The journal of
PROSTHETIC AND IMPLANT DENTISTRY
Official Publication of Indian Prosthodontic Society
Kerala State Branch

COMPARISON OF STAINING OF CERAMIC BY REGULAR CHLORHEXIDINE MOUTHWASH AND CHLORHEXIDINE (ADS) ANTI-DISCOLOURATION SYSTEM.

*P. Kabilan, **N. Venkatesan, ***K.Prabhu, ****Mohammad Imthiyas

*PG Student, **Prof & Head, ***Reader, ****Senior Lecturer, Adhiparasakthi Dental College and Hospital, Melmaruvathur | Corresponding Author: Dr. P. Kabilan, E-mail: kabilanparthiban@gmail.com

Introduction

Every human being have different appearance among one another in which the smile is more important factor for their aesthetics, the smile can be affected in various ways, that can be by the common factors like tooth shape, texture, position, and colour. The colour of the teeth will mostly give the pleasant lookto the people while smiling, for that the colour should look brighter and attractive. The darker teeth will remain unaesthetic often so that the teeth can be modified to give a pleasing look by restoring it with an aesthetic material. One of the most popular dental aesthetic materials is ceramic. Dental ceramics are generally used to restore the teeth because of their excellent aesthetics, wear resistance, chemical inertness, low thermal conductivity, and diffusivity. In addition to that, they match the characteristics of tooth structure to quite a large degree[1].

After the restoration is placed it is our duty to maintain it properly with good oral hygiene if it is not so, the long-term therapeutic targets of comfort, good function, treatment predictability and longevity of the fixed and removable prosthesis is very difficult to achieve. For maintaining the good oral hygiene we must understand the infectious nature of dental diseases and increased interest in plaque control and prevention by using chemicals such as antibacterial mouthrinses like chlorhexhidine. Several other clinical investigations confirmed the initial finding that two daily rinses with 10 ml of a 0.2% aqueous solution of chlorhexidine digluconate almost completely inhibited the development of dental plaque, calculus, and gingivitis in the human model for experimental gingivitis.

The chemical agents will give medicinal effects but at the same time the adverse affects too. The side effects of prolong usage of chlorhexidine mouthrinse are brown staining of the teeth, tongue, silicate and resin restorations and transient impairment of taste perception. Since the usage of chlorhexidine can cause colour change of aesthetic material, it is duty to pick up which material is less susceptible to extrinsic staining.

Many researchers have shown the effect of cholorhexidine and other chromogenic mouth washes on different restorative materials. However, according to Lamba et al have shown that immersion of composite, glass ionomer cement and compomer in the respective mouth rinses will make significant colour change of these materials[2]. Reis et al., the smoothest surfaces

The journal of
PROSTHETIC AND IMPLANT DENTISTRY
Official Publication of Indian Prosthodontic Society
Kerala State Branch

were not necessarily the most stain-resistant, comparing colour resistance of these materials with each other[3]. Celik et al. evaluated the effects of 3 mouth rinses including chlorhexidine on 4 different resin-based composite restorative materials, and concluded that although visually non-perceptible, all resin restorative materials tested showed a colour change[4].

The manufacturers claiming that a newly available product chlorhexidine ADS(Anti-Discolouration System) will have reduced staining effect. Though we know the fact that ceramics are the most common material in indirect aesthetic dentistry, there is no published article regarding the effect of staining agents including mouth rinses on colour stability of ceramics through chlorhexidine ADS. Therefore the aim of this study was to evaluate and compare the influence of chlorhexidine (CHX) mouth wash and chlorhexidine Anti-Discolouration System (CHX-ADS) mouth wash on colour stability of porcelain.

Aim and Objective

Aim:

To assess the amount of colour change during the usage of chlorhexidine anti-discolouration system on dental ceramic.

Objectives:

1. To evaluate the colour change during the usage of regular chlorexhidine mouthwash system

2. To evaluate the colour change during the usage of chlorexhidine (ADS) anti-discolouration system

3. To compare both (1) and (2).

Materials and methods:

20 specimens were prepared by mixing porcelain powder and liquid of shade B1 (VITA VMK Master®). Then the specimens were formed by condensing body porcelain on square shaped metal plates 10mm length, 10mm breadth and 2mm in thickness

According to manufacturer's instructions, all specimens were fired in vacuum furnace in 890°C, and 900°C. After air-cooling at room temperature, they were ground flat and wet polished with progressively finer grit aluminum oxide abrasive papers and then these specimens were cleaned with 1 min air water spray and stored in distilled water for 24 hours. Then the specimens in each group were numbered from 1 to 10 (A1 to A10 for regular chlorhexidine mouthwash and B1 to B10 for chlorhexidine ADS mouthwash).

After that, the baseline colour values (L*, a*, b*) were measured with a Photo obtained and evaluated in adobe photoshope 7.0 software against a Grey background. Quality of colour was examined using the Commission International de l'Eclairage (CIE L* a* b*) system as tristimulus values and reported as colour differences (ΔL*, Δa*, and Δb*) compared with standard conditions. Measurements were repeated 3 times in each specimens and mean values were calculated and tabulated.

Each group were immersed in respective mouth rinses twice daily in 15 ml of the 0.2% chlorhexdine mouth rinse and chlorhexidine ADS mouth rinse (DR. REDDYS CLOHEX, INDIA) for 2 min respectively. After immersion specimens were washed in distilled water and then it was placed in the artificial saliva for the next consecutive rinses for the time period of 3 weeks.

After the immersion period, the colour values of each specimen were remeasured, and the colour change value (ΔE) L*a*b* was calculated according to the following formula [5].

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

Where L* stands for lightness, a* for green-red (-a=green; +a=red) and b* for blue-yellow

(-b=blue; +b=yellow)

ΔE stands for colour change value.

Statistical analysis:

The key objective of the study is to differentiate between 2 mouthwashes based on levels of stain on ceramics. So, analysis and compare the 2 groups by using Mann-Whitney U test, since the total sample size within the group is less than 30. Mann-whitney U test was used instead of T-test because the sample does not compliment the central limit theorem

COLOUR CHANGE VALUE TABLE

			Before immersion			After immersion			
s.no	solution	sample	L	A	b	L	a	b	ΔE
1	REGULAR CHLORHEXIDINE MOUTHRINSE	A1	82.33	2.33	16.33	82.66	2.33	17	0.44
2		A2	81.66	2.33	16.66	87.33	3	15.66	3.9
3		A3	81	3	16.33	82.33	3.33	16	1.02
4		A4	83.33	2	17	81.66	3	14.66	2.29
5		A5	80.66	3	16.66	83	4	15.33	2.23
6		A6	82.33	2	17.33	83.33	3.33	15.66	2.19
7		A7	82.33	2.33	16.33	83	3.33	16	1.32
8		A8	80.66	3	16.66	83	4	15.33	2.23
9		A9	81	2.33	17	82	3	16	1.27
10		A10	85.33	2.33	17.33	80.66	3.66	16.33	3.59
1	CHLORHEXIDINE (ADS) MOUTHRINSE	B1	83.33	1.66	15.66	85	3	15	2.07
2		B2	83	2.33	16	83.33	3.33	14.33	1.79
3		B3	83	2.66	15	85.33	2.66	14.66	1.59
4		B4	84	2	15	85.33	3	15.66	1.49
5		B5	82.66	2.33	17	83.33	3.33	17	1.25
6		B6	83	2.66	16	84.33	2.66	15.66	0.94
7		B7	83	2.66	15	85.33	2.66	14.66	1.59
8		B8	81.33	1.66	16	86.33	3.33	15.66	3.91
9		B9	85.33	2.66	15	85.66	2.66	15.33	0.29
10		B10	81	2.66	15.66	83.33	3	16.66	1.7

Where L* stands for lightness,
a* for green-red(-a=green; +a=red) and
b* for blue-yellow (-b=blue; +b=yellow)
ΔE stands for colour change value

The journal of
PROSTHETIC AND IMPLANT DENTISTRY
Official Publication of Indian Prosthodontic Society
Kerala State Branch

Result:

Explanation: Mann-Whitney test is performed between Chlorhexidine mouthwash group and Non staining Chlorhexidine mouthwash group.

The calculated test statistic value in table (Table: 2) is lesser than the critical value that there is no significant difference between the Test (Group A) and Control (Group B).

The value of p exact is greater than 0.05 which further aids Acceptance of null hypothesis, which is Chlorhexidine mouthwash group and Non staining Chlorhexidine mouthwash are not significantly different from each other.

The mean colour change (ΔE) value for regular chlorhexidine is 2.05 and for chlorhexidine ADS is 1.66 which is lesser than that of regular chlorhexidine mouthwash value. Hence we can tell that the property of chlorhexidine ADS is little bit

DESCRIPTIVE:

Table: 1

	Group							
	ADS chlorhexidine				chlorhexidine			
	Mean	Minimum	Maximum	Standard Deviation	Mean	Minimum	Maximum	Standard Deviation
Delta E change	1.66	0.29	3.91	0.93	2.05	0.44	3.9	1.09
L before	82.96	81	85.33	1.22	82.06	80.66	85.33	1.45
A before	2.33	1.66	2.66	0.42	2.47	2	3	0.39
B before	15.63	15	17	0.66	16.76	16.33	17.33	0.39
L after	84.73	83.33	86.33	1.09	82.90	80.66	87.33	1.75
A after	2.96	2.66	3.33	0.29	3.3	2.33	4	0.51
B after	15.46	14.33	17	0.86	15.80	14.66	17	0.63

Mann-Whitney U test

Table:2

Ranks				
	group	N	Mean Rank	Sum of Ranks
Delta E change	Chlorhexidine ADS	10	9.20	92.00
	Chlorhexidine	10	11.80	118.00
	Total	20		

Table:3

Test Statistics[a]	
	Delta E change
Mann-Whitney U	37.000
Wilcoxon W	92.000
Z	-.983
Asymp. Sig. (2-tailed)	.325
Exact Sig. [2*(1-tailed Sig.)]	.353[b]
a. Grouping Variable: group	
b. Not corrected for ties.	

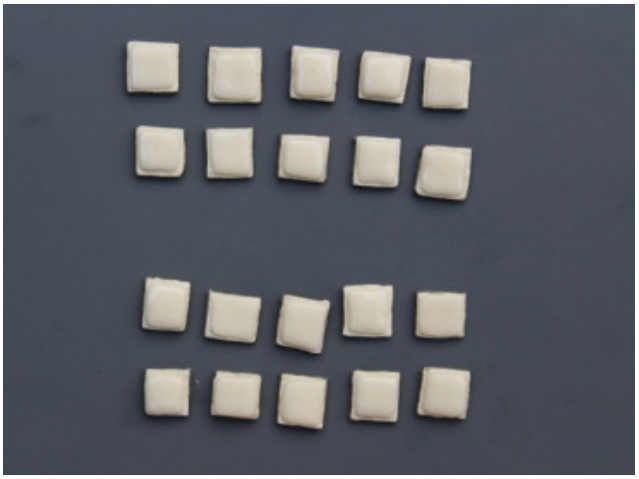
superior than regular chlorhexidine mouthwash solution.

Discussion:

The dentist should know about all the properties of the restorative material. They should have the clear idea about the colour change of restorative materials. Discolouration can be evaluated with different instruments and techniques. In this study, digital analysis of colour changes was done with photographs obtained before and after immersion in chlorhexidine mouthrinses and chlorhexidine ADS mouthrinses respectively and which was evaluated in the adobe photoshop software for the L*,a*,b* values and the colour change values are measured by colourimeter.

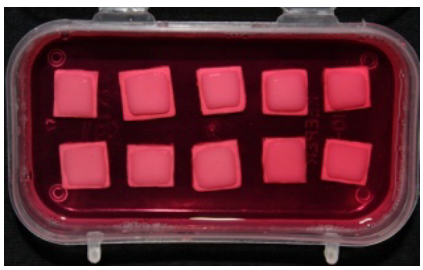
Colourimeter uses the CIE L* a* b* colour system, which is a method developed in 1978 by the Commission Internationale de I'Eclairage for characterizing colour based on human perception. L* coordinates are located along a vertical axis that ranges from a value of 0 (blackest) to 100 (whitest). a* and b* coordinates revolve on axes around L*. Coordinate a* measures red at the positive value and green at the negative value, similarly, coordinate b* measures yellow at the positive value and blue at the negative value. Absolute measurements can be made in L* a* b* coordinates and colour change calculated as ΔE (L* a* b*).

So far in dental literature, only a few studies have been reported on the colour stability of porcelain[6,7,8]. Kokosal and Dikbas showed that porcelain denture

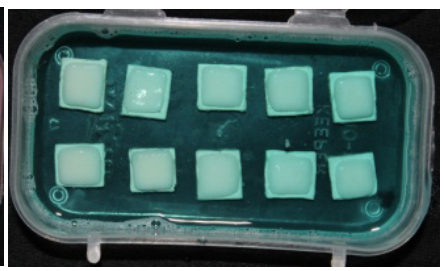


Square shaped specimens with 10mm length, 10mm breadth and 2 mm in thickness

Red – Regular Chlorhexidine Mouthwash
Blue- Chlorhexidine ADS Artificial Saliva



RED – Regular Chlorhexidine Mouthwash



BLUE- Chlorhexidine ADS

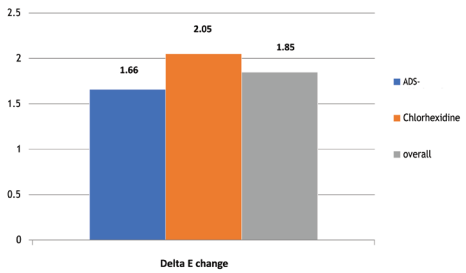


Figure 1 Mean Delta change values of Mouthwashes

The journal of
PROSTHETIC AND IMPLANT DENTISTRY
Official Publication of Indian Prosthodontic Society
Kerala State Branch

teeth were more colour stable than acrylic denture teeth against coffee, tea and coke[9]. Bernardi stated that there is no statistically significant difference in the ability of the mouthwashes to prevent bacterial plaque, however evidence of the stain was much less with the ADS mouthwash in natural teeth[10], Varoni EM assessed that there was no evidence to support the 0.12% chlorhexidine with anti-discoloration agent to reduce staining of natural teeth[11], Solis stated that the test group with ads had less staining than the control group during a usage period of 15 days. However, the two mouthwashes seemed to be equally effective as antiplaque and antigingivitis agents in natural teeth[12], so many studies were done to assess the staining effect of chlorhexidine mouthwash with ADS system on natural teeth. Most of the studies gave the result as no significant colour change was appreciated.

However, no investigation has been done on the effect of chlorhexidine ADS on discolouration of porcelain materials, hence we decided to conduct this in-vitro study to compare the staining of ceramic by regular chlorhexidine mouthwash and chlorhexidine mouthwash.

We experienced that the regular chlorhexidine mouthwash gave more colour change value when compared with chlorhexidine ADS mouthwash Since this is the first study about the discolouration of porcelain by chlorhexidine ADS mouthwash further research is essential to determine the effect of discolouration of other mouthwashes on different ceramic materials.

Conclusion:

When compared in terms lab parameters we also find there is no significant difference between chlorhexidine mouthwash group and non-staining chlorhexidine ADS mouthwash group based on staining level. But the colour change value of regular chlorhexidine mouthwash is greater than that of the chlorhexidine mouthwash. So it can be concluded that the chlorhexidine ADS mouthwash is somewhat giving lesser discolouration on ceramic when compared to regular chlorhexidine mouthwash.

References:

1. Khaledi Aar, Safari A, Adibi A, Adibi S. The effect of chlorhexidine mouth rinse on colour stability of porcelain with three different surface treatments: an in vitro study. J dent biomater, 2014;1(1):3-8.
2. Lamba B, Lamba A, Ponnappa KC. Effect of mouth rinses on the color of three tooth-colored restorative materials. Int J Stomatol Occlusion Med. 2012;5:104-109.
3. Reis AF, Giannini M, Lovadino JR, Ambrosano GM. Effects of various finishing systems on the surface roughness and staining susceptibility of packable composite resins. Dent Mater J Dent Biomater 2003;19:8-12.
4. Celik C, Yuzugullu B, Erkut S, Yamanel K. Effects of mouth rinses on color stability of resin composites. Eur J Dent. 2008;2:247-53.
5. Ergün G, Mutlu-Sagesen L, Ozkan Y, Demirel E. In vitro color stability of provisional crown and bridge restoration materials. Dent Mater J. 2005; 24:342-50
6. Rinke S, Hüls A, Kettler MJ. Colorimetric analysis as a means of quality control for dental ceramic materials. Eur J Prosthodont Restor Dent. 1996;4:105-110.
7. Seghi RR, Johnston WM, O'Brien WJ. Spectrophotometric analysis of color differences between porcelain systems. J Prosthet Dent. 1986;56:35-40.
8. Rosenstiel SF, Johnston WM. The effects of manipulative variables on the color of ceramic metal restorations. J Prosthet Dent. 1988;60:297-303.
9. Koksal T, Dikbas I. Color stability of different denture teeth materials against various staining agents. Dent Mater J.2008;27:139-44
10. Bernardi F, Pincelli Mr, Carloni S, Gatto Mr, Montebugnoli Chlorhexidine with an Anti Discoloration System. A comparative study. Int J Dent Hyg2004 Aug;2(3):122-6.
11. VaroniEm, Gargano M, Efficacy of an anti-discoloration system (ads) in a 0.12% chlorhexidine mouthwash: a triple blind, randomized clinical trial. J Dent 2017 oct;30(5):235-242.
12. Solís C, Santos A, Nart J, Violant D. 0.2% chlorhexidine mouthwash with an antidiscoloration system versus 0.2% chlorhexidine mouthwash: a prospective clinical comparative study. J Periodontol 2011 Jan;82(1):80-5.