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Superficial Roughness and Micro Hardness of Nanoparticular Composite Resin Affect by Whitening Dentifrices Contain Optical Agent

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Abstract

Background: Because of their aesthetic appeal, whitening toothpastes are now a common habit, especially among young adults. The effects of brushing with those novel dentifrices on the wear characteristics of resin composites are unknown. Materials and Methods Sixty prepared samples of composite resin fabricate in plastic matrix and stored in distilled water for 24h. For surface roughness measurements, using Stylus profilometer and this considered initial roughness value. The specimens were randomly divided into three groups. Group A use distal water (Control Group), group B Oral B 3D White Perfection toothpaste, group C Colgate Luminous White Brilliant. After this, the electric toothbrush was used to brush the specimens in the three groups investigated for 2 minutes twice a day for 30 consecutive days, Surface roughness measurements using also stylus profilometer and micro hardness test this considered final values. Result: In Experiment there was greater diffrenss in GB and G C in relation to GA, with no differences among them. Conclusion: whitening dentifrices containing Blue covarine (optical agent) have an influential effect on surface characteristics (Superficial roughness and micro hardness) of nanoparticular composite resin.

Introduction

Teeth whitening performed by dentists and other dental professionals is more expensi ve than methods used by patients (1), Plaque accumulation and caries can be reduced by practicing pr oper dental hygiene (2) Patients and consumers will want white teeth, and many will be unhappy with their current tooth color and want white teeth (3) Becausteeth pastes are excellent at remove -ing and reducing stains, a growing variety of whitening tooth pastes with better claims to efficacy have been launched to the market (1). By scraping, dentifrice offers medicinal

ingredients while also improving dental hygiene (2).Dentifrices can have a varietyof affects. Scratches may vanish, or new micro wear may form(4.). Toothpaste abrasives and toothbrush bristles can cause superficial grooves on tooth and restorative material surfaces, causing them to degrade (5). Aesthetic restorative materials are frequently employed in dentistry as anterior restoratives and for less invasive procedures.

The three most significant characteristics for any restorative material's lifetime are color, surface roughness, and micro hardness.

The surface hardness of the restorative substance is crucial. Its low surface hardness makes it vulnerable to scratches and causes repair failure (6). Rough surface structure might cause material stains and discoloration, jeopardizing the quality of the restoration. As a result, understanding the impact of a dentifrice abrasion on restorative material loss is critical (7) Because they are known to have high abrasives, new dentifrices that claim to whiten teeth can have a negative impact on restorative materials. As a result, this research was conducted to determine the impact of whitening and dentifrice on aesthetic restorative materials (8).

Materials and Methods

Sixty specimens (SPs) of nanoparticulate composite resin, FILTEK Z350XT (3M ESPE®, Dental Products, St. Paul, Minnesota, USA), color A2, universal restorative.

Preparation of the Specimens

To make the mold, a custom-built brass mold with a diameter of 1.2 cm and a height of 2mm was employed.60 standardized specimens should be prepared. For each of the groups there will be a total of n=20 specimen. The smoothest surfaces were obtained by curing the materials against the mylar strip and then light curing the material for 40 seconds on each side with a light cure device (Bee Cool plus top light LED Curing).

The Masses' Stabilization

Our SPs were maintained in distilled water at 37°C in a Q316M microbiological oven (Quimis® Ltda., Diadema, So Paulo, Brazil) for 24 hours after preparation.Following this time, the test specimens were subjected to a finishing and polishing procedure. used medium grain abrasive discs. The specimens were randomly divided into three groups group A (n=20) use distal water(Control Group). Group B Colgate Oral B 3D White Perfection Toothpaste, Group C White LuminousWhite Brilliant

After the initial reading was taken for each specimen, the three analyzed groups' specimens were brushed for 2 minutes twice a day for 30 days with an electric tooth brush (Oral B® cross action). Using a toothpaste/distilled water mixture in a 1:3 ratio. The test specimens were transferred to a distilled water solution between brushing sessions.

A final readings of micro hardness, surface roughness, were checked after four weeks of continuous brushing.

Surface roughness evaluation

Specimens were evaluated using a surface testing machine (Surf meter model no. SJ 201 T, Mitutyo-Japan) with a radius 1.5µm, moved at a constant speed of 0.1 mm/s, with a force of 0.7 mm. The cut off point was set to 0.25mm. Each specimen had three tracings performed at different locations; the average of these three measurements was calculated.

Micro hardness measurement

The hardness of each pellet was measured using a surface micro hardness tester (Shimatzu HMV2000, Germany). The hardness of each test specimen was measured in three separate places with a load of 25 grams for 20 minutes.seconds.Anaverage of three was used as a criterion.

Analytical statistics

The Shapiro Wilk test (p 0.05) was used to determine whether the data were normal. The Analysis of Variance (ANOVA) was performed to compare the b

eginning and final roughness values be tween groups, followed by the Tuketes t. The Ttest for dependent samples was used to compare the roughness and hardness of each group before and after brushTable(1) , (2).There were no statisti cally significant variations between the ini tial roughness ,hardnessand the ultimate ro ughness values of the B andCgroups under examination, according to the findings. There was a statistically si gnificant difference between the beginning and final roughness ,hardnessvalues after the simulated brushing technique for A and B,C(p = 0.01).

Discussion:

Clinical wear of a resin composite restorati on can be caused by a variety of reasons, i ncluding centric functional interactions, fo od friction, and interproximal contacts.(15) Abrasion caused by toothbrushing has be en found to be one of the most common ty pes of wear.The most significant issue affe cting dental materials, especially resin co mposites, has been toothbrush abrasion (1 1).After the brushing challenge, a statistica l difference in roughness levels was establi shed, regardless of the toothpaste type. Br ushing movements, according to Quirynen et al. (12), can affect composite restoratio n finishing and polishing.generating wear and increasing the composite's surface rou ghness

A rougher surface, on the other hand, inter feres with shine, material aesthetics (13) a nd bacterial plaque accumulation, promoti ng the development of secondary caries an d gum disorders.

Furthermore, Pinto et al. (9) discovered th at differing toothpaste formulations had a direct impact on the enamel and resin com posite surface roughness, as seen by their f indings.

New toothpastes have been introduced to the market with the primary goal of imp roving looks. Peroxide compounds, surfact ants, polyphosphates, and enzymes interac t with abrasive ingredients to produce the major whitening effect (10,14,22).

This study looked at the impact of two toot hpastes with different abrasives on a nano particle composite resin: hydrated silica (Oral B-3D White),and titanium dioxide (Colgate Luminous White).Some research (16,17) found similar results using a denti frice containing silica and oxide compoun ds are classified as the most abrasive comp ounds(18), as demonstrated in our study.

As a result, all dentifrices were able to incr ease surface roughness, suggesting that ev en a less harmful substance can improve s urface roughness.

Ferreira *et al.* (2013) (19) investigated the profile particles by SEM of toothpastes and discovered that SiO2based products h ave higher roughness values.

However, the presence of glycerin, cellulo se, and fluoride in all investigated toothpas tes was able to prevent further mass loss b y wearing structure, which could explain, i n part, the statistical results (20).The resin matrix composition, matrix/particle interfa ce, particle shape and size, degree of poly merization, and hardness of resin composit es could all affect abrasion resistance (21). The larger and more protruded the filler p articles were, the more the energy created by the abrasion processes would be passed directly to the surrounding matrix, accordi ng to Leinfelder et al. (22).causing microcr acks to proliferate and produce particle det achment, hence increasing the roughness a nd potentiating the repair wear process eve n more.After brushing hydrated silica containing tooth paste gave the greatest reduction in micro hardness in resin composite . This might be because hydrated silica has greater hardness number than calcium carbonate and trisodium phosphate. Initially the abrasive particles removed protruded fillers from esthetic restorative materials and gave reduction in micro hardness value. With increasing brushing removed extra fillers produced high decreasing in micro hardness (23).The results of our study was in agreement with some investigators who compared the effect of whitening dentifrices on the surface hardness of a nano hybrid composite, they found that maximum reduction in micro hardness was produced by

whitening paste contains silica as the abrasive agent (24)

Conclusion

whitening dentifrices containing Blue covarine have an influential effect on surface characteristics (Superficial roughness and micro har dness) of nanoparticular composite resin.

Table (1): shows the initial and final roughness values and standard deviation of each group

Groups	Initial roughness (Mean ,SD)	Final roughness (Mean ,SD)
Control group(A)	0.56(0.15)A c	0.65(0.15)B d
GroupB Oral B 3D White Perfection tooth paste	0.59(0.17)A c	0.77(0.17) B d
Group C Colgate Luminous White Brilliant value	0.54(0.18)A c	0.74(0.18)B d

similar capital letters indicated no significant differences among all groups, similar lower case indicated no significant differences in the same group.

Table (2): shows the initial and final Micro hardness values and standard deviation of each group.

Groups	Initial Micro hardness Mean ± SD	final Micro hardness Mean ± SD
Control groupA	96.23 ± 0.55 Ac	92.90 ± 1.54 Ac
GroupB Oral B 3D White Perfection tooth paste	98.23 ± 1.58 Ac	97.90 ± 0.66 Bd
Group C Colgate Luminous White Brilliant value	97.23 ± 1.39 Ac	96.23 ± 0.61 Bd

Means with different letters states for significant difference, mans with the same letter's states for non-significant difference.

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