Non Surgical Management of Large Periapical Lesions Using Calcium Hydroxide - A Report of Two Cases

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Abstract: Nonsurgical management of periapical lesions has shown to have a high success rate. In the present case series, two large periapical lesions were treated with conservative therapy by the use of calcium hydroxide as an interim root canal dressing. The lesions resulted in successful resolution and healed completely. Long term follow-up of these cases is required to assess the success rate achievable by this mode of treatment.

Keywords: Calcium hydroxide, chlorhexidine gluconate, intracanal medicament, non surgical endodontic therapy, periapical lesions.

1. INTRODUCTION

Bacterial infection of root canal system occurs as a result of tooth caries, surgical treatments, and trauma. The endodontic microbial flora is mainly composed of mixed, predominantly gram-negative anaerobic bacterium [1] and presents with a close relation between pulp and periapical region. This forms a path which allows passage to bacteria, fungi, and cell components for proceeding an inflammatory processes in periapical regions and activation of resorption in the periapex. These immunopathological mechanisms further lead to formation of granuloma, periapical cyst or periapical abscess [2].

The ultimate goal of endodontic therapy is to return the infected/inflamed teeth and the supporting periodontium to a state of health and function with or without surgical intervention [3]. Initial treatment for all the periapical lesions should be with conservative nonsurgical procedures [4]. Surgical intervention is recommended only after treatment with nonsurgical methods have failed [5]. However, periapical surgery has many drawbacks, which limit its use in the management of periapical lesions [6, 7]. Various studies have reported a success rate of up to 85% with non surgical root canal treatment of periapical lesions [8-10]. A high rate of 94.4% has also been reported showing complete and partial healing of periapical lesions following nonsurgical endodontic therapy [11].

For many years, calcium hydroxide with chlorhexidine [$Ca(OH)_2$] has been extensively used as intracanal medicament in endodontics. It has been used in various clinical situations like apexification, repair of perforation, in enhancement of healing of periapical lesions or in control root resorption, or to decrease exudation from the canal in tooth with persistent periapical inflamma-tion [12]. It is well demonstrated that, interim dressing with calcium hydroxide with chlorhexidine in cases with the presence of large and chronic periapical lesions, an environment which is more favorable for healing and which encourages osseous repair, is created [13].

The present article describes the successful endodontic management of two cases with large periapical lesion using calcium hydroxide with chlorhexidine as interim dressing.

2. CASE REPORT 1

A 23-year-old female patient reported to the Department of Conservative Dentistry and Endo-dontics, for a routine follow up. Patient presented with a history of proclined upper front teeth for which ceramic veneers were placed a year back. There was no history of pain reported by the patient. The medical history was non-contributory. On clinical examination, well seated ceramic veneers were seen from 12 to 22. Intra oral periapical radiographic examination revealed large diffused periapical radiolucency (12x12mm) with an ill-defined border involving the apices of 12, 11, 21 and 22 (Figure **1**). Careful examination of the intraoral periapical radiograph revealed that, tooth 11 and 21 had a radiopaque material blocking the coronal third of the root canal. Pulp sensibility testing was done using electric pulp tester (Parkell Electronics Division, Farmingdale, NY) in relation to all the four teeth and was found to be negative. All the teeth were non tender to percussion. The surrounding periodontium was normal, and oral hygiene was well maintained. A

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Figure 1: Preoperative radiograph of maxillary right and left incisors with large periapical radiolucnecy.

Figure 2: Working length radiograph of maxillary right and left incisors.

treatment plan of non-surgical root canal therapy for all the four teeth was made. Informed consent was obtained from the patient, following which access cavity was prepared using Endo-Z FG burs (Dentsply Maillefer, Ballaigues, Switzerland) under rubber dam isolation. There was no drainage from any of the canal. The apical foramen was gauged using K- files (Mani Inc- Tochigi Ken, Japan), and the apical width was found to be equivalent to a #30 K- file for all the four teeth. Working length was determined using Ingles technique [14] (Figure **2**) following which the shaping and cleaning of the root canals was done using the step-back technique with the apical size of #40 K file. The root canals were irrigated with 5ml of 2.5% sodium hypochlorite solution (KMC Pharmacy, India) for 1min after each instrument change and finally with 5ml of 0.9% saline solution (KMC Pharmacy, India) for 1min. All the irrigation procedure was performed using 29 gauge stainless steel needle (NaviTip, Ultradent Products. Inc USA). The canals were then dried with sterile paper points (Dentsply Maillefer, Ballaigues, Switzerland) and [$Ca(OH)_2$] powder (Ramam Research, Kolkata, India) was mixed with 2% chlorhexidine solution (CHX) (KMC Pharmacy, India), made into a paste, and was placed as an intra canal medicament using a lentulospiral (Mani Inc- Tochigi Ken, Japan). The access cavity was then temporized with Cavit (3M ESPE, St Paul, MN, USA). The patient was advised to return after every two weeks for the replacement of calcium hydroxide with chlorhexidine dressing. Follow up was done every three months to assess the response of the tooth to the endodontic treatment with the help of intraoral periapical radiographs. After three months, bone formation was evident in the periapical area, and then the canals were cleaned with #30 H file (Mani Inc- Tochigi Ken, Japan) and irrigated with 5ml of 17% EDTA solution (Merck, Germany) for 1min using 29 gauge stainless steel needle for the removal of any remnants of the calcium hydroxide with chlorhexidine. Finally the canals were irrigated with 5ml of saline and dried using sterile paper

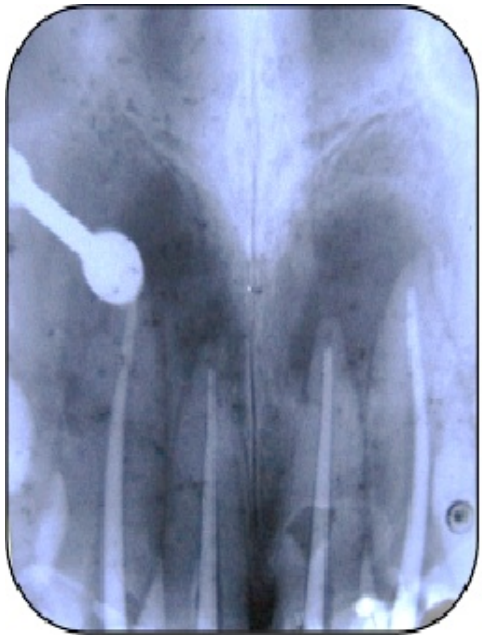

Figure 3: Master cone radiograph of maxillary right and left incisors.

points. Master cones (Dentsply Maillefer, Ballaigues, Switzerland) were selected (Figure **3**) and the canals were obturated with gutta percha points (Dia Dent, Mumbai, India) and AH Plus sealer (Dentsply, Maillefer, Switzerland) using lateral and vertical condensation technique. The access cavity was then restored with composite resin (3M ESPE, St, Paul, MN, USA). Post operative instructions were given and the patient was reviewed after one year and was found to be asymptomatic with adequate periapical healing (Figure **4**).

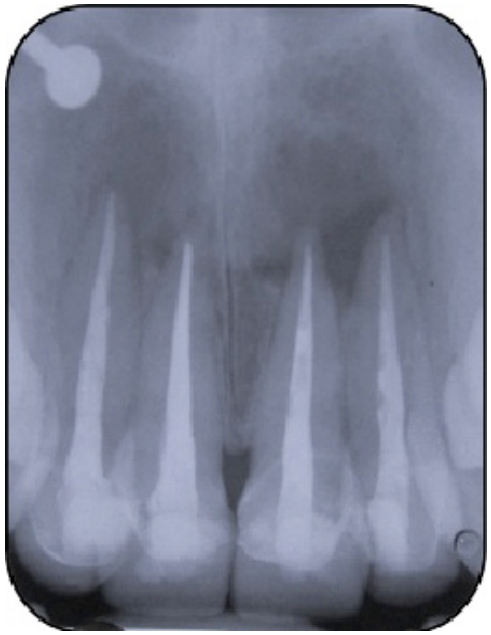

Figure 4: One year recall radiograph of maxillary right and left central and lateral incisors demonstrating favorable healing.

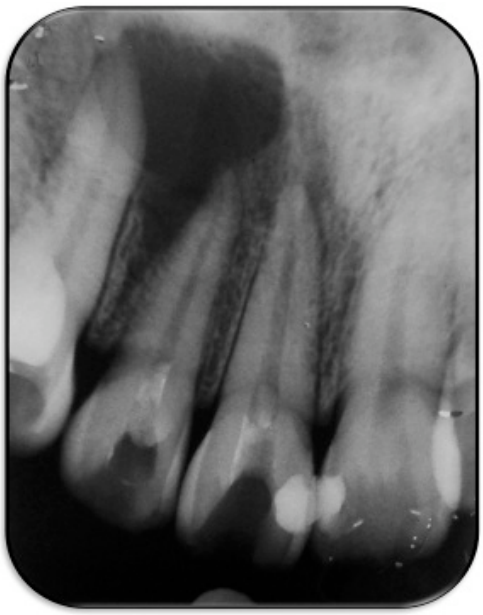

Figure 5: Preoperative radiograph of maxillary anterior teeth with large periapical radiolucnecy.

3. CASE REPORT 2

A 28 year old female patient presented to the Department of Conservative Dentistry and Endodontics, with a complaint of sensitivity and mild pain on biting with respect to her upper front teeth. Patient reported a history of initiation of root canal treatment for the same upper front teeth one year back. She also reported that, root canal treatment was completed once, but due to non-healing of the lesion the same dentist had later removed the root filling. Her medical history was non-contributory. On clinical examination, discolored teeth with respect to 21, 22 and 23 were seen which were non-tender to percussion. Intraoral periapical radiographic examination revealed large diffuse ill-defined periapical radiolucency involving the apices of 21, 22 and 23 and irregular radiopacity in the pulp chamber of these teeth which was suggestive of previous initiation of endodontic treatment (Figure **5**). A treatment plan of completion of root canal therapy was decided. Informed consent was obtained from the patient, following which the access opening was re-established using Endo-Z FG burs (Dentsply Maillefer, Ballaigues, Switzerland) under rubber dam isolation and working length was determined using Ingles technique [14] (Figure **6**). Cleaning and shaping of the canals was completed using step back technique with the apical size of #40 K file with respect to 21 and 23 and #30 K file with respect to 22. The root canals were irrigated with 5ml of 2.5% sodium hypochlorite solution (KMC Pharmacy, India) for 1min after each instrument change and finally with 5ml of 2% CHX solution for

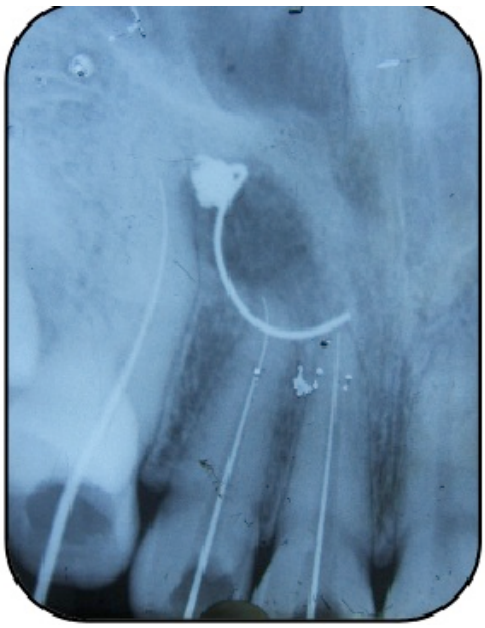

Figure 6: Working length radiograph of maxillary anterior teeth.

1min. All the irrigation procedure was performed using 29 gauge stainless steel needle (NaviTip, Ultradent Products. Inc. USA). The canals were then dried with sterile paper points (Dentsply Maillefer, Ballaigues, Switzerland) and [$Ca(OH)_2$] powder was mixed with 2% CHX solution and made into a paste, and was placed as an intra canal medicament using a lentulospiral. The access cavity was then temporized using Cavit. This medicament was changed twice with two weeks of interval. On recall after 4 weeks, the canals were cleaned with #30 H file and irrigated with 5ml of 17% EDTA solution for 1min using 29 gauge stainless steel needle for the removal of any remnants of the calcium hydroxide with chlorhexidine. Finally the canals were irrigated with 5ml of saline and dried using sterile paper points. Obturation was then completed using gutta percha cones and AH Plus sealer using the lateral and vertical condensation technique. A follow up of two year revealed complete healing of the periapical lesion (Figure **7**).

Figure 7: Two year recall radiograph of maxillary anterior teeth demonstrating good healing.

4. DISCUSSION

The various methods for non-surgical management of periapical lesions are: conservative root canal treatment without adjunctive therapy, method using calcium hydroxide with chlorhexidine, aspiration and irrigation technique, decompression technique, active nonsurgical decom-pression technique and lesion sterilization and repair therapy [15]. The simple non invasive technique of use of calcium hydroxide with chlorhexidine as an intracanal medicament was used in the present case series which provided satisfactory results.

Calcium hydroxide with chlorhexidine when mixed with suitable vehicle, forms a paste for use in endodontics. The type of vehicle used has a direct relation with the antibacterial action of calcium hydroxide with chlorhexidine as well as the concentration and velocity of ionic liberation when the paste is condensed into the contaminated area [16, 17]. A number of vehicles have been added to calcium hydroxide with chlorhexidine in an attempt to enhance its antimicrobial activity, biocompatibility, ionic disso-ciation, and diffusion. Chlorhexidine (CHX) has been widely used as an endodontic irrigant because of its antimicrobial activity against Gram-positive and Gram-negative microorganisms [18, 19]. CHX may also present residual antimicrobial activity on the dentin surface after prolonged contact (at least one week) with the root canal. Recent studies have suggested that, CHX could be used in combination with [$Ca(OH)_2$] to improve antimicrobial efficacy against [$Ca(OH)_2$] resistant microorganisms [20-25]. Evans MD *et al.* found that, [$Ca(OH)_2$] when mixed with 2% CHX solution in a paste form was more effective in the eradication of *E. faecalis* from the dentinal tubules than [$Ca(OH)_2$] with sterile water [26]. Gomes *et al.* concluded that, 2% CHX gel + [$Ca(OH)_2$] showed an increase in the antimicrobial activity than [$Ca(OH)_2$] manipulated with water [27]. The present cases healed almost completely with [$Ca(OH)_2$] and CHX mixture when used as an intracanal medicament suggesting that, combination of [$Ca(OH)_2$] and CHX have synergistic action that enhances their efficacy. The specific mechanism by which [$Ca(OH)_2$] exerts its activity is not clearly known. The probable mechanism of action of calcium hydroxide with chlorhexidine in these cases can be attributed to its basic pH, which leads to conversion of the acidic environment of periapical tissues to a more on the basic side therefore, in this alkaline environment, $Ca(OH)_2$ can inhibit osteoclast activity and can stimulate hard-tissue deposition favoring repair of the diseased periapical tissues [28]. Another possible mechanism is that, $Ca(OH)_2$ inactivates the endotoxin present in association with the bacteria, and appears currently the only clinically effective medicament for inactivation of endotoxin [28]. Two other theories have been proposed in its mechanism which are, the calcifying potential of $Ca(OH)_2$ may initiate the buildup of bone in the

periapical lesion due to release of calcium ions and also, the caustic action of $Ca(OH)_2$ cauterizes the residual chronically inflamed tissue and its subsequent resolution [29]. In present cases, [$Ca(OH)_2$] in combination with CHX, used as interim root canal dressing, arrested the resoptive process which lead to promotion of good periapical healing.

CONCLUSION

The present case series describes non surgical endodontic management of two large periapical lesions with respect to maxillary anterior teeth. Lesions were treated with conservative therapy by the use of calcium hydroxide with chlorhexidine as an interim root canal dressing. The lesions resulted in successful resolution and healed completely. This report confirms that, for treatment of a large periapical lesion it is not always necessary to do surgical intervention but following conservative endodontic therapy the lesions do heal.

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