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Review Article

Resorption of Extruded Obturating Material in Primary Teeth

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ABSTRACT

The main objective in paediatric dentistry is to maintain primary teeth in the oral cavity till exfoliation. Endodontic therapy has to be done to treat infected pulp. Various obturating materials are zinc oxide eugenol (ZOE), iodoform, Vitapex, metapex, calcium hydroxide, Endoflas, etc. were used in primary teeth but none of these materials have the ideal obturating properties. In primary teeth, a tight apical seal, complete debridement of the canals and obliteration of the canal space is not always possible, even in pulpectomies that succeed. Because of open apices due to resorption there is no apical barrier that can prevent the extrusion of the filling material.

Keywords: Calcium Hydroxide, Endoflas, Extrusion, Obturating material Zinc oxide Eugenol

INTRODUCTION

Success of endodontic treatment in primary teeth the resorbable capacity of obturating material plays a vital role[1]. The objective of pulpectomy in primary teeth is resolution of infection within 6 months, radiographic evidence of successful obturation without gross overextension or under extension, clinically asymptomatic and natural resorption of the teeth leading to normal eruption of the succedaneous teeth.

Rifkin[4] identified criteria for an ideal pulpectomy obturant that include (1) Resorbability (2) Antiseptic property (3) Non-inflammatory and nonirritating to the underlying permanent tooth germ, (4) Radiopacity for visualization on radiographs, (5) Ease of insertion and (6) Ease of removal. However, none of the currently available obturating materials meet all of these criteria.

Various materials used for obturation in primary teeth are ZOE, calcium hydroxide, Walkhoffs paste, KRI paste, Maisto paste, Vitapex, Endoflas, Colla cole, Guedes–Pinto paste. Since 1930 the most commonly used obturating material is ZOE cement. However, animal studies with ZOE as an obturating material have reported chronic inflammatory reactions and slow resorption. The retained material alters the path of eruption of permanent teeth in 20% of cases [2].

The quality of the root canal filling was defined as Modification of Coll and Sadrian [3].

Classification of the canal obturation based on the amount of filling

I	Under filling	All the canals were filled more than 2 mm short of the apex.
II	Optimal filling	One or more of the canals having ZOE ending at the radiographic apex or up to 2 mm short of the apex.
III	Overfilling	Any canal showing ZOE outside the root.

Source: ref [3] Coll and Sadrian, who reported a significant success rate for teeth filled to the apex (89%)

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and teeth filled short (87%) compared to overfilled teeth which had a 58% success rate. In primary teeth, a tight apical seal is not always possible after a pulpectomy, even in successful pulpectomy cases.

Extruded zinc oxide eugenol cement

The ZOE paste was the first root canal filling material to be recommended for primary teeth, as described by Sweet[17] in 1930. It is most commonly used material for the obturation of the primary teeth. Excess material forced through the apex during filling procedures can remain in the apical tissue during the process of physiological root resorption and it takes few months or even years to resorb.

Hashieh[6] studied the beneficial effects of eugenol. The amount of eugenol released in the periapical zone immediately after placement was 10^{-4} and falls to 10^{-6} after 24 hours, reaching zero after one month. Within these concentrations eugenol is said to have anti-inflammatory and analgesic properties that are very useful after a pulpectomy procedure.

Erasquin *et al*. 1967 reported that canals overfilled with ZOE are not recommended because it irritates the periapical tissues and causes necrosis of bone and cementum[7].

Coll *et al.* has reported that when ZOE extrudes, it develops a fibrous capsule that prevents resorption of the material[2]. Thus, it has a slow rate of resorption and has a tendency to be retained even after tooth exfoliation, in some cases unresorbed material has been found to cause deflection of the succedaneous teeth[8].

Mononucleated and polymorpho-nucleated inflammatory cells were observed in the apical cementum region, surrounding the filling material at the apical foramen. Areas of cementum resorption were evident,periodontal ligament exhibited intense and moderate thickening. Noticeable fibrilar dissociation and reduced fibrogenesis, in addition to generalized edema among the inflammatory cells, were observed in this region. The inflammatory infiltrate was moderate degree. Dentin resorption was not observed, whereas bone resorption was found[9].

Excess material of ZOE is forced through the apex during filling procedures can remain in the apical tissue during the process of physiologic root resorption, taking months or even years to resorb[10]. Frequently, ZOE cement fragments are left where the pulpectomized tooth has exfoliated, perhaps due to ZOE's resistance to foreign body giant cell resorption. Coll and Sadrian[11] reported anterior cross-bite, palatal eruption, and ectopic eruption of the succedaneous tooth following ZOE pulpectomy.

Resoprtion of calcium hydroxide

Beneficial properties of calcium hydroxide are its biocompatibility antibacterial activity, induction of mineralized tissue formation , activation of alkaline phosphatase and collagen synthesis and ability to produce hydrolysis of bacterial endotoxin[12].

Calcium hydroxide despite its antiseptic and osteoinductive properties, has a tendency to get depleted from the canals earlier than the physiologic resorption of the roots[13].

Likewise, iodoform-based material though resorbs if pushed beyond the apex however the rate of resorption is faster than the root. It also has the drawback of causing discoloration of the teeth[14].

Erasquin *et al*. 1967, have shown that iodoform is irritating to the periapical tissues and can cause cemental necrosis[15]. Bismuth iodoform paste has been reported to cause encephalopathy when used as wound dressing following head and neck surgery[14].

Materials containing iodoform in their composition have also been advised for root canal filling in primary teeth[16] because of its antibacterial activity and easy resorption. However, the rapid elimination of iodoform by the organism leaves behind empty spaces inside the root canal, which may undermine the success of the endodontic therapy[17]. Additionally, the use of iodine-based materials in contact with live tissues has no longer been indicated because of their potential for causing toxic side-effects[18].

Vitapex when extruded into furcal or apical areas, can either get diffused or resorbed by macrophages, in as

short a time as 1 or 2 weeks up to 2 to 3 months and causes no foreign body reaction, with success rate of 96% to 100% by Nurko *et al.*[19].

Vitapex has been shown to resorb at a much faster rate than the root[21]. Since Vitapex resorbs early and leaves no residue in the tissue this is the advantage over ZOE. Machida claimed that Vitapex is a nearly ideal root canal filling material for primary teeth[22]. Unlike ZOE, vitapex can be rapidly eliminated from periapical tissues and does not set to a hard mass and therefore, the probability of deflection in successor tooth is minimized.

Chawla *et al.* have reported that use of mixture of zinc oxide and calcium hydroxide would reduce the resorption rate and if the root canal filling material contained fluoride, it will leach out, which could be beneficial to the erupting tooth[20].

Nurko & Garcia-Godoy suggested that resorption of extruded Vitapex took from 1–2 weeks to 2–3 months. Contrary to the findings of Machida, however, there was no evidence of Vitapex within the root canals being resorbed in any of the patients in this study during the 10–16-month follow-up period. It is probable that the rapid elimination of extruded Vitapex and the fact that it does not set to a hard mass can be considered as one of the most important advantages of Vitapex over ZOE. One of the main purposes of treating and retaining a necrotic primary tooth is to maintain space for the eruption of the succedaneous tooth in a proper position, promoting normal development of occlusion. Therefore, if deflection of the successor tooth occurs following treatment of the predecessor, little is gained from such a treatment. Immediate postoperative radiographs showed that the number of short fills was greater in the ZOE group, contrary to the higher number of long fills and complete fills in the Vitapex group. This may be because of the thinner consistency of Vitapex in comparison to ZOE. This premixed paste may more easily flow into the narrow and tortuous root canals of primary molars, and reach the apex or even beyond[26].

Commercial available products of iodoform based are Metapex, Vitapex, Calplus, Diapex, Apexdent.

Resorption of endoflas

Endoflas is an obturating material for primary teeth and is composed of zinc oxide, calcium hydroxide, iodoform, barium sulphate, Eugenol and pentachlorophenol. Fuks *et al*. 2002, in their study with Endoflas observed that the material resorbed when over-extended periapically[23]. However, it did not resorb intraradicularly in their study. Intriguingly, the material which had overextruded periapically and intraradicularly was resorbed within seven days. After three months, optimal obturation with normal periapical region was seen in the radiograph, with no resorption within the canal. The dissolution could be by the macrophagic activity[24]. Earlier Ramar & Murgara (2010) observed a much higher success rate with Endoflas (95%) compared to other materials, and also reported healing ability, bone regeneration characteristics and resorption of excess Endoflas without washing within the roots[25].

CONCLUSION

For the successful endodontic therapy in primary teeth requires through clinical diagnosis, radiographic examination and select nearly ideal obturating material for the particular case. ZOE is gold standard obturating material in primary but it is not indicated in the resorbed roots, calcium hydroxide and Endoflas are recommended are easily resorbed even though it is extruded.

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