

Intracanal Medicaments in Paediatric Endodontics

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Abstract

The basic motive of Paediatric Endodontic Therapy is to remove microorganisms such as bacteria from the root canal system in which the remaining bacteria cannot survive. Intracanal Medicaments is an imperative step in killing the bacteria in root canals. Moreover, in Paediatric Endodontic, cleaning & shaping is important than intracanal medicaments. The objective of Intracanal Dressing is for a blockade coronal discharge from the space between filling materials and cavity walls. For intracanal medicaments, calcium hydroxide mixed with slim paste is more convenient as it is stable, harmless to the body and bactericidal. If multiple visits to endodontic are chosen, it is strongly recommended. Therefore, the purpose is to examine the need for an intracanal medicament.

Keywords: *Paediatric Endodontic; Medicaments, Formocresol, Glutaraldehyde, Calcium hydroxide.*

Introduction

Intracanal Medicament is a cardinal step in killing the bacteria in root canals and is considered to be an integral part of the success of Root Canal Therapy. In Endodontic Therapy of deciduous teeth because of the convoluted structure of the root canal and the change in the biomechanical preparation is restricted to the only debridement of Root Canals. There is no need of Intracanal Medicament in the vital pulp. When the Root canal space is left unfilled microbial recolonisation takes place and provide shelter to the microorganisms and they are by-products within the pulpal tissue for which it becomes an important part for placing the medicaments within the pulp chamber by their antimicrobial effect.¹ Out of which 2% glutaraldehyde, potassium iodine is reported to have better effect. Dical is also available in two forms which are base (titanium dioxide in glycol salicylate with pigments) and catalyst paste

(Calcium Hydroxide and Zinc Oxide in Ethyl Toluidine Sulphonamide).²

History: In 1045 AD Serebonium, initialised oils and wine in the mouth of the patient which was a drastic attempt to achieve a topical anaesthetic effect on the tooth. In 1800, various Medicaments were used for Paediatric Endodontic treatment; Phenol was added to preserve and sterilize the canal contents and to pacify pain.³

Table 1. Classification of Intracanal Medicaments by Grossman

Essential Oils	Eugenol
Phenolic Compounds	Phenol, Parachlorophenol, Cetylpyridinium Chloride (CPC), Formocresol, Metacresylacetate (Crestatin), Cresol, Creosote (Beechwood), Thymol
Aldehydes	Formocresol, Glutaraldehyde
Halides	Sodium Hypochlorite, Iodine, Potassium Iodide, Steroids, Calcium Hydroxide, Antibiotics

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Composition of Medicaments:

For Primary Tooth: It includes medicaments such as Formocresol, Glutaraldehyde, Calcium Hydroxide and Ferric Sulphate.

For Permanent Teeth: It includes medicaments such as Calcium Hydroxide, Electrosurgery, Laser Pulpotomy, Bone Morphogenic Proteins (BMP), Osteogenic Proteins I, II, Mineral Trioxide Aggregate (MTA)

Ideal Requirements: It should be stable in solution which is an effective antimicrobial agent. It should have low surface tension and does not stain tooth structure. It should be non-irritating to the periradicular tissue. It should be active in the presence of blood serum and protein derivatives of tissues. It should have a tedious antimicrobial effect with a non-induced cell-mediated immune response.⁴

Properties:

Duration: Activity can inhibit the regrowth of bacteria because of calcium hydroxide. Phenolics dissipate their activity within 24hrs while Tetracycline activity lasts up to 12hrs but the clinical effectiveness of MTAD decreases the duration to 4weeks.

Toxicity: To become a foreign substance, medicaments act as chapters which elicit an immune response. Phenolics and Aldehydes are generally potent cell killers. Due to strong alkalinity of Calcium Hydroxide, it may destroy the Carboxylate and Phosphate groups which results in the collapse in the dentine structure.⁵

Antibiotics: In primary teeth, Ciprofloxacin, Metronidazole & minocycline are used for sterilization of infected root dentine to prevent the resistance development against microorganisms. These drugs penetrate deep into the root dentine which eradicates bacteria. Root canal dressings are found to be effective in a combination of antibiotics. Thus, it can be widely used as an Intracanal Medicaments in Paediatric patients.

Indications: For persistently wet or weeping canals. For neutralizing tissue debris with rendering root canal contents. For eliminating excess microbes which act as a barrier against leakage and for dressing in symptomatic cases.⁶

Recent Advancement of Intracanal Medicaments Used in Paediatric Dentistry:

Bioactive Glass: Invented in 1969, by Dr French,

it allows the hard and soft tissues so that the surface gets directly bonded with the materials. Due to their antimicrobial effect pH level is raised which is not effective for bacterial and host cells. Because of complex particles, the dentin powder solution act as a recipient and in aqueous suspension the glass act as a catalyst. As mineralisation of dentin is induced and it possesses a negative effect when used as an intracanal dressing which harms the teeth. It is more effective than Calcium Hydroxide and less effective than 2% CHX.⁷

Ozonised Oil: It can be used as Intracanal Medicaments in various possible ways by dissolving the ozone with oil for lubrication and disinfection purpose. After its use on behalf of Intracanal Medication, the success rate for periradicular lesions and their antibacterial activity is also very high. So it can be used because of its greater efficacy and productivity.

Propolis: It serves as a better Intracanal Medicament because of its anti-inflammatory and good antimicrobial agent but when compared with saline and NaCl, propolis activity is equal to that of NaCl. In the case of pulp and periapical pathologies, it can be used as short term medications.⁷

Octenidine: Due to the prolonged bacterial anti-adhesive activity, it is more effective than chlorhexidine. Hence, complete elimination of root canal is ensured due to its anti-bacterial action which may harm the paediatric patients. Microorganisms may be guarded against the Intracanal Medicaments within the dentinal tubules by the inhibiting effects of dentin and progressive resistance after direct contact with them to Intracanal Medicaments.⁷

Other commonly used intracanal medicaments

Calcium Hydroxide:

Introduced by Hermann, in 1920, as a Calcium Hydroxide paste which is prepared by diluting with sterile or saline water. Lentilspiral is used for placing the paste inside the canal to full working length. They are used for root inflammatory resorption is inhibited and microbial control is obtained. It serves as temporary obturating material. It stimulates hard tissue formation. It heals the inflammation of the periapical region.⁸

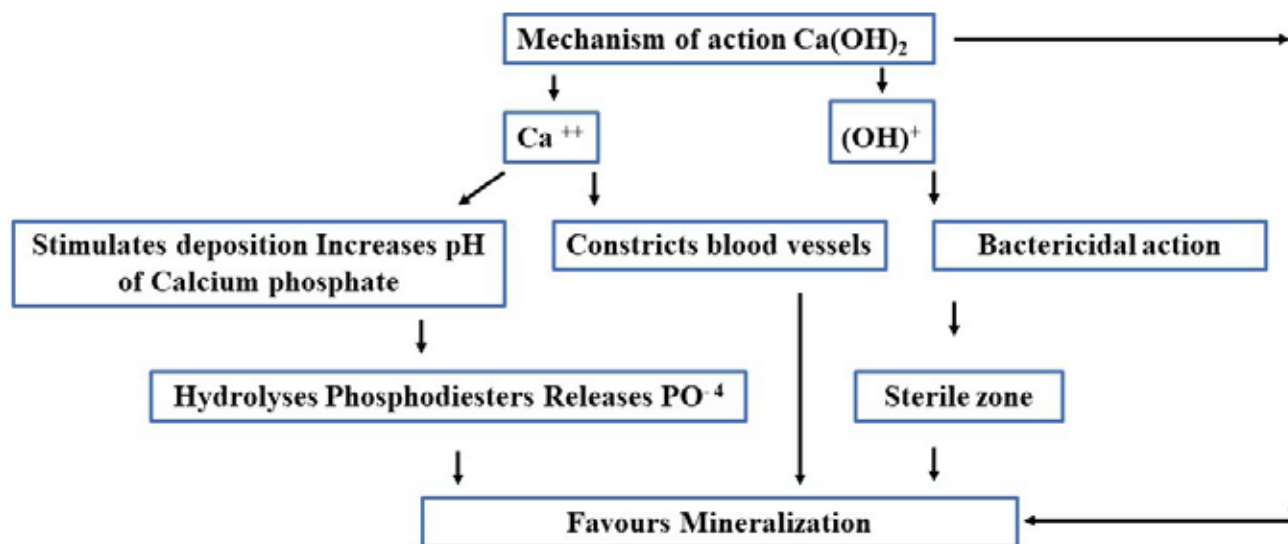


Figure 1. Mechanism of action of Ca(OH)₂

Formocresol: It was coined by Buckley, in 1906. It is composed of 35% Cresol, 46% water and glycerine and lastly 1% formaldehyde. It has a proportional ratio of 1:2. It is prepared with a particular mixture which is

3 parts of glycerine diluted with 1 part of distilled sterile water to dilute 4 part in which 30ml formocresol is added to obtain 150ml of diluted Formocresol.⁸

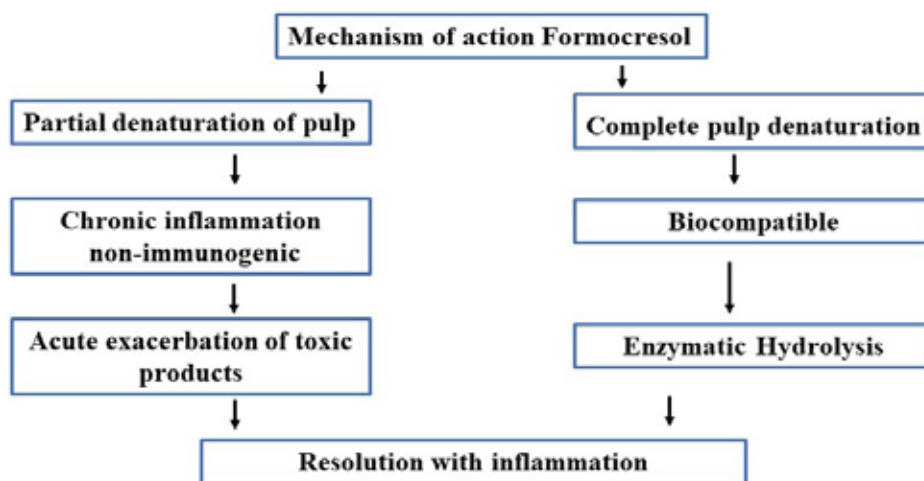


Figure 2. Mechanism of action of Formocresol

Glutaraldehyde: Properties: It is available as 2% Glutaraldehyde. It acts as an excellent bactericidal agent which leads to less necrosis of pulp tissue. It has across Linkage formation with limited depth of penetration. The irreversible changes occur on binding with protein as a result there is no response to the immune system.⁹

Advantages of Glutaraldehyde Over Formocresol: Glutaraldehyde at high concentration act

better fixating agent leading to less necrosis of granulation tissue formation on exposition to longer periods than Formocresol. In Primary Tooth, 2% Glutaraldehyde solution placed over root stumps and a drop into ZOE paste, the solutions give better outcome (2% solution) than the drop. Because of smaller molecular size, it cannot reach the apical foramen creating a minimal disturbance in the systematic circulation.⁹

Chlorhexidine Digluconate: It is available in various forms such as MOUTHWASH- (0.12% & 0.2%)—decrease in content of Streptococcus Mutans after 24 hours, GEL- 1% Medicament, VARNISHES- (1%, 10%, 20%, 35%). It is least toxic and effective against *Enterococcus faecalis* which is found in root canal filling with a common pathogen. In Intracanal medicaments, it is used in the form of 2% CHX gel and a mixture of CHX and Calcium Hydroxide which is active against aerobic and anaerobic bacteria.⁹

Rationale and Application of Medicaments:

There are signs of canal infection while treating teeth as maintaining asepsis is the means of preserving the antibacterial canal. If there is a violation in asepsis chain the antiseptics measures are necessary to prevent infection in vital pulp extirpation. To prevent infection from the root canal, the rationale behind the intracanal antiseptic medication is to eliminate bacteria. Chemo mechanical preparation cannot eliminate all the bacteria from the root present in dentinal tubules as it has an important cleaning effect. For several days or weeks, it is recommended that root canal should be filled between an appointment with an antibacterial diffusion through the tubules which another aspect in using intracanal medicaments.¹⁰

Complications and Side Effects: The pulp has ready accessibility to the periapical tissues of systematic circulation. The drug has side effects because of the physiochemical and galenic formation properties which increase the risk of vascular complications. At the site of injection with obliteration of vascular flow, acidic substances cause tissue necrosis. Surgical removal of necrotic substances and extruded materials is the sole motto of the treatment protocol.¹⁰

Conclusion

In human primary teeth, complete eliminating of aerobic and facultative anaerobic microorganisms was effective as usually not used intracanal medicaments that are Calcium Hydroxide, 1% CHX gel, 1% Metronidazole gel. The intracanal medicaments commonly used is Calcium Hydroxide because of its versatile action, open root apex and weeping canal. For a long time, the root canal compared to other intracanal medicaments retains its effectiveness. In root canal therapy the only important thing is root canal medicament. Efficacy of poly antibiotic paste consisting of Ciprofloxacin, Metronidazole and Minocycline is used in primary teeth referred to as

“Lesions Sterilization and Tissue Repair”. The increase in the success rate and prognosis of Endodontic Treatment is because of the use of Intracanal Medicament along with efficient biomechanical preparation with copious irrigation. In the initial phase of Endodontic Therapy followed by Calcium Hydroxide dressing, antibiotic is associated with Corticosteroids which is helpful for root resorption and periodontal healing. From the article’s perspective, Intracanal Medicaments plays an influential role in Paediatric Endodontics.

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Conflict of Interest: None

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