

ORIGINAL ARTICLE

Determination of surface roughness of different composite resins

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ABSTRACT:

Background: The proper finishing and polishing of dental restoratives are significant to promote a plaque-free environment and to enhance the esthetics and longevity of restoration. The present study was conducted to determine surface roughness of different direct resin-based composites. **Materials & Methods:** The present study was conducted in the department of Endodontics. It comprised of three resin composites, one nanohybrid, one nanoceramic and one bulk-fill resin-based composite. After polishing, the composite surfaces were assessed quantitatively by profilometry and qualitatively by scanning electron microscopy. **Results:** Tertric N Ceram Bulk-Fill material revealed significant difference in surface roughness value between mylar and eve type of polishing material. Tetric Evo Ceram had non-significant difference in surface roughness value whereas Ceram-X revealed significant difference with 0.021 (mylar) and 0.035 (eve) values. **Conclusion:** Tertric N Ceram Bulk-Fill and Ceram-X material revealed significant difference in surface roughness value between mylar and eve type of polishing material.

Key words: Ceram-X, Composite, Tertric N Ceram Bulk-Fill.

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INTRODUCTION

Composite, polyacid-modified resin composite, resin-modified glass ionomer, and traditional glass ionomer restoratives as options for direct restorations. In addition, resin composite materials are available with a variety of filler types that affect both their handling characteristics and physical properties. The ultimate esthetics of these tooth-colored restoratives are strongly influenced by the final surface polish.¹

The proper finishing and polishing of dental restoratives are significant to promote a plaque-free environment and to enhance the esthetics and longevity of restoration. Plaque accumulation occurs on composite samples with a surface roughness of 0.7-1.44 μm . Early studies have shown that curing composite against a matrix strip will produce the smoothest surface. Unfortunately, in the clinical environment such a finish cannot be obtained, further some degree of finishing and polishing of restorations is usually necessary.²

A highly polished surface of composite resin restorations is somewhat difficult to achieve. The resin matrix and the filler particles of composites do not abrade to the same degree due to different hardness. For instance, craters are often formed around hard quartz particles of conventional composites after polishing.³ As a consequence, irregularities appear on the surface of the restoration. The filler content of the composite also affects its roughness, as microfilled composites show smoother surfaces than hybrid composites. Similarly, the resin matrix composition may also play a role in the final smoothness of the restoration.⁴ The present study was conducted to determine surface roughness of different direct resin-based composites.

MATERIALS & METHODS

The present study was conducted in the department of Endodontics. It comprised of three resin composites, one nanohybrid, one nanoceramic and one bulk-fill resin-based composite. Cylindrical Teflon mold and 2 mm X 6 mm disc

specimens were prepared. For each composite material, 20 discs were fabricated, with a total of sixty discs were obtained. A glass slide 1–2 mm thick was placed over the strip before curing with the light-curing unit to flatten the surfaces. The specimens were then cured for 40 seconds through the Mylar strip and the glass slide. Five specimens per each material received no finishing treatment after being cured under Mylar strips; these specimens served as a

control. Ten specimens from each composite material were polished with Eve discs at coarse, medium, fine, and superfine grits for 30 seconds each on the specimens. After polishing, the composite surfaces were assessed quantitatively by profilometry and qualitatively by scanning electron microscopy. Results were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of materials

S. no	Materials
1.	Tertric N Ceram Bulk -Fill
2.	Tetric Evo Ceram
3.	Ceram -X

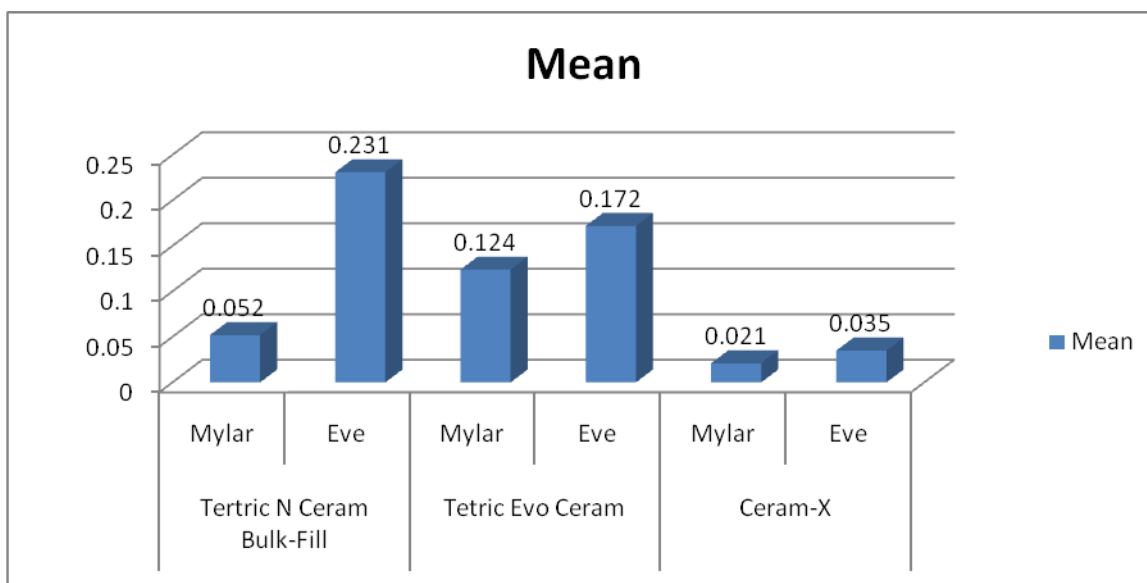
In present study, Tertric N Ceram Bulk -Fill, Tetric Evo Ceram and Ceram -X materials were used.

Table II Surface roughness of materials

Materials	Polishing system	Mean	P value
Tertric N Ceram Bulk -Fill	Mylar	0.052	0.01
	Eve	0.231	
Tetric Evo Ceram	Mylar	0.124	0.91
	Eve	0.172	
Ceram -X	Mylar	0.021	0.05
	Eve	0.035	

Table II, graph I shows that Tertric N Ceram Bulk-Fill material revealed significant difference in surface roughness value between mylar and eve type of polishing material. Tetric Evo Ceram had non- significant difference in surface roughness value whereas Ceram-X revealed significant difference with 0.021 (mylar) and 0.035 (eve) values.

Graph I Surface roughness of materials



DISCUSSION

With the advancement of technology and material science, there is a drastic development of restorative composite resins and the finishing and polishing systems. The composite resins are generally classified according to the size, content, and filler type. The newer classification includes the nanoparticles and a mixture of particle sizes known as a hybrid, microhybrid, or minifill. Studies have shown that filler size and shape can affect the surface roughness of composite resins.⁵

The flexibility of the backing material in which the abrasive is embedded, the hardness of the abrasive, and the grit size determine surface roughness. An extrafine diamond bur produces a surface smoothness equal to or better than that achieved with a fine diamond bur.⁶ The present study was conducted to determine surface roughness of different direct resin-based composites.

In this study, Tetric N Ceram Bulk-Fill, Tetric Evo Ceram and Ceram-X materials were used. The primary goal of finishing is to obtain a restoration that has good contour, occlusion, healthy embrasure forms, and a smooth surface. Bacterial adhesion to the surface of composite resins and other dental restorative materials is an important parameter in the etiology of secondary caries formation.⁷

In this study, Tetric N Ceram Bulk-Fill material revealed significant difference in surface roughness value between mylar and eve type of polishing material. Tetric Evo Ceram had non-significant difference in surface roughness value whereas Ceram-X revealed significant difference with 0.021 (mylar) and 0.035 (eve) values.

Nair et al⁸ in their study found that Tetric Evo Ceram and Tetric Evo Ceram Bulk-Fill specimens polished with Eve revealed slightly the same surface appearance as the Mylar strip. Eve discs scratched and exposed fillers of Ceram-x. Eve discs for Z250 surfaces exposed and scratched the filler particles but less than occurred with Ceram-X.

Magdy et al⁹ in their study investigated the effects of finishing and polishing procedures on four novel resin composites using three-dimensional optical profilometer. The smoothest surfaces for all the resin composites tested were obtained from the Mylar strip; statistically significant differences were observed among them. The order of composites was ranked from the lowest to highest surface roughness; Filtek Z350 XT < Te Econom < Tetric EvoCeram < Esthet XHD. Filtek Z350 to have the smoothest surface and the least with Tetric EvoCeram.

Among the polishing systems, Soflex showed the smoothest surface and was significantly different from Pogo.

Roeder et al¹⁰ evaluated the effect of surface finishing methods on the average surface roughness of resin composites. The results showed no statistical difference in average surface roughness (Ra, μm) between the polyester strip and aluminum oxide discs. However, finishing with diamond burs showed a statistically higher average roughness for all composites.

CONCLUSION

Tetric N Ceram Bulk-Fill and Ceram-X material revealed significant difference in surface roughness value between mylar and eve type of polishing material.

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