

## COMPARISON OF STAINING PROPERTIES OF COMPOSITES

<sup>1</sup>Chandrasekhar M<sup>2</sup>Ramesh T<sup>3</sup>Narendra R<sup>4</sup>Simhachalam Reddy<sup>5</sup>Chandra Sekhar G<sup>1</sup>Director, Professor and Head<sup>2</sup>Assistant Professor<sup>3</sup>Professor and Head<sup>4</sup>Associate Professor,<sup>5</sup>Tutor

<sup>1,2</sup> Department of Conservative Dentistry, <sup>3,4</sup> Department of Prosthodontics, Government Dental College and Hospital, Rajiv Gandhi Institute of Medical Sciences, Kadapa.

**ABSTRACT**

Esthetics forms an important aspect of human's life, because human's personality and psychological well-being rests considerably on his appearance. Discolouration of esthetic restorative materials from the dietary habits vary with geographic distribution especially poor Oral Hygiene increases susceptibility to staining. Restorative resins are susceptible to softening caused by organic acids produced in plaque. Consequently plaque-covered resin restorations may be liable to pronounced staining.

**KEY WORDS:** Staining , Hybrid Composite, Microfilled Composite, Densicord

**INTRODUCTION**

Esthetics forms an important aspect of human's life. Poor oral hygiene increases susceptibility to staining. Restorative resins are susceptible to softening caused by organic acids produced in plaque. Consequently plaque-covered resin restorations may be liable to pronounced staining<sup>1</sup>. This study was undertaken to evaluate discolouration of mylar finished visible light cured Microfilled composite resin discs and Hybrid composite resin discs in-vitro under environmental circumstances, where intake of beverages like coffee, gold spot and chewing of pan (Betel nut), tobacco are prevalent dietary habits.

**Materials and Method :** The object of this in vitro study to determine the influence of staining agents on surfaces of Microfilled composite resin and Hybrid composite resin. These staining agents or test solutions are : 1) Coffee, 2) Gold Spot, 3) Tobacco and 4) Pan. Distilled water was used as control. Total 190 specimens were prepared.

**Materials :** 1) Microfilled composite (Durafil) Kulzer GmbH, Group-A specimens. 2) Hybrid composite (Prisma APH) Group-B specimens. Dentsply L.D. Caulk, U.S.A., 3) Black Plastic Sheets 4) White Plastic Sheet 5) Labeled Petri Dishes 6) Filter Papers 7) Plastic Containers.

**Instruments-** 1. Optilux Visible curing light: (12V) 400-500 nanometers, 2. 'Densicord' Model 542 Photovolt corp, U.S.A.

**Procedure of Experiment**

**Preparation of Specimen:** Group A (Microfilled) 95 Disk Specimens made from light opaque Shade *Durafil* anterior restorative material. Group B (Hybrid) 95 Disk specimens were made from Light Gray Shade *Prisma APH* composite material. The disks were made by placing the resin in a die hole of 30mm X 30mm X 1mm (10mm die hole) of plastic sheet pressed between two glass microscope slides. A cellophane strip as mylar matrix was placed between the die and glass microscope slides. The resin material was polymerized with a 'Optilux' visible curing Light for 20sec on each side of specimen (40 sec). The specimens were 10mm in diameter and 1mm in thickness. These disks were arranged in 95mm X 25mm X 1mm piece of black plastic sheet with 5 die holes, die numbers noted. These specimens were divided into two groups: A (Microfilled) and B (hybrid) both groups of specimens stored in distilled water of separate container till they were used for just before inserting under transmitted light densitometer, all specimens were dried with filter paper to avoid unnecessary reflection of light, and initial readings were recorded. Before immersing the

**Table.1. Comparison within Group-A –pan solution**

MEAN ± S.D. mm				'F' Value	'P' Value	Significance
Initial (1)	24 Hours (2)	72 Hours (3)	7 <sup>th</sup> day (4)			
95.63±3.83	83.47±12.67	70.21±7.29	62.00±8.15	56.49	P<0.01	Highly Significant

**COMPARISON**

Between 1 and 2	P<0.01	Highly Significant
Between 2 and 3	P<0.01	Highly Significant
Between 3 and 4	P<0.01	Highly Significant
Between 1 and 3	P<0.01	Highly Significant
Between 1 and 4	P<0.01	Highly Significant
Between 2 and 4	P<0.01	Highly Significant
Between 1, 2, 3 and 4	P<0.01	Highly Significant

**Table.2. Comparison within Group-B –pan Solution**

MEAN ± S.D. mm				'F' Value	'P' Value	Significance
Initial (1)	24 Hours (2)	72 Hours (3)	7 <sup>th</sup> day (4)			
99.95±1.51	64.84±19.28	69.63±13.21	69.32±16.28	24.39	P<0.01	Highly Significant

**COMPARISON**

Between 1 and 2	P<0.01	Highly Significant
Between 2 and 3	P<0.05	Not Significant
Between 3 and 4	P<0.05	Not Significant
Between 1 and 3	P<0.01	Highly Significant
Between 2 and 4	P<0.05	Not Significant
Between 1, 2, 3 and 4	P<0.01	Highly Significant



**Fig.1. Densicord Model 542**



**Fig.2. Specimen immersed in distilled water**

resin discs in test solutions, their die numbers and the test solutions in which they immersed were recorded accordingly. In each test solution 19 composite resin specimens were immersed. The container of each test solution was 1000ml plastic container, which were painted in black, which could render them light proof. All plastic containers with test solution and resin discs immersed in them were kept on rotary shaker, which kept the test solution continuously stirred during entire period of study. This would ensure the exposure of all surface of specimen to test solutions without settling. Separate containers used for Group-A and Group-B specimens.

Readings with densicord were taken at the end of 24 hours (1<sup>st</sup> day), 72 hours (4<sup>th</sup> day) and 7<sup>th</sup> day. Each time, before taking densitometric measurements, resin discs were washed in distilled water for one minute. All the specimens were carried separately in labeled petri dishes to avoid confusion and mixing up of specimens with each other. This also would avoid dust accumulation on specimens, exposing specimens to air and also would avoid touching specimens with fingers. Each specimen before taking readings were dried with filter paper and inserted under Densicord along with plastic sheet. Plastic sheet contains five resin specimens. After taking readings at the end of 24 hours (1<sup>st</sup> day) and 72 hours (4<sup>th</sup> day) the resin discs were reimmersed in their respective test solution and kept on rotary shaker till 7<sup>th</sup> day, when final readings were taken.

All Densicord readings were recorded and all readings were tabulated and statistical analysis was made at the end of the experiment. (Fig -1 and Fig-2)

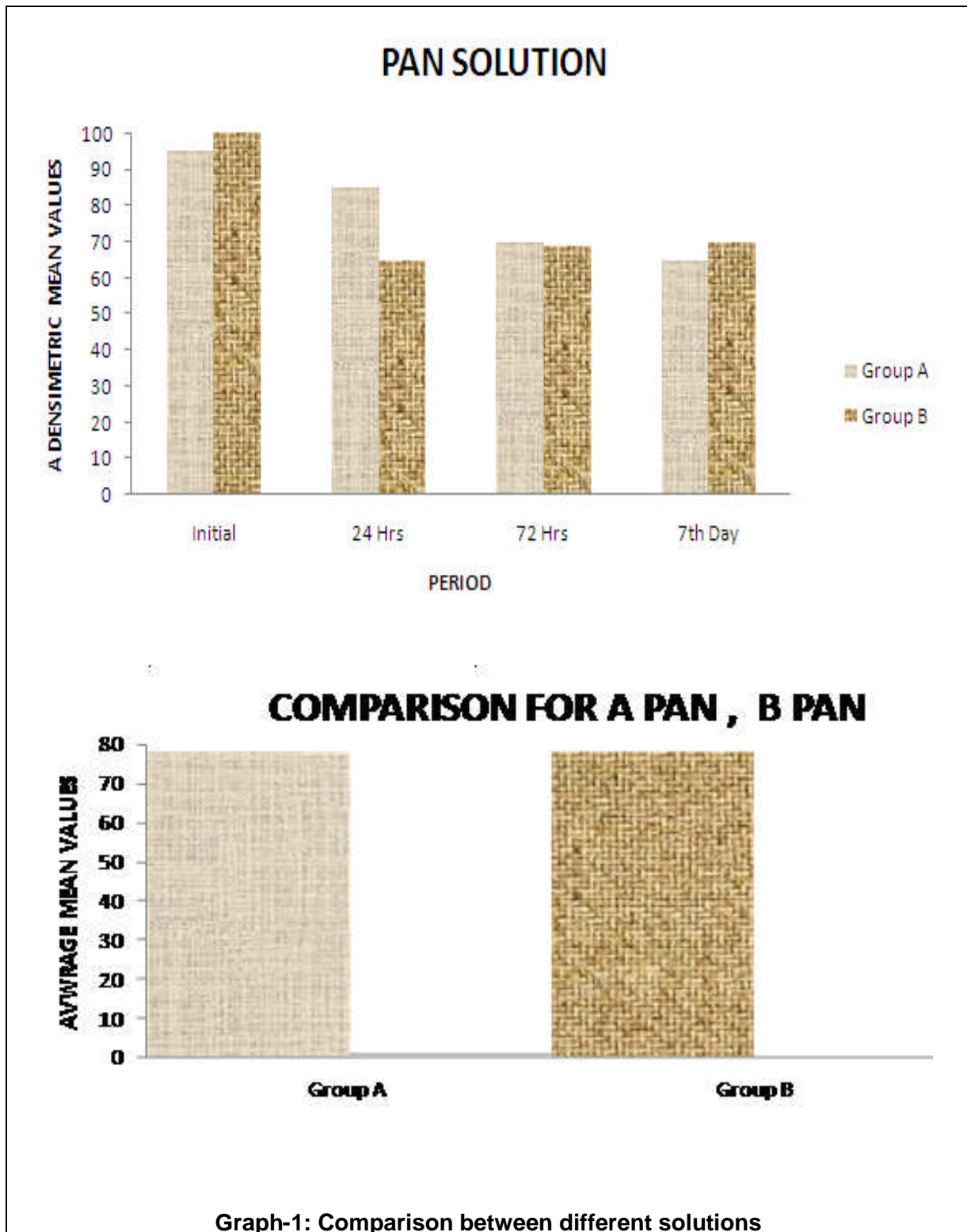
## Results

Densitometric comparison readings within Group-A and Group-B control, Group-A and Group-B gold spot, Group-A and Group-B coffee solution, Group-A and Group-B tobacco solution and Group-A and Group-B pan solution were recorded. All these solutions were significant except Group-A and Group-B control. Among all these solutions, the results of Group-A and Group-B Pan solution undergone discs were highly significant when compared to other solution. Therefore this article discusses mostly on the discolouration due to Pan solution.

Optical densitometer recorded (Densicord) for Group-A specimens and Group-B specimens, which were immersed in different staining agents. These readings were obtained initially, after 24 hours (2<sup>nd</sup> day), after 72 hours (4<sup>th</sup> day) and 7<sup>th</sup> day. Analysis of variance (ANOVA) test for statistical significance showed following effect.

**Control:** Distilled water did not show effect on Group-A specimens and Group-B specimens even at 7<sup>th</sup> day period ( $P > 0.05$ ).

**Pan or Betel Nut Solution :Comparison within Group-A Pan Solution** :- Table-I shows that there is highly significant ( $P < 0.01$ ) discoloration after 24 hours. There is highly significant discoloration between 24 hours and 72 hours. There is highly significant discoloration of Microfilled composite resin specimen after 7<sup>th</sup> day immersion in Pan Solution. (Graph No.1, Table-I)



Graph-1: Comparison between different solutions

**Comparison within Group-B Pan Solution** :- Table-II shows that there is no significant discoloration after 24 hours. There is highly significant discoloration after 72 hours and 7<sup>th</sup> day. There is highly significant ( $P < 0.01$ ) discoloration of Hybrid composite resin specimens after 7<sup>th</sup> day immersion in Pan Solution. (**Graph No.1, Table-II**)

**Comparison for Group-A and Group-B Pan Solution** :- Pan solution caused highly significant discoloration on both group specimens after 72 hrs and 7<sup>th</sup> day, but both groups were different after 24 hrs. (**Graph No.1**).

### Discussion

The procedure adopted in the study was a standardized one. Coffee, Gold Spot, Tobacco and Pan solutions significant on both groups specimens except control group (Distilled water). Light passing through Durafill (Microfilled) specimen is less compare to Prisma APH (Hybrid) specimen. So, it indicates more discoloration with Durafill than Prisma APH. Prakash Rao B. (2) (1979) investigated the effect of surface finish of composite disc, irrespective of their finish, Coffee and Tea caused more discoloration of white arakansas finished specimens only.

According to Gross, M.D<sup>3</sup> and Lingard, G.L<sup>4</sup>, in 1977-78 shows that all studies conducted so far have been comparing the effect of different solutions on various instrumentally finished composite resin surfaces, taking mylar finished specimens as control. Many of these studies showed that finish obtained by mylar finished specimens. The influence of the beverage like coffee, gold spot and the dietary habits like chewing of pan and tobacco are highly significant in changing the surface colour of these materials. Gross[3], Lee[5], Leinfelder[6] (1977-78) emphasized the role of these agents in surface discoloration of these restorative materials. R. Yazici (2007)[7] This study investigated the effects of two different light curing units and two staining solutions on the color stability of a hybrid composite and a nanohybrid composite. After 30 days of storage, no significant difference was found between tea and coffee. The effect of the staining solutions (tea, coffee) on color changes in composites was immersion time and resin-material dependent.

**Summary:** In this in-vitro study total 190 specimens (resin discs) were divided into two groups:A and B. Coffee, Gold Spot, Tobacco and Pan or Betel-Nut Solutions and distilled water (Control). All the specimens were immersed in mechanically stirred solution for 24 hours and stored for 7 days. A sophisticated and sensitive instrument "Densicord" was made use to record the surface staining under transmitted light after the respective observation period. The observation revealed that all these staining agents caused discoloration markedly on microfilled composite resin than Hybrid composite

### CONCLUSION

The discoloration produced on Hybrid Composite resin surface is less significant than microfilled composite resin. Hence Hybrid composite resin is desirable

### References

1. Asmussen E, Hansen E.K. Surface discoloration of restorative resins in relation to surface softening and oral hygiene. Scand J Dent 1986; Res. 94(2): 174-7.
2. Prakash Rao B. Staining properties of composites and glass inomer cements. An in vitro study. Dissertation submitted to the Mysore University for Masters Degree in Oper Dent, 1979.
3. Gross M, Masfri B. A colorimetric study of coffee and tea staining of four composite resins, J Oral Rehab. 1977; (4): 311-332.
4. Lingard GL. et. al. Davies FH., An in vitro study of the staining of anterior restorative materials, J Dent, 1978; 6 (3): 247.
5. Lee Et al., Hand Book of Dental Composites, Lee Pharmaceuticals, Sourth Ekmonte, Cited, J Oral Rehab, 1977; 4: 311-322.
6. Leinfelder K. Fetal Clinical Evaluation of composited resins as anterior and posterior restorative resins. J Pros Dent, 1975; 33(4): 40.
7. Yazici A R., Çelik Ç, Dayangaç B., and Özgünaltay G. The Effect of Curing Units and Staining Solutions on the Color Stability of Resin Composites. J Oral Dent, November 2007; Vol. 32, No.6: 616-622.
8. Reusens B., Dhoore W., Vreven J. In vivo comparison of a microfilled and a hybrid minifilled composite resin in class III restorations. 2-year follow-up Clin Oral Invest, 1999; Volume 3, [Issue 2](#): 62-69.
9. Yaffe MJ. Alkind. The Effect of topical application of fluoride on composite resin restorations. J Pros Dent, 1981; 45:1,59-60.

### Corresponding Author

Dr. **M.Chandra Sekhar**, MDS.,  
 Director, Professor and Head,  
 Conservative Dentistry & Endodontics,  
 Govt. Dental College & Hospital,  
 RIMS, Kadapa.  
 E mail : [chansek171@gmail.com](mailto:chansek171@gmail.com),  
 Phone No. : 09701501051