# EVALUATION OF DENTAL DISCOLORATION CAUSED BY FILLING PASTES IN PRIMARY TEETH

**André Luis Fideles Padilha** [1]
**Orlando Aguirre Guedes** [2]
**Universidade Evangélica de Goiás – UniEVANGÉLICA**[12]

**ABSTRACT**

The aim of this research project was to evaluate the dental discoloration caused by filling pastes used in pediatric dentistry. Blocks of bovine lower incisor crowns were prepared, leaving a 2 mm thick enamel and dentin remnant. The blocks were randomly assigned into 2 groups, according to the presence or absence of dentin hybridization. After hybridization, the blocks were further subdivided into 5 experimental groups based on the type of endodontic cement: 1) Guedes Pinto Paste; 2) Zinc oxide-eugenol paste; 3) Calcium hydroxide paste, prepared with calcium hydroxide and propylene glycol; 4) Paste containing Chloramphenicol + tetracycline chloride + zinc oxide-eugenol; 5) Vitapex®. Color determination was performed using a digital spectrophotometer, and measurements were obtained at 7, 30, and 60 days after the material placement. Data related to discoloration were tabulated and tested for normality using the Shapiro-Wilk test. ANOVA and Tukey tests were used for analysis. Both the filling paste and evaluation period showed statistical differences in color alteration ($p < 0.05$). Endodontic pastes induce staining of the dental structure.

**Keywords:** Pediatric dentistry, dental discoloration, dentin bonding agents.

## INTRODUCTION

Different intracanal medications have been proposed for use in pediatric dentistry (Benfatti and Andrioni, 1969; Tchaou et al., 1995; Bonow et al., 1996; Pabla et al., 1997; Estrela et al., 2001a). However, even after an effective sanitization process, viable bacteria may still be recovered from the root canals. The difficulties in microbial control make it necessary to use filling pastes in endodontic therapy for primary teeth (Guedes-Pinto et al., 1981; Costa et al., 1994; Nurko and Garcia-Godoi, 1999; Mani et al., 2000).

Nowadays, there is great concern about aesthetics, and the expectations of children and their parents regarding dental treatment must be considered by the dentist when choosing a specific approach (Crystal et al., 2017; Gonçalves et al., 2017; Bagher et al., 2019). One alternative that may reduce the negative effects of filling pastes is the protection of the exposed coronal dentin through dentin hybridization before starting endodontic therapy. This protection can be performed

[1] Acadêmico da Faculdade de Odontologia, Universidade Evangélica de Anápolis - UniEVANGÉLICA, E-mail: andrefideles62@gmail.com
[2] Professor do Programa de Pós-Graduação em Odontologia, Universidade Evangélica de Anápolis - UniEVANGÉLICA, E-mail: orlandoaguedes@gmail.com

using the immediate dentin sealing (IDS) technique, which is widely used in indirect restorations (Magne et al., 2005; Gillen et al., 2011). The aim of this study was to evaluate the dental discoloration caused by filling pastes indicated in pediatric dentistry.

## METHODOLOGY

**Sample Selection and Preparation**: Two hundred and ten crown blocks (10 mm x 10 mm) were prepared with the aid of a double-sided diamond disk (4" x 0.12 x 0.12, Extec, Enfield, CT, USA), mounted on a hard tissue microtome (Isomet 1000, Buehler, Lake Bluff, IL, USA), under water cooling and a cutting speed calibrated at 250 rpm. The crowns were attached to an acrylic plate using a cyanoacrylate adhesive (Loctite Super Bonder, Henkel Loctite Corporation, USA) and stick wax (Nova DFL, Rio de Janeiro, RJ, Brazil). The blocks were obtained in a single cut, ensuring flat surfaces. Cavities with a diameter of 5 mm and a depth of approximately 1.5 mm were prepared in the center of the lingual face of each specimen using diamond tips (#4054; KG Sorensen, Cotia, SP, Brazil); a remnant of 2 mm thickness of dentin and enamel was achieved. The remnant thickness was verified with the help of a micrometer (Metalúrgica Fava Indústria Comércia, São Paulo, SP, Brazil).

The specimens were then subjected to ultrasonic baths (Cristófoli Biossegurança, Campo Mourão, PR, Brazil) with 2.5% sodium hypochlorite (Fitofarma, Lt. 20442, Goiânia, GO, Brazil) for 15 minutes, distilled water (Farmácia Escola da UFG, Goiânia, GO, Brazil) for 1 minute, 17% EDTA (Biodinâmica, Ibiporã, PR, Brazil) for 3 minutes, and again distilled water (Farmácia Escola da UFG, Goiânia, GO, Brazil) for 1 minute. After being dried with filter paper (Melitta do Brasil Indústria e Comércio Ltda., Avaré, SP, Brazil), the cavities were conditioned with 37% phosphoric acid (Condac 37%; FGM Produtos Odontológicos, Joinville, SC, Brazil) for 15 seconds, washed with distilled water (Farmácia Escola da UFG, Goiânia, GO, Brazil) for 1 minute, and gently dried with an air syringe for 15 seconds. A layer of adhesive (Adper Single Bond 2; 3M ESPE, Sumaré, SP, Brazil) was applied to the conditioned area and polymerized (Optilight LD Max; Gnatus, Ribeirão Preto, SP, Brazil) for 20 seconds to allow sealing of the interface with resin.

**Filling Paste Manipulation and Insertion**: At this point, the blocks were divided again into 5 experimental groups (n = 40) based on the filling paste: 1) Guedes

Pinto Paste [composed of 0.30 g of iodoform (K-Dent; Quimidrol, Joinville, SC, Brazil), 0.25 g of Ricofort (Merrel Lepetit, Santo Amaro, SP, Brazil), and 0.1 mL of camphorated paramonochlorophenol]; 2) Zinc oxide-eugenol paste (SS White, Rio de Janeiro, RJ, Brazil); 3) Calcium hydroxide paste, prepared with calcium hydroxide (Quimis Mallinkrodt, Inc.; St. Louis, MO, USA) and propylene glycol (Natu Phamas, Goiânia, GO, Brazil); 4) Paste containing Chloramphenicol + tetracycline chloride + zinc oxide-eugenol (CTZ; Neo Química, Anápolis, GO, Brazil + Cifarma, Santa Luiza, MG, Brazil + SS White); 5) Vitapex® (DiaDent Group International Inc., Burnaly, BC, Canada). The pastes were manipulated to a toothpaste consistency and inserted into the cavities with the help of a #18 dentin spatula (SS White Duflex, Rio de Janeiro, RJ, Brazil). Five blocks served as a negative control group for the pastes, in which the cavities were only restored, and five blocks served as a negative control group for the dentin hybridization technique, in which the hybridized cavities were only restored. After the restorations were completed, the specimens were immersed in individual containers containing 2 mL of distilled water (Farmácia Escola da UFG, Goiânia, GO, Brazil) and kept until the end of the experiment at room temperature.

**Evaluation of Dental Discoloration After Insertion of Endodontic Cements**: Color determination was performed using a digital spectrophotometer (Vita EasyShade Compact; Vita Zahnfabrik, AG, Bad Sachington, Germany). The equipment was calibrated before measuring each specimen. Measurements were obtained immediately after the material placement (reference color 0), after 30, and 60 days. The color parameters were recorded according to the International Commission on Illumination (CIE, 1978), considering "L", "a", and "b", where "L" represents the color luminosity values, "a" corresponds to the measurement along the red-green axis, and "b" is the measurement along the yellow-blue axis. The color change (ΔE) relative to the time intervals was calculated based on the initial values using the following formula: $\Delta E = [(L1-L0)^2 + (a1-a0)^2 + (b1-b0)^2]^{1/2}$.

**Statistical Analysis**: Data related to discoloration were tabulated and tested for normality using the Shapiro-Wilk test. Based on a normal distribution, ANOVA and Tukey tests were employed for analysis. The influence of dentin hybridization on the discoloration process was also tested using t-Student tests. A significance level of 5% ($\alpha = 0.05$) was adopted for all tests.

## RESULTS

The factors studied—filling material, hybridization, and evaluation period—showed a statistical difference in dental color change ($p < 0.05$) (Table 1).

**Table 1.** Analysis of dental color variation (ΔE) according to the filling paste and evaluation period investigated (ANOVA with post-hoc Tukey; α=5%)

| Groups | ΔE 7 days | ΔE 30 days | ΔE 60 days |
|---|---|---|---|
| Guedes Pinto Paste | 18.30c | 16.01c | 17.51c |
| Zinc Oxide Eugenol Paste | 10.73b | 11.48b | 11.07b |
| Calcium Hydroxide Paste | 11.75b | 9.12b | 9.69b |
| CTZ Paste | 11.04b | 12.98b | 12.63b |
| Vitapex | 13.60b | 12.62b | 14.02b |
| Control | - | 3.55a | 3.19a |
| p-value | <0.05 | <0.05 | <0.05 |

## CONCLUSION

It is possible to conclude that the filling pastes used in pediatric dentistry induce staining in the dental structure.

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