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Effect of different chemical cleanser on surface roughness of silicone relining material – an in vitro study

(Efecto de diferentes limpiadores químicos sobre la rugosidad de la superficie del material de revestimiento de silicona: un estudio in vitro)

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Abstract(english)

The objective of the study was to evaluate surface roughness and to determine the effectiveness of denture cleansers in the disinfection of silicone-based soft relining materials. ilicone soft relining materials were immersed in three different types of cleansers. In the immersion test specimens were immersed in neutral peroxide, sodium hypochlorite, polident, and distilled water for 1440 hours of. Surface roughness of the specimens has been recorded using a White Light Interferometry system. The immersion test revealed significant differences in surface roughness of the silicone soft relining material when exposed to different solutions. Specifically, Polident showed significant differences in surface roughness compared to Neutral peroxide, Sodium hypochlorite, and Distilled water. This suggests that Polident had a distinct effect on the surface roughness of the silicone soft relining material, differing from the other tested solutions.

Keywords(english)

Denture cleanser, disinfection, Relining, Surface roughness.

Resumen(español)

El objetivo del estudio fue evaluar la rugosidad superficial y determinar la efectividad de los limpiadores para dentaduras postizas en la desinfección de materiales de rebase blandos a base de silicona. Los materiales de rebase blandos de silicona se sumergieron en tres tipos diferentes de limpiadores. En la prueba de inmersión, las muestras se sumergieron en peróxido neutro, hipoclorito de sodio, Polident y agua destilada durante 1440 horas. La rugosidad superficial de las muestras se registró utilizando un sistema de interferometría de luz blanca. La prueba de inmersión reveló diferencias significativas en la rugosidad superficial del material de rebase blando de silicona cuando se expuso a diferentes soluciones. Específicamente, Polident mostró diferencias significativas en la rugosidad superficial en comparación con el peróxido neutro, el hipoclorito de sodio y el agua destilada. Esto sugiere que Polident

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tuvo un efecto distintivo en la rugosidad superficial del material de rebase blando de silicona, que difiere de las otras soluciones probadas.

Palabras clave(español)

Limpiador de prótesis dentales, desinfección, rebase, rugosidad superficial.

Introduction

Residual ridge resorption is a common phenomenon in dentulous patients. The average rate of ridge resorption in denture wearers is about -0.01+ 0.22 or -0.01-0.22 in 12 months. As clinicians we face challenges in restoring patients with complete denture, and also during their follow up with ill-fitting denture.

Management of alveolar bone resorption is considered to be a challenge in prosthodontic treatment (1). Numerous methods, techniques and materials are used to reduce the residual ridge resorption. In consideration of age and inability to fabricate a new denture, the only option left is to reline the denture. Silicone soft relining material has been used since in denture ,the hardness of the silicone soft relining material is relatively stable owing to its stable siloxane polymer, and has long-lasting cushioning effects. Therefore, silicone is the first choice in soft relining materials compared to hard acrylic resin. Although they are the available option, they come with some challenges.

The longevity of a denture mainly lies in its maintenance. Denture wearers are suggested with use chemical and mechanical cleansing for disinfection of the prosthesis. The silicone soft relining material being shore A hardness, adhesion strength, water absorb-ability and solubility of the material. Mechanical cleaning physically removes the biofilm on the denture, but chemical cleaning is recommended because it yields better results by reducing the surface roughness and by reducing the amount of bacteria and fungi attached to the denture. In mechanical cleaning , popularly dental brushes were used. In chemical cleaning sodium hypochorite, neutral peroxide, polident were used. Chemical cleaning is recommended because it yield better result. Nowadays, dentists may instruct the patient to use chemical cleaning alone for cleaning silicone soft relining material to avoid the increase in surface roughness caused by mechanical cleaning.

The current study investigated the effects of chemical cleaning using sodium hypochlorite, neutral peroxide, polident on the surface roughness of silicone relining material and aimed to identify a cleaning method that least roughens the soft relining surface. The clinically acceptable limit for surface roughness is 0.2 µm (2). Rougher denture surfaces can promote, plaque buildup bacterial adhesion and colonization, making them harder to remove during cleaning. All this can eventually lead to frequent ulcerations landing into denture stomatitis.

Denture stomatitis is an inflammatory fungal infection that affects many denture wearers. It can be caused by a number of factors, including surface roughness, and can lead to symptoms like redness, irritation, swelling, and thrush. This can be reduced by decreasing the surface roughness. Thus, the rougher the surface, the higher the chance for mucosal inflammation turning to infections

This study focuses on identifying the chemical cleanser that causes the least surface roughness on the denture silicone relining material. The null hypothesis are that there is no difference in surface roughness among all three denture cleansers.

Materials and methods

Sample preparation. A rectangle-shaped sample with 2 mm thickness of heat-cured acrylic block was prepared (3). The 2mm block of silicone soft reline

Table 1. Samples.

Group	Cleanser solution
I	Distilled water (control)
II	Sodium hypochloride 0.5%
III	Polident
IV	Neutral peroxide 1%

Table. 2. Samples further analysis.

GROUPS	SAMPLE	Ra
POLIDENT	I	15.6
	II	22.2
	III	23.2
SODIUM HYPOCHLORITE	I	21.7
	II	20.2
	III	19.8
NEUTRAL	I	16.3
PEROXIDE	II	21.8
	III	22.4
DISTILLED WATER	I	18.5
	II	18.7
	III	19

(GC TOKYO CORPORATIO) here placed above the block and allowed to set for 30 minutes. A total of 12 samples were prepared. the surface roughness and by reducing the amount of bacteria and fungi attracted to the denture (5).

Immersion test. Samples were divided into 4 groups, each group has 3 samples (table 1). The specimens were immersed for 1440 hours of duration of, being 6 months of usage, and the solution was replaced every 8 hours (5). Post surface roughness analysis: The samples were further sent for post elevation for surface roughness, and the results were recorded (Table 2 and figure 1).

Statistical Analysis. SPSS SOFWARE was used to analyse the data. Samples were analysed and graphs were used to display mailed data (figure 2).

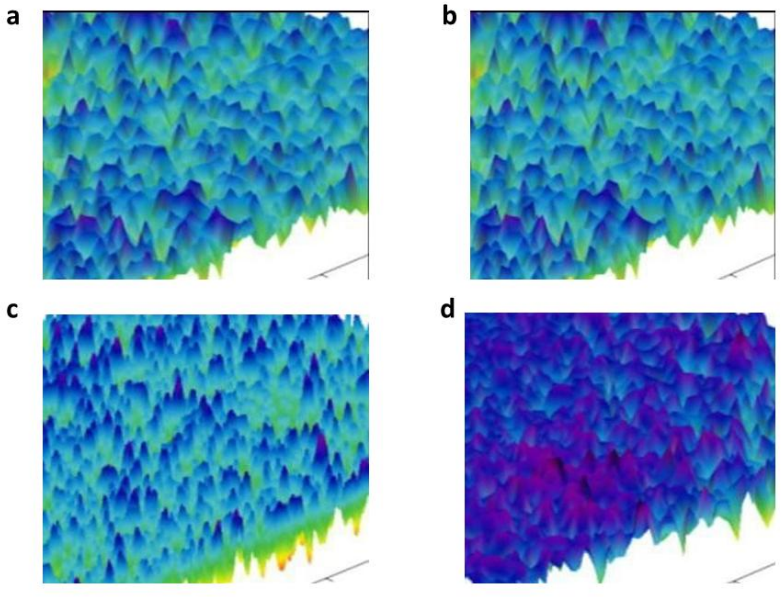

Figure 1. 1a. Distilled water **1b.** Polident**. 1c** Neutral peroxide**,** and **1d.** Sodium hyphochlorite.

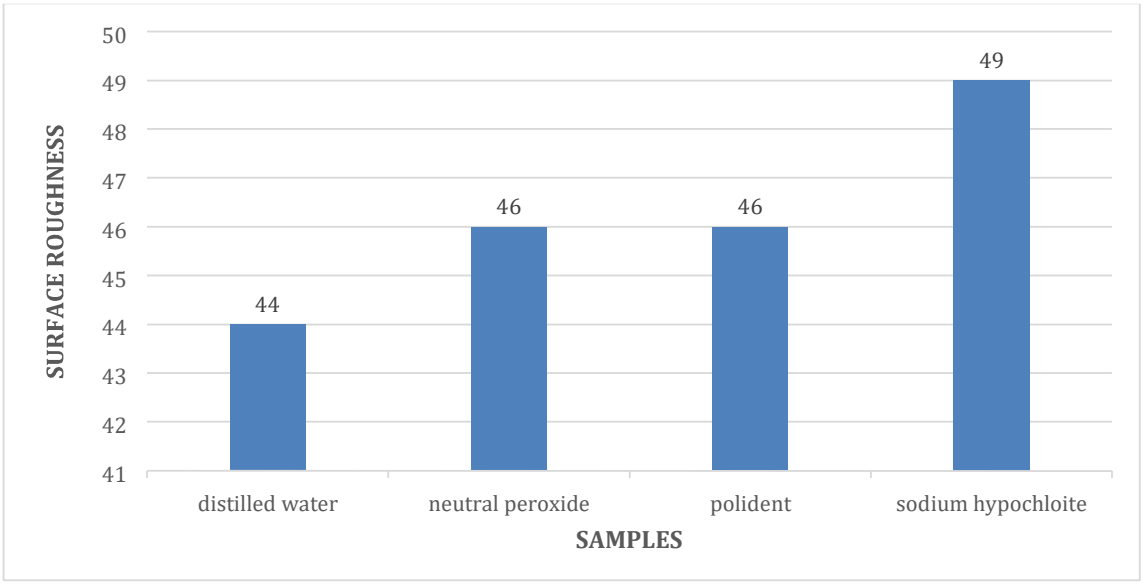

Figure 2. Surface roughness.

Results and discussion

Based on the immersion test and data analysis there is a rejection in null hypothesis. distilled water shows less surface roughness' 44Ra, neutral peroxide 46Ra sodium hypochlorite, and the polydent because it doesn't have adequate antifungal and antibacterial property which indicates less removal of plaques, calculus, and bacteria etc. Hence result shows decreased surface roughness.

The surface roughness of Hypochlorite was considered to increase by the cross-linked structure of the silicone soft relining material owing to the oxidizing action of the denture cleanser (6). Peroxide-based neutral peroxide denture cleansers have lower oxidizing properties than hypochlorite. The neutral peroxide cleansers used in the current study contain peroxide, which has a bleaching effect. They also contain other acidic ingredients, such as citric acid, to nullify the effect. This inhibitory effect depends on the oxidizing properties of peroxide. These results indicate that neutral peroxide denture cleansers have less influence on the surface properties of the silicone soft relining material than hypochlorite denture cleansers (7). The hypochlorite used had a pH of 12.5, whereas the neutral peroxide denture cleanser had a pH of 7.4. whereas, pH affects the ion content of the fluid, at pH < 7, the amount of hydrogen increases, and at pH > 7, the amount of hydroxide ions increases. A greater amount of hydroxide ions increases the denaturation properties of the fluid. Hence, neutral peroxide denture cleansers with a pH close to 7 do not roughen the silicone soft relining material. Incorporating Polident into your daily denture cleaning routine can effectively preserve surface smoothness, thereby reducing the likelihood of bacterial accumulation and plaque buildup. (8) Sodium hypochlorite is recommended for occasional deep cleaning and disinfection, but exercise caution and follow up with a thorough rinse to counteract its potential impact on surface texture (2)

In conclusion, the immersion test demonstrated that Polydent chemical cleanser effectively reduces surface roughness of silicone soft reline material, making it a suitable option for maintaining its surface quality.

Conflict of interest

None to declare.

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