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EVALUATION OF THE EFFECT OF DENTURE CLEANSERS ON COLOUR OF THE ACRYLIC DENTURE BASE- AN IN VITRO STUDY

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ABSTRACT

Materials like wood, ivory, metal etc were used as denture base materials, which were cumbersome and required extreme skill of operator. With the availability of man-made polymers in the early 1930, came an opportunity to apply some of the optically brilliant polymers to dentistry. Due to their porous nature, acrylic resin attracts plaque deposit on its surface. This plaque may get colonized extensively by *Candida Albicans* in conditions like altered immune response, broad-spectrum antibiotic therapy, ill-fitting dentures etc. Various methods like, brushing with a denture brush and a mild soap, soaking in a commercial denture cleanser, use of household products like dilute hypochloric acid solution. In this study, one mineral acid cleanser, one hypochlorite solution and two peroxide cleansers are used.

Key words: Denture Cleansers, Hypochloric acid, *Candida Albicans*.

INTRODUCTION

Metals have been used quite extensively Gold, cobalt(or) nickel based alloy containing chromium are best suited as denture base material due to their high corrosion resistance, high strength and modulus of elasticity. They also have the disadvantage of nickel allergy, minor adjustments are difficult, cannot be rebased and relined. The introduction of titanium removed much of the disadvantages of base metal alloys.

With the introduction of polymers in the early 1930, the dough technique and compression molding method in mid-1930's made use of acrylic in dentistry possible. In the oral cavity, denture is bathed in protein rich saliva². Some of these proteins are absorbed and altered forming a pellicle. Bacterial colonization of pellicle and food, results in accumulation of plaque, which develops and mature when left undisturbed. This plaque may get colonized extensively by *Candida albicans* in conditions like altered immune response, broad-spectrum antibiotic therapy, ill-fitting dentures etc. Various methods for cleaning like brushing with denture brush, soaking in commercial in denture cleanser, use of household products

etc. Use of abrasive paste lead to wear of denture, ultrasonic instrument could not be used singly, household products are not reliable. Hence soak type denture cleanser is preferred. They are three major types of denture cleansers: Oxygenating cleanser-Alkaline peroxide, Hypochlorite solution-Dilute sodium hypochlorite, dilute mineral acids-Dilute hydrochloric acid. Alkaline peroxide cleanser forms an alkaline solution of hydrogen peroxides, which liberate nascent oxygen in the presence of organic material and assists in removal of denture deposit [3]. Hypochlorite solution renders mucin and other protein soluble; they also bleach away the stains. Mineral acids dissolve calcareous deposits and denature the proteins.

MATERIALS AND METHODS

Materials used: Heat cured acrylic(Travelon-Dentsply), 0.75mm spacer wax, Type IV Gypsum(Diestone), Sabourauds glucose broth(Himedia), Yeast nitrogen base (Himedia), Phosphate buffered saline, Galactose, *Candida G.E.* Agar and Denture cleansers used are Hydrochloric acid-5% solution, Hypochlorite solution-0.525%, Peroxide Cleanser A-(Fitty dent-Group Pharma), Peroxide Cleanser B-(Clinsodent-ICPA).

INSTRUMENTS AND EQUIPMENTS

"1.5x2.5x1/8" metal dies, Petri dishes, Test-Tubes, Microscope, Reflection spectrometer, Incubator, Centrifuge.

Colour Stability Test

Preparation of acrylic plates (ASTM E.308) [1]

Metal dies of dimension "1.5x2.5x1/8" was invested with Type IV gypsum (ultra rock-Kalabai). Then these dies were removed. In the mold space, heat cured acrylic (Travelon-Dentsply) was packed and cured. Then the acrylic plates were trimmed and polished to a high glossy surface.

Colour stability test

After base line measurements were made, acrylic plates were immersed completely in sample solution and were kept aside for 72hrs. Care was taken to change the solution every 6hrs. Then the specimens were washed with distilled water. To quantify colour difference, the CIE Lab colour system was used. This system has three parameters L*, a*,

and b* to define colour. L* being the measure of lightness-darkness of the sample, greater the value of L*, lighter the sample. a* measures the chroma along the red green axis. Positive a* relatives to amount of redness and negative a* to greenness. b* measures, the chroma along the yellow-blue axis. Positive b* being amount of yellow and negative b* related to the amount of blues to the sample.

A reflection spectrometer with a 20mm aperture was used to quantify the colour of the sample. A beam of light from a known source was cast on the sample and the reflected light's wavelength was analyzed to quantify the colour of the sample.

First the instrument was calibrated by using it against a black and then a white background. Then the colour co-ordinate (La*b*) was measured for each sample near its center. These consecutive measurements were made for each sample and an average was made to give the CIE Lab value for that sample. The colour co-ordinates of the sample before and after immersion were measured and the colour difference calculated.

Figure 1. Metal Dies for sample fabrication

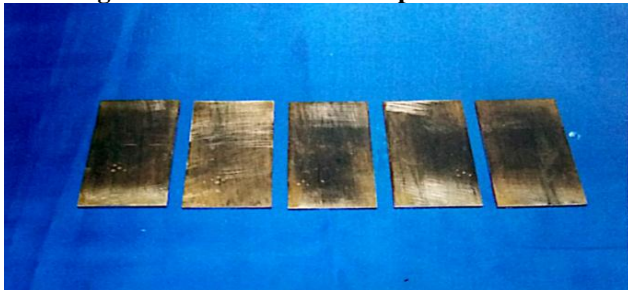


Figure 2. Samples

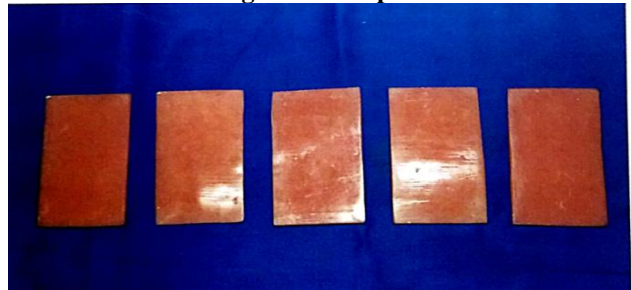


Figure 3. Samples in 5% Hydrochloric Acid

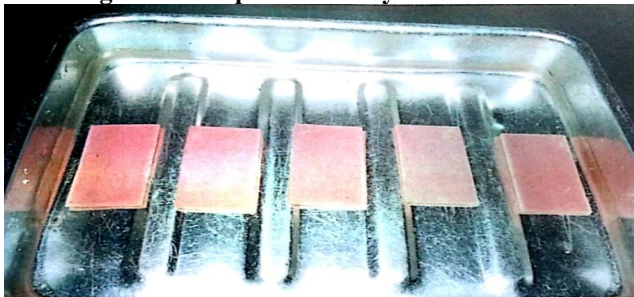


Figure 4. Samples in 0.525% Sodium Hyochlorite

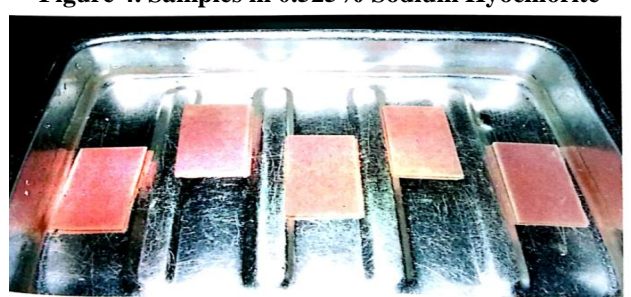


Figure 5. Samples in Fittydent

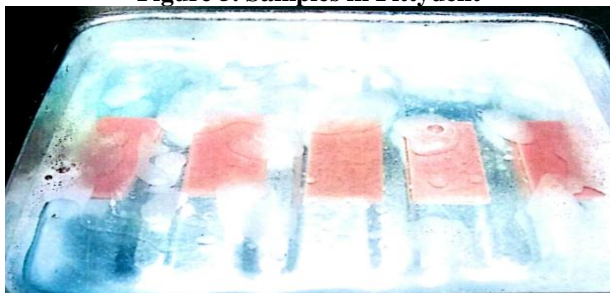


Figure 6. Samples in Clinsodent



Figure 7. Reflection Spectrometer**Figure 8. Sample under Reflection spectrometer**

RESULTS

The CIE Lab values before and after immersion in the hydrochloric acid, sodium hypochlorite, Fittydent & Clinsodent and the average colour change is shown in table 1,2,3 & the mean values and standard deviation are shown in table 5. The mean colour change an immersion in hydrochloric acid, sodium hypochlorite, Fittydent & Clinsodent are 0.25,0.13,0.44 & 0.93 respectively with a standard deviation of 0.31,0.02,0.05 & 0.09 respectively.

Table 6 shows the result of student t-test comparing the average colour change on immersion in 5% hydrochloric acid, 0.525% sodium hypochlorite and two peroxide denture cleansers-(Fittydent & Clinsodent).

It shows that immersion in Clinsodent caused the most colour change followed by fittydent, hydrochloric acid and then sodium hypochlorite, which caused the least colour change.

Table 1. Colour change during immersion in Hydrochloric Acid

Sample	L	a*	b*	ΔE
A1	60.65	23.13	6.25	0.32
A1*	60.33	23.11	6.20	
A2	61.05	21.63	6.27	0.02
A2*	61.03	21.62	6.27	
A3	60.35	22.72	6.32	0.12
A3*	60.23	22.70	6.30	
A4	61.23	22.32	6.29	0.06
A4*	61.18	22.29	6.27	
A5	60.96	23.06	6.18	0.84
A5*	60.12	23.02	6.15	
A6	61.52	22.54	6.16	0.12
A6*	61.41	22.51	6.12	

Table 2. Colour change during immersion in sodium Hypochlorite

Sample	L	a*	b*	ΔE
B1	60.13	23.13	6.24	0.12
B1*	60.01	23.10	6.21	
B2	61.56	22.56	6.17	0.16
B2*	61.42	22.50	6.12	
B3	61.05	23.09	6.31	0.12
B3*	60.98	23.04	6.22	
B4	60.42	22.96	6.08	0.14
B4*	60.29	22.89	6.06	
B5	59.96	21.94	6.38	0.14
B5*	59.82	21.90	6.37	
B6	61.24	22.51	6.21	0.13
B6*	61.11	22.49	6.20	

Table 3. Colour change during immersion in Fittydent

Sample	L	a*	b*	ΔE
C1	60.42	22.96	6.08	0.40
C1*	60.02	22.92	6.06	
C2	61.56	22.56	6.17	0.42
C2*	61.14	22.51	6.14	
C3	59.90	21.90	6.37	0.43
C3*	59.47	21.86	6.32	
C4	60.35	22.70	6.31	0.53
C4*	59.82	22.62	6.30	
C5	59.94	21.98	6.36	0.42
C5*	59.52	21.94	6.31	
C6	61.32	22.65	6.23	0.42
C6*	60.92	22.59	6.15	

Table 4. Colour change during immersion in Clindosent

Sample	L	a*	b*	ΔE
D1	60.18	23.12	6.21	0.97
D1*	59.21	23.09	6.18	
D2	61.05	23.07	6.30	0.99
D2*	61.5	23.07	6.30	
D3	60.45	23.03	6.24	0.84
D3*	59.61	23.03	6.24	
D4	61.28	22.30	6.27	0.97
D4*	60.31	22.27	6.16	
D5	60.26	22.32	6.29	0.80
D5*	59.46	22.29	6.27	
D6	60.96	23.06	6.18	1.02
D6*	59.95	23.02	6.15	

Table 5. Colour change - Mean and S.D

Group	Mean	Standard Deviation
A	0.25	0.31
B	0.13	0.02
C	0.44	0.05
D	0.93	0.09

Table 6. Colour change

Groups compared	Mean	S.D	t-value	p-value
A	0.25	0.31	0.89	NOT SIGNIFICANT
B	0.13	0.02		
A	0.25	0.31	1.49	NOT SIGNIFICANT
C	0.44	0.05		
A	0.25	0.31	5.23	P<0.01 STSTICALLY SIGNIFICANT
D	0.44	0.09		
B	0.25	0.02	15.03	P<0.001 STSTICALLY HIGHLY SIGNIFICANT
C	0.93	0.05		
B	0.13	0.02	21.54	P<0.001 STSTICALLY HIGHLY SIGNIFICANT
D	0.93	0.09		
C	0.44	0.05	12.03	P<0.001 STSTICALLY HIGHLY SIGNIFICANT
D	0.93	0.09		

DISCUSSION

Care of any prosthesis is very important and it is mandatory that every patient be informed about the maintenance. But often patients leave the dental clinic without any information of care of denture. In the present study, four different chemical soak type denture cleansers are used. As the efficiency of denture cleanser to remove the plaque from the surface of denture is a primary requisite, it is evaluated by the cleansers ability to remove adherent *Candida albicans* from the surface of acrylic⁴. As any deterioration of colour of denture will affect the aesthetics of the patient, the effect of the cleanser on the colour of denture base resin is studied. For the purpose of this study, one mineral acid (5% hydrochloric acid), one hypochlorite solution (0.525% sodium hypochlorite) and two commercially available alkaline peroxide cleansers (Fittydent & Clinsodent) are used. The present study was conducted to evaluate the effect of denture cleansers on colour of denture base acrylic. In the test to evaluate colour change, immersion in Clinsodent produced the most colour change followed by Fittydent, 5% hydrochloric acid and then 0.525% sodium hypochlorite in that order. The effect of denture cleanser on colour depends on their bleaching capability⁵. As additional bleaching agents are added to commercial denture cleanser, the alkaline peroxide denture cleanser produced the most colour change.

SUMMARY AND CONCLUSION

Due care has to be taken to keep the denture clean. This is important as accumulation of plaque and

colonization of candida on the denture leads to denture stomatitis [6]. The most common and safe method used to clean a denture is by the use of chemical denture cleanser. In the present study, four different commonly available chemical denture cleansers (5% hydrochloric acid, 0.525% sodium hypochlorite, and two peroxide denture cleansers, Fittydent & Clinsodent) were compared. The aim of the study was-Comparing the effect of denture cleansers on colour of denture base acrylic.

The values of the test performed was subjected to statistical analysis and following conclusion was drawn: In the test to assess their effect on colour of denture base acrylic, Clinsodent produced the most colour change followed by Fittydent, dilute hydrochloric acid and then sodium hypochlorite which caused the least colour change. So on comparing the four denture cleansers, sodium hypochlorite was found to be better than Fittydent, Clinsodent and dilute hydrochloric acid in that order.

The above said study was done for a soaking period of 5-15 min, further studies with longer time period might be useful to further evaluate the denture cleansers to assess their action on physical properties of materials used to construct denture and their biological effects.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

REFERENCES

1. American National Standard E-308-66. Standard recommended practice for spectrophotometer and description of colour in CIE 1931 system. ASTM manual, Vol 36, 2010.
2. Shotwell MS, Razzoog and A Koran. Colour stability of long-term soft denture liners. *J Prosth Dent*, 68, 1992, 836.
3. Stanley J Mc Neme, Ann. S. Von Goten & Gerald D. Woolsey. Effects of laboratory disinfecting agents on colour stability of denture acrylic resins. *J Prosth Dent*, 66, 1991, 132.
4. Robert C Sproull. Colour matching in dentistry. Part 1. The three dimensional nature of colour. *J Prosth Dent*, 86(5), 2001, 453-457
5. May KB, Razzoog ME, Koran A et al. Denture base resins: Comparison study of colour stability. *J Prosth Dent*, 68, 1992, 78.
6. Kenneth B May, Michael E Razzoog, Andrew Koran and Emerson Robinson. Denture base resin, comparison study of colour stability. *J Prosth Dent*, 68, 1993, 78.