

# Accelerated Non Surgical Healing of Large Periapical Lesions using different Calcium Hydroxide Formulations: A Case Series

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## ABSTRACT

Chronic apical periodontitis with large periapical radiolucency may be a periapical granuloma, periapical cyst or periapical abscess. Histological examination of these lesions gives the definitive diagnosis. A preliminary diagnosis can be made based upon clinical and radiographic examination. Earlier periapical surgery was considered the first choice for a large periapical lesion. But nowadays these lesions are first treated conservatively with root canal treatment with high success rate. These lesions whether a granuloma, cyst or abscess can be treated non-surgically with the almost similar treatment protocol. Evacuation of the lesion content followed by proper disinfection of canal with long-term calcium hydroxide therapy help the regression of large periapical lesions. Periapical surgery can be the alternate treatment protocol but should be considered after the failure of conservative nonsurgical treatment. Nonsurgical treatment fails if there remains a persistent source of infection. This paper describes a case series of three cases in which large periapical lesions (granuloma, cyst, abscess) are successfully treated non-surgically with root canal treatment with long-term calcium hydroxide therapy. Calcium hydroxide formulations Metapex and RC Cal were used and intentionally pushed into the lesions which lead to the healing of the periapical radiolucency within 18 months.

**KEYWORDS:** Large periapical lesions, non-surgical healing, periapical cyst, calcium hydroxide formulations, metapex

## INTRODUCTION

Pulpal necrosis as a result of trauma and caries is the main cause of large periapical lesions. Varieties of lesions mimic the large periapical radiolucency, but most of them are the cyst, granuloma, or abscess.<sup>1</sup> Most of these lesions remained asymptomatic for years and diagnosed during the routine radiographic examination or during acute exacerbation of chronic lesion. Apart from the periapical abscess which can be easily diagnosed based on the clinical symptoms combined with a radiographic examination, it is difficult to differentially diagnose between periapical granuloma and periapical cyst. The cyst has a well-defined radiolucent lesion more than 200 mm<sup>2</sup> in size and contains straw colored fluid. However, definitive diagnosis between the periapical granuloma and periapical cyst can be made by histological examination only.<sup>2</sup>

Periapical surgery is the first treatment choice that comes to our mind to manage a large cyst like lesion. However, nonsurgical endodontic approach should be considered first.<sup>3</sup> Surgical intervention is considered only when nonsurgical approach fails. Moreover, the surgical intervention has many limitations such as the medical condition of patient, proximity to anatomical structures, psychological trauma to the patient and is not possible in

every patient.<sup>4</sup>

Periapical lesions are mainly inflammatory in origin and expand by epithelial proliferation and increase in hydrostatic pressure inside the lesion.<sup>5</sup> Microorganisms and their by-products are the main cause of inflammation. After removing the microbiological etiology of inflammation epithelial lining undergoes the process of apoptosis.<sup>3</sup> The hydrostatic pressure of the lesion can be reduced by decompression and aspiration of lesion contents through the cortical plate or the aspiration through the root canal. Aspiration and decompression of the lesion contents through the root canal is more conservative approach and preferred over decompression and aspiration through cortical plate since it creates the buccal or palatal wound.<sup>6</sup> So reducing microbial load by long-term use of intracanal medicament after the evacuation of lesion content leads to regression of the lesion. Calcium hydroxide is the intracanal medicament extensively used in endodontics for many years due to its antimicrobial properties and mineralization potential.<sup>7</sup> This paper presents a case series of non-surgical management of large periapical lesions in which different calcium hydroxide formulations were used as an intracanal medicament.

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## CASE REPORT

### Case- I

A 29-year-old female patient reported to the Department of Conservative Dentistry and Endodontics with the chief complaint of intermittent pain and swelling in lower right front tooth region for 5 days which subsides after taking an analgesic. Her medical history was non-contributory. Dental history reported trauma 7 years back for which she had undergone dental treatment. Intraoral examination revealed bony swelling with the expansion of the buccal cortex in the region of tooth #41, #42. Tooth #41 was slightly extruded from its socket and found to be grade II mobile. It was tender on percussion. Vitality testing reveals nonvital #41 and vital #42. Radiographically huge periapical radiolucency was noticed around #41 measuring 16 x10 mm (fig. 1a) with a well-defined border. The tooth had already been opened by some

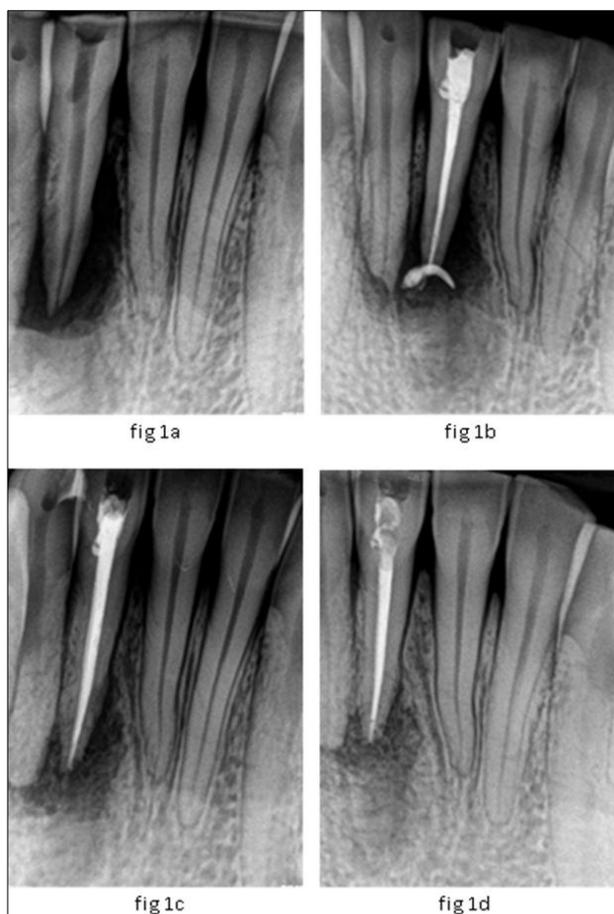


Fig.1 Different radiographs of case I

general practitioner before. Straw colored fluid flooded the canal after the removal of canal debris by 15# H file (Dentsply Maillefer Ballaigues, Switzerland) along with the simultaneous application of digital pressure. A provisional diagnosis of the periapical cyst was made, and non-surgical root canal treatment was decided. Working length was determined and working width of 0.45 mm was obtained by step back technique with 45# master apical file (Dentsply Maillefer Ballaigues,

Switzerland). Over instrumentation was done 2 mm beyond the apex with #30 k file (Dentsply Maillefer Ballaigues, Switzerland). After over instrumentation the straw colored fluid was aspirated with 24 gauge needle (Sigma-Aldrich) from the canal while obtaining the digital pressure in the vestibular area. Canal was irrigated with the help of sodium hypochlorite (Belo Dez de Ouro, Brazil). Finally, canal was dried with paper point (Dentsply Maillefer Ballaigues, Switzerland) and sealed with temporary restoration (Orafil-G, Prevest Denpro Ltd). The patient was prescribed with a course of antibiotic (Oforen- OZ 500mg BD for 5 days, Indoco Remedies Ltd.) and analgesic (Ibugesic Plus BD for 3 days, Cipla Ltd). After three days there was a marked reduction in the swelling but patient complained some discomfort in the vestibular area of the corresponding tooth. There were no exudates from the canal. After irrigation with sodium hypochlorite and temporization, the tooth was checked after 7 days and was found to be totally asymptomatic. Canal was dried, and calcium hydroxide with idoform (Metapex, Meta-Biomed Co. Ltd) was intentionally pushed slightly into the lesion and checked radiographically (fig. 1b). The patient was monitored radiographically every month. After 5 months the lesion reduced in size considerably and metapex inside the lesion got resorbed. Metapex was removed from the canal, and root canal treatment was completed at this stage (fig. 1c). The patient was recalled after one year when most of the lesion was found to be healed (fig. 1d).

### Case – II

A 21-year-old female, an undergraduate student of our college reported for radiographic examination because she had the history of trauma 4 years back w.r.t. tooth #22. Tooth # 22 was asymptomatic, and there was no sign of mobility and swelling. Vitality testing gave negative response w.r.t. tooth #22 but tooth #21 was vital. Radiographic examination reveals a radiolucency of 6x9 mm on the mesioapical aspect of the root. A provisional diagnosis of periapical granuloma was made and the tooth was decided to treat non-surgically. Access was made, with endo- Z bur (Dentsply Maillefer Ballaigues, Switzerland) and working length was established (fig 2a). Over-instrumentation was done with #15 K-file (Dentsply Maillefer Ballaigues, Switzerland). Since there were no exudates from the canal so diagnosis of periapical granuloma was confirmed. The biomechanical preparation was completed with the crown down technique with 5.25% sodium hypochlorite (Belo Dez de Ouro, Brazil) was used as an irrigant. Canal was dried with the paper points (Dentsply Maillefer Ballaigues, Switzerland) and calcium hydroxide formulation metapex (Metapex, Meta-Biomed Co. Ltd) was pushed into the lesion (fig 2b). The tooth was monitored radiographically every month. After 6 month sign of lesion, regression was found radiographically, and most of the metapex inside the lesion got resorbed (fig 2c). Root canal treatment was completed, and the patient was recalled one year after the obturation when the whole of the lesion was completely healed (fig 2d).

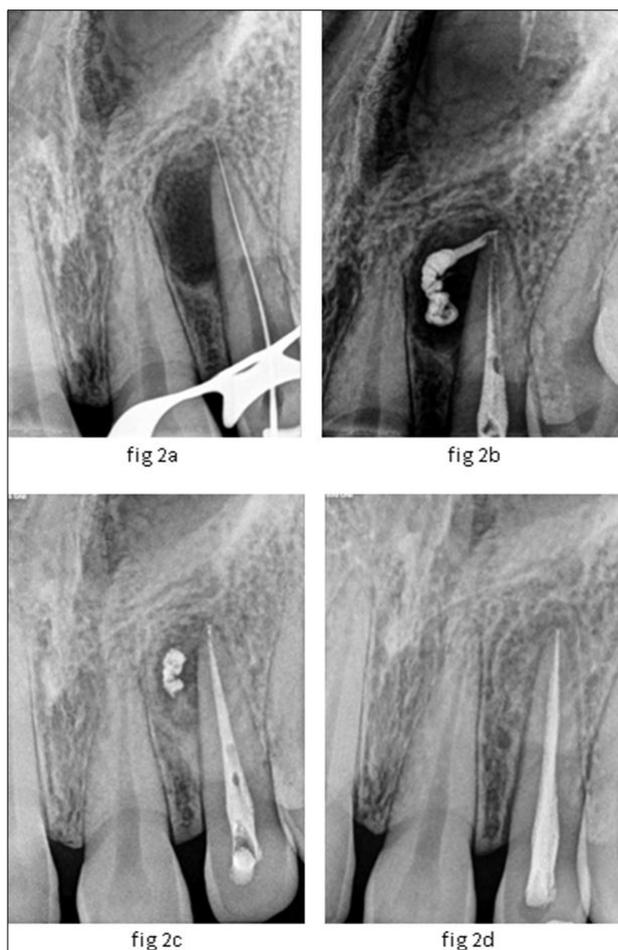


Fig. 2 Different radiographs of case II

### Case- III

32-year female patient was referred to our department from a general hospital. The reason behind referral was a continuous, pain in her front teeth for 4 days. She gave the history of trauma 5 years back w.r.t. tooth #11 and #12 and after trauma both the teeth were asymptomatic. On clinical examination, considerable swelling was noticed in the buccal vestibule of tooth #11 and #12 and was tender on palpation in the vestibular area. Both the teeth were slightly extruded from the socket and were also tender on percussion. Upon radiographic examination, large radiolucent lesion was found w.r.t. tooth #11 and #12 (fig 3a). So after clinical and radiographic examination provisional diagnosis of the periapical abscess was made. Access was made with Endo- Z (Dentsply Maillefer Ballaigues, Switzerland) bur and apical patency was confirmed with #15-K file (Dentsply Maillefer Ballaigues, Switzerland). A marked reduction of pain was noticed after access being opened, and the abscess was allowed to drain through the canal while making a constant digital pressure on the vestibular area. The biomechanical preparation was completed with the crown down technique to perform proper irrigation. Teeth were thoroughly irrigated with 5.25 % sodium hypochlorite (Belo Dez de Ouro, Brazil), dried with paper point (Dentsply Maillefer Ballaigues, Switzerland) and sealed with temporary restoration (Orafil-G, Prevest

Denpro Ltd). Canals were continuously irrigated for five days and the patient was prescribed a course of antibiotic and analgesic. Both swelling and pain gradually disappear. No exudates from the canal were found after 7 days. Calcium hydroxide formulation RC Cal (Prime Dental Private Ltd.) was placed inside the canal (fig 3b). Patient didn't come for follow up appointments and came after one year of medicament placement. There was a clear sign of bone healing radiographically (fig 3c). Obturation was completed, and the tooth was observed again six months after obturation which showed complete healing of periradicular area (fig 3d).

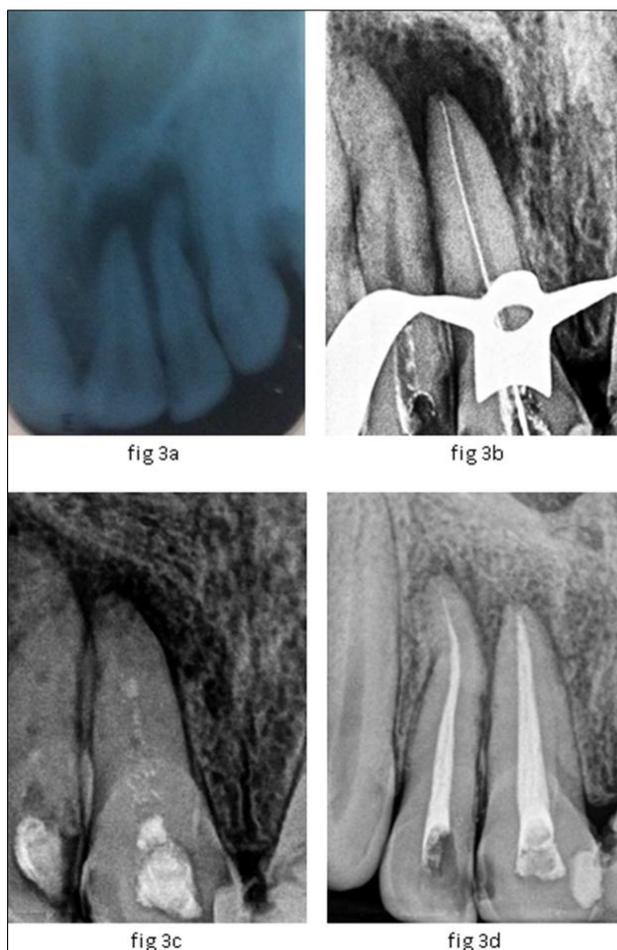


Fig. 3 Different radiographs of case III

## DISCUSSION

Necrosis of pulp due to trauma or caries that creates a favorable environment for different bacteria to grow, are the main reason behind the formation of a large periapical lesion.<sup>[1]</sup> An exact diagnosis of these lesions can only be made through histological examination, but a preliminary diagnosis can be made based on clinical and radiological examination. Non-surgical treatment protocol of these lesions whether a granuloma, cyst or abscess are almost similar. These lesions are considered to be inflammatory in origin, and inflammatory lesion can be healed after the removal of etiology of inflammation.<sup>8</sup> To reduce microbial load mechanical instrumentation and proper

irrigation of the canal are very important. However, medicament with bactericidal action is still needed to ensure optimum disinfection.<sup>9</sup> Irrigant is the chemical adjunct to the biomechanical preparation for the success of root canal treatment. Sodium hypochlorite is the main irrigant used in endodontics.<sup>10</sup> Calcium hydroxide is the most commonly used intracanal medicament to disinfect the canal.<sup>7</sup> So for the success of treatment of large periapical lesions, two things are important. Firstly, removal of the conditions responsible for the expansion of the lesion and secondly, removal of the microbiological etiology and disinfection of root canal along with long-term calcium hydroxide medicament. To reduce the hydrostatic pressure aspiration of cystic content through the root canal space by a narrow gauge needle is preferred.<sup>6</sup> Keles and Alcin<sup>11</sup> advocated the use of EndoVac system for aspiration of exudates from large periapical lesions. To disrupt the epithelial lining Bhaskar<sup>1</sup> advocated the over-instrumentation beyond the apex, which results in an inflammatory reaction that destroys the cyst lining and transforms the lesion into granuloma. This granuloma further heals by itself spontaneously after the microbiological factors are removed. Recently Metzger et al.<sup>12</sup> introduce a novel method that allows the removal or debulking of periapical tissues without surgical intervention. This method is based on a device known as Apexum ablator (Apexum Ltd, Or-Yehuda, Israel) that removes the chronically inflamed periapical tissues through a root canal by a procedure that is minimally invasive when compared with periapical surgery.

In the present case series, a very simple procedure is performed. Drainage of exudates through root canal was done either by using narrow gauge needle or through the canal by maintaining digital pressure in the vestibular area. This was followed by over-instrumentation beyond the apex to disrupt the epithelium lining and proper disinfection with suitable irrigants and medicaments. To reduce the microbial load and to disinfect the canal sodium hypochlorite was used as irrigants and calcium hydroxide formulations Metapex (calcium hydroxide + barium sulphate + iodoform) and RC Cal (calcium hydroxide + barium sulphate) were used for long term intracanal medicament. Iodoform provides antiseptic action due to iodine release in the nascent state.<sup>13</sup> Barium sulphate is used for radio-pacifier. In the present case series, these formulations were intentionally pushed into the lesion. Extension of the material beyond the apex has been advocated by some authors however some author contradicts this. Mode of action of calcium hydroxide beyond the apex may be due to its antibacterial, anti-inflammatory, neutralization of acid products and activation of alkaline phosphatase which plays an important role in hard tissue formation.<sup>14</sup> Barium sulphate may provide long-term effect of calcium hydroxide because it resorbs slowly. The intentional extrusion should be avoided in lower premolar and molar area to avoid inferior alveolar nerve paraesthesia. Vernieks and Messer<sup>15</sup> advocated that calcium hydroxide extrusion beyond the apex might cause the lack of early

healing of periapical lesions. Barium sulfate present in these formulations can obscure the apex and makes the radiographic interpretation more difficult because of the radio-opacity of barium sulfate. This is also advocated by De Moor and De Witte,<sup>16</sup> they reported that in the cases of calcium hydroxide overextension, repair took more time to be complete. However in the present case series, complete resorption of these calcium hydroxide formulations within 5 month with very good periapical healing occurs. Orucoglu,<sup>17</sup> and Matsuzaki<sup>18</sup> and UP Singh<sup>19</sup> also reported no detrimental effect of iodoform and barium sulfate on the healing kinetics of periradicular area. Healing of periradicular tissues involves regeneration of bone, periodontal ligament, and cementum. In the present case series, the obturation is completed after favorable healing and repair seen radiographically. Decrease the size of the lesion, increase the density of bone, formation of lamina dura is the radiographic sign of healing and repair of the periradicular area. In a long time period clinical study, Calskan<sup>20</sup> reported 42 non-surgically treated teeth with large cyst-like lesions observed that 73.8% of all cases completely healed with nonsurgical treatment. These large lesions fail to heal if there remains a persistent source of infection.<sup>21</sup> Any medical conditions such as diabetes or immune-compromised state of the patient may also contribute to the failure of treatment. In a case of treatment failure, additional surgical treatment should be considered along with the nonsurgical root canal treatment.

## CONCLUSION

The surgical approach is not the only treatment option that remains for treating the large periapical lesions. These lesions can be successfully treated with the nonsurgical endodontic approach along with long-term calcium hydroxide therapy. Barium sulphate and iodoform along with calcium hydroxide do not have the detrimental effect on healing kinetics if extruded periapically.

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