



Obturing Materials for Primary Teeth – A Review

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ABSTRACT

If an infected tooth can be repaired and is disease-free, it should be managed and kept in the dental arch as a natural space maintainer. The care given to deciduous teeth differs from that given to permanent teeth. There have been a number of obturating materials developed for use in primary teeth's root canal fillings, but none have been able to meet all of the material's desirable qualities. The major objective of the medical professional should be to fill the root canal with a substance that may best fulfill the ideal qualities' strictest requirements. In light of this, the purpose of this review is to outline several obturation materials utilized in routine clinical practice.

Key words : Primary Teeth , Obturating Materials

INTRODUCTION

Pediatric patients frequently receive pulp therapy in an effort to delay the premature exfoliation of their primary teeth. Endodontic therapy's primary goals are the complete eradication of microorganisms from the root canal and the avoidance of subsequent reinfection. This is accomplished by carefully cleaning and sculpting the canal space, followed by total obturation. In deciduous teeth, materials having antimicrobial qualities are widely utilized as root canal filling materials to increase the likelihood that the endodontic treatment will be successful.

characteristics that should be present in a pulpectomy obturant are

- Resorbability
- Antiseptic property
- Noninflammatory and nonirritating to the underlying permanent tooth germ
- Radiopacity for visualization on radiographs
- Ease of insertion
- Ease of removal.

Various root canal obturating materials for primary teeth

- Zinc Oxide Eugenol
- Calcium Hydroxide
- Iodoform based pastes
- Walkhoff paste
- KRI paste
- Maisto paste
- Vitapex/Metapex
- Endoflas
- Endoflas-Chlorophenol-free (CF)
- Calen Paste
- Guedes Pinto Paste
- Pulpotec
- Aloe vera
- Ozone
- CTZ paste

ZINC OXIDE EUGENOL

ZOE was discovered by Bonastre in 1837, and Chisholm employed it in dentistry in 1876 as one of the most popular materials for primary teeth's root canal fillings. Zinc oxide, staybelite resin, bismuth subcarbonate, sodium borate, and BaSo₄ are all present as powder. Eugenol, as liquid ZOE features include analgesic and anti-inflammatory properties, a larger zone of bacterial inhibition, material availability, radiopacity, affordability, good plasticity, poor solubility in tissue fluids. After 24 hours, the amount of eugenol emitted in the periapical zone decreases to 10⁻⁶ from 10⁻⁴ when it was first placed. Eugenol is claimed to have analgesic and anti-inflammatory effects in these doses. It may be advantageous at concentrations between 10⁻⁸ and 10⁻⁵ (inhibiting prostaglandin synthesis, nerve activity, and the chemotaxis of white blood cells), but at doses above 10⁻³ it may be cytotoxic [5,8]

The material may be pushed past the apex by a thin ZOE mixture that makes it flow easily. Underfilled canals result from using a thick paste, though. Because ZOE takes few months or even years to resorb, when there is an excess that is forced through the apex, it may create a fibrous capsule that inhibits ZOE from being reabsorbed and causes it to be held in the apical tissue. Therefore, it might lead to an aberrant eruption of permanent tooth germ. ZOE has a good success rate as an obturation material for deciduous teeth, but its antibacterial properties are restricted and its rate of root resorption is slower than that of primary teeth, therefore it cannot be called an excellent root canal filling material

ZOE AND COMBINATIONS

Zinc oxide eugenol has been combined with a variety of ingredients, including formaldehyde, formocresol, and paraformaldehyde, aloe vera, and cresol, in an attempt to improve characteristics and success rate. However, adding these ingredients had no effect on success rate or any of the qualities.[2,5]

CALCIUM HYDROXIDE

Hermann introduced calcium hydroxide (1920). A White, crystalline powder has no odour. It is prepared by slaking, or the reaction of calcium oxide (lime) with water, which results in low solubility in water and a high pH of 12.5; it is also known as slaked lime. The antimicrobial capabilities, ease of resorption, lack of hard mass formation, and absence of tooth discolouration are the characteristics of calcium hydroxide[9,17]

For primary teeth, calcium hydroxide has been utilized either alone or in combination with iodoform as a root canal filling material. which are marketed as Vitapex, Metapex, and Diapex. If unintentionally pushed past the apex, these compounds readily resorb. However, the rate of material resorption from the canals is faster than physiologic root resorption

Alkaline phosphatase activity and a local buffering effect, which are crucial for the development of hard tissue, were believed to be activated by the calcium hydroxide's alkaline characteristic, which inhibits the inflammatory process. It was discovered that Calcium Hydroxide's biggest drawback as a root canal filler material was the material being removed from the root canals. [2,6]

IODOFORM PASTES

Iodoform

It is an iodine preparation produced when chlorinated lime reacts with an alcoholic potassium iodide solution at a temperature of 1040°F. No irritating behavior. Acts as a strong disinfectant. superior than ZOE in terms of resorbability and disinfectant capabilities.

IODOFORM BASED PASTES

- KRI PASTE
- WALKHOFF PASTE
- MAISTO PASTE
- VITAPEX/METAPEX
- ENDOFLAX
- GUEDES-PINTO PASTE

Walkhoff paste

Iodoform, Parachlorophenol 33-37%, Camphor 63-67% and Menthol crystals 1.40-2.90%.%constitutes the compound . This paste can be used to treat non-vital teeth with sizable periapical lesions [2,5]

Parachlorophenol: Utilized as an antibacterial, parachlorophenol dissolves albumin to gradually enter the canaliculi of the tooth.

Camphor: Used to treat pain , Helps in arresting the hemorrhage

Menthol: It acts as Anodyne ,Antispasmodic ,Antiseptic ,and an external treatment for facial neuralgia, odontalgia, as an obtunder of sensitive dentin as a local anesthetic

KRI paste

It was mentioned by Volkoff. It is both highly absorbable and bacteriocidal. It contains iodoform (80.5%), camphor (4.84%), parachlorophenol (2.023%), and menthol (1.213%). To reduce coagulation with surrounding tissues, camphor and menthol are combined with parachlorophenol, an antibacterial agent. Since it is non-irritating and radiopaque, iodoform is used to transport the antibacterial ingredient. [6,2,17]

Maistopaste

It was introduced by Maisto ,aniodoform based paste . It contains of Zinc oxide -14g, Iodoform-42g, thymol-2 g, Chlorophenol camphor-3 cc, lanolin-0.5 g. The goal of this formulation was to slow down the rate of resorption of paste from the canals of primary teeth.[4,9] Most infected teeth can be treated with it because of its powerful antibacterial activity. On periradicular tissue, it has a beneficial healing effect.

Metapex/vitapex

Vitapex was introduced by Kawakami et al in 1979. vitapex contains calcium hydroxide 30.3% and iodoform 40.4% along with silicone 22.4%. Iodoform, a well-known bactericide, eliminates any lingering bacteria in the canal or periapical area. The properties of calcium hydroxide include

biocompatibility, antibacterial activity, induction of the development of mineralized tissue, activation of the synthesis of alkaline phosphate and collagen, and the capacity to create the hydrolysis of bacterial endotoxins. Silicone as an oily base enhancer[1,7]. Iodoform pastes that work well as root canal filler material rapidly resorb from the periapical regions, don't cause a foreign body reaction, and have strong germicidal qualities. When material is forced past the apex, it resorbs at a rate that is quicker than the root. When extruded extraradicularly, Metapex can be quickly removed and does not solidify into a hard mass, unlike zinc oxide eugenol.

ENDOFLAS

Endoflas is a resorbable paste which contains barium sulphate(1.63%) , calcium hydroxide(1.07%) , iodoform(40.6%) and zinc oxide eugenol (56.5%). And with a liquid consisting of eugenol and paramonochlorophenol. Dentinal tubules and difficult-to-reach accessory canals that cannot be cleaned or sterilized mechanically can be cleaned with Endoflas. Endoflas can be reabsorbed since its constituent parts are biocompatible and phagocytosed. The endoflas resorption rate is comparable to that of physiological root resorption, with the exception that it only affects the obturation material that has been extruded beyond the apex extra and not the material that is inside the root canal. Comparing the effectiveness of endoflas and zinc oxide eugenol, endoflas has a higher percentage of success. Three substances—ZOE, Ca(OH)₂, and iodoform—were possibly added to endoflas in order to make up for one substance's shortcomings with those of the others. Having eugenol as a component, this substance has drawbacks like periapical irritation, tooth discoloration .

ENDOFLAS CHLOROPHENOL-FREE(CF)

Primary teeth that had had endodontic treatment developed radiolucent lesions, which may have been caused by phenol-containing filling materials. As a result, endoflas that is free of chlorophenol was created. Since chlorophenol has a fixation that could harm osteoblast cells, it was removed from the composition of endoflas.

CALEN PASTE

It is a paste made of calcium hydroxide. Calen paste demonstrates biocompatibility, strong antibacterial activity, positive clinical and radiographic results, and moderate setting time values. The average pH started out at 6.1 and increased gradually until reaching a peak of 8.4 at the five-hour mark. When compared to the other groups, it displays high registration levels, which suggest greater radiopacity and reduced solubility.[5,8]

GUEDES PINTO PASTE

It was introduced by guedes pinto in 1991 .It includes rifocort ,champhoratedparacholorophenol,iodoform

- Rifocort has antibacterial and anti inflammatory properties
- Champhoratedparacholorophenolhas an analgesic and antibacterial substance.
- Iodoform possesses antibacterial properties.
- The drawback of manipulating the paste is that various doctors may vary its biological characteristics and component concentrations, which could impair its effectiveness or raise its toxicity.

PULPOTEC

Pulpotec has antiseptic ,antibacterial and anti inflammatory properties .Iodoform, which makes up the majority of this medication, has antiseptic qualities that make it act like an antibiotic paste at the opening of an empty root canal. In order to reduce the clinical indications of infection, Pulpotec can be applied on teeth that have bone lesions. Clinical and radiographic findings indicate that this approach may be used as an alternative to traditional endodontic therapy for pediatric dentistry patients with necrotic primary teeth[3,6].

ALOE VERA

Aloe vera is an herbal and naturally found material .This gel-like fluid is made up of a variety of amino acids, minerals, enzymes, and sugars that are hydrating, anti-inflammatory, antioxidant, antibacterial, antiviral, and antifungal. And because of numerous therapeutic characteristics, its properties enabled its widespread use in dentistry. It speeds up a number of wound healing processes, including collagen production, macrophage recruitment, and wound contraction.

OZONE

The gaseous and energetic form of oxygen is called ozone. It is unstable and easily dissociates back into oxygen, releasing singlet oxygen, a potent oxidizing agent with bactericidal and fungal properties. [17,12]. When ozonated oil is combined with zinc oxide eugenol, it has good antibacterial and therapeutic qualities of ozone peroxides and promotes progressive bone regeneration and excellent healing property . ZOE has radiographic success rate less than that of ozonated oil -ZOE .

CTZ Paste

CTZ is an antibiotic paste made up of 500 mg of chloramphenicol, 500 mg of tetracycline, 1000 mg of zinc oxide, and 1 drop of eugenol. A significant number of aerobic, facultative anaerobe, spirochete, and gram positive and gram negative bacteria are susceptible to the antibiotic chloramphenicol. Tetracycline is a broad range antibiotic with strong efficacy against gram-positive bacteria and all anaerobes. At high concentrations, it can also be bactericidal. ZOE has powerful antibacterial characteristics that last for more than 30 days against staphylococcus, micrococci, bacillus, and enterobacteria

Table 1 shows authors and their observation about comparison of various obturating materials

AUTHOR		OBSERVATION
Rewal N[31]	Comparison of ZOE and endoflas	Endoflas paste has the advantage that resorption of the material does not occur within the canal and it has a broad spectrum of antibacterial efficacy. Endoflas is superior to zinc oxide eugenol in many ways, yet despite this, it is not the most frequently used material for root canal filling in primary teeth.
Pabla T et [35]	Comparison of Zno, iodoform, KRI paste, vitapex, Maistopaste	Evaluation of the antimicrobial effectiveness of Vitapex, Iodoform, KRI, and Maisto pastes against aerobic and anaerobic bacteria from infected primary anterior teeth Order of antimicrobial activity: Maisto paste > Iodoform paste > Zinc Oxide Eugenol > Vitapex.
Gupta S[32]	Comparison of ZOE and metapex	However, Metapex was shown to resorb overfilled material more quickly than ZOE, and preoperative signs and symptoms gradually but almost completely decreased. The results of the current studies suggest that Metapex could be employed as a root canal material alternative to ZOE.
Rifkin[36]	Comparison of KRI paste and ZOE	KRI paste meets all criteria required from an ideal root canal filling material for primary teeth. It was also found to have long-lasting bactericidal potential. Overall success rate for KRI paste was 84% versus 65% for ZOE.
Chandra et al. [33]	Comparison of zno and ozonated oil-zno	This was linked to ozone peroxides' remarkable healing and antibacterial qualities. Additionally, growing bone regeneration is observed at the follow-up visits. Compared to ZOE with ozonation, ZOE had a lower radiograph.

Conclusion

The right material must be chosen for the obturation process in order for endodontic therapy to be successful. Although existing obturating materials offer primary teeth clinically satisfactory results, adjustment is still necessary to accommodate the numerous clinical scenarios that have been experienced. Due to ZOE's numerous shortcomings, several additional materials have been researched and various combinations have been tested with varying degrees of effectiveness. Compared to ZOE cement, the present calcium hydroxide and iodoform mixtures appear to perform better. Recent developments in alternative root filling materials also promise improved root canal adherence and do away with guttapercha's drawbacks.

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