Possible Pathways of Disease Communication of the Endo-Perio Lesions and their Management

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Abstract

The periodontal therapy deals with all the aspects of a periodontium as a whole including both the prevention and repair. Whereas the endodontic therapy deals with only the pulp and the periapical tissues. The relationship among the periodontal and endodontic disease has remain always a controversial part in the dentistry. However, to have the accurate treatment, a practitioner must possess a very sound knowledge of all the possible pathways of communication of an endo-perio lesion. Hence, this review paper aims at presenting the possible pathways of communication for the endo-perio lesions at a simpler way to help the clinician in their daily basis of perio-endo management.

Keywords: *Perio-endo lesions, pathways of inflammation of endo-perio.*

Introduction

Many literatures have shown the close speculative relationship among the pulpal and the periodontal tissues. The knowledge of the disease transmission between these two has become a mandatory protocol to reach the correct and accurate diagnosis.

1. **Atypical Anatomic Factors/Developmental Factors:**

A. **Mal-alignment:** Mal-alignment such as the presence of a multirooted tooth in a position usually occupied by a single-rooted tooth, or additional roots of a tooth, a predisposing factor to occlusal trauma and food impaction which predispose into endo-perio lesions.[1-5]

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B. **Lateral and Accessory Canals:** Large lateral, accessory canals in coronal and middle sections of roots, presence of additional canals, with resultant changes in root morphology in single and multirooted teeth are the pathways for the endo-perio lesion. Lateral and accessory canals may result from a lack of dentin elaboration around a blood vessel located in the periradicular connective tissue. When the roots begin to mature, lateral and accessory canals are generated. The apex from varied directions also carries not only the blood vessels but also the nerve bundles. Lateral and the accessory canals are usually generated when the maturation of the root takes place. If the continuity of the root sheath breaks, it leads to the formation of foramina which acts as a pathway for the inflammation leading to an endo-perio lesion.[4]

C. **Dentinal Tubules:** When there isan absence of cementum and the dentinal tubules get exposed on the root surface they serve as a potential communication between the periodontal ligament and the pulp. The radicular dentin tubules are well connected from the pulp up to the cement- enamel junction and the maximum density of it meets at the

range of 57,000 per square mm at the pulpal end. Thus, it is apparent that when such a large number of dentinal tubules are exposed, a pulpal response to such a trauma will occur like irreversible pulpitis and pulpal necrosis. [3]

D. Lingual Groove: These occur most frequently on the lingual surfaces of maxillary lateral incisors. Very often such a tooth is found pulpless and has a periapical lesion. Adequate root canal therapy may resolve the periapical lesion but may not resolve the periodontal defect associated with the developmental groove. Prognosis should be determined by the extent of the periodontal defect.[6,7]

E. Tooth Anomalies: Enamel pearls, cervical enamel projectionsor spurs or extensions into the furcation of multirooted teeth are found frequently. They help in retention of plaque leading to the formation of the periodontal lesion which in turn can lead to endo-perio slowly by time.[7]

F. Developmental Malformations: The type of developmental anomaly occurs when the tooth germ fails to form the other root-like vertical developmental radicular groove. It is seen mostly in the maxillary central incisor central fossa and lateral incisor. The healthy periodontium maintains its integrity until the intact position of the epithelial attachment. But once the breach of the attachment takes place and the groove becomes contaminated by the infection, the entire length forms an infra bony pocket which seems to be self-sustained. It leads to the niche of the tissue-like channel to microbial plaque and periodontal disease progression occurs. Slowly it leads to an endo-perio lesion. The course of the groove is followed by the bone destruction area, appreciated radiographically.[8]

2. Iatrogenic/Contributing Factors

A. Types of Trauma: Trauma can injury both the teeth and the alveolar bone, involving the pulp or PDL or both. Enamel fractures, crown fractures with or without involvement of the pulp, crown root fracture, root fracture and luxation and avulsion are examples of trauma.[5]

In the case of Enamel Fracture, chipping or cracks on the enamel surface of the tooth. There is no pulpal or periodontal involvement hence this vitality enriches the prognosis part.

In the case of crown root fracture, they are always oblique involvement of both the root and the crown part. Pulp may not be involved here, but the enamel, dentin, and the cementum is affected mostly in molars and premolars and less affected in the anterior teeth. Conservative restoration like composite resin or union reattachment of the fractured fragments is the line of treatment. But if the crown fracture involves the pulp involvement, these types of cases often becomes complicated. Hence the pulp exposure will dictate the restorative pulpal treatment. If the fracture is very extensive then root canal therapy is indicated. Pulpotomy and pulpectomy can also be a protocol which is decided by the stage does the tooth maturation lies. Sometimes, the amount of time-delayed for the start of the treatment, soon after the injury, may hamper the pulpal prognosis. The better prognosis can be achieved by the earlier treatment. When the fracture of the cusp extends beyond the subgingival margin, the case becomes much more challenging, the severity of the fracture decides the treatment part. Sometimes the fragmented fractured part of the tooth is splinted, stabilization with the coronal segment repositioning for 12 weeks to achieve the perfect pulpal and periodontal repair. Later on, root canal therapy along with periodontal therapy is recommended. Quite a times, the decision of the treatment is extraction been taken because of the hopeless prognosis. If the fractured tooth does not involve the pulp, then there is no requirement of the root canal therapy as healing takes place on its own.[8] In the case of luxation, the different types of injuries seen are mainly are concession, extrusion, lateral luxation and intrusive luxation. And the treatment is different for the different types of luxation injuries. In the case of root fractures following trauma, fracture can happen in the root in different directions, mesially/ distally, or facially/lingually. It may or may not involve the pulp chamber. A vertical root fracture can extend the entire length of the tooth and involve the gingival sulcus or pocket area but may also be incomplete and confined to either the coronal or the apical portions.(2) As an outcome of bacterial expansion in the fracture gap, the neighboring periodontal ligament will turn into the place of an inflammatory wound causing the collapse of the connective tissue fibers and alveolar bone.[1]

A. Perforations: Perforations either laterally or apically on the tooth are seen as a treatment failure or is a considered as undesirable complications of the clinical treatment. Prognosis of the teeth is impeded due to communications between the root canal system. Various reasons for usual

root perforations are carious lesions extending extensively root resorption by the error made by the operator during the preparation of the root canal orpost preparation. Hence the prognosis of the root perforation treatment depends on factors like how big is the size of the perforation, its location, and the right time in diagnosing it. The ability to seal the perforationdepends upon how far the repair material isbiocompatible. If immediate sealing of the perforation is done at the right time with good infection control, it leads to successful treatment. The popular root perforation sealer available are EBA super, composites, amalgam, cavity.[8]

B. Accidental Lateral Perforations: If the treated root perforation goes undetected or not successfully treated, it may give rise to many sites of inflammatory lesions in the marginal periodontium. They manifest as increased probing depth, suppuration, increased tooth mobility and loss of fibrous attachment. At the time of endodontic treatment, and in concurrence with the preparation of root canals for the insertion of the post, unintentional instrumentation can by accident forms perforation of the root and wounding of periodontal ligament. Perforations may be made through lateral walls of the root or the pulpal floor in multirooted teeth. At the site of perforations, the subsequent inflammatory reaction can result in the formation of a periodontal pocket, if the perforation is located close to the gingival margin.[9] Other complications include exacerbation of clinical symptoms, similar to those of a periodontal abscess. Eg: acute pain, swelling, drainage of pus from the pocket, increased tooth mobility and further loss of fibrous attachment. Treatment of a root perforation should be initiated once it has been spotted. Healing of the lesion in the periodontium depends largely on whether bacterial infection can be excluded from the wounded site by a tight seal of the perforation.[1] If the perforation is close to the sulcus area or conducted through the floor of a multirooted tooth, the inflammatory response may induce the proliferation of sulcular epithelium to form a deepened periodontal pocket.

C. Poor Restorations: The critical cause behind the failure of the endodontic treatment is the coronal leakage. And if the fracture of the coronal restoration is the reason behind coronal leakage and is delayed, there is a high risk of recontamination of the root canals. And sometimes, the exposure of the root canal to the oral cavity can lead to coronal leakage, coronal restoration plays a vital role in such cases as it forms a barrier between the bacterial contamination of endodontic treatment and the coronal leakage. Hence a very good endodontic obturation and a fantastic sealed coronal restoration is mandatory to protect the root canal system . And this does not end the coronal leakage but the cemented full crowns, as well as dentin bonded crowns, helps still better the coronal leakage long term prognosis of endodontic treatment areas.[5] There are certain precautions to be taken to avoid accidental perforation during the other endodontic treatment. They are: Rubber dam isolation is a must for performing cementation and space preparation postoperatively, heated plugger should be used during the preparation of the post space, the preparation should hold at least a minimum of 3 mm root canal filling, same as the root canal treatment, the post should also be well irrigated and well dressed, the delay should not happen to place the restoration for leak-proof, immediately after the completion of the endodontic treatment, only after 3 months of coronal seal, endodontic treated tooth should go for crown restorations.[5]

D. Internal And External Root Resorption: These are seen as pathologic process or sometimes even as a physiologic process. Delayed untreated external resorption cases may lead to invade of cementum, dentin and ultimately lead to pulpal space. Root resorptions are free from clinical symptoms. And the internal resorption cases if left untreated they may advance and end up in more complications like perforation of the external root surface. External root resorption where the external surfaces of the teeth are hampered. Internal tooth resorption starts when the pulp space affects the primary internal dentin. The main generating cause in root resorption is a root surface separated from its defensive blast cell layer. This type of separation may follow any damage to the cementoblasts cell layer. For the resorption to carry on, there is a mandatory requirement of a stimulus, an example may be a disease or a constant mechanical strength such as the one in orthodontic treatment.[10] Consequently the treatment of root resorption should be directed towards the cause of the continuance of the resorption, such as removal of the infected material in a root canal or by discontinuing orthodontic tooth movement.

E. Apical Foramen: The principal route between the

periodontium and the pulp is the apical foramen. Periapical pathosis is usually caused by the inflammatory mediators also by the bacterial end products. Through the apex/apical foramen, the inflammatory mediators reach the pulp by the portal entry from a deep periodontal pocket. External resorption of the alveolar crest also arises because of the periapical granuloma from the necrotic pulp and spreading toward the lateralparts of the root.[6]

F. **Empty Spaces Created By Destroyed Sharpey's Fibers:** Due to the destruction of the periodontium in cases of periodontal disease, the contents of the root canal system get exposed to toxic products. Thus there is direct communication established between the pulp and the oral cavity through the exposed dentinal tubules.[3]

G. **Cemental Agenesis or Hypoplasia:** When the root surface is exposed to the oral environment due to congenital absence or faulty cementum, especially at the cementoenamel junction, there is a direct spread of infectious products between the pulp and the periodontium.

H. **Exposure of Dentinal Tubules Following Root Planing:** Scaling and root planning are indispensable procedures in the treatment of periodontal disease. However, sometimes with the removal of bacterial deposits, cementum and superficial parts of dentin are also removed. Therefore, due to this instrumentation, dentinal tubules gets exposed and left unprotected to the environment. Subsequent microbial colonization of the exposed root dentin may result in bacterial invasions of the dentinal tubules. As a consequence, inflammatory lesions may develop in the pulp. The risk for bacterial penetrations and pulpal injury is further enhanced by the injudicious use of acid for the conditioning of the root surface in the attempts to promote periodontal tissue regeneration. During the maintenance phase of periodontal therapy, scaling and root planning or are frequently repeated procedures. At each recall session, the root surfaces are debrided and some dentin is removed. This remedy can consequence only in the deteriorating of the tooth structure and also wide reparative dentin formation in the pulp.[2]On rare occasions, deep periodontal scaling may expose lateral canals that in turn can induce severe symptoms of pulpal pain. This kind of lesion is termed 'retrograde pulpitis' and may also be initiated by exposure of the tissue around the apical foramen to the periodontal disease.

Conclusion

The result of periodontal inflammation on the pulp is controversial and conflicting always. It has been recommended that periodontal disease does not affect the pulp, until it involves the apex. There are different schools of thought; numerous studies recommended that the consequence of periodontal disease on the pulp is degenerative together with a rise in calcifications, fibrosis, and collagen resorption, as well as a direct inflammatory effect. On the other hand, it seems that the pulp never gets affected by periodontal disease, until the recession has started up an accessory canal to the oral environment. Hence, the management of combined lesions has toseek at eliminating equally both of the problems.

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