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RESEARCH ARTICLE

EFFECT OF INTENTIONAL EXTRUSION OF NON-SETTING CALCIUM HYDROXIDE IN TREATMENT OF TEETH WITH INTRAORAL DRAINING SINUS

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ABSTRACT

Calcium hydroxide is one of the most effective, biocompatible, alkaline substance that has been in use by endodontists around the world since almost a century. It is also considered as the material of choice by many clinicians. This case series of six cases (5 males and 1 female aging 32 to 66 years), describes a successful management of periapical lesions with intraoral draining sinus by intentionally extruding premixed non setting paste of calcium hydroxide. The patients were reviewed after 1 week of application and the canals were obturated after 2 weeks followed by 1 year follow up. The presented case reports revealed almost complete healing of the sinus tract within first 2 weeks of application of calcium hydroxide and at 1 year follow up, it was observed that the peri-apical lesion had disappeared radiographically and no recurrence of draining sinus had been reported. The extrusion of calcium hydroxide turned out to be a boon to the cases and had no detrimental effect.

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INTRODUCTION

The use of Calcium hydroxide $Ca(OH)_2$ as an intra-canal medicament is a standard procedure all across the globe for almost a century. It has also been associated with periradicular healing. The antibacterial efficacy of $Ca(OH)_2$ in human root canals has been well documented in the past (Bystrom *et al*., 1985; Bystrom and Sundqvist, 1985). Subsequent studies proved these reports and validated the use of $Ca(OH)_2$ as an intra-canal medicament (Orstavik *et al*., 1991; Sjogren *et al*., 1990). Dental caries is associated with bacteria, which sometimes enter the pulp space and subsequently into the peri-radicular tissues. Some of the pyogenic bacteria may lead to pus formation in peri-radicular tissues and this infection can destroy the cancellous alveolar bone and may proceed along the periosteum until perforation occurs. As a result of which an intra-oral or an extra-oral sinus can develop, which is dictated by surrounding muscles and facial spaces. The most common between the two is intra-oral sinus, which is a result of cortical bone perforation above the level of muscle attachment in the mandible. A few cases of extra-oral sinus or cutaneous sinus are also reported which formed due to perforation of the bone below the level of muscle attachment on the mandible (Yang and Lai, 1992). These intracanal medicaments were always thought to be used within the confines of root canal space (Jose Jose and Siqueira, 2005). But during the procedure, the medicament can sometimes unintentionally or accidentally extrude through the apex of the tooth, if there is a large peri-apical lesion present or in the cases of transportation or blunderbuss apex. Although, some clinicians intentionally extruded $Ca(OH)_2$ beyond the apex into the periradicular tissues, as they believe that it has a healing effect on inflamed tissue and cystic or sinus epithelium. This is mainly because of its high alkalinity that it can necrose the epithelium of any cyst or sinus tract. It also encourages periapical healing and encourages osseous repair because of its osseoinductive property (Tronstad *et al*., 1981). Such deliberate overextension is not, however, widely accepted because according to some reports the $Ca(OH)_2$ can have detrimental effects on peri-radicular tissues. (Dunham *et al*., 1966; Andreasen and Kristerson, 1981; De Bruyne *et al*., 2000) In endodontics, $BaSO_4$ is the most common radiopaquer used in $Ca(OH)_2$ pastes. But when $Ca(OH)_2$ paste with $BaSO_4$ (radiopaquer) is extruded beyond the apex, the $BaSO_4$ being insoluble can obscure the apex and it is not readily resorbed over time. It is also reported to slow down the healing of peri-radicular tissues in the past. This radiopaque $BaSO_4$ might also make the radiographic interpretation of osseous healing more difficult. Therefore, some clinicians prefer to use pure $Ca(OH)_2$ powder mixed with distilled water or saline because they believe that most of the commercially available preparations have variable

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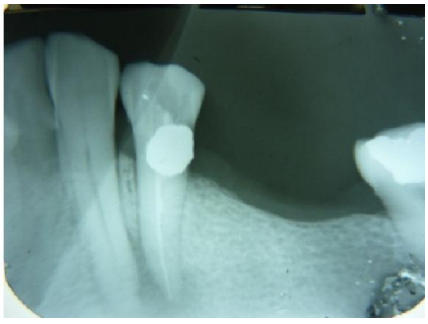
amounts of $BaSO_4$ or some other ingredients that can retard the healing (Alacam *et al*., 19990). This case series aims to demonstrate six cases of periapical lesions with intraoral draining sinus, managed conservatively by intentionally extruding premixed low viscosity calcium hydroxide without any radiopaquing agent, out of the sinus tract and also evaluating its prognosis over 1 year time.

Case Report 1

A 52 years old female patient came to our clinic with a chief complaint of swelling in right lower back teeth region since 1 year. She got her root canal treatment done in the same tooth 10 years ago. There was an intra-oral draining sinus present in respect to 44. A routine periapical radiograph revealed the presence of GP obturation till apex and a periapical lesion in association with the premolar. Sinus tracking was done with the help of gutta percha and on radiographic examination we could find out the presence of sinus tract with respect to mandibular right 1st premolar. Re-RCT was planned for the case. Old amalgam restoration was removed by bur and GP were retrieved with the help of an #25 H- file. There was no drainage through the canal. Working length was determined and the apex was perforated with 15no K file. Canal was then shaped with manual protapers (DENTSPLY) using crown down technique upto the finishing file #25(F2). During the preparation, the canal was irrigated copiously with normal saline and 2.5% sodium hypochlorite. Canal was then dried with sterile paper points. Injectable calcium hydroxide was placed in to the canal and forced intentionally through the apex until visible through the other end of the sinus tract. Acess cavity was sealed with cavit. Patient was recalled after 1 week for evaluation, which showed marked resolution of the sinus opening. On next visit after 15 days, the tooth was asymptomatic and healing of sinus tract was evident so the tooth was obturated on the same appointment. Post and core was done after the abturation in subsequent appointments and crown was luted over it.

a. Diagnostic Picture



b. Diagnostic IOPA X-ray

c. 1 year Post-op RVG

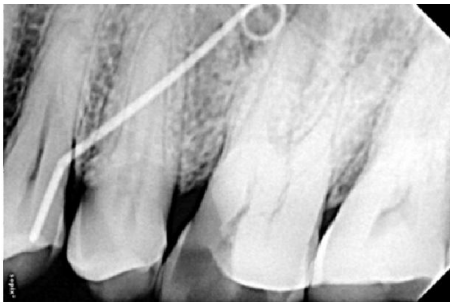
d. 1 year post-op picture

The patient was happy with complete healing and no pain. After 12 months follow up, radiograph showed the progressive process of healing.

Case Report 2

A 61 years old male patient was referred to our clinic with a chief complaint of pain in left upper back teeth region of the jaw since 2 months. 26 had a fractured mesio-lingual cusp & 27 was tender on percussion. There was also a swelling in the gums irt 24 & 25. A tracing GP was inserted into the swelling to trace its origin, which was found to be the mesiobuccal canal of 26. Endodontic therapy was planned for 26 & 27 the case. The access cavity was prepared after injection of local anaesthesia. There was no drainage through the canal. Working length was determined and the apex was perforated with 15no K file. Canal was then shaped with manual protapers (DENTSPLY) using crown down technique upto the finishing file #25(F2) for MB & DB canal and F3 for palatal canal. During the preparation, the canal was irrigated copiously with normal saline and 2.5% sodium hypochlorite. Canal was then dried with sterile paper points. Injectable calcium hydroxide was placed in to the canal and forced intentionally through the apex until visible through the other end of the sinus tract. Access cavity was sealed with cavit. Patient was recalled after 1 week for evaluation, the tooth was asymptomatic and healing of sinus tract was evident. He was then recalled after a week for obturation of the canal. The patient reported after 12 months, radiograph showed the progressive process of healing. He also reported no recurrence of any sinus or pain in the area.

a. Diagnostic Picture



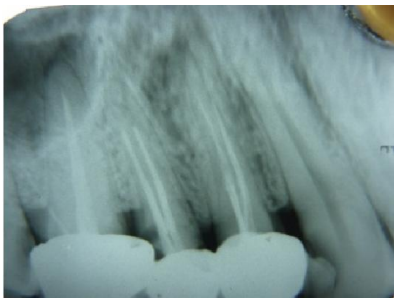
b. Diagnostic RVG with Tracing GP

c. 1 year post-op picture

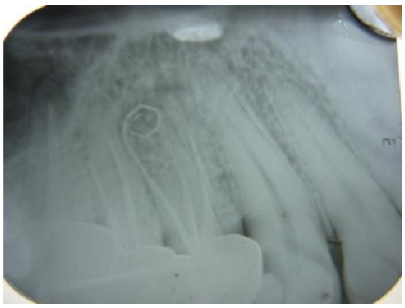
d. 1 year post-op RVG

Case Report 3

A 46 years old male patient came with a chief complaint of swelling in right upper back teeth region of the jaw since 2 weeks. There was a draining sinus present irt 14 & 15. The premolars were slightly tender on percussion. A routine peri-apical radiograph revealed the presence of a peri-apical lesion in association with 14. Careful examination revealed intraoral draining sinus tract on the buccal gingiva of the right maxillary premolars. Sinus tracking was done with the help of gutta percha and on radiographic examination we could find out the presence of sinus tract with respect to maxillary right 1st premolar. Both the premolars were RC treated some 4-5 years ago. Endodontic therapy was planned for 14. Crown was removed. Working length was determined and the apex was perforated with 15 no K file. Canals were then shaped with manual protapers (DENTSPLY) using crown down technique upto the finishing file #20(F1). During the preparation, the canal was irrigated copiously with normal saline and 2.5% sodium hypochlorite. Canals were then dried with sterile paper points. Injectable calcium hydroxide was placed in to the canals and forced intentionally through the apex until visible through the other end of the sinus tract. Acess cavity was sealed with cavit. Patient was recalled after 1 week for evaluation. On next visit the tooth was asymptomatic and healing of sinus tract was evident. She was then recalled after a week for obturation of the canals. The patient was happy with complete healing and no pain. After 12 months follow up, radiograph showed the progressive process of healing.



a. Diagnostic IOPA X-Ray

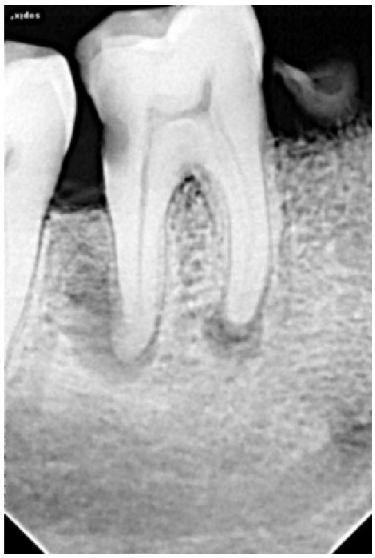


b. Diagnostic X-Ray with tracing GP

c. 1 year post-op RVG

Case Report 4

A 54 years old male patient was referred to our clinic with a chief complaint of decay in right lower back teeth region of the jaw since 6 months. There was a Class II carried in 46 and an intra-oral draining sinus present between 46 & 47. 45 was missing A routine periapical radiograph revealed the presence of a periapical lesion in association with 46. Sinus tracking was done with the help of gutta percha and on radiographic examination we could find out the presence of sinus tract with respect to mandibular right 1st molar. Endodontic therapy was planned for 46. The access cavity was prepared after IANB. There was no drainage through the canal. Working length was determined and the apex was perforated with 15 no. K file. 4 Canals were then shaped with manual protapers (DENTSPLY) using crown down technique upto the finishing file #25(F2). During the preparation, the canals were irrigated copiously with normal saline and 2.5% sodium hypochlorite. Canal were then dried with sterile paper points. Injectable calcium hydroxide was placed into the distal canal and forced intentionally through the apex until visible through the other end of the sinus tract. Acess cavity was sealed with cavit. Patient was recalled after 1 week for evaluation. On next visit the tooth was asymptomatic and healing of sinus tract was evident. He was then recalled after a week for obturation of the canal. The patient was happy with complete healing and no pain. After 10 months follow up, radiograph showed the progressive process of healing.



a. Diagnostic RVG

b. Intra-op $Ca(OH)_2$ extrusion through sinus tract

c. 1 year post-op RVG

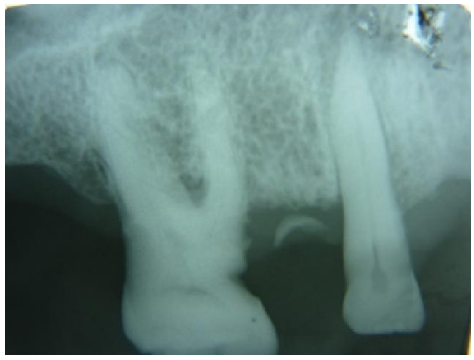
d. 1 year post-op picture

Case Report 5

A 66 years old male patient came with a chief complaint of multiple missing teeth since 4-5 years and also a small swelling which comes and goes on and off on its own. Careful examination revealed severe abrasion in 14 intraoral draining sinus tract on the buccal gingiva of the right maxillary 1st premolar. Sinus tracking was done with the help of gutta percha and on radiographic examination we could find out the presence of sinus tract with respect to maxillary right 1st premolar. Endodontic therapy was planned for the case. The access cavity was prepared after injection of local anaesthesia. There was no drainage through the canal. Working length was determined and the apex was perforated with 15no K file. Canal was then shaped with manual protapers (DENTSPLY) using crown down technique upto the finishing file #20(F1). During the preparation, the canal was irrigated copiously with normal saline and 2.5% sodium hypochlorite. Canal was then dried with sterile paper points. Injectable calcium hydroxide was placed in to the canal and forced intentionally through the apex until visible through the other end of the sinus tract. Acess cavity was sealed with cavit. Patient was recalled after 1 week for evaluation. On next visit the tooth was asymptomatic and healing of sinus tract was evident . She was then recalled after a week for obturation of the canal. The patient was happy with complete healing and no pain. After 12 months follow up, radiograph showed the progressive process of healing.

Case Report 6

A 32 years old male patient came with a chief complaint of pain & swelling in right lower back teeth region of the jaw since 3 years. He got his RCT done in the same tooth 3 years ago and shortly sfter the treatment was finished, this small swelling appeared which increases and decreases in size with time and drains pus through it.



a. Diagnostic IOPA X-Ray

b. 1 year post-op RVG

The 1st molars was slightly tender on percussion. Sinus tracking was done with the help of gutta percha and on radiographic examination we could find out the presence of sinus tract with respect to mandibular right 1st molar. The radiograph also showed 2 distal roots (Radix Entomolaris). Re-RCT was planned for the case. The crown was removed and old amalgam filling over the access cavity was also removed. 4 canals were found in total and Disto-lingual was missed last time. Working length was determined and the apex was perforated with 15no K file. Canal was then shaped with manual protapers (DENTSPLY) using crown down technique upto the finishing file #25(F2). During the preparation, the canal was irrigated copiously with normal saline and 2.5% sodium hypochlorite. Canal was then dried with sterile paper points. Injectable calcium hydroxide was placed in to the canal and forced intentionally through the apex until visible through the other end of the sinus tract. Acess cavity was sealed with cavit. Patient was recalled after 1 week for evaluation. On next visit the tooth was asymptomatic and healing of sinus tract was evident. She was then recalled after a week for obturation of the canal. The patient was happy with complete healing and no pain. After 12 months follow up, radiograph showed the progressive process of healing.

a. Diagnostic RVG with tracing GP

b. 1 year post-op RVG

DISCUSSION

The presented case reports showed that when a premixed $Ca(OH)_2$ paste was applied as an intracanal dressing and forced out through the sinus tract, there was no discomfort to the patients with complete healing of the tract within 15 days of application and the teeth were completely asymptomatic. Progressive healing of the lesion was observed on 1 year follow up. Earlier studies reported that if $Ca(OH)_2$ containing radiopaque materials is extruded beyond, it can obscure the apex and does not readily resorb over time leading to delayed healing (Alacam *et al*., 1990). A study by Webber *et al*. suggested, if BaSO4:Ca(OH)2 is reduced to 1:8 then it will reduce the problem of residual radiopacity at the root apex (Webber *et al*., 1981). Henceforth, in our cases we decided to use non setting calcium hydroxide without any opacifier which came out to be a boon to our cases. The efficacy of $Ca(OH)_2$ is dependent on the time for which it is left inside the canal as it has the ability to dissociate into hydroxyl and calcium ions. Studies of hydroxyl ion diffusion through dental structure suggest that the minimum time for keeping calcium hydroxide in the canals should be 2-3 weeks (SiqueiraJr and Lopes, 1999). This is the minimum time in which it can reach threshold alkalinity so it can inactivate or eliminate bacteria and fungi

from the root canal complex and may be the smear layer as well (Soares *et al*., 2005; Leonardo *et al*., 2002). However, previous reports have also showed satisfactory antiseptic results with $Ca(OH)_2$ in just 7 days as well (Sjögren *et al*., 1991). In the present case reports, complete biomechanical preparation of the root canal was done and recommended irrigants were used with simultaneous application of a calcium hydroxide dressing for 1 week at the first appointment followed by obturation of the root canal at the second appointment a week after. In the literature, there are number of reports relating the beneficial effects of calcium hydroxide preparation (Siqueira and Lopes, 1999; Soares *et al*., 2005; Leonardo *et al*., 2002; Sjögren *et al*., 1991). Calcium hydroxide in a paste form is a widely used medicament in endodontics pertaining to its high alkalinity, antibacterial action and its osseoinductive property (Siqueira and Lopes, 1999; Webber, 1983; Cvek, 1972; Tronstad *et al*., 1981; Ghose *et al*., 1987; Sonat *et al*., 1990). It has been established that overfilling of root canals with calcium hydroxide has been advocated, because of its healing effect on inflamed tissue and cystic epithelium and is also beneficial for osseoinductive reasons (Cvek, 1972; Tronstad *et al*., 1981; Orstavik *et al*., 1991). Sahli (Rotstein *et al*., 1990) suggested that the necrotising ability of calcium hydroxide might destroy any epithelium present and which allow connective tissue to invaginate into the lesion with ultimate healing. Consequently, although there are many controversies in the extrusion of calcium hydroxide for the healing of sinus tracts, in the present case reports, there was successful healing of the draining sinus with no adverse effect. There have not been many studies conducted on the extrusion of $Ca(OH)_2$ from sinus tracts in the past according to the best of our knowledge. Therefore, more comparative studies with greater sample size are required on this methodology for validation of this concept.

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