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Research paper

Non-Surgical Management of Periapical Lesion in Mandibular Incisor using Calcium Hydroxide Intracanal Medication

A Case Report

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ABSTRACT

Sterilization of the root canal space is necessary for the success of endodontic therapy. Medications and intracanal irrigants are frequently used for this. Numerous intracanal medications and irrigation methods have been studied for improved treatment results in order to achieve sterilisation and healing of periapical region. This case report discusses the non-surgical treatment of an extensive periapical lesion in the mandibular anterior teeth of a 34-year-old male who complained of occasional swelling and pain following a traumatic accident. During the first appointment, access was opened, followed by biomechanical preparation and disinfection, and the root canal was filled with calcium hydroxide. After two weeks, the patient was found to be asymptomatic, therefore obturation was performed. After 12 months, clinical and radiographic evaluations revealed that bone repair was evident. This case report demonstrates how a precise diagnosis combined with root canal treatment, as a conservative non-surgical strategy, can result in complete healing of big lesions without the need for invasive therapies.

1. Introduction

Traumatic injuries interrupt the pulpal blood flow, resulting to pulp necrosis and anaerobic conditions that promote the growth of opportunistic microbes. This can result in the development of periapical lesions (Soares et al., 2006). Periapical lesions occur when microrganisms and their by-products invade the root canal system, causing inflammation. These lesions develop through several causes, such as osmotic fluid buildup, epithelial growth, and molecular mechanisms (Dhillon et al., 2014).

It has proven difficult for the clinician to eradicate pathogens when there are extensive periapical lesions. The root canal system is challenging to sterilize due to the polymicrobial infection. Therefore, if the root canal therapy has not sufficiently removed or decreased the intraradicular burden, the endodontic treatment may not be successful, resulting in chronic infections (Kumar et al., 2021). To effectively disinfect the root canal system, chemical irrigation and disinfection are necessary in addition to mechanical instrumentation. Intracanal medicaments have been recommended to reduce inflammat-

ion, pain, and promote healing (Kawashima et al., 2009).

Calcium hydroxide ($Ca(OH)_2$) is currently the most commonly used intracanal medicament in endodontic practice. Although the exact mechanism by which $Ca(OH)_2$ inhibits bacteria is unknown, it is thought to be connected to rising pH. Because calcium hydroxide releases hydroxyl ions gradually, it can sustain an elevated tissue pH for an extended period of time. A -$Ca(OH)_2$ containing intracanal medication must diffuse from the root canal into the periapical tissues and alter the local pH in order to have the intended extraradicular effect. The medication would be more efficient and efficacious if it diffused more quickly and caused a higher final tissue PH. Since calcium hydroxide kills by the action of hydroxyl ions, its effectiveness is dependent on the ions' availability in solution, which is influenced by the vehicle that carries the $Ca(OH)_2$ (Robert et al., 2005).

The initial line of treatment for any inflammatory lesions of endodontic origin should be conservative endodontic procedures that do not include surgery. According to studies, with basic non-surgical treatment and appropriate infection control, 94.4% of endodontic lesions resolve completely or partially (Fernandes & de Ataide, 2010).

This case report details the nonsurgical treatment of a large chronic periapical lesion with $Ca(OH)_2$ intracanal medication.

2. Case Report

A 34-year-old male patient presented to the department with the major complaint of pain and swelling in the lower mandibular anterior teeth. There was no relevant medical history. Upon conducting a full dental history, the patient revealed trauma to the mandibular anterior teeth. Clinical examination showed that there was an enamel fracture with respect to 41, which was sensitive to vertical percussion. Intraoral examination revealed a soft, fluctuant swelling on the labial alveolar mucosa near the right mandibular anterior teeth, with a sinus tract opening. Periodontal probing revealed that the gingiva was normally intact.

Teeth 41 did not respond to heat or electric pulp tests; the neighboring and contralateral teeth responded normally. According to radiographic analysis, there was periapical radiolucency in 41, which could indicate a diagnosis of Ellis class I fracture with chronic periapical abscess (Fig. 1).

Non-surgical root canal treatment was planned with exploration, biomechanical preparation and obturation of the tooth. Isolation was completed using a rubber dam. To prepare the access cavity, incisal margin was first prepared with a round bur, followed by a round end tapered bur with significant labiolingual extension. Initially, root canal space negotiation was performed with a size 10 K-file (Fig. 2) and extensive saline irrigation. By exerting digital pressure to the swelling on the labial surface of the mandibular anterior teeth, a yellow straw-colored fluid was drained through the access-opened teeth and the sinus tract opening. The working length was then calculated, followed by mild irrigation with sodium hypochlorite (3% NaOCl) and normal saline, and a closed dressing was given on the first visit.

Fig. 1 Preoperative radiograph

Fig. 2 Working length determination

During the second visit biomechanical preparation was carried out with Protaper Gold Rotary file system up to F2 size (Dentsply Sirona, Charlotte, North Carolina, United States), and irrigation with 3% NaOCl and 17% ethylenediamine tetra-acetic acid (EDTA) was used. Following isolation and canal drying, $Ca(OH)_2$ medication (Metapexô, META Biomed Co. Ltd., Korea) was administered for a week (Fig. 3). At the subsequent appointment after 2 weeks, the tooth was found asymptomatic, and the warm vertical compaction technique was used to obturate it with 6% 25 size gutta percha and AH Plus sealer (Fig. 4). After a week, a composite post-endodontic restoration was done, and a year later, it was evaluated (Fig. 5). The radiograph after a year revealed completely healed bone with distinct trabeculae.

Fig. 3 Intracanal medication placement

Fig. 4 Postoperative radiograph

Fig. 5 1 year follow-up radiograph

3. Discussion

Microorganisms in the root canal system are clearly linked to the development of endodontically generated periapical diseases. Such instances can be treated with both non-surgical and surgical approaches. The preferred method of treatment for teeth with significant periapical lesions is non-surgical root canal therapy (Lin et al., 2007). Other options include non-surgical retreatment or periapical surgery, must be taken into consideration if this treatment is unable to resolve the periradicular pathosis. The root canal must be properly cleaned, shaped, asepsised, and filled for the non-surgical endodontic treatment to be successful. A successful root canal treatment is built on a foundation of extensive instrumentation and abundant irrigation. Even though irrigation and instrumentation lower the number of microbes, a bactericidal agent is still required for the best possible disinfection (Zanza et al., 2023). Irrigation with NaOCl and proper biomechanical preparation are indicated for a successful root canal therapy, followed by intracanal medications. Calcium hydroxide is the most widely used medicament for root canal asepsis because of its high alkalinity and antibacterial activity (Bhaskar, 1972).

Bhaskar proposed four possible mechanisms for the action of $Ca(OH)_2$ beyond the apex: (a) anti-inflammatory; (b) neutralization of acid products; (c) activation of alkaline phosphatase; and (d) antibacterial action. Additionally, it may aid in the absorption of carbon dioxide, which is essential for the metabolic processes of many root canal pathogens (Bhaskar, 1972).

In the presence of large periapical lesions such as in the present case placement of intracanal calcium hydroxide would have a direct effect on inflamed tissue and epithelial cystic linings and in this manner would favour periapical healing and encourage osseous repair (Tronstad et al., 1981). Periodic checkups revealed significant bone development in the periapical area. Non-surgical healing of periapical lesions resulted in a favorable clinical and radiological response. Combining standard endodontic therapy with calcium hydroxide as an intracanal medication resulted in successful healing of periapical lesions (Er et al., 2007).

An oil-based calcium hydroxide paste formulation that contains calcium hydroxide, silicon oil, and iodoform was used in this case. Oily vehicles were used in this case because the patient had a large lesion with sinus opening, which is characterized by a wide root canal space and increased foraminal opening. This is because oily vehicles are substances that are not soluble in water, which promote the lowest solubility and diffusion of the paste within the tissues (Fava & Saunders, 1999).

This case report shows that a periapical lesion on the mandibular right central incisor disappeared completely after endodontic treatment throughout a 12-month follow-up period. Non-surgical root canal treatment is a viable option for teeth with significant periapical lesions, as revealed by this case report.

4. Conclusions

This case report shows how nonsurgical root canal therapy with $Ca(OH)_2$ intracanal medication treated an extensive periapical lesion. This demonstrates that nonsurgical treatment is always the primary option because even huge periapical lesions can respond well to it.

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