

THE STAINING ABILITY OF CHLORHEXIDINE AS A MOUTH WASH TO HOT CURE ACRYLIC RESIN (PINK AND CLEAR)⁺

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Abstract:

The influence of chlorhexidine as a mouth wash on the staining ability of hot cure acrylic resin (pink and clear) is studied .Forty clear and pink hot cure acrylic resin specimens were divided into 4 groups, each group contained 10 specimens' . Each group was placed into different combinations of soaking and rinsing solutions (saliva, 0.2%chlorhexidine, and distilled water) for six consecutive days. The results showed that chlorhexidine produces significant change in the optical density of hot cure acrylic resin of both the pink ($p<0.05$) and the clear ($p<0.01$).

المستخلص:

قابلية تلوين الكلورهكسدين كغسول للفم للراتنج الاكريلي ذات التصلب الحراري (الوردي والشفاف) تمت دراسة تأثير الكلورهكسدين كغسول للفم لتلوين للراتنج الاكريلي ذي التصلب الحراري (الوردي و الشفاف).

قسم اربعون نموذجاً من الراتنج الاكريلي ذي التصلب الحراري الوردي والشفاف الى اربع مجاميع. كل مجموعة تحتوي على عشرة نماذج. كل مجموعة وضعت في انواع مختلفة من محاليل الغسل والغطس (لعاب ، ٢% كلورهكسدين، الماء المقطر) لمدة ستة ايام متتالية.

النتائج اظهرت ان الكلورهكسدين له القابلية على تلوين الراتنج الاكريلي ذي التصلب الحراري الوردي ($p<0.05$) والشفاف ($p<0.01$).

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أظهر الراتنج الاكريلي ذو التصلب الحراري الشفاف ($p<0.01$) تأثيراً أكثر مقارنة بالراتنج الاكريلي ذي التصلب الحراري الوردي عندما تم غطسه في الكلور هكسدين.

Introduction:

The dental profession has used chlorhexidine for over two decades. It is an antibacterial agent, cationic bisbiguanide with strong affinity for binding to skin and mucous membrane [1]. Chlorhexidine is used as a mouth wash and in denture disinfection [2]. It was found that chlorhexidine produces clear reduction of inflammation and total elimination of *Candida albicans* from the denture as well as from the palate [3, 4]. *Candida albicans* is associated with denture stomatitis and has the ability to grow on the surfaces of the dentures. Chlorhexidin proved to be effective to eliminate these organisms in addition, chlorhexidine apparently can bind to acrylic surfaces for at least 2 weeks [5]. Some researchers recommend including disinfection in the regular denture hygiene, particularly in patients who are highly susceptible to systemic candidiasis [4]. Other researchers found chlorhexidine able to reduce the number of microorganisms that could be detected in saliva [6]. But the most common and troublesome side effect of chlorhexidine is a brownish discoloration of teeth, dentures, porcelain and plastic restorations [7]. The stain on the denture is very difficult to remove and some patients found this side effect unacceptable [4]. It was recommended that the new denture should be disinfected before and after adjustment procedures [8].

The purpose of this study is to evaluate the staining ability of chlorhexidine to clear and pink hot cure acrylic resin.

Materials and Methods

Mold preparation: A mold was prepared from wax plate 52 x 36 x 2.6mm in dimensions (length, width, and thickness respectively). The mold was prepared from dental stone using dental flask. Then wax elimination was done by immersing the flask in boiling water for 4 minutes. Hot cure acrylic resin (Qualyle Dental LTD) was mixed according to the manufacturer instructions in sealed jar until doughy consistency was reached. Before packing all stone surfaces of the mold were coated with separating medium (Cold mold seal QD). The dough was then packed into stone mold by repeated application of slow pressure with flask press and held for 5 minutes before clamping was done. Polymerization was accomplished by placing the flask into

thermostatically controlled water bath. Finally specimens were finished and polished. In this method 40 specimens of hot cure acrylic resin (20 pink & 20 clear) were prepared.

Collection of saliva:

Human saliva (60 cc for each group) was collected from one subject a 30 yr. old female at the same time each morning (7:30 a.m.) .

Specimens Grouping:

A total of 40 acrylic resin specimens were made divided into 4 groups each group contained 10 specimens.

Group 1& 2 (Pink& Clear) acrylic resin:

Twenty acrylic (ten pink and ten clear) specimens were placed in human saliva in universal container (S) for one hour twice daily at 8.00 a.m. and 12 a.m. placed into thermostatically controlled incubator at 37 °C with 270 V orbital shakers at speed of 150 rotations per minute in a dark environment to simulate conditions in the oral cavity. Then at 9.00 a.m. the specimens were removed from saliva rinsed with distilled water (D.W.) and placed for 2 minutes in 0.2% chlorhexidine (CH). After that the specimens were rinsed with distilled water and placed in distilled water until 12.00 a.m. They were removed and placed in saliva in the same condition mentioned above till 1.00 p.m. then placed for 2 minutes in for a second time in chlorhexidine and then kept in distilled water till the next day. The role of distilled water is to keep the specimen wet because repeated wetting and drying of finished acrylic resin should be avoided to prevent irreversible warpage [5].

Group 3& 4 (Pink & Clear) acrylic resin:

The specimens were placed in saliva for one hour twice daily in the same manner mentioned in the previous groups, but instead of using clorhexidine, distilled water was used for 2 minutes twice daily .The solutions used were (S+D.W.+D.W.).These groups were considered as a control for group 1 & 2.

Test of color:

All specimens after 6 days were tested by using spectrophotometer to measure the optical density for each specimen [9]. The specimens were prepared to fit spectrophotometer cell in which specimens were placed during measurement. Optical density reading was recorded for each specimen at lambda maximum for chlorhexidine. Testing was done at Ibn Alhaithum College of Education, Biology Department by the researcher.

Results:

Measurements of staining ability of chlorhexidine as a mouth wash were statistically analysed and listed in Table [1]:

Table (1): Descriptive statistics of all experimental groups

Group No.	1st Soaking Solution	2nd Rinsing Solution	3rd Soaking Solution	Mean	S.D.
1(Pink)	Saliva	D.W.	CH	0.1104	0.000107
2(Clear)	Saliva	D.W.	CH	0.2204	0.00032
3(Pink)	Saliva	D.W.	D.W.	0.1072	0.000090
4(Clear)	Saliva	D.W.	D.W.	0.0078	0.00018

The highest mean values of optical density reading in group 2 show the clear acrylic (S+CH+D.W) mean value 0.2204. The lowest mean value shows in group 4 the clear acrylic (S+D.W+D.W.) mean value 0.00788.

The result reveals that the chlorhexidine produces significant change in the optical density of hot cure acrylic resin both the pink ($p < 0.05$) and the clear ($p > 0.01$). (Table 2). When the two experimental groups 1 and 2 are compared using Student's t-test (Table 2), the result shows that the clear acrylic resin (group 2) has a highly significant change ($p < 0.01$) in optical density compared to the pink (group 1) when soaked in chlorhexidine.

Table (2): Student's T-test results comparing all pairs of experimental groups

1st Soaking Solution	2nd Rinsing Solution	3rd Soaking Solution	Group No.	T-Value	d.f.	P-Value	C.S.
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Saliva	D.W.	CH	1(Pink)	36.179	9	P<0.011	HS
Saliva	D.W.	CH	2(Clear)				
Saliva	D.W.	CH	1(Pink)	2.900	9	P<0.05	S
Saliva	D.W.	D.W.	3(Pink)				
Saliva	D.W.	CH	2(Clear)	43.347	9	P<0.01	HS
Saliva	D.W.	D.W.	4(Clear)				

Discussion:

The daily denture disinfection produces no serious biological adverse effect over a period of several months. However Olsen in 1975 reported brownish discolorations of tongue and denture in long term use of chlorhexidine , such discolorations are almost constant [10].

Student t-test as shown in (Table 2) reveals that all groups that were soaked in chlorhexidine showed change in optical density reading, this means that the specimens were heavily stained more than in water. Also the clear acrylic resin (group 2) had a highly significant change ($p<0.01$) in optical density compared to the pink (group 1) when soaked in chlorhexidine (Table 2). This means that clear acrylic resin specimens were more heavily stained than the pink acrylic resin when soaked in chlorhexidine.

The saliva was collected at the same time each day to avoid biological rhythmic variation. The acrylic specimens when immersed in saliva, a layer of acquired pellicle is formed by a selective adsorption of glycoprotein's from saliva which is composed of proteins and carbohydrate [11]. The chlorhexidine has great affinity for acidic groups of the proteins in pellicle. Since chlorhexidine has dicationic nature (positive charged) ,one hypothesis of staining is the staining which occurred as a result of a cationic-anionic interaction between chlorhexidine and negatively charged ions in the oral environment [12]. When clear or pink acrylic resin is used during denture construction partial or complete the patient should be formed that using chlorhexidine mouth wash will cause staining of the denture. The problem of chlorhexidine staining to the acrylic denture base will be increased with consumption of tea and coffee beverages [13]. The patient should be instructed to use denture cleansing agents

containing hypochlorite which exhibits the ability to remove stain from denture base materials most effectively [14].

Conclusions:

- 1- Hot cure acrylic resin (pink & clear) stain results from the use of chlorhexidine as a mouth wash.
- 2- The clear acrylic resin more affected by chlorhexidine stain than the pink.

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