Calcium Hydroxide Paste Formulations : A Review & Case Reports Showing Non Surgical Healing.

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Abstract

Calcium hydroxide has been used in endodontology for many years. The aim of this paper is to review the various formulations of calcium hydroxide and its use in non surgical healing of periapical radiolucencies. The review also describes the use of various active components that have been added to calcium hydroxide, including antimicrobial and anti inflammatory agents. This review will help clinicians to make informed judgments about which formulations of calcium hydroxide should be used for specific endodontic procedures.

Keywords: Calcium Hydroxide, Pastes, Vehicles.

Introduction

Since its introduction in dentistry , calcium hydroxide has been indicated to promote healing in many clinical situations. Although the overall mechanisms of action of calcium hydroxide are not fully understood, many articles have been published describing its biological properties which are achieved by the dissociation in Ca2. and OH ions. The role of the high pH and the ionic activity in the healing process, diffusion through dentinal tubules, influence on apical microleakage and some clinical topics, such as the placement of the paste within the root canal, how to deal with interim flare-ups, the importance of periodic follow-up and re-dressings and the importance of the interappointment restoration, are examples of how this material has been evaluated since its introduction.

Along with the expanded clinical use of calcium hydroxide, the literature also discusses the use of various formulations and provides suggestions for mixing calcium hydroxide powder with other substances. As will be seen, many substances have been added to the powder to improve properties such as the antibacterial action, radiopacity, flow and consistency. In spite of the variations, the literature lacks a classification of these different paste formulations.The purpose of the present paper is to classify and describe the different formulations of calcium hydroxide, relating these to in vitro investigations, evaluation in laboratory animals and clinical studies where different pastes have been employed and present case reports showing non surgical healing of periapical radiolucencies.

Calcium hydroxide paste formulations

When calcium hydroxide powder is mixed with a suitable vehicle, a paste is formed and, because the main component is calcium hydroxide.

The easiest method to prepare a calcium hydroxide paste is to mix calcium hydroxide powder with water until the desired consistency is achieved. However, a paste prepared with water or other hydrosoluble non-viscous vehicle does not have good physicochemical properties, because it is not radio-opaque, is permeable to tissue fluids and is rendered soluble and resorbed from the periapical area and from within the root canal.

In essence, a calcium hydroxide paste for use in endodontics is composed of the powder, a vehicle and a radiopacifier. Other substances may be added to improve physicochemical properties or the antibacterial action.

Types of vehicles and their importance

Aqueous vehicles

Pastes prepared at the chairside-

1. Water- The literature describes different `types' of water with which to prepare the paste, including sterile water, distilled water, sterile distilled water, bidistilled water and sterile bidistilled water.

2. Saline or sterile saline- According to the United States Pharmacopeia (1989) saline is prepared by dissolving 9 g of

sodium chloride in water to make 1000 mL.

3. Anaesthetic solutions - Anaesthetic solutions, with or without a vasoconstrictor, have been used as the vehicle of the paste because these solutions are readily available, sterile and easy to handle.

4. Methylcellulose and carboxy-methylcellulose- This paste composed of equal volumes of calcium hydroxide powder and iodoform mixed with a 5% aqueous solution of methylcellulose.

5.Anionic detergent solution- calcium hydroxide powder has been mixed with an aqueous detergent solution to\increase the action of the calcium hydroxide deeper into the tissues.

Proprietry Brands: Calxyl, Pulpdent, Tempcanal, Calvital, Reogen, Calcept, hypocal, Calcicur etc.

Viscous Cehicles

Pastes prepared at the time of use-

1. Glycerine- Because of its hygroscopic properties, glycerine is very useful as a moistening substance and, as it is soluble in water, it is easily removed. Furthermore, it is non-toxic and is used as an intracanal lubricant. This paste was employed for root-end closure of immature non-vital teeth.

2. Polyethyleneglycol- Polyethyleneglycol is a viscous, colourless liquid with a characteristic odour and it is slightly hygroscopic.

3. Propyleneglycol- Propyleneglycol is a clear, colourless, odourless liquid with a slightly characteristic taste resembling that of glycerine. Chemically, it is a dihydric alcohol with a syrupy consistency, hygroscopic in nature and non-toxic that can be mixed with water, acetone and alcohol in any proportion.

Proprietry Brands - Calen, Calen + CMCP, Calen + Parachlorphenol etc.

Oily vehicles

Pastes prepared at the time of use-

1.Olive oil- Purified olive oil is a primrose or slightly green coloured liquid with a characteristic odour, which is non-soluble in water but fairly soluble in alcohol. It promotes low solubility for the calcium hydroxide but improves its physical properties

2. Camphorated parachlorophenol. When camphorated parachlorophenol is the vehicle of a calcium hydroxide paste, it is an oily vehicle because camphor is considered an essential oil with low solubility in water .

3. Metacresylacetate- When calcium hydroxide is mixed with metacresylacetate, a chemical reaction occurs yielding calcium cresilate and acetic acid. The acetic acid suffers an ionic dissociation and gives off H. ions, which decreases the pH.

4. Eugenol- In humans it has been employed as an intracanal dressing for vital and non-vital deciduous teeth .

Proprietry Brands - Endoapex, L&C, Vitapex, Metapex etc.

Case reports showing non surgical healing using METAPEX

Conclusions

The vehicle to which calcium hydroxide is mixed to form the paste used in endodontics affects the physical and chemical properties of the compound and hence its clinical applications. In general, viscous and oily vehicles prolong the action of the calcium hydroxide compared with water-soluble substances.

References

1. Abbott PV, Hume WR, Heithersay GS (1989) Effects of combining Ledermix1 and calcium hydroxide pastes on the diffusion of corticosteroid and tetracycline through human roots in vitro. Endodontics and Dental Traumatology 5, 188±92.
2. AlacË am T, Gorgul G, Omurlu H (1990) Evaluation of diagnostic radiopaque contrast materials used with calcium hydroxide. Journal of Endodontics 16, 365±8.
3. Allard U, Stromberg U, Stromberg T (1987) Endodontic treatment of experimentally induced apical periodontitis in dogs. Endodontics and Dental Traumatology 3, 240±4.
4. Barbosa CAM, GoncË alves RB, Siqueira JF Jr, Uzeda M (1995) Evaluation of the antibacterial activities of calcium hydroxide, chlorhexidine and camphorated paramonochlorophenol as intracanal medicaments. A clinical and laboratory study. Journal of Endodontics 23, 297±300.
5. Barclay C (1993) Root resorption. 2 ± internal root resorption. Dental Update 20, 292±4.
6. CË aliskan MK, Pehlivan Y (1996) Prognosis of root-fractured permanent incisors. Endodontics and Dental Traumatology 12, 129±36.
7. Calcium hydroxide pastes: classification and clinical indications L. R. G. Fava & W. P. Saunders International Endodontic Journal, 32, 257±282, 1999.
8. Dumsha TC, Gutmann M (1985) Clinical techniques for the placement of calcium hydroxide. Compendium of Continuing Education in Dentistry 6, 482±9.
9. Fuss Z, Rafaeloff R, Tagger M, Szajkis S (1996) Intracanal pH changes of calcium hydroxide pastes exposed to carbon dioxide in vitro. Journal of Endodontics 22, 362±4.
10. Holland R, Souza V, Nery MJ, Mello MJ, BernabeÂ PFE, Otoboni Filho JA (1978b) Effect of the dressing in root canal treatment with calcium hydroxide. Revista da Faculdade de Odontologia de AracË atuba 7, 40±5.
11. Juge H (1959) Resorbable pastes for root filling. International Dental Journal 9, 461±76.
12. Nosrat IV, Nosrat CA (1998) Reparative hard tissue formation following calcium hydroxide application after partial pulpotomy in cariously exposed pulps of permanent teeth. International Endodontic Journal 31, 221±6.
13. Saad AY (1988) Calcium hydroxide and apexogenesis. Oral Surgery, Oral Medicine and Oral Pathology 66, 499±501.
14. Siqueira JF Jr, Uzeda M (1997) Intracanal medicaments: evaluation of the antibacterial effects of chlorhexidine, metronidazole and calcium hydroxide associated with three vehicles.

Journal of Endodontics 23, 167±9.

15. Tronstad L, Mjor IA (1972) Pulp reactions to calcium hydroxide-containing materials. Oral Surgery, Oral Medicine, Oral Pathology 33, 961±5.

Legends

Case Report 1

Fig 1: Anterior Teeth Showing Periapical Radiolucency

Fig2: Anterior Teeth Showing Healing

Case Report 2

Fig3: Premolar Showing Periapical Radiolucency

Fig4: Premolar Showing Healing

Fig 5 Molar Showing Periapical Radiolucency

Fig6: Molar Showing Healing

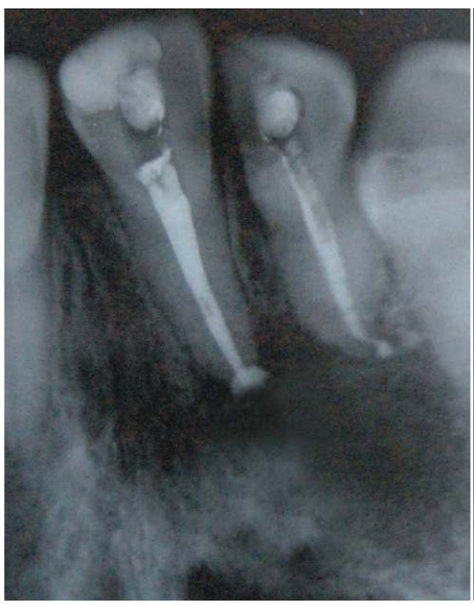


Fig. 1

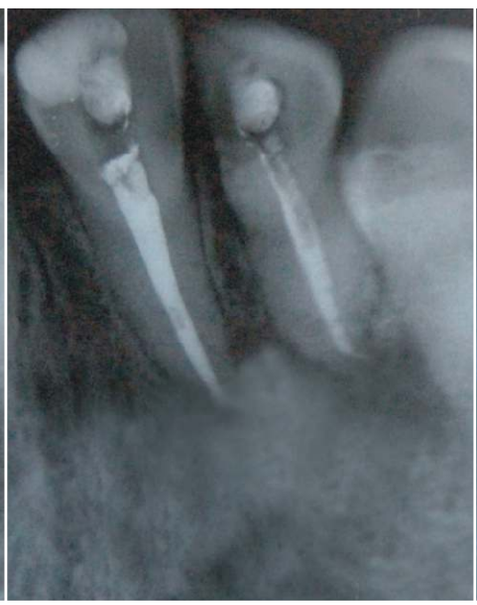
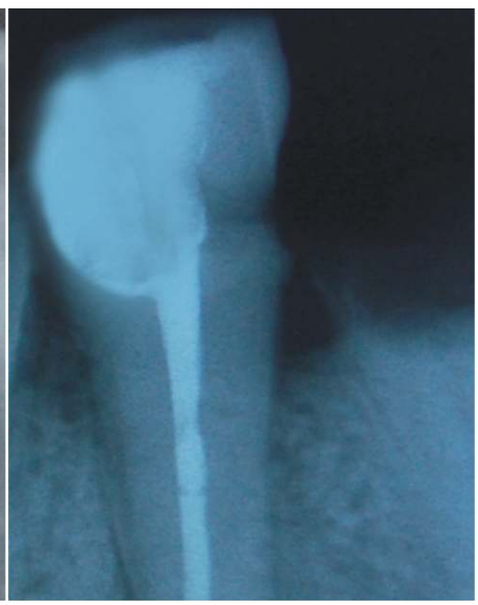


Fig. 2



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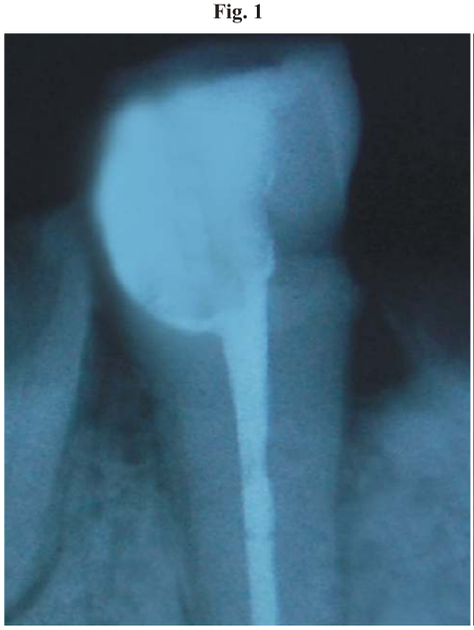

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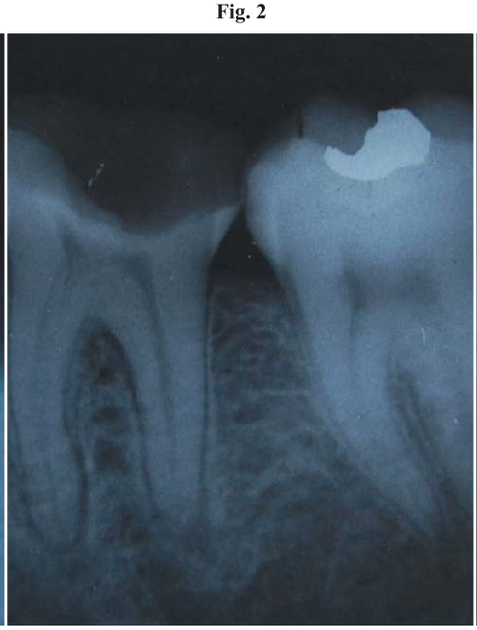

Fig. 5

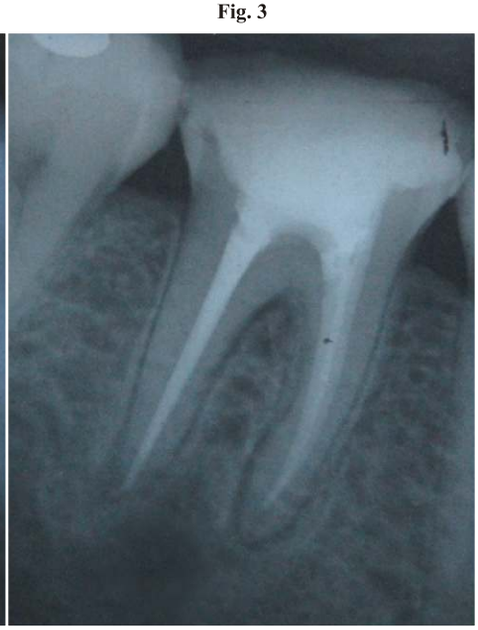

Fig. 6