





Effect of different children's toothpastes on compomer surface roughness: An in vitro study

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Highlights

The type of toothpaste used in pediatric patients may influence the surface integrity of restorative materials.

Reduced surface roughness may contribute to decreased plaque accumulation and lower risk of secondary caries.

The use of herbal- and fluoride-containing toothpastes may improve the long-term durability and aesthetic stability of restorations.

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Abstract

Aim: To compare the effects of different children's toothpastes on the surface roughness (Ra) of compomer materials under conditions simulating one year of toothbrushing. **Methods:** A total of 80 disc-shaped specimens prepared from a Dentsply Sirona compomer material were polished and randomly assigned to five groups (n = 16): control (distilled water), Sensodyne Pronamel Kids, Chicka Chicka, The Humble Co. Kids, and Weleda Kids. Baseline surface roughness (Ra) values were recorded using a profilometer. Toothbrushing was performed using a brushing simulation in accordance with ISO standards, and post-brushing Ra measurements were obtained under identical conditions. Data distribution was assessed using the Shapiro–Wilk test. Intergroup comparisons were conducted with the Kruskal–Wallis test, followed by the Dunn–Bonferroni post hoc test when appropriate, while intragroup comparisons were performed using the Wilcoxon test. The primary outcome variable was defined as ΔRa ($\alpha = 0.05$). **Results:** No statistically significant differences were observed among the groups in terms of absolute Ra values at baseline or after brushing ($p > 0.05$). In all groups, Ra values showed a significant increase after brushing in intragroup analyses ($p < 0.001$). A significant difference was detected among the groups with respect to ΔRa values ($p < 0.001$). Post hoc analyses revealed that the increase in ΔRa was significantly higher in the Sensodyne Pronamel and Chicka Chicka groups compared with the control, The Humble Co. Kids, and Weleda Kids groups. **Conclusions:** Toothbrushing increased the surface roughness of compomer materials in all groups, with toothpaste formulation playing a determining role in this change. The Humble Co. Kids and Weleda Kids groups demonstrated more limited surface alterations in compomer restorations, as indicated by lower ΔRa values.

Keywords: Compomers; Surface Properties; Toothbrushing; Toothpaste

INTRODUCTION

Dental caries is a major health problem affecting individuals of all age groups. Therefore, ensuring effective oral hygiene during childhood, removing dental plaque that leads to caries, and preventing enamel demineralization constitute the fundamental goals of preventive dentistry.^{1, 2} Dental plaque is one of the primary etiological factors in the initiation and progression of caries and periodontal diseases. Toothbrushing, which constitutes a fundamental component of daily oral care, enables the mechanical removal of dental plaque.^{3, 4} Toothpastes are among the most important therapeutic components of daily oral hygiene and are one of the most commonly used dental products.⁵

Toothpastes contain numerous components in their formulations, each serving different functions. Among these, abrasive agents may consist of various materials such as hydrated silica, calcium pyrophosphate, dicalcium phosphate dihydrate, sodium metaphosphate, perlite, sodium bicarbonate, zirconium silicate, pumice powder, aluminum oxide, calcium carbonate, and nano-hydroxyapatite. Abrasive particles contribute not only through their mechanical action but also by facilitating the removal of extrinsic surface stains. However, increased abrasivity may result in undesirable surface roughness on enamel, soft tissues, and various restorative materials. The abrasivity of a toothpaste is closely related not only to the amount used but also to the particle size, shape, and chemical properties of the abrasive components.⁶

The abrasivity of a toothpaste is generally expressed by the Relative Dentin Abrasivity (RDA) value, which is the most widely accepted method for defining toothpaste abrasivity. The International Organization for Standardization (ISO) has established an upper RDA limit of 250 for adult toothpastes.^{7, 8} However, to date, no internationally defined RDA limit has been

established for children's toothpastes.⁹

In recent years, increasing awareness regarding the potential effects of chemical ingredients has led to growing interest in herbal-based toothpastes.¹⁰ Owing to their antimicrobial, anti-inflammatory, and antioxidant properties, herbal extracts may play a supportive role in the prevention of dental caries and periodontal diseases.^{11,12} Currently, many children's toothpastes—both conventional and herbal formulations—contain fluoride, aiming to provide effective protection against dental caries. An ideal children's toothpaste formulation should aim to maximize fluoride bioavailability, minimize abrasivity, and ensure user tolerance through an acceptable flavor.¹³

Both herbal and conventional toothpastes are readily accessible and widely used in daily clinical practice. Since fluoride plays a critical role in caries prevention, only fluoride-containing toothpastes were included in this study to ensure clinical relevance. The selected toothpastes differed in terms of their active ingredients, abrasive systems, and formulation characteristics.

Herbal toothpastes are characterized by plant-based formulations, the use of milder surfactants, and generally silica-based abrasive systems, which may influence their interaction with restorative materials. For example, Weleda Kids (Weleda AG, Germany) toothpaste contains *Calendula officinalis* extract and plant-derived oil components, whereas The Humble Co. Kids (The Humble Co., Sweden) toothpaste includes biologically active components such as erythritol, aloe vera, and xylitol. In contrast, conventional formulations may incorporate more pronounced cleaning and abrasive systems. In this context, Sensodyne Pronamel Kids (Haleon, UK) represents a formulation known for its erosion-protective properties, whereas Chicka Chicka Kids (Kundal, South Korea) contains botanical components such as *Camellia* (tea) extract, mint extract, and broccoli extract, as well as abrasive

agents including hydrated silica and sodium bicarbonate.

Surface roughness of restorative materials may change following toothbrushing, and increased surface roughness may promote plaque accumulation. A smoother surface can reduce plaque retention and surface staining, thereby improving both the longevity and esthetics of restorations.¹⁴

Compomer is a restorative material developed specifically for pediatric dentistry and is particularly susceptible to surface alterations associated with long-term toothbrushing and toothpaste use. Surface roughening of compomer materials may adversely affect esthetics and increase plaque retention, ultimately reducing the lifespan of the restoration.¹⁵ Therefore, evaluating the long-term effects of children's toothpastes with different fluoride-containing formulations on compomer surfaces is of considerable importance for the clinical success of pediatric restorations.

The aim of this in vitro study was to evaluate the surface roughness induced on compomer materials by different children's toothpastes under conditions simulating one year of toothbrushing, using a profilometer. The null hypothesis (H_0) tested in this study was that toothbrushing with different children's toothpastes would not result in a statistically significant difference in surface roughness (Ra) of compomer materials.

METHODS

Sample Size Determination

A power analysis was performed to determine the required sample size. The sample size calculation was based on a type I error rate of 5% ($\alpha = 0.05$), an effect size of 0.40, and a statistical power of 80% ($1 - \beta = 0.80$). Accordingly, a total of 80 compomer specimens were prepared, with at least 16 specimens allocated to each group.

Specimen Preparation

Dyract XP compomer material (Dentsply Sirona, Dyract XP, Compomer, 2025, York, PA, USA) was used in this study. Compomer discs were fabricated using standardized stainless steel molds with a diameter of 10 mm and a thickness of 2 mm. A glass slide was placed over the molds to ensure surface flatness, prevent air bubble formation, and remove excess material. The specimens were polymerized for 20 seconds using an LED light-curing unit (3M ESPE, Elipar S10, light-curing unit, 2025, St. Paul, MN, USA) in accordance with the manufacturer's instructions.

Surface Standardization

To obtain a standardized compomer surface, all specimens were sequentially polished under water using 600-, 800-, and 1200-grit silicon carbide abrasive papers. Following polishing, the specimens were rinsed with distilled water and air-dried.

Baseline Surface Roughness Measurement

Baseline surface roughness (Ra) values of all specimens were measured using a profilometer (Mahr GmbH, Perthometer M2, Profilometer, 2025, Göttingen, Germany) at the Central Laboratory of Ankara University Faculty of Dentistry. Three measurements were obtained from different locations on each specimen, and the mean value was recorded as the baseline Ra. Measurements were performed with a cut-off length of 0.25 mm, a tracing length of 0.8 mm, and three repeated surface scans. Measurement areas were marked to ensure that post-brushing measurements were obtained from the same locations.

Group Allocation

After completion of baseline surface roughness measurements, specimens were randomized into

five groups (n = 16 per group) using a computer-generated randomization method. The compositions of the toothpastes used are presented in Table 1. The groups were defined as follows:

- (1) control group (brushing with distilled water),
- (2) Sensodyne Pronamel Kids toothpaste (Haleon, fluoride toothpaste, 2025, UK),
- (3) Chicka Chicka Kids toothpaste (Kundal, fluoride toothpaste, 2025, South Korea),
- (4) The Humble Co. Kids toothpaste (The Humble Co., herbal fluoride toothpaste, 2025, Sweden), and
- (5) Weleda Kids toothpaste (Weleda AG, herbal fluoride toothpaste, 2025, Germany).

Toothbrushing Procedure

The toothbrushing procedure was performed using a toothbrushing simulator (Lua Instruments 3median B12, Toothbrushing Simulator, 2025, Türkiye, Serial No: DT250514) (Figure 1). Medium-bristle nylon brush heads compatible with electric toothbrushes (Procter & Gamble, Oral-B White series, toothbrush head, 2025, USA) were used. The bristle structure, stiffness, and physical properties of the brush heads were consistent with the criteria defined in ISO 11609:2017.¹⁶

Table 1. Ingredient characteristics and manufacturer information of the children's toothpastes used in the study

Product (Brand – Country)	Fluoride (ppm)	Abrasive Agents	Herbal/Natural Ingredients	Other Ingredients
Sensodyne Pronamel Kids (GSK – UK)	1450 ppm NaF	Hydrated Silica	—	Aqua, Sorbitol, Glycerin, PEG-6, Cocamidopropyl Betaine, Xanthan Gum, Flavor, Sodium Saccharin, Sucralose, Titanium Dioxide, Sodium Hydroxide, Limonene
Chicka Chicka Kids (Kundal – South Korea)	1450 ppm NaF	Hydrated Silica, Sodium Bicarbonate	Camellia (tea) extract, mint extract, broccoli extract, mixed botanical extracts (CBHC-C)	Glycerin, Aqua, Lauryl Glucoside (plant-derived surfactant), Xylitol, low-acidity ethanol (70%), Steviol Glycosides (natural sweetener), Sodium Carboxymethyl Cellulose (thickener), Flavor
The Humble Co. Kids (Sweden)	1000 ppm NaF	Hydrated Silica	Erythritol, <i>Aloe barbadensis</i> leaf juice, Xylitol, Cellulose gum, Disodium Cocoyl Glutamate, Lauryl Glucoside, Rebaudioside A	Glycerin, Aqua, Hydroxyapatite, Flavor, Potassium Citrate, Citric Acid, Sodium Benzoate, Potassium Sorbate
Weleda Kids (Germany)	1000 ppm NaF	Silica	<i>Calendula officinalis</i> flower extract, <i>Prunus amygdalus dulcis</i> (sweet almond) oil, esculin	Glycerin, Aqua, Flavor, Limonene



Figure 1. Toothbrushing simulator (Lua Instruments 3median B12, Serial No: DT250514, Türkiye)

The brushing force of the simulator was set at 2.5 ± 0.2 N, and 10,000 brushing cycles were applied to the compomer surfaces to simulate approximately one year of toothbrushing. A toothpaste slurry was prepared by mixing 25 g of toothpaste with 40 mL of distilled water. To minimize variability associated with bristle deformation, brush heads were replaced every 2,500 cycles, corresponding to the clinical recommendation of replacing a toothbrush every three months. The procedure was performed in a continuous manner without predefined rest intervals between brushing cycles, with interruptions occurring only during toothbrush replacement. All other parameters, including brushing force, frequency, and duration, were kept constant throughout the experiment. All brushing procedures were conducted using a linear back-and-forth motion at a constant speed of 50 mm/s, while maintaining constant contact pressure and cycle length throughout the experiment.

Post-Brushing Surface Roughness Measurement

Following the toothbrushing procedure, the specimens were carefully rinsed with distilled water and gently air-dried. Post-brushing surface

roughness (Ra) values were then determined using the same profilometer device and measurement parameters as those used for the baseline measurements. All measurements were performed under identical environmental conditions, and the obtained data were recorded for analysis.

Statistical Analysis

All data obtained in the study were analyzed using IBM SPSS Statistics version 22.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics for continuous variables were presented as mean \pm standard deviation (SD) and median (minimum–maximum). Data distribution was assessed using the Shapiro–Wilk test, and nonparametric tests were applied when the assumption of normality was not met.

The Kruskal–Wallis H test was used to compare baseline (Ra_{before}) and post-brushing (Ra_{after}) surface roughness values among groups. For variables showing statistically significant differences, pairwise comparisons were performed using the Dunn post hoc test with Bonferroni correction.

Intragroup comparisons between pre- and post-brushing values were conducted using the Wilcoxon signed-rank test. To evaluate the net effect of toothpastes on surface roughness, the variable ΔRa was calculated as $(Ra_{\text{after}} - Ra_{\text{before}})$, and these difference values were compared among groups using the Kruskal–Wallis test. Statistical significance was set at $p < 0.05$. Effect sizes were calculated as $r = |z|/\sqrt{n}$ for intragroup analyses and epsilon-squared (ϵ^2) for intergroup comparisons.

RESULTS

In this study, the effect of toothbrushing on the surface roughness of compomer materials was evaluated based on the change in Ra values between pre- and post-brushing measurements ($\Delta Ra = Ra_{\text{after}} - Ra_{\text{before}}$). At baseline, no statistically significant difference was observed among the groups in terms of Ra values (Kruskal–Wallis $H = 2.11$; $p = 0.715$).

According to intragroup comparisons using the Wilcoxon signed-rank test, post-brushing Ra values in the control group were found to be significantly higher than baseline values ($p < 0.001$). Similarly, statistically significant increases in Ra values after brushing were observed in the Sensodyne Pronamel Kids, Chicka Chicka Kids, The Humble Co. Kids, and Weleda Kids groups ($p < 0.001$, $p = 0.003$, $p < 0.001$, and $p < 0.001$, respectively).

Intergroup comparison of ΔRa values revealed a statistically significant difference among the groups, with a large effect size (Kruskal–Wallis $H = 26.2$; $\epsilon^2 = 0.30$; $p < 0.001$). Post hoc Dunn–Bonferroni analyses demonstrated that the Sensodyne Pronamel Kids and Chicka Chicka Kids groups exhibited significantly higher ΔRa values compared with the control group. In addition, these two groups showed significantly greater ΔRa values than the The Humble Co. Kids and Weleda Kids groups. No statistically significant difference

in ΔRa values was found between the Sensodyne Pronamel Kids and Chicka Chicka Kids groups. Likewise, no significant differences were observed among the control, The Humble Co. Kids, and Weleda Kids groups, indicating similar levels of surface roughness change.

Baseline and post-brushing Ra values for each group are presented in Table 2, while intergroup comparisons of ΔRa values are shown in Table 3. The visual distribution of median ΔRa values across groups is illustrated in Figure 2.

DISCUSSION

Despite the wide variety of toothpastes currently available for children, the number of studies investigating their effects on enamel and restorative materials remains limited.^{9, 17–22} The effects of different fluoride-containing children's toothpastes on the surface roughness of compomer materials were evaluated under a toothbrushing simulation performed in accordance with ISO standards. Most existing studies have focused on the effects of children's toothpastes on glass ionomer cements or primary tooth enamel.^{9, 17, 18, 19} Previous research has reported that compomer materials may exhibit increased surface roughness and material loss following toothbrushing.²³ However, no studies were identified that specifically evaluated the effects of herbal-based children's toothpastes on compomer surfaces, making direct comparison with the present findings difficult.

According to ISO/TR 14569-1:2007, brushing forces applied in toothbrushing wear tests should reflect physiological forces used under clinical conditions. Brushing forces ranging from 0.5 to 2.5 N have been reported to represent clinical toothbrushing conditions. Accordingly, the brushing force of 2.5 N selected in the present study falls within physiological limits and was considered appropriate for clinic conditions.^{14,24,25}

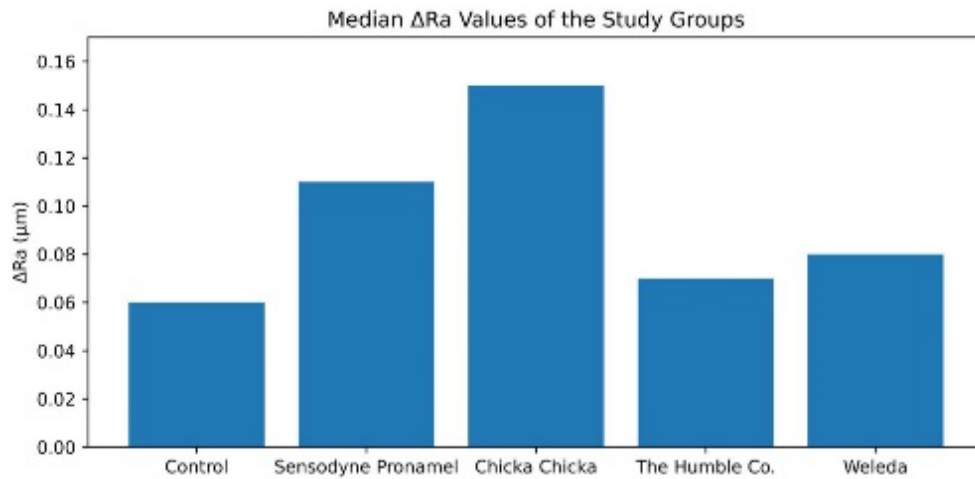


Figure 2. Comparison of median ΔRa values among the study groups

Table 2. Baseline and post-brushing Ra values of the study groups

Group	n	Ra Before, Median (Min–Max)	Ra After, Median (Min–Max)
Control (Distilled Water)	16	0.40 (0.21–0.81)	0.45 (0.28–0.87)
Sensodyne Pronamel Kids	16	0.35 (0.21–0.73)	0.46 (0.31–0.93)
Chicka Chicka Kids	16	0.31 (0.17–0.94)	0.64 (0.28–1.29)
The Humble Co. Kids	16	0.45 (0.21–0.96)	0.52 (0.28–1.03)
Weleda Kids	16	0.34 (0.22–0.90)	0.42 (0.30–1.01)

Data are presented as median (minimum–maximum); Ra: surface roughness (μm); Intragroup comparisons between baseline and post-brushing Ra values were performed using the Wilcoxon signed-rank test

Table 3. Intergroup comparison of ΔRa values

Group	ΔRa (Median, μm)
Chicka Chicka Kids	0.15 ^a
Sensodyne Pronamel Kids	0.11 ^a
Weleda Kids	0.08 ^b
The Humble Co. Kids	0.07 ^b
Control	0.06 ^b

Intergroup differences in ΔRa values were evaluated using the Kruskal–Wallis test ($H = 26.2$; $p < 0.001$), followed by Dunn–Bonferroni post hoc analysis for pairwise comparisons. Different superscript letters (^a, ^b) indicate statistically significant differences between groups, while identical superscripts indicate no significant difference (Bonferroni-adjusted $p < 0.05$).

The application of 10,000 brushing cycles is a commonly used parameter in in vitro studies evaluating surface roughness of restorative materials and has been reported to simulate approximately one year of clinical toothbrushing.^{14, 26–28}

In line with ISO 11609 and commonly reported protocols in the literature, toothpaste slurries were prepared by mixing 25 g of toothpaste with 40 mL of distilled water.^{16, 29, 30} This standardized ratio allows for a comparable assessment of the abrasive effects of different toothpaste formulations.

The absence of statistically significant differences among baseline Ra values for compomer specimens indicates that the groups were homogeneous in terms of surface characteristics prior to the experimental procedures and that the observed post-brushing changes were attributable to the brushing process and the properties of the toothpastes used. An increasing trend in Ra values was observed in all groups following toothbrushing, with even the control group (brushing without toothpaste) showing a significant increase in surface roughness. This finding is consistent with previous studies reporting that mechanical toothbrushing alone can alter compomer surface topography and lead to surface degradation and matting in resin-based materials.^{23,28,31} In addition, wear of toothbrush bristles has been reported to contribute to increased surface roughness.³² Therefore, brush heads were replaced every 2,500 cycles in the present study to minimize this effect.

The main factors determining surface changes during toothbrushing include the mechanical action of the toothbrush, the abrasivity profile of the toothpaste, and the structural characteristics of the restorative material.^{30, 33, 34} The observation that ΔRa values were significant even in the control group highlights the baseline effect of mechanical brushing. For this reason, the use of ΔRa as an outcome variable is essential for accurately

evaluating the net effect of toothpastes, and intergroup comparisons in the present study were therefore based on this parameter.

Although Chicka Chicka Kids toothpaste contains botanical ingredients, it is not marketed as an herbal toothpaste. In the present study, significantly higher ΔRa values were observed in the Chicka Chicka Kids group compared with the control, The Humble Co. Kids, and Weleda Kids groups, indicating that this toothpaste may induce more pronounced surface alterations on compomer materials. Although a precise comparison of abrasivity was not possible due to the lack of detailed RDA information for this product, this finding underscores the importance of formulation-related surface effects. Previous studies have reported that toothpastes with higher abrasive potential or whitening properties can significantly increase surface roughness of resin-based restorative materials.^{34, 35}

Although statistically significant increases in post-brushing Ra values were observed in The Humble Co. Kids and Weleda Kids groups, their median ΔRa values were lower than those of the Chicka Chicka Kids and Sensodyne Pronamel Kids groups and were closer to those of the control group. The predominantly herbal composition of these products may be associated with more limited surface alterations. Herbal extracts, natural thickeners such as alginates, and oil-based components present in these formulations may reduce friction between abrasive particles and the surface during brushing, resulting in a gentler cleaning profile. In particular, ingredients such as *Calendula officinalis* flower extract, sweet almond oil, and alginate in Weleda Kids toothpaste may have contributed to this effect.

The literature suggests that the morphology and surface charge of hydrated silica particles may result in a more controlled surface interaction with resin-based materials and that formulations with low-to-moderate abrasivity profiles may limit

increases in surface roughness.^{15, 30, 33} Although all groups except Weleda Kids contained hydrated silica, differences in ΔRa values may be related to variations in particle shape, size, and fineness of abrasive derivatives.²⁸

In the Sensodyne Pronamel Kids group, ΔRa values were significantly higher than those observed in the Weleda Kids and The Humble Co. Kids groups, while no statistically significant difference was detected when compared with the Chicka Chicka Kids group, despite numerically lower values. This finding may reflect the balance between abrasive-cleaning efficacy and the effect of fluoride on surface modification in the Sensodyne Pronamel Kids formulation. The moderate ΔRa values observed suggest that this toothpaste may provide a balanced cleaning–abrasion profile on compomer surfaces. Indeed, such formulations have been recommended in the literature, particularly for individuals at risk of enamel erosion.^{30, 33}

It is well established that exceeding the critical surface roughness threshold ($\sim 0.2 \mu\text{m}$) increases the risk of plaque retention and discoloration.²⁶ Therefore, the use of toothpastes with lower abrasivity profiles may represent a clinically rational approach for the maintenance of compomer restorations in pediatric patients. The more limited ΔRa values observed in The Humble Co. Kids and Weleda Kids groups suggest that these products may offer potential advantages in this regard. However, the clinical relevance of these findings should be confirmed through *in vivo* studies.

The main limitations of this study include the inability of *in vitro* conditions to fully replicate the dynamic oral environment, such as the presence of saliva, biofilm formation, and fluctuations in pH and temperature. Additional limitations include the evaluation of only one compomer material, the assessment of a limited number of commercially available children's toothpastes, and the lack of

precise RDA data for all tested products. Compomer material was selected due to its widespread use in pediatric dentistry. Future studies should evaluate a broader range of compomer and composite systems, include toothpastes with known RDA values, and incorporate advanced surface analysis techniques such as SEM, AFM, three-dimensional profilometry, gloss, and color measurements in addition to surface roughness.^{34–37}

CONCLUSIONS

This study demonstrated that different children's toothpaste formulations may exert varying effects on the surface roughness of compomer materials. While the Chicka Chicka Kids and Sensodyne Pronamel Kids groups exhibited higher ΔRa values, more limited surface alterations were observed in The Humble Co. Kids and Weleda Kids groups. These findings suggest that formulation characteristics of children's toothpastes—particularly the type of surfactants and abrasive systems—may influence the surface integrity of compomer restorations. Nevertheless, long-term *in vivo* studies are required to confirm these results under clinical conditions.

REFERENCES

1. Dentistry SoP, Health O. Preventive oral health intervention for pediatricians. *Pediatrics* 2008;122:1387-1394
2. Han SY, Chang CL, Wang YL, Wang CS, Lee WJ, Vo TTT, et al. A narrative review on advancing pediatric oral health: comprehensive strategies for the prevention and management of dental challenges in children. *Children (Basel)* 2025;12:286
3. Van der Weijden G, van Loveren C. Mechanical plaque removal in step-1 of care. *Periodontol* 2000 2023;92:47-63

4. Kaneyasu Y, Shigeishi H, Nütani Y, Takemoto T, Sugiyama M, Ohta K. Manual toothbrushes, self-toothbrushing, and replacement duration to remove dental plaque and improve gingival health: a scoping review. *J Dent* 2024;148:105240
5. Sanz M, Serrano J, Iniesta M, Santa Cruz I, Herrera D. Antiplaque and antigingivitis toothpastes. *Monogr Oral Sci* 2013;23:27-44
6. Ganss C, Möllers M, Schlueter N. Do abrasives play a role in toothpaste efficacy against erosion/abrasion? *Caries Res* 2017;51:52-57
7. American Dental Association. Toothpastes. 2025. Available from: <https://www.ada.org/resources/ada-library/oral-health-topics/toothpastes>
8. Singla MG, Viridi I. Abrasive action of different herbal toothpastes: a profilometric analysis. *J Dent Res Rev* 2021;8:312-316
9. Athawale R, Srinath S, Chowdary C. Comparative evaluation of enamel abrasivity of different commercially available dentifrices: an in vitro study. *J Indian Assoc Public Health Dent* 2018;16:78-82
10. Kengadaran S, Anusha D, Baskar K, Muthukrishnan K, Pooraninagalakshmi J, Prabakar J. Comparative effectiveness of herbal and conventional toothpaste on prevention of dental caries: a systematic review and meta-analysis. *Indian J Dent Res* 2022;33:332-337
11. Mehta V, Shetiya SH, Kakodkar P, Janakiram C, Rizwan SA. Efficacy of herbal dentifrice on the prevention of plaque and gingivitis compared to conventional dentifrice: a systematic review and meta-analysis. *J Indian Soc Periodontol* 2018;22:379-389
12. Mazumdar M, Chatterjee A, Majumdar S, Chandrika M, Patki P. Evaluation of the safety and efficacy of complete care herbal toothpaste in controlling dental plaque, gingival bleeding and periodontal diseases. *J Homeop Ayurv Med* 2013;2:124
13. Ferracane JL. Resin composite—state of the art. *Dent Mater* 2011;27:29-38
14. Kyoizumi H, Yamada J, Suzuki T, Kanehira M, Finger WJ, Sasaki K. Effects of toothbrush hardness on in vitro wear and roughness of composite resins. *J Contemp Dent Pract* 2013;14:1137-1144
15. Da Costa J, Adams-Belusko A, Riley K, Ferracane JL. Effect of various dentifrices on surface roughness and gloss of resin composites. *J Dent* 2010;38:e123-e128
16. International Organization for Standardization. Dentifrices—requirements, test methods and marking. Geneva: ISO; 2017. ISO 11609:2017
17. Poonacha K, Deshmukh S, Deshpande AN, Shah R. Comparative evaluation of abrasive effect of three commercially available children's toothpastes in India on glass ionomer cement: an in vitro study. *J South Asian Assoc Pediatr Dent* 2023;6:118-123
18. Yilmaz N, Avcı G, Ozkaya S, Tüzüner T, Baygin O. Comparison of the abrasive effects of children's toothpaste on glass ionomer cement. *Pediatr Dent J* 2021;31:145-151
19. Altınsoy GO, Ceyhan D. Effects of five different toothpastes on remineralization and surface roughness of primary tooth enamel with artificial initial caries. *Appl Sci* 2024;14:7232
20. Passos V, Sousa R, de Melo M, Gomes E, Santiago S, Lima J. In vitro effect of children's toothpaste on brushing abrasion of eroded primary enamel. *Eur Arch Paediatr Dent* 2021;22:157-162
21. Arat EM, Özmen B, Altun C. Çocuk diş macunlarının süt dişi mine yüzey pürüzlülüğü üzerine etkisinin in vitro olarak değerlendirilmesi. *Ataturk Univ Dis Hekim Fak Derg* 2016;26:1-6
22. Uysal S, Öz FT. Süt dişi başlangıç mine lezyonlarının remineralizasyonunda farklı yapıdaki diş macunlarının mikrosertlik üzerine etkisinin in vitro değerlendirilmesi. *Selcuk Dent J* 2022;9:533-539

23. Mondelli RFL, Wang L, Garcia FCP, Prakki A, Mondelli J, Franco EB, et al. Evaluation of weight loss and surface roughness of compomers after simulated toothbrushing abrasion test. *J Appl Oral Sci* 2005;13:131-135
24. International Organization for Standardization. Dental materials—guidance on testing of wear—part 1: wear by toothbrushing. Geneva: ISO; 2007. ISO/TR 14569-1:2007
25. Heintze SD, Forjanic M. Surface roughness of different dental materials before and after simulated toothbrushing in vitro. *Oper Dent* 2005;30:617-626
26. Turssi CP, Hara AT, Magalhães CS, Serra MC, Rodrigues AL Jr. Influence of storage regime prior to abrasion on surface topography of restorative materials. *J Biomed Mater Res B Appl Biomater* 2003;65:227-232
27. Wang L, Garcia FCP, de Araújo PA, Franco EB, Mondelli RFL. Wear resistance of packable resin composites after simulated toothbrushing test. *J Esthet Restor Dent* 2004;16:303-314
28. Monteiro B, Spohr AM. Surface roughness of composite resins after simulated toothbrushing with different dentifrices. *J Int Oral Health* 2015;7:1-5
29. Kim JH, Miletic V, Leprince JG, Park YS. Evaluation of relative dentin abrasivity in whitening toothpastes containing acids. *Int Dent J* 2024;74:1044-1052
30. Enax J, Meyer F, Schulze zur Wiesche E, Fuhrmann IC, Fabritius HO. Toothpaste abrasion and abrasive particle content: correlating high-resolution profilometric analysis with relative dentin abrasivity. *Dent J (Basel)* 2023;11:79
31. AlAli M, Silikas N, Satterthwaite J. Effects of toothbrush wear on surface roughness and gloss of resin composites with various matrix types. *Dent J (Basel)* 2021;9:8
32. Neme A, Frazier KB, Roeder L, Debner T. Effect of prophylactic polishing protocols on the surface roughness of esthetic restorative materials. *Oper Dent* 2002;27:50-58
33. Johannsen G, Tellefsen G, Johannsen A, Liljeborg A. The importance of measuring toothpaste abrasivity in both a quantitative and qualitative way. *Acta Odontol Scand* 2013;71:508-517
34. Meseli S, Alkan E, Korkut B, Kanar O, Tagtekin D. Abrasiveness and bleaching level of toothpastes on composite resins: a quantitative analysis using a novel brushing simulator. *Appl Sci* 2025;15:2314
35. Ferreira NMR, Lippert VF, Heck ABdS, Spohr AM, Kunrath MF, Feldens CA, et al. Surface roughness of composite resins subjected to brushing with whitening toothpastes: an in vitro study. *Braz Oral Res* 2025;39:e006
36. Senawongse P, Pongprueksa P. Surface roughness of nanofill and nanohybrid resin composites after polishing and brushing. *J Esthet Restor Dent* 2007;19:265-273
37. Hilgenberg SP, Pinto SCS, Farago PV, Santos FA, Wambier DS. Physical-chemical characteristics of whitening toothpaste and evaluation of its effects on enamel roughness. *Braz Oral Res* 2011;25:288-294

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