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The Effect of Newly Prepared Cleansing Agent on The Color property of High Impact Acrylic Denture Base Material

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ABSTARCT

To evaluate the effect of two prepared and commercial solutions on color properties of high impact acrylic denture base material. The total number of specimens was 60 specimens. They were prepared from high impact acrylic and subdivided into four groups for each solution (EDTA, Soda+Alum, Corega and distilled water). Color property and (ΔE) tests were performed .The specimens were prepared with uniform dimensions of 30×20×1.5mm (length, width, and thickness respectively). The immersion periods in this research are (2days, 7 days and 1 month). ANOVA and Duncan multiple range test were used. The statistical results were considered significant at p ≤ 0.05. ***Results:*** *The result shows that there were significant differences in (color L*) in (EDTA) and not significant in Soda+alum ,Corega and distilled water, and significant different in (color a*) and (color b*) in (Soda+ Alum and Coreg) and not significant in (EDTA and distilled water) in (2days, 7 days, and 1 month)* ***conclusion:*** *(EDTA) have the lowest effect on the color property of high impact acrylic denture base material in (2days, 7 days, and 1 month)*

Key words*:* denture cleanser, Color property, Corega .

INTRODUCTION

Polymethyl methacrylate (PMMA) has been used in dental prosthetic devices for almost 70 years. Three fundamental features have contributed to its success: excellent appearance, simple processing technique and easiness of the repair. However, the resistance to impact and fracture of PMMA during function are low fracture [1-3]. The denture base resin is subjected to various stresses during function. During fabrication of a denture, the physical and mechanical properties influence by cure condition and choice of materials. Each cure cycle or fabrication technique is a compromise that attempts to optimize the properties thought important for a given application. Dentist and manufacturers of denture base materials have long been searching for ideal materials and designs for dentures. So far, the results have been noteworthy, although there are still some physical and mechanical problems with these materials [4].Many attempts have been made to enhance the strength properties of acrylic denture bases including the addition of metal wire. The primary

problem of using metal wire reinforcement is poor adhesion between wire and acrylic resin. Although several methods have been used to improve the adhesion between these components, enhancement in mechanical properties, such as transverse strength and fatigue resistance, was not significant. [5,6] Modifications of chemical structure, by the addition of cross-linking agents such as polyethylene glycol di-methacrylate or by copolymerization with rubber, have been attempted [7] Various types of fiber including carbon fiber whisker fiber, aramid fiber, polyethylene fiber, and glass fiber have been used as a reinforcement. Reinforcement with fibers enhances the mechanical strength characteristics of denture bases, such as the transverse strength, ultimate tensile strength and impact strength. In addition, fiber reinforcement has advantages compared with other reinforcement methods, including improved esthetics, enhanced bonding to the resin matrix, and ease of repair. [8-12] Cleansers and cleaning methods used may have a harmful effect on the plastic or metal component of the denture. Knowledge of the constituents of denture cleansers, their efficiency, adverse effect and safety would aid in dispensing appropriate information to the patient , so the dentist must be able to recommend a denture cleanser that is effective, non deleterious to denture material and safe for patient use**.** [13,14]

The aims of this study are to evaluate the effect of two prepared and one commercial solution on color property of high impact acrylic denture base material in (2day, 7 day and 1 month).

MATERIALS AND METHODS

The total number of specimens was 60 specimens. were prepared from high impact acrylic and subdivided into four groups for each solution. The immersion periods in this study are (2day, 7 days and 1 month).High impact acrylic (vertex-dental) used in this research mixed according to the manufacturer instruction. The liquid powder ratio is 1 ml liquid and 1.2 mg powder, adding powder to the liquid and then mixing the powder to liquid for 30 min , leave the mixing for 8 min in room temperature 22 °C until reach to the dough stage adding the high impact acrylic to the flask through in room temperature 22 °C and then press the flask by press , and putting immediately inside hot water approximately 70°C for 90 min and then rising the degree of temperature to the 100 °C for 30 min and the remove the flask and leave it to cool. the specimens were prepared with uniform dimensions of 30×20×1.5mm (length, width, and thickness respectively)[15] .

The specimens converted to digital images on computer by using a digital scanner (Epson scanner ,stylus 4050) (. The images were digitized, with an input resolution of 600 pixels per inch [16]. These digital images were prepared with dimension 25 pixels × 15 pixels for each specimen (exclude label on the sample) by software program Adob Photoshop 9.0. Then these images were saved.A Special program was recreated in this study operating within MATLAB to reach direct values of (CIE L*a*b*) for (7225) pixels that were presented in these surface areas of the image. Each (CIE L*a*b*) for all pixels in images will be given mean values, and present the result t directly on excel program

The total color change (ΔE) of each sample was calculated for each sample at each evaluation using the following formula [17]

$$\Delta E = [\ (\Delta L^*)2\ + (\Delta a^*)2\ + (\Delta b^*)2\ ]1/2$$

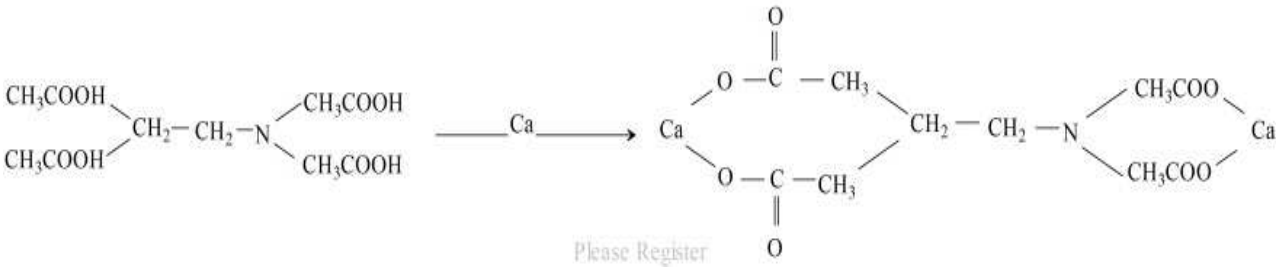
$$\Delta E = [\ (L^*2- L^*1)2\ + (a^*2- a^*1)2\ + (b^*2- b^*1)\ 2\ ]1/2$$

In principle, when no color difference will be detected after its exposure to the testing environment Delta E value of (0) [18]. The Delta E value of (3.7) or less is considered to be clinically acceptable in vitro study and of (6.8) is considered to be clinically acceptable in vivo study [19].

The color change test specimens for each disinfections in specific immersion cycle for 2 days, 7 days and 1 month were compared with a control group in each cleansing agent method.

The specimens were fabricated by using Type III model dental stone (Zhermack SPA Rovigo, Italy) as a mold. This study deals with four solutions (table 1).two experimental prepared solutions,

solution one (Ethylene Diamin Tetra acetic Acid) EDTA and solution two (soda Na_2Co_3 and Alum $KAl(SO_4)$ one commercial denture cleanser tablets (Corega) for comparison and distilled water as a control solution. Every solution was diluted in 100 ml of distilled water.
The following equations illustrate the preparation of the above solutions
1-EDTA [20]



2-Soda +Alum [21]

$$NaHCO_3 + KAl(SO_4) \longrightarrow K_2CO_3 + Al(OH)_3 + Na_2SO_4 + CO_2\uparrow$$

Artificial Saliva was developed in order to bring the trials closer to real in-mouth conditions. Indeed, its mineral composition is close to that of resting mixed saliva.

By mixing the following compounds in distilled water, the artificial saliva solution were prepared [22].

Compounds	**Concentrations (mg/L)**
➢ NaCl	0.4
➢ KCl	0.4
➢ $CaCL_2$	0.79
➢ NaH_2PO_4	0.78
➢ UREA	1
➢ DISTELD WATER	1 L

The fresh solutions were prepared daily at the beginning of soaking trial (1/2h). The specimens were removed from the solution washed with distilled water, and dried in air by shaking the specimen for about 30 seconds. The solutions were removed, the beakers were cleaned and the specimens were immersed in distilled water for 8 hs. at (21 ± 2^oC) then immersed in artificial saliva for about 15.5 h. at (37 ± 1^oC) in the incubator. According to the method described previously The immersion periods in this study are (2days, 7 days and 1 month). [23].
Corega denture cleanser, release an active CO2, used in this study and prepared as manufacture instruction

The following statistical methods were used to analyze and assess the results via SPSS V. 11.5 for Windows:
Descriptive statistics include mean ± standard deviation values and Duncan multiple range test were used. The statistical results were considered significant at $p \leq 0.05$.

RESULT AND DISSCUSION

Color Stability

The One Way Analysis of variance (ANOVA) as shown in Tables (1), demonstrated that there was a significant difference in 7 days and 1 month and no significant difference in 2 days at $P \leq 0.05$ in the color L^* measurement of high impact acrylic among the solutions .

Color L^* measurement of high impact acrylic, in comparison between solutions, figure (1-3) demonstrated the mean ± SD values and Duncan's multiple range test of color L^* values according to (CIE L* a* b*) system. In 7 days, the highest value in Soda +Alum and the lowest value in distilled water. In 1 month the highest value in Soda +Alum and the lowest value in EDTA

The One Way Analysis of variance (ANOVA) as shown in Table (2) demonstrated that there was a significant difference in 2 ,7 days and 1 month at $P \leq 0.05$ in the color a^* measurement of high impact acrylic among the solutions.

Color a^* measurement of high impact acrylic, in comparison between time interval, figure (4-6) demonstrated the mean ± SD values and Duncan's multiple range test of color a^* values according to (CIE L* a* b*) system. In 2 days, the highest value in (EDTA) the lowest value in (Corega). In 7 days, the highest value in (EDTA and distilled water) and the lowest value in Soda+ Alum. In 1 month the highest value in EDTA and the lowest value in Soda +Alum

The One Way Analysis of variance (ANOVA) as shown in Tables (3) demonstrated that there was significant difference in 7 days and 1 month and no significant difference in 2 days at $P \leq 0.05$ in the color L^* measurement of high impact acrylic among solutions.

Color b^* measurement of high impact acrylic, in comparison between time interval, figure (7-9) demonstrated the mean ± SD values and Duncan's multiple range test of color b^* values according to (CIE L* a* b*) system. Color b^* measurement of high impact acrylic, in comparison between time interval. In 7 days and 1 month the highest value of distilled water and the lowest value in Soda +Alum.

The One Way Analysis of variance (ANOVA) as shown in Tables (4) demonstrated that there was a significant difference in (EDTA,)and no significant difference in (Soda+alum, Corega and distilled water) at $P \leq 0.05$ in the color L* measurement of high impact acrylic among different solutions.

Color L^* measurement of high impact acrylic, immersing in (EDTA, Soda+Citric Acid, Soda+Alum, Soda+H_2O_2, Soda +Vinegar, Corega, Lacalute, distilled water) figures (10-13) demonstrated the mean ± SD values and Duncan's multiple range test of color L^* values according to (CIE L* a* b*) system. (EDTA) showed the highest value in 7 days and the lowest 2 days. (corga, Soda +Alum and distilled water) showed that there was no significant difference**.**

The One Way Analysis of variance (ANOVA) as shown in Tables (5) demonstrated that there was a significant difference in (Soda+alum , Corega) and no significant difference in (EDTA, and distilled water) at $P \leq 0.05$ in the color a* measurement of high impact acrylic among different solutions.

The One Way Analysis of variance (ANOVA) as shown in Tables (6) demonstrated that there was a significant difference in(Soda+alum, Corega,) and no significant difference in (EDTA, and distilled water) at $P \leq 0.05$ in the color b* measurement of high impact acrylic among different solutions.

Color b^* measurement of high impact acrylic, immersing in (EDTA, Soda+Alum, , Corega, distilled water). Figures (14-17) demonstrated the mean ± SD values and Duncan's multiple range test of color b^* values according to (CIE L* a* b*) system. (Corega) showed the highest value in 1 month and the lowest value in 2 days. (Soda+Alum) showed the highest value in2 days and lowest value in 1 month. (EDTA and distilled water) showed that there was no significant difference.

Color Change (ΔE)

As shown in Table (7), the color change (ΔE) accepted ($\Delta E < 3.7$) when high impact acrylic denture base material were immersed in denture cleanser solutions at different time intervals (2, 7 days and 1 month), except in Soda+Alum showed that ($\Delta E > 3.7$) This result occurred due to trace element in the Alum content, color change of high impact acrylic denture base materials were increased proportionally with immersion cycle.

CONCLUSION

The presented results indicate a moderate antioxidant potential of *S. saponaria* leaves methanol extract and this activity is due the presence of different phytoconstituents as flavonoids and triterpenes.

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