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Case Report

Non-invasive endodontic treatment of large periapical lesions

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ABSTRACT

Background*: In most cases of large periapical radiolucent lesions of pulpal origin, we often encounter a dilemmatic situation, such as whether to either treat these cases endodontically or surgically. Development of techniques, instruments and root medicaments as well as the tendency toward minimally invasive treatment, all support dentists to treat those cases using the minimal invasive principle (i.e. endodontically instead of surgically).* ***Purpose****: The purpose of this paper is to report and discuss the managing of periapical lesions by endodontic no invasive treatment.* ***Case management****: The patient with large periapical lesions were treated with non-invasive endodontic treatment. After 6 months, patients in this report were asymptomatic and radiolucencies had disappeared. When the root canal treatment is done according to accepted clinical principles and under aseptic condition, including cleaning, shaping, abturating as well as proper diagnosis, the healing process of the infected area will occur.* ***Conclusion****: Some lesions, however, may not be treated conservatively and may require surgical treatment for total elimination of the lesions.*

Key words*: invasive treatment, periapical lesions*

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INTRODUCTION

Clinical classification of periapical lesions is divided into three clinical groups i.e: asymptomatic apical periodontitis, asymptomatic apical periodontitis and apical abscess. Periapical lesions commonly occur due to irritants and are initiated by neglected dental caries. The irritants could be microorganism, virus, mechanic, thermal, and chemical.[1] The effect of the intervention of microorganisms and their by-products into the root canals of untreated teeth may cause this intervention process to move apically, which leads to antigen-antibody reaction, finally, periapical lesions may occur.[1] In this study, the presented cases were limited only to periapical lesions, such as: periradicular granuloma, periradicular cyst, condensing osteitis, apical abscess,[1] which can be managed by endodontic non invasive treatment, and to non retreatment cases. In addition, some lesions, such as: true cysts, extraradicular infection lesions, fungi, foreign body reactions, can be treated through invasive treatment.[2,3]

The development of instruments, medicaments and techniques of root canal treatment allows periapical lesions to be perfectly treated by endodontic non invasive treatment. Endodontic treatment should be conducted in accordance with good clinical principles such as establishing correct diagnosis as well as using the accepted chemico-mechanical debridement process in asepsis conditions. After clinical procedures have been done correctly, hermetical permanent restoration has the important role in preserving the endodontically treated teeth over an extended period. Hermetical restorations are able to protect the treated root canal from the invasion of microorganisms.[4,5,6]

CASE

Case 1: A 23-year-old female visited the clinic with a chief complaint of having a lump at the palatum region. Extraorally, no impairment was found. Medical history was noncontributory. Intraorally, a purulent nodule was found at the right palatum. Tooth #12 (right maxillary lateral incisor) was tender to percussion and palpation. A large composite filling and secondary carries were found. Tooth #12 was non-responsive to vitality test. Radiographic examination showed a large radiolucent with a sharp margin around the apex of #12. The apex showed slightly curved,

A B

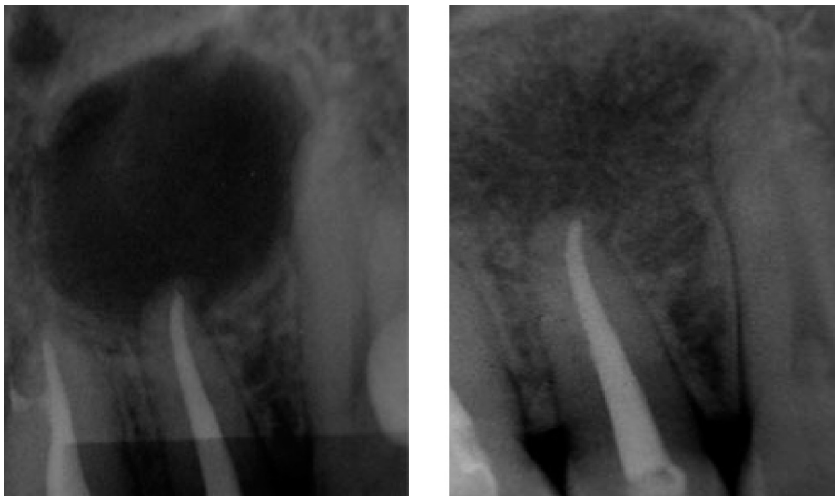
Figure 1. Radiographs immediately after completing the root canal therapy and at the 12-months follow up. A) Radiographic examination after root canal treatment and B) after 12 month

discontinuity of periodontal ligament and lamina-dura. The periodontal condition was excellent, with no gingivitis and absence of pocket. The tooth was diagnosed as a chronic apical periodontitis.

First of all, therapy was done by removing the whole remaining restorative material and carries; subsequently a new hermetic restoration was built up to form a new seal, preventing invasion of microorganisms. After obtaining infiltration anesthesia surrounding the gingiva by using 2% lidocaine solution (this procedure to avoid pain at gingival region when clamp was applied) the tooth was isolated under rubber dam. MD-cleanser (17% EDTA = *ethylenediaminetetraacetic*) and 5% NaOCl were applied consecutively as irrigants before inserting endodontic files into the canal. This has been proved to be a valuable action in penetrating small spaces by removing debris. A size K file (0.8) was used to identify the canal. An apex locator was used to verify the working length. Individual canal instrumentation was performed sequentially with K files using a crown-down pressureless technique to a master apical size of 50. Copious chemical irrigation was performed with 17% EDTA and recapitulation was always done to verify the working-length during chemico-mechanical debridement. Prior to obturation, a final irrigation with 2.5% sodium hypochlorite was used. Ultrasonic tips were used to activate the irrigants in the entire canal for 2 minutes, subsequently, 2% chlorhexidine was used as a neutralizing agent. The root canal was dried with sterile paper point and obturation was performed using warm vertical compaction of gutta-percha and AH-26 as a root canal sealer. Excess of gutta-percha cones were cut at the level of the root canal orifice and vertical compaction was applied immediately with ISO size of 40 finger plugger after being heated by System-B. This action will ensure better homogeneity of gutta-percha which in turn will fill canal irregularties as well as accessory canals. A coronal temporary restoration of glass-ionomer was placed and a postoperative radiograph was taken in order to assess the quality of obturation.

The following week, periapical radiographs were exposed for examination with the following results: patient asymptomatic, the tooth was nonresponsive to percussion and palpation. A final coronal permanent restoration of composite was placed. The patient was recalled 12 months postoperatively for clinical and radiographic examination. At that time, the patient was symptom-free. The clinical appearance of the area was satisfactory. The radiographic examination revealed that a great part of the lesion had been covered with healthy bone (Figure 1).

Case 2: A 35-year-old female patient visited the clinic with a chief complaint of having sinus tract at left maxillary lateral incisor (22) buccally. Extraorally, there was no evidence of swelling and medical history was noncontributory. Intraorally, a sinus tract was present buccally. The tooth was non-responsive to palpation, percussion as well as vitality test. The periodontal condition was excellent, with no gingivitis and absence of pocket. Radiographic examination showed an evidence of large radiolucency with discontinuity of periodontal ligament and lamina-dura. At first, therapy was done by removing the whole remaining restorative material and carries; subsequently a new hermetic restoration was built up to form a new seal, preventing invasion of microorganisms. After obtaining infiltration anesthesia surrounding the gingiva by using 2% lidocaine solution (this procedure to avoid pain at gingival region when clamp was applied) the tooth was isolated under rubber dam. MD-cleanser (17% EDTA = *ethylenediaminetetraacetic*) and 5% NaOCl were applied consecutively as irrigants before inserting endodontic files into the canal. This has been proved as a valuable action in penetrating small spaces by removing debris. A size K file of 0.8 was the initial instrument of



A B

Figure 2. Radiographs show immediately after completing the root canal therapy and twelve-month radiograph showing almost complete healing of periradicular radiolucency.
A) Radiographic examination after root canal treatment and B) after 1 year

choice to negotiate the canal. An apex locator was used to verify the working length. Individual canal instrumentation was performed sequentially with K files using a crown-down pressureless technique to a master apical size of 50. Copious chemical irrigation was performed with 17% EDTA and recapitulation was always done to verify the working-length during chemico-mechanical debridement. Prior to obturation, a final irrigation with 2,5% sodium hypochlorite was used. Ultrasonic activation was used to activate the irrigants in the entire canal for 2 minutes, subsequently, 2% chlorhexidine was used as a neutralizing agent. The root canal was dried with sterile paper-points and obturation was performed using warm vertical compaction of gutta-percha and AH-26 as a root canal sealer. Excess of gutta-percha cones were cut at the level of the root canal orifice and vertical compaction was applied immediately with ISO size of 40 finger plugger after being heated by System-B. This action will ensure better homogeneity of gutta-percha which in turn will fill canal irregularties as well as accessory canals. A coronal temporary restoration of glass-ionomer was placed and a postoperative radiograph was taken in order to assess the quality of obturation.

The following week, periapical radiographs were exposed for examination, with the following results, patient asymptomatic, the tooth was nonresponsive to percussion and palpation. A final coronal permanent restoration of composite was placed. The patient was recalled 12 months postoperatively for clinical and radiographic examination. At 12 months, the tooth remained symptom-free. The clinical appearance of the area was satisfactory. The radiographic examination showed almost complete osseous repair of preoperative periradicular pathosis (Figure 2).

DISCUSSION

Periapical lesions can commonly be treated through non invasive root canal treatment. The treatment consists of a series of mechanical and chemical procedures and is initiated by opening the occlusal with a dental bur to obtain the pulp chamber. The entire process is performed under rubber dam isolation, subsequently followed by chemico-mechanical debridement. Copious irrigants are used after each instrumentation.

Periapical lesions can occur as a result of interaction when the host responds to invasion of microorganisms and their by-products egress into the root canal. In 1697 Anthonie Van Leeuwenhoek was the first person who could see bacteria from root canals using one of the first generation of microscopes.[7] Definitive pathological mechanisms of the periapical lesion are still unclear. Initially, it was assumed that polymicrobial infection induced the human body defenses. The pathogenesis study of periapical lesions has been conducted in various animal models, such as: rats, dogs, and rabbits and monkeys. However, the result of the study should not be applied directly to humans owing to different responses between microbial flora and the human condition.[7]

The response of host defenses against microorganisms and their by-products causes various histological and clinical images,[7] such as: acute and chronic periapical inflammation, chronic suppurative periapical inflamation, acute periapical abscess/cellulitis, periapical osteomyelitis, periapical osteosclerosis, granulomas and cysts. Qualitative analysis has not been able to identify all of the microbial in

the root canal systems of infected teeth, whereas microbial have been found in every infected tooth so far around hundreds of types.[7]

In 1965 Kakehashi *et al.* published a classic experiment, which revealed that exposure of the pulp in rats with normal microbial flora produced pulpal necrosis and periradicular lesions developed. However, only minimal pathological changes occurred in germ-free rats when the pulp was exposed, furthermore a reparative bridge was formed. Implication of this experiment shows that periapical lesions can repair themselves owing to the absence of microorganisms and their by-products. This experiment obviously showed that microorganisms are the predominant irritants of the dental and the periodontal tissues. This study reported that periapical lesions can improve by themselves when the microorganisms and their by-products are absent.[8] Extra -radicular infections, true cysts and foreign body reactions can only be successfully treated by corrective surgical treatment, whereas periapical lesions that heal by fibrous scar tissue do not require any treatment.[9]

Based on the fact that periapical lesions may develop due to the interaction between human defense mechanisms against microorganisms and their by–products, the formation of lesions depends upon this interaction. Whereas the recovery process of periapical lesions may occur when the microorganisms and their by-products are absent in the contaminated regions. This allows macrophages to invade the zones of infection and contamination in order to remove debris and dead cells. Subsequently, osteoblasts, fibroblasts and new in-growing nerve fibers as well as blood vessels will proliferate into the infected zones.

Finally, the recovery process will occur, starting from the outer part of lesions to the inner part of the lesions until a normal periodontal ligament is formed. Provided the periodontal tissues and cells are not irreversibly damaged then the recovery process will form cementum over the apical foramen which will completely isolate the entire root canal system from poor environments. The insufficient removal of inflammation may lead to an incomplete recovery process, whilst any delay in the recovery process is determined by treatment procedures and materials used.[7] Even though the precise mechanisms of the recovery of periapical lesions are still controversial, all inflammatory periapical lesions should be initially treated with non surgical treatment then by surgical treatment. Adequate endodontic treatment will induce the recovery process around periapical tissues that follow the same recovery principles as that of connective tissues elsewhere in the body.[10]

When the root canal treatments are done according to accepted cleaning and shaping procedures, and are able to eliminate the entire microorganisms, necrotic tissues as well as the remnants of organic tissues from the infected root, the success rate is generally high.[8] Accepted endodontic treatments may induce a favorable healing process. Recently, a study reported that programmed cell death has an important role in the entire healing process.[10]

After treating the root canal properly, the process of chemical debridement and removal of microorganisms will be continued by sealing a chemical agent in the canal hermetically over a period of time, to eliminate and to prevent microorganisms recolonizing the root canal system. Previously, a culture test used to be done, but in modern root canal treatment the culture tests are not always conducted, although there are some who still practice it. As long as clinical symptoms, inflammatory signs and radiolucencies are absent, then the root canal system is ready to fill three dimensionally. The purpose of root canal obturating is to fill the root canal system with inactive materials (such as gutta-percha and a sealer) to isolate from either periapex tissues or oral environment. The hermetical permanent restorations have an important role in providing definitive coronal seal preventing re-infection of the root canal system. It will entomb the residue of microorganisms in the canal; finally, the microorganisms cannot survive.

The definitive measure of root canal treatment is the recovery of periapical lesions, since the purpose of the treatment is to eliminate the lesions. This measure could take up to 4 years or more for reevaluation by taking a series of radiographs until normal tissues are restored. In the fact, even the utmost sophisticated methods of root canal treatment are still unable to remove the entire microorganisms and their by-products from root canals and tubulus dentin, therefore, the obturation process becomes the second opportunity to entomb all the remaining microorganisms and their by-products in the root canal so that they are unable to escape. Theoretically, a proper obturation will ensure microorganisms cannot survive, but in fact there is no perfect filling materials available in the market, consequently, communication still occurs between the root canal and the oral environment.[11] To avoid that communication, a hermetical coronal restoration is needed in order to prevent re-invasion of either new microorganisms or nutrients into the root canals through the unsealed zone, If this is not done then within a couple of days new microorganisms or nutrients will reach the periapical tissues, resulting in the remaining microorganism becoming more active in their growth, and finally will develop a chronic periapical inflammation. Clinicians must keep in mind, therefore, that the root canal system is not only pipe-like with open ends but also a complex series of canals with accessories, lateral canals, furcations and containing milliards of tubulus dentin.

The root canal system should be filled three dimensionally and the final hermetical coronal restorations are needed.[8] Evaluation of successful and unsuccessful root canal treatments still remains controversial. Nevertheless, when the teeth are clinically asymptomatic and radiographic images show improvement, the conclusion can be drawn that the root canal treatment is successful clinically, although the alteration of tissue structures has histologically and microscopically occurred.[1] The main goal of this case study is to report successful treatments of the two cases owing to asepsis conditions, accepted clinical procedures

and final hermetical coronal restorations that allow the periapical tissue to improve completely, regardless the size of the lesions and nonsurgical treatments. Surgery is recommended after non invasive root canal treatment is unsuccessfully performed.

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