originate from the inter-dental/inter-radicular area and from a distinct apical area. The area of radiolucency is evident on the lateral root surface and extends to the apical region. In the progressed state or where lateral canals are present, the furcation area may also be involved. Be wary of the 'J-shaped' radiolucent lesion as it is usually indicative of the presence of a root fracture, though further assessments are needed to diagnose it as such. Pulp Testing is routinely done by clinicians to determine whether the tooth remains innervated or not. The standard tests of ethyl-chloride, electrical pulp testing (EPT) and hot GP can be used quite easily chairside but may not always be appropriate for some teeth. Alternative temperature testing can be utilized where concerns arise. The author's endodontic colleague prefers the use of endo-frost as a cold test due to its suitability to test crowned teeth; and the use of a warm water bath where the tooth is isolated using a rubber dam and bathed in warm water to see if it elicits a response to heat. A negative vitality test in most cases will indicate a tooth requiring endodontic treatment or extraction, but the accuracy of individual tests means they cannot be relied upon as the sole indicators of tooth vitality.<sup>6</sup> Detailed Periodontal Charting is essential for any assessment of periodontal disease. The charting should include a record of pocket depth, recession, attachment loss, bleeding/suppuration, furcation and mobility grading. The importance of plaque scores cannot be stressed enough. They are a vital aspect of managing disease and provide a record of monitoring on the clinician's behalf when faced with an uncompliant patient. For a patient with an existing periodontal diagnosis, comparisons can be made with previous charts to note disease progression or stability. If this is the first instance of this issue arising, a baseline chart is essential in order to monitor the success of future treatment. Occlusal testing is often an overlooked investigation but can help narrow the diagnosis and prevent irreversible damage to the tooth. Part of the history taking process should include questions pertaining to parafunctional habits and symptoms experienced during mastication or occluding. An occlusal assessment is routinely performed as part of a dental examination and includes recording movements, guidance, interferences and the presence of fremitus.<sup>6</sup>

A more detailed occlusal assessment and further investigations would be indicated where abnormalities present, or a traumatic element is suspected. Using a tooth sleuth over individual cusps can help to determine whether a cracked cusp is present. Where a patient has had a restoration placed, marking the occlusal surfaces using articulating paper can help identify any high spots which can easily be adjusted chairside. Where an amalgam restoration is in place, the observant clinician may notice areas which appear to shine which can help identify discrepancies in occlusal loading.



#### Management/Treatment

The pathological origins of which came first are relevant in the management of disease where a primary endodontic or primary periodontal lesion exists. Where there is a primary endodontic lesion draining through the gingival crevice, successful endodontic treatment alone may lead to resolution of a narrow, isolated site. However, if there are any clinical and radiographic features of periodontal disease then both diseases must be treated, or their respective processes will continue. The management of this remains relatively unchanged and requires root canal treatment to be completed first, followed by the periodontal treatment. Perio-endo lesions can present with some clinical challenges for any dentist. It is not uncommon to see increased pulpal calcification which can make endodontic treatment more complicated, particularly for a clinician who lacks the appropriate experience or access to the correct armamentarium. It is important to remember that any compromises in the endodontic treatment process will have a knock-on effect on the periodontal health and will prevent resolution of the lesion.

Some clinicians prefer to allow a period of healing following root canal treatment in order to determine whether endodontic treatment has been successful. This approach is acceptable, but should be taken with caution to ensure the periodontal condition is not left untreated for too long. Ideally initial non-surgical periodontal therapy should take place following completion of the endodontic treatment. The success of both treatment modalities can be reviewed at subsequent review appointments. Where the endodontic and/or periodontal aspects of treatment appear relatively straightforward, it would be appropriate to treat in primary care provided the general practitioner feels competent to do so. The clinician should be mindful about possible complications which may present and inform the patient of these before the start of treatment.

There may be multiple factors which influence a patient's decision on whether to have treatment, what that treatment should be and who should provide it. It is the dentist's responsibility to ensure these options have been discussed during the decision-making process and to respect the patient's final decision. There may be signs present on the radiographs or other clinical investigations which already indicate some case complexity e.g. calcifications, complex root anatomy, the presence of advanced disease. In these cases, it would be appropriate to refer to a specialist for a second opinion or treatment. In primary care a patient should be given the option of a specialist referral even when the case appears relatively simple in order to ensure the patient has been fully informed when deciding on care.

Due to the common aspect of further training undertaken by general practitioners, the nature of primary care is changing; and patients now routinely have the option of being referred internally within the practice for specialist treatment instead of travelling to other locations or facing long waiting lists for consultations. The final decision on who ultimately undertakes treatment usually rests with one person, the patient. When a patient is referred for specialist treatment of a combined lesion, it is likely to involve both an endodontist and periodontist. It is important that all clinicians who are involved with the treatment and long-term maintenance of the patient are all aware of the treatment plan, with a clear understanding of when treatment will take place and the aspect of treatment each clinician is responsible for. A sound treatment plan can fail when there is a breakdown in communication which can often be confusing or frustrating for the patient. The presence of a perio-endo lesion provides a great opportunity for specialists to work with each other in a multidisciplinary format and can help strengthen the team dynamic within a practice.

Characteristics of the	studies included and its	quality scores according to	ladad et al. (1996)
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		teeth).				
Arslan et al. 2011	Adults (18-52 years) Turkey n=48	Not specified.	≥50	Pulp chamber access, nstrumentation and filling.	Single dose of ibuprofen (200 mg) or tenoxicam (20 mg) before the endodontic procedures.	Placebo
Mehrvarzfar et al., 2012	Adults (20-60 years) Iran n=95	Irreversible pulpitis in single- rooted premolars or anterior teeth with no clinical or radiographic signs or symptoms of acute or chronic apical periodontitis.	≥40	Pulp chamber access and instrumentation of canals.	Single dose of tramadol (100 mg) or acetaminophen (325 mg)+ ibuprofen (200 mg)+caffein (40 mg) ornaproxen (500 mg) after the endodontic procedures.	Placebo
Baradaran et al., 2014	Adults (20-45 years) Iran n=45	Irreversible pulpitis in molars.	Not informed.	Pulp chamber access and instrumentation of canals.	Single dose of ibuprofen (400 mg) or alprazolam (0.5 mg)+ ibuprofen (400	Placebo

#### A Novel Approach

Varughese et al, (2015) proposed a surgical approach for the treatment of the perio-endo lesion involving root resection and regenerative therapy. Their case report features a perio-endo lesion on an upper first molar with

significant bone loss on the disto-buccal root. Periodontal treatment was undertaken initially utilizing systemic antibiotics, but no rationale was given as to why they were prescribed or why the endodontic treatment was not undertaken first. Endodontic treatment was subsequently undertaken using a conventional approach, with the disto-buccal tooth being resected three months after this was completed. Following resection, regenerative surgery was undertaken using platelet rich fibrin with bone grafting and a guided tissue regeneration membrane. Positive results were noted following an annual review.

However, this approach was utilized on a single patient and may not be suitable for every patient. It should be noted that the endodontic treatment was not done using a new approach and there is little mention of the endodontic outcomes following review. It is the authors' belief that any antimicrobial use should be carefully considered due to the very real concerns pertaining to antibiotic resistance. Any deviations from the accepted evidence base, in this case undertaking periodontal therapy before addressing the endodontic issues, needs to have a good justification which is discussed with the patient and documented clearly in the patient's records.

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