Resorption of a calcium hydroxide/iodoform paste (Vitapex®) in root canal therapy for primary teeth: A case report

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Abstract

This case report presents a clinical and radiographic follow-up (38 months) of pulpectomy treatment performed on maxillary primary anterior teeth using Vitapex®. Vitapex® was resorbed extraradicularly and intraradicularly without apparent ill effect, and proved to be clinically and radiographically successful. The present case report illustrates that even if the paste resorbs within the canals, the clinical and radiographical outcome is excellent. A longer follow-up is recommended to evaluate if there is any effect on the permanent succedaneous tooth.(Pediatr Dent 22:517-520, 2000)

Resorption of the filling material is considered one of the requirements of an ideal root-canal medicament for pulpectomies of primary teeth.[1-4] Resorption of the root-canal filling material should occur as the primary tooth root is resorbed during exfoliation, permitting normal eruption of the succedaneous tooth.[3] If the material is expressed beyond the apex, it should be resorbable and non-toxic to the periapical tissues and the permanent tooth germ.[3-5]

The most popular root canal filling materials for primary teeth are zinc oxide and eugenol, iodoform paste, and calcium hydroxide.[6-8] Of these, the former is most problematic. When extruded beyond the apices, zinc oxide and eugenol sets into a hard cement that resists resorption.[2,4,9-11] It can remain in the alveolar bone from months to even years, and it can cause a mild foreign body reaction.[12] Disturbances to the succedaneous permanent teeth have been reported and deflection of the succedaneous tooth may occur.[9]

Iodoform pastes (KRI 1 paste, which is basically Walkhoff's[13] paste), has shown excellent clinical and radiographic results.[2,4] When iodoform paste was inadvertently extruded from the canals in these studies, it was resorbed within one to two weeks, and none of the succedaneous teeth exhibited enamel disturbances or other morphological defects. Dominguez et al[14] reported that when combining pure iodoform with calcium hydroxide as a pulpectomy agent, excellent clinical, radiographic and histological results were obtained.

Vitapex®

A commercial product named Vitapex® (Diadent® Group International Inc., Burnaby, B.C.,Canada), containing a viscous mix of calcium hydroxide and iodoform in a syringe with disposable tips has recently come on the market in the US (Fig1). Vitapex® is used all over the world. Several articles have been published, mainly in Japan,[15-22] the US,[23] and South America.[24] The main ingredients of Vitapex® are iodoform 40.4%, calcium hydroxide 30.3%, and silicone 22.4%. Vitapex,® when extruded into furcal or apical areas, can either diffuse away[23,25] or be resorbed in part by macrophages,[21,22] in as short a time as one or two weeks.[23] Bone regeneration has been clinically[23,26] and histologically[26,27] documented after using Vitapex®. The Vitapex® paste is used because of its easy delivery system, suc-

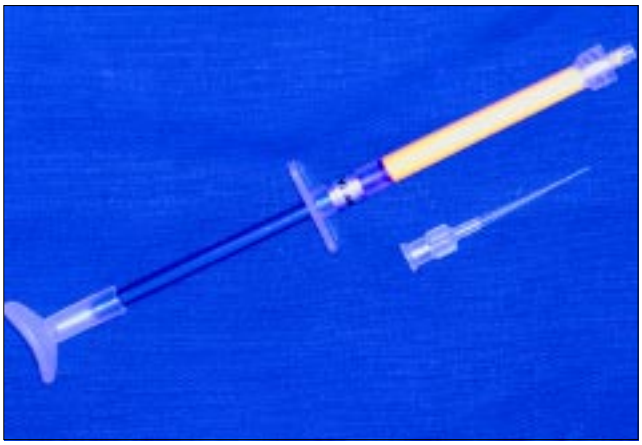

Fig 1. Vitapex® is available in pre-mixed, pre-packed polypropylene syringes and disposable tips.

Fig 2. Preoperative occlusal radiograph revealing deep carious lesions probably involving the pulps of the lateral incisors.

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Fig 3. Immediate postoperative radiograph revealing that the Vitapex® had been extruded from the apex of teeth D and G.

Fig 4. Thirteen months follow-up radiograph showing partial resorbtion intra-radicularly Vitapex® from teeth D and G.

Fig 5. Thirteen months follow-up photo showing no adverse signs.

cess history, and the proven beneficial effect of iodoform[2,4,11,14] in pulpectomy treatment in primary teeth.

Case report

A 17-month male patient presented to the Infant Oral Health Clinic in the Department of Pediatric Dentistry at the University of Texas Health Science Center at San Antonio for an initial visit. Clinical examination showed early childhood caries in the anterior maxillary teeth and in one primary first molar. No gingival swelling, sinus tract, or abnormal mobility was noted, and no pain was reported. An occlusal radiograph revealed deep carious lesions probably involving the pulps of the lateral incisors (Fig 2). Dental treatment was performed under general anesthesia. All of the maxillary incisors were restored with stainless steel crowns (SSCs) with esthetic facing (Kinder Crown, Mayclin Dental Studio, Inc., Minneapolis, MN); teeth #D and #G were pulpectomized with Vitapex®. Access was gained to the pulp chamber by removing the roof chamber with a No. 330 tungsten-carbide bur in a high-speed handpiece. The pulp chamber was cleaned with a water-cooled No. 330 tungsten-carbide bur in a high-speed handpiece and a slow-speed No. 4 round bur. Files were used to enlarge the canals up to size #40. The canals were irrigated with water and dried with sterile paper points. The root canal filling material used was Vitapex®. The filling material was transported to the canals directly from the pre-packed polypropylene syringe (Fig 1).

The syringe was inserted into the canals, near the apex. The paste was pressed down into the canals and when the paste flowed back from the canal into the pulp chamber the syringe was then slowly withdrawn. Tooth #B was restored with a SSC (Ion Ni-Cro, 3M Unitek, St. Paul, MN, USA), and teeth #L and #S were sealed (Ultra Seal XT R plus TM, Ultradent Products, Inc. USA). An immediate postoperative radiograph (Fig 3) revealed that the Vitapex® had extruded from the apex of teeth D and G. The patient returned to the clinic 13 months later and unfortunately presented new carious lesions in the primary molars. In addition, the intra-radicular Vitapex® was partially resorbed from teeth D and G (Fig 4), but they were asymptomatic and clinically without pathosis (Fig 5). The patient was again treated under general anesthesia and SSCs were placed on teeth A, J, K, L, S and T. On a recall visit 3 months later, an occlusal radiograph showed complete resorption of the filling material from the canals of the lateral incisors (Fig 6). In spite of the disappearance of the filling material, there were no clinical or radiographic signs of treatment failure. The patient was placed on a 6 month recall schedule. In subsequent recall visits teeth D and G continued asymptomatic and without any clinical pathosis. Thirty-eight months after the initial treatment, the patient presented with chipped esthetic facings on teeth E and G (Fig 7). After a radiograph (Fig 8), which revealed no pathosis and the complete intraradicular resorption of the Vitapex,® it was decided to restore the facings with composite. In the process of restoring teeth D and G with open face composites, the pulp chamber of tooth D, originally treated with Vitapex®, was accessed. A sample of the radicular canal was taken with a sterile size 35 endodontic file and was placed into a sterile viale containing 1 ml of sterile reduced transport fluid. The sample was then transferred to the microbiological laboratory and processed immediately. The sample was dispersed for 60 s with a Vortex mixer. One hundred microliter of the sample was plated in duplicate on to trypticase soy agar plate enriched with 5% sheep blood (ETSA) to determine the composition of the predominant cultivable anaerobic microbiota. The ETSA plates were incubated for 96 h in a Coy anaerobic chamber in an atmosphere of 85% N_2, 10% H_2, and 5% CO_2 at 37^{0}C. Similarly inoculated ETSA plates were incubated aerobically for 96 h at 37^{0}C. Neither aerobic nor

Fig 6. Sixteen month follow-up radiograph showing complete resorption of the filling material from the canals of the lateral incisors.

Fig 7. Thirty-eight months after the initial treatment, the patient presented with chipped esthetic facings on teeth E and G.

Fig 8. Radiograph revealed no pathosis and the complete intraradicular resorption of the filling material.

anaerobic bacteria were grown in ETSA plates after 96 h of incubation.

Discussion

Because of the anatomy of primary roots and furcal areas, it is difficult to avoid the extrusion of filling materials beyond the root canals in all pulpectomy cases. Therefore, an intra-radicular filling material should be non-toxic and easily resorbable.

In a dog study where Vitapex® was purposefully extruded beyond the apical foramen into the mandibular canal, radiographic and histologic findings revealed that the paste was resorbed over time, and macrophages appeared to be involved in this process .[25] Overfilling is not a problem because the paste is completely resorbable. Overfills are not common, but if there is an overfill there is not as much concern as if the overfill is with a ZOE paste .[2,4,9-11]

A positive finding with respect to the treatment of primary teeth was the appearence of heterotopic calcification and/or ossification within the area of original penetration. In a case report [21] anterior permanent teeth in an eldery patient were treated with Vitapex®. Bone was removed for histological analysis, showing that osteoid bone closed the apical foramen, indicating succesful healing.

This case report confirms previous findings that extruded Vitapex® can be easily removed from extra-dental sites. The Vitapex® resorption could be a beneficial characteristic in pulpectomies of primary teeth. The resorption of the paste within the canals was not a problem from a clinical nor radiographical standpoint as shown in this case. Radioactive tracers of $Ca(OH)_2$ and silicone have been shown to be excreted via the feces and urine, demonstrating the expeditious removal of the components from the system.[27,28]

We are not certain what the effects of intra-radicular resorption of the paste will mean in the long term. There is a well-known "hollow tube"[29] effect in the lexicon of endodontics, where it is thought that an unfilled root canal can be permeated with tissue fluid that becomes stagnant and eventually a nidus for infection. Whether this actually occurs has never been determined, and at least in our case does not appear to have happened. The material sampled from the treated canal was negative microbiologically.

Although the canal of the Vitapex-treated incisor was free of bacterial contamination, we caution against being over-zealous in the use of this material. The pulp of the tooth in question was involved by the decay process, but it was not necrotic. We are uncertain how effective Vitapex® would be in cases of acute infection, particularly in light of the findings by Tchaou et al[30,31] that it has minimal antibacterial properties. (The preliminary findings of Hayden[32] suggest that this issue has not been laid to rest).

Because zinc oxide and eugenol pastes are not particularly antibacterial unless formocresol is incorporated[30] (an addition that complicates the resorbtion of extruded material) and Vitapex® is suspect, we suggest that Kri Paste may be better suited for more aggressive treatment. Its better antimicrobial properties[30-32] in vitro have been borne out by clinical studies. In cases where Kri Paste is unavailable, antibiotic therapy may augment the treatment with Vitapex®.

Vitapex®, used as a root canal filling material for pulpectomy treatment for primary teeth resorbed extraradicularly (as reported previously[23,25]) and intraradicularly without apparent ill effect, proved to be clinically and radiographically successful. A longer follow-up is recommended to evaluate if there is any effect on the permanent succedaneous tooth.

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