ORIGINAL ARTICLE

Polishability of Silorane Based Composite Resin – A Pilot Study

Jamini N¹, Gayatri N², Geena Mary G³, Usha C⁴.

ABSTRACT: *Background:* Silorane based composite resin has been introduced to esthetic dentistry in the recent past as a solution to overcome the polymerization shrinkage problem of the methacrylate based resin composites. Numerous studies have been done on the polymerization shrinkage of Silorane based composite resin, but very few have been done on the long lasting esthetics of this material. Thus a pilot study was done to comparatively evaluate the polishability of the Silorane based resin composites (SBC) with Nano hybrid resin composites (NHC) and Hybrid resin composites (HC). *Materials and methods:* The surface roughness of Silorane Based resin composite (Filtek P90, 3M) with nano-hybrid resin based composite resin (Tetric N-ceram, Ivoclar vivadent) and hybrid resin based composite resin (TE econom plus, Ivoclar vivadent) was assessed using contact profilometer after polishing with composite polishing kit (Shofu Super-Snap mini kit, Shofu Inc.). The surface structure after polishing was observed under Scanning Electron Microscope. *Results:* The surface smoothness of SBC and HC compared well whereas the NHC showed rough surface. But no statistically significant difference was present in the surface roughness when measured with contact profilometer. *Conclusion:* The Silorane based resin composites exhibited polishability similar to hybrid resin based composites.

Key words: Nanofill composite, Hybrid composites, Silorane composite, Surface roughness, Profilometer, Polishing.

Polymerization shrinkage observed in the methacrylate based composite resins, is the single reason for multiple undesirable consequences, such as post operative sensitivity, marginal leakage, interfacial stain, secondary caries and open contact.^[1] Numerous measures have been advocated to control this and one such is the introduction of silorane based composite resin.^[2]

Silorane based resin composites (SBC) is a combination of siloxanes and oxiranes.^[3] It is claimed to reduce the polymerization shrinkage by 0.9 %. This is attributed to the ring opening cationic polymerization involved in the polymerization.^[1]

Yet another problem of an esthetic restorative resin composites are that they have problem in staying esthetic for a long time. These restoration lose the color and translucency over a period of time, due to internal or external degradation, which can be due to many factors such as water solubility, resin matrix type, filler particle size, shape and chemistry. Therefore good polishability of an esthetic restorative material is imperative to obtain a smooth finish, to increase the surface energy and thus

to resist accumulation of plaque, debris, or food stains.^[4] Such a restoration should enable the restoration to be color stable for a prolonged period in an adverse oral ambience.

Though numerous studies are available regarding the polymerization shrinkage, physical and mechanical properties of the silorane based resin composites, studies on its polishability are relatively less.

Therefore this pilot study was done to evaluate the polishability of silorane based resin composites, comparing it with the nano hybrid and hybrid composites that are found to have good polishability.^[5]

MATERIALS AND METHODS

Three restorative resins were studied.

- Silorane resin based composite (Filtek P90, 3M)
- Nano-hybrid resin based composite (Tetric N ceram, Ivoclar vivadent)
- Hybrid resin based composite (TE econom plus, Ivoclar vivadent)

Samples of resin discs, of 10x2 mm dimension were

Received : 15.6.11

Accepted : 28.6.11

Fig 1: A 2 Shade of the three experimental Group resin

Fig 2: Resin discs

Fig 3: Polishing Kit

Fig 4: Profilometer

made in an acrylic template, sandwiched between glass slides lined with mylar strips and cured with an LED unit at 800 mW intensity from front and back for 20 seconds each.^[6] One side of the disc was abraded with a 800 grade silicone carbide abrasive under running water. The other mylar finished surface was retained as a control. The abraded surface was polished with composite polishing kit (Shofu Super-Snap mini kit, Shofu Inc.).^[7] Three groups, Group SBC, Group NHC, Group HC, of sample size 9 each (n=9) resin were prepared thus and were stored in distilled water.

Five samples per resin group were subjected to surface roughness study using Contact Profilometer (TR 100 Surface roughness tester). Each sample surface was assessed for roughness at an interval of 0.8 mm and the

Fig 5: Scanning Electron micrographs at x1000 magnification showing the mylar finished surface and the polished surface of samples from Group SBC, NHC and HC.

Groups	Mean Ra in μm / SD	one way Anova $P \leq 0.05$
Silicone	0.24/ 0.02	Not statistically significant
Nano hybrid	0.34/ 0.13	
Hybrid	0.21/ 0.05	

Table 1: Mean/ Standard deviation of the Ra values in microns and One way Anova test of significance

3 values (Ra) were recorded in μm . Mylar surface of each sample acted as the control for the polished surface of the same sample (Fig-1-4).

Mean and standard deviation was computed for the values. Statistical evaluation was done for intergroup comparison, using one way ANOVA test at p values ≤ 0.05 .

Four samples per resin were subjected to scanning electron microscopy evaluation. Two mylar surface and two polished surface per resin group was observed in x1000 magnification.

RESULTS

Scanning electron micrographs revealed similar smooth surface for the silorane group as well as the hybrid group, whereas the nano hybrid group showed rough surface (Fig-5).

The Mean/ SD Ra value for silorane based resin composite was 0.24/0.02 μm , for nano hybrid resin composite 0.34/0.13 μm and for hybrid resin composite 0.21/ 0.05 μm . One way Anova test revealed no statistically significant difference in the Ra values. (Table 1)

DISCUSSION

Roughness value of 0.2 microns is the ideal threshold level of roughness, beyond which plaque accumulation occurs.^[8]

The results of the present study shows that silorane based resin composites and the hybrid resin based composites exhibited similar surface roughness. The Ra value was 0.2 microns, that makes both clinically acceptable with regards to polishing.

Nano hybrid on the contrary exhibited unacceptable surface roughness. This may be due to the exfoliation of the large glass filler particles from the matrix while polishing.^[9]

However, the results of this pilot study contradicted a recent study which found the siloranes to exhibit statistically significant roughness than the nano composites.^[10] Increasing the sample size and varying the polishing techniques in the future study might clarify this contradiction.

CONCLUSION

The present study showed that the polishability of silorane based resin composites was comparable to that of hybrid resin based composites. However long living esthetics is not a virtue related only to the polishability but also to the inherent ability of the material per se to resist degradation. Thus it is important to realize at this juncture that the hydrophobicity of silorane composites can play a role in reducing the adhesion of extraneous substances and bacteria, thus conferring extended longevity to the restoration when compared to methacrylate based resin composites.^[11]

A well designed study to assess the staining capacity of

the above experimental resins after storage in varying staining solutions, might also throw more light on the research question raised in this study.

REFERENCES

1. Schneider LF, Cavalcante LM, Silikas N. Shrinkage stresses generated during resin-composite applications: a review. *J Dent Biomech* 2010;2010.pii:131630.
2. Weinmann W, Thalacker C, Guggenberger R. Siloranes in dental composites. *Dent Mater* 2005;21(1):68-74.
3. Guirardo Ricardo Danil, Consani Simonides, Consani Rafael Leonardo Xedick, Berger Sandrine Bittencourt, Mendes Wilson Batista, Sinhoreti Mário Alexandre Coelho et al . Comparison of silorane and methacrylate based composite resins on the curing light transmission. *Braz Dent J* 2010;21(6):538-42.
4. Bollen CML, Lambrechts P, Quirynen M. Comparison of surface roughness of oral hard materials to the threshold surface roughness for bacterial plaque retention: a review of the literature. *Dent Mater* 1997;13:258-69.
5. Strassler HE. Product advances with direct placement composite resins: current state-of-the-art. *Contemporary Esthetics* 2006;10(2):16-9.
6. 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.
7. Topcu FT, Sahinkesen G, Yamanel K, Erdemir U, Oktay EA, Ersahan S. Influence of different drinks on the colour stability of dental resin composites. *Eur J Dent* 2009;3(1):50-6.
8. El-Murr J, Ruel D, St-Georges AJ. Effects of external bleaching on restorative materials: A review. *J Can Dent Assoc* 2011;71:b59.
9. Endo T, Finger WJ, Kanchira M, Utterodt A, Komatsu M. Surface texture and roughness of polished nanofill and nanohybrid resin composites. *Dent Mater J* 2010;29(2):213-23.
10. Buchgraber B, Kqiku L, Allmer N, Jakopic G, Städtler P. Surface roughness of one nanofill and one silorane composite after polishing. *Coll Antropol* 2011;35(3):879-83.
11. Buergers R, Schneider-Brachert W, Hahnel S, Rosentritt M, Handel G. Streptococcal adhesion to novel low-shrink silorane-based restorative. *Dent Mater*. 2009;25(2):269-75.

Address for correspondence:

Dr. Geena Mary. G
Tutor
Conservative Dentistry and Endodontics
Indira Gandhi Institute of Dental Sciences
Sri Balaji Vidhyapeeth
Pondy - Cuddalore Main Road
Pillayarkuppam
Puducherry - 607 402
Email: ggeens123@gmail.com

Authors:

¹Reader, ²Reader, ³Tutor, ⁴Professor and Head
Conservative Dentistry and Endodontics, IGIDS, SBV.

How to cite this article:

Jamini N, Gayatri N, Geena Mary G, Usha C. Polishability of silorane based composite resin – A pilot study. Journal of Scientific Dentistry 2011;1(2):19-22.

Source of Support: Nil, **Conflict of Interest:** None declared