

# Root Canal Treatment for Deciduous Teeth: A Review

## *Süt Dişlerinde Kök Kanal Tedavisi: Derleme*

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### Abstract

The early loss of deciduous teeth leads to many negations in terms of physiological, functional and aesthetic. The structure of the deciduous teeth causes decay to progress much easier and less time and this is the need for frequent dental pulp treatment to be kept in the mouth. The new materials that will increase the success of deciduous teeth root canal treatment are continuing to investigate. In this study, it is aimed that recently prominent current approaches are to be compiled in root canal treatment of deciduous teeth.

### Öz

Süt dişlerinin erken kaybı fizyolojik, fonksiyonel ve estetik açıdan birçok olumsuzluğa yol açmaktadır. Süt dişlerinin yapısı, çürüğün çok daha kolay ve kısa sürede ilerlemesine sebep olmakta ve bu dişlerin ağızda tutulmaları için sıklıkla pulpa tedavilerine ihtiyaç duyulmaktadır. Süt dişi kök kanal tedavilerinin başarısını arttıracak yeni materyallerin araştırılmasına devam edilmektedir. Çalışmamızda süt dişi kök kanal tedavilerinde son dönemde öne çıkan güncel yaklaşımların derlenmesi amaçlanmıştır.

### Keywords

Pediatric dentistry, deciduous teeth, pulp treatment, endodontic treatment

### Anahtar Kelimeler

Pedodonti, süt dişi, pulpa tedavileri, endodontik tedaviler

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### Introduction

Despite the advances made in protection from tooth decay, the widespread natural dentition protection awareness, and the increasing number of patients seeking help from pedodontic clinics, the early loss of the deciduous teeth is still a common problem (1).

Early loss of deciduous teeth may cause the mesialization of permanent teeth, arc length loss, and ultimately malocclusions. Furthermore, keeping the deciduous teeth in the mouth by treatment is very important to ensure aesthetic and chewing functions, preventing the ectopic or early eruption of the bottom permanent teeth, preventing the abnormal tongue habits created by positioning the tongue in the toothless cavity and thus negatively affecting speech (2,3).

Today, the frequency of tooth decay in children benefiting from decay-prevention programs is lower, but in the regions where protective dental applications are not fully implemented, deep decay lesions are found in children with inadequate oral hygiene education and poor dietary habits (4-6). The wide-fissured occlusal surfaces and

flat contact areas of the deciduous teeth increases the decay in this type of teeth. Furthermore, the fact that deciduous teeth enamel and dentin thickness is only half that of the permanent teeth, the clones of the pulp horns to the outer surface of the deciduous teeth, the large width of the dentin canals and the increasing permeability of dentin as it gets closer to the pulp lead decay to progress much easier and faster and this often calls for pulp treatments.

The exploration to find new material and techniques to increase success in deciduous teeth endodontic treatments is going on. This compilation aims to review the new material and techniques that have become recently prominent in the deciduous teeth root canal treatment.

### Root Canal Treatment for Deciduous Teeth

Root canal treatment is indicated in the deciduous teeth with chronic inflammation or necrosis, and this treatment aims to purify the root canals from infection, and to keep the teeth in the mouth until the age they normally fall off. For this purpose, in the canal treatment process, the new advances are benefited from for deciduous teeth just like the permanent teeth. Among such advances are the new techniques and materials used in the measurements of canal height and canal preparation.

The basic advantages of the digital imaging techniques over conventional radiographies are their higher speed of imaging, image-saving abilities and enabling changes on the images (7). The studies comparing digital and conventional radiographies regarding the canal measurement of the deciduous teeth found that, apart from the aforementioned advantages of digital imaging techniques, their image quality yielded similar results to conventional radiographies, and there was no statistically significant difference between the two systems (8,9).

The use of apex finders, especially when the radiographical imaging of the root apexes are blocked by anatomical structures, is very helpful. Besides, contrary to radiographic methods, not applying radiation to the patient, and eliminating the need for time to process the film are other important advantages (10). The studies on deciduous teeth indicate that, in the deciduous teeth that show different degrees of root resorption, using apex locator have been successful (11-14).

In their study where they compared the measurements taken with Root ZX with those supported by radiographies, Kim et al. (15) found that merging the two methods increases the success rate. The 84% success rate with the measurements made by using Root ZX alone was raised to 96% by adding the use of radiographies.

Due to their low flexibility, the stainless steel instruments routinely used in root canal treatment may cause undesirable canal shapes especially in the curvy canals, and may cause perforations (16). In order to overcome this problem, the Ni-Ti high-flexibility canal instruments have been developed. The most important advantages offered by the Ni-Ti rotary instrument systems are: increasing the cutting effectiveness of the files, facilitating the shaping of the curvy canals, shortening the work time, and thus simplifying the canal preparation procedure (16-19). For the molar deciduous teeth, in the studies comparing the rotary tool system and K type file, the canal shaping performed by rotary tool system was completed faster than the K type, furthermore, it was demonstrated that the rotary tool system enables smoother canal surface and more conical shape, and facilitated the flow of the filling material within the canal (20,21). In their study regarding canal cleansing effectiveness, Katge et al. (22) concluded that the rotary tool systems are superior to the preparations performed via K type hand file; while Nazari Moghaddam et al. (23) could not find any significant difference between the two.

### Canal Irrigation Agents

Because of its positive qualities like being non-toxic to periapical tissues, and its safe use with children, but considering its negative characteristics such as not having an antibacterial effect and not removing the smear layer, sterile saline solution is used in combination with other irrigation solutions (24,25).

Sodium hypochlorite is an agent often preferred for its qualities such as solving the vital and nonvital tissues well, being a wide-spectrum antibacterial agent, its easy diffuse on the walls of the dent due to low surface tension, and being easily and cheaply obtainable. Sodium hypochlorite concentration and toxicity increase in direct ratio (26). In their study where they studied the effect of using 1% sodium hypochlorite (NaOCl) and various percentages of (4%,

6% and 8%) citric acid use on the removal of smear layer in molar deciduous teeth, Götze Gda et al. (27) suggested the use of 1% NaOCl and 6% citric acid as a chemical substance for irrigation for deciduous teeth.

In the studies where the effectiveness of sodium hypochlorite on *Enterococcus faecalis* in deciduous tooth canals was analyzed, successful results were obtained (26,28). Additionally, in the studies on deciduous teeth, it was found to remove the smear layer (29).

The toxic effects of the sodium hypochlorite overflowing from the apex on the periapical tissues root resorption and canal height measurement in deciduous teeth are recommended to be carefully performed (30,31).

Chlorhexidine gluconate is an agent with broad antimicrobial spectrum and tissue solvent quality. It was shown to be effective on *E. faecalis* in the deciduous teeth (26). In their study, Onçağ et al. (32) showed that 2% chlorhexidine gluconate has more antibacterial effect and less toxic effect than 5, 25% sodium hypochlorite.

Etilendiamintetraacetic acid (EDTA), a chelation agent, causes demineralization and increases the permeability of dentine. With its combined use with sodium hypochlorite, it is highly effective on removal of the smear layer (33).

Sodium hypochlorite, chlorhexidine, gluconate, citric acid and EDTA, which are all among irrigation solutions used in deciduous teeth, were compared with respect to cytotoxicity, and chlorhexidine gluconate was reported to have a lower level of toxic effect than others (34).

Mixture of tetracycline, acid and detergent (MTAD) is a canal irrigation solution including tetracycline and acid. It has an antibacterial effect on *E. faecalis* and bacteria isolated from deciduous teeth (35,36). In addition, it is also reported to lead to successful results in removing the smear layer in deciduous teeth (24).

Apart from the traditional irrigation agents, use of ozonized water, a method applied in deciduous teeth was found to be effective on *E. faecalis* (26). Propolis, another antibacterial product, had antibacterial effect on bacteria isolated from the deciduous tooth canals (37). Kapdan et al. (28) reported that the irrigation method with laser had antibacterial effect on deciduous tooth canals.

## Materials Used in Deciduous Tooth Canal Treatments

### Calcium Hydroxide

Because pastes containing calcium hydroxide have a high level of biocompatibility and alkaline pH and because they can be absorbed out the root canal system, they are frequently favored as root canal sealing materials. In addition, it has several advantages like being easily prepared and applied, having no irritant effects on periapical tissues and having no toxic effect on permanent dental germ (38). Also, it is reported to have antibacterial effect on bacteria isolated from the deciduous tooth canals (39).

Although calcium hydroxide is used successfully in deciduous tooth canal treatment, the biggest disadvantage of the material is that it can not be resorbed from the canal before the deciduous tooth physical resorption process (39,40).

### Zinc-Oxide Eugenol

Besides the anti-inflammatory and antibacterial features of eugenol, it is also reported to have cytotoxic effect (41). Some researchers stated that eugenol might cause foreign tissue reaction and osteonecrosis if eugenol is transmitted to periapical tissues. Another disadvantage of zinc-oxide eugenol paste is that it results in problems with the coming permanent tooth and causes wastes in the tissues following the deciduous tooth since it is not resorbed in accordance with the root resorption (41,42).

### Iodoform

Besides its antiseptic features, when used for canal filling in deciduous teeth, it is resorbed in accordance with the root, and it does not cause any harmful effect on the permanent tooth germ. It can easily be applied to root canals and side canals. In addition, it is also reported that the excessive iodoform path replaces the normal tissue rapidly and that it does not cause any foreign object reaction. The material is sometimes resorbed more rapidly than the root and makes the canals empty (41).

### Calcium Hydroxide-Iodoform Pastes

The purpose of adding iodoform into calcium hydroxide is to combine the known positive features

of both pastes and to increase the antibacterial effectiveness of calcium hydroxide.

The calcium hydroxide-iodoform paste has several advantages such as being easy to apply, having no toxic effect on the permanent teeth, being able to resorb with roots and being a radio opaque material (42). The parts of the material exceeding the canal to the periapical tissues are rapidly resorbed and does not form a hard body. In this way, it minimizes the probability of the canal filling path to change the direction of the permanent tooth. In addition, two basic materials forming the paste (calcium hydroxide and iodoform) are responsible for the high-level antibacterial features of the material (38).

In their study, Estrela et al. (43), for investigating the effect of iodoform on the antibacterial effectiveness of calcium hydroxide, used the agar diffusion method and found that iodoform did not have any effect on the antibacterial effectiveness of calcium hydroxide.

Harini Priya et al. (44) compared the antibacterial effectiveness of four canal filling pastes (KH, ZOE, Vitapex and Metapex) on the bacteria they obtained via the devital deciduous teeth. The results revealed that facultative/aerob from all the devital deciduous teeth and anaerob microorganisms from 80% of them were isolated. In addition, in one of the samples, *Candida albicans* was found. The researchers reported that ZOE had the highest level of antibacterial effectiveness on the microorganisms in question and that the calcium-iodoform paste ranked the second in terms of antibacterial effectiveness.

In clinical and histopathological studies, it was found that canal fillings with calcium hydroxide-iodoform paste in deciduous teeth led to successful results and that in these cases, bone regeneration was observed (38,45). It was also reported that wall adaptation and impermeability were good. The mixture of calcium hydroxide-iodoform is thought to be an ideal pulpal filling material for deciduous teeth (38,46). In addition, some researchers stated that the paste is resorbed early in the canal, which does not have negative influence on the success of the treatment, though (45,46).

Nakornchai et al. (45), in their 12-month study, reported clinical success rates of %96 for calcium hydroxide-iodoform paste and %56 for radiographic. Howley et al. (47) found in their study on deciduous incisor teeth that calcium hydroxide-iodoform

paste had a success rate of 100% clinically and 73% radiographically.

In another study conducted in a period of 18 months by Subramaniam and Gilhotra (48), who compared calcium hydroxide-iodoform paste, zinc oxide eugenol and calcium hydroxide-iodoform-zinc oxide eugenol, it was found that calcium hydroxide-iodoform paste demonstrated a success rate of 100%, while calcium hydroxide-iodoform-zinc oxide eugenol paste and zinc oxide eugenol had a success rate of 93.3%.

Gupta and Das (49), in their study in which they followed the canal treatments using zinc oxide eugenol and calcium hydroxide-iodoform paste on necrotic deciduous teeth for six months, found that calcium hydroxide-iodoform paste had a success rate of 90.48% and that zinc oxide eugenol had a success rate of 85.71%.

#### **Calcium Hydroxide-Iodoform-Zinc Oxide Eugenol Paste**

The compound of zinc oxide eugenol, calcium hydroxide and iodoform removing the disadvantages of these materials was produced to benefit from its advantages. Calcium hydroxide-iodoform-zinc oxide eugenol paste is not resorbed as long as it is found in the canal (50). Due to its hydrophilic feature, it is appropriate to use in wet canal surfaces. It has an antibacterial effect and allows disinfection in accessory canals and dentin tubules which can not be mechanically cleaned (51).

In their retrospective study investigating the long-term effects of canal treatment in deciduous teeth, Moskovitz et al. (52) evaluated the success of the root canal treatment applied using the calcium hydroxide-iodoform-zinc oxide eugenol paste on 242 deciduous molar teeth at the end of 33,5 months. The researchers reported 90% success for teeth receiving radiolucent in the root environment and provided no information about the place or width of the radiolucent area for these teeth.

Rewal et al. (53) compared calcium hydroxide-iodoform-zinc oxide eugenol paste and zinc oxide eugenol paste and found that calcium hydroxide-iodoform-zinc oxide eugenol paste was a good choice for deciduous teeth canal treatments with a rate of 100%.

## Conclusion

Unless protective treatments become common in deciduous teeth, endodontic treatments will go on playing a big role in the treatment of tooth decays. This situation brings about search for new materials and techniques. In recent years, mineral trioxide aggregate (MTA) has become prominent in deciduous tooth endodontic treatments, and the current material is gradually being developed. Also, related studies are being conducted. Besides MTA, products which form hard tissues and which have antibacterial features are put forward, and enough *in vitro* and *in vivo* studies are expected to be carried out. As a result of these studies, endodontic treatments in deciduous teeth can be given more successfully, and early loss of deciduous teeth can be avoided. Eventually, the problems regarding permanent tooth development can be overcome.

## Ethics

**Peer-review:** Externally and internally peer-reviewed.

## Authorship Contributions

Concept: K.G.U.G., Design: K.G.U.G., Data Collection or Processing: M.D., Analysis or Interpretation: M.D., Literature Search: M.D., Writing: M.D.

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