

## Analysis of the effect of various finishing and polishing procedures on the surface roughness of nano filled composite

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### ABSTRACT

**Background:** Dental composite resins have certain properties that will benefit patients according to the patient's cavity. The present study evaluated the effect of various finishing and polishing procedures on the surface roughness of nanofilled composite.

**Materials & Methods:** The present study was conducted on 45 recently restored composite teeth. All restorations were divided into 3 groups depending upon finishing and polishing systems. Group I had Shofu finishing and polishing kit, group II had Sof-Lex composite finishing and polishing kit and group III had Mylar Strips.

**Results:** The mean value of surface roughness in group I was 0.81, in group II was 0.74 and in group III was 0.49. The difference was significant (P- 0.01). The mean value of surface roughness in group I was 0.75, in group II was 0.71 and in group III was 0.42. The difference was significant (P- 0.01).

**Conclusion:** Mylar strip provided the smoothest surfaces followed by Sof-Lex followed by Shofu. The surface texture for the composite improved significantly when sealant is applied after finishing and polishing procedures.

**Keywords:** Composite, Finishing, Polishing.

### INTRODUCTION

Introduction of composite restorative materials in the 1960s marked the beginning of modern cosmetic dentistry by combining the principles of esthetics and tooth conservation. Smooth, highly polished restorations are more esthetically appealing and less susceptible to plaque accumulation and extrinsic discoloration and they also exhibit improved mechanical properties.<sup>1</sup>

Dental composite resins have certain properties that will benefit patients according to the patient's cavity. It has a micro-mechanic property that makes composite more effective for filling small cavities

where amalgam fillings are not as effective and could therefore fall out. Synthetic resins evolved as restorative materials since they were insoluble, of good tooth-like appearance, insensitive to dehydration, easy to manipulate and reasonably inexpensive. Composite resins are most commonly composed of Bis-GMA and other dimethacrylate monomers, a filler material such as silica and in most current applications, a photoinitiator.<sup>2</sup>

Early studies have shown that the smoothest surface of a resin restoration is attained when the resin is polymerized against an appropriate matrix strip. When a matrix is not used, polymerization of outer layer is inhibited, resulting in a surface layer

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rich in organic binder with stick and soft consistency. In either case, removal of that outermost resin by trimming and finishing procedures would lead to producing a harder, more wear resistant, and, hence, a more aesthetically stable surface.<sup>3</sup>

Carbide and diamond finishing burs, abrasive impregnated rigid points, impregnated rubber cups and points, aluminium oxide coated abrasive discs, abrasive strips, and polishing pastes are commonly used for finishing and polishing tooth-colored restorative materials. Each of these instruments or devices remove the oxygen inhibited layer of resin but leave the surface of restorative materials with varying degrees of surface roughness. Thus it is important to understand which type of surface-finishing treatments would significantly affect the surface irregularities of different composite resin restorations.<sup>4</sup> The present study evaluated the effect of various finishing and polishing procedures on the surface roughness of nanofilled composite.

## MATERIALS & METHODS

The present study was conducted in the department of Endodontics. It included 45 recently restored composite teeth. All patients were informed regarding the study and written consent was obtained.

General information such as name, age, gender etc. was recorded. All restorations were divided into 3 groups depending upon finishing and polishing systems. Group I had Shofu finishing and polishing kit, group II had Sof-Lex composite finishing and polishing kit and group III had Mylar Strips.

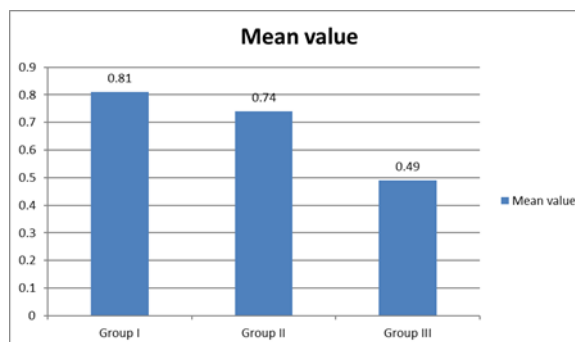
Three measurements in different directions were recorded in each group, the mean Ra value was determined for each specimen, and mean Ra for each group then was determined. Then surface sealant (prime & bond) was applied to all treated specimens and the average roughness (Ra) was measured. Results were tabulated and subjected to statistical analysis. P value less than 0.05 was considered significant.

## RESULTS

Table 1: Distribution of teeth

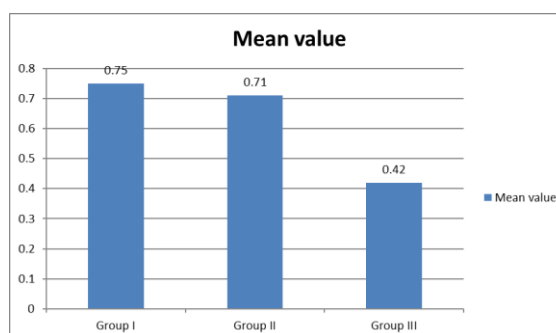
| Group I                           | Group II                                      | Group III    | P value |
|-----------------------------------|-----------------------------------------------|--------------|---------|
| Shofu finishing and polishing kit | Sof-Lex composite finishing and polishing kit | Mylar Strips | 1       |
| 15                                | 15                                            | 15           |         |

Table I shows that group I had Shofu finishing and polishing kit, group II had Sof-Lex composite finishing and polishing kit and group III had Mylar Strips. The difference was non-significant (P- 1).



Graph I: Comparison of Surface roughness between different groups using Z-350 (before sealant application)

Graph I shows that the mean value of surface roughness in group I was 0.81, in group II was 0.74 and in group III was 0.49. The difference was significant (P- 0.01).



Graph 2: Comparison of Surface roughness between different groups using Z-350 (after sealant application)

Graph II shows that the mean value of surface roughness in group I was 0.75, in group II was 0.71

and in group III was 0.42. The difference was significant ( $P = 0.01$ ).

## DISCUSSION

The primary goal of finishing is to obtain a restoration with good contour, occlusion, healthy embrasure forms and a smooth surface. Tight margins of the restorations should blend aesthetically into the tooth's natural contours. The resin matrix and the filler particles of composite resins do not abrade to the same degree due to different hardness.<sup>5</sup> The present study evaluated the effect of various finishing and polishing procedures on the surface roughness of nanofilled composite.

We found that the mean value of surface roughness in group I was 0.81, in group II was 0.74 and in group III was 0.49 before sealant application. The mean value of surface roughness in group I was 0.75, in group II was 0.71 and in group III was 0.42 after sealant application. A study by Singh et al<sup>6</sup> used 30 composite discs of dimension 6mm x 3 mm using a custom made stainless steel mould and then randomly divided into 3 subgroups for finishing and polishing by three different methods. Statistically significant difference was observed in surface roughness values before and after sealant application when finished and polished with shofu system. The lowest roughness values, before and after sealant application, was obtained when cured under a Mylar strip and the highest values were obtained when treated with Shofu.

For instance, craters are often formed around hard quartz particles of conventional composite resins after polishing. As consequence, irregularities appear on the surface of the restorations. The filler content of the composite resin also affects roughness, as microfilled composite resins show smoother surfaces than hybrid composite resins. Similarly, the resin matrix composition may also play a role in the final smoothness of the restoration. The finishing and polishing procedure involves some fundamental principles that allow us to better understand its application in dentistry.<sup>7</sup>

It has been reported that the colour measuring geometry influenced the colour measurement of composite resins with different surface roughness. If the surface configuration has a matte finish there

would be an excessive amount of light reflected at the surface level and a reduction of light transmission through the material.<sup>8</sup>

The factors significantly affecting the microhardness values of restorative materials include the filler volume fraction, composition resin type, and polymerization degree.<sup>9, 10</sup> A reduced polymerization is associated with a higher affinity to intrinsic discoloration due to colorants under clinical conditions. It might be assumed that due to surface changes caused by polishing, these properties of composites are affected by finishing and polishing procedures.<sup>11, 12</sup> Surface roughness which is closely related to the organic matrix, inorganic filler composition of the material, and finishing and polishing procedures can influence dental biofilm retention, resulting in superficial staining, gingival inflammation and secondary caries, thus affecting the clinical performance of the restorations.<sup>13-15</sup>

Surface texture controls the degree or scattering or the reflection of the light striking on the natural tooth or restorative material. For this reason clinicians experience problems in establishing harmony of the shade, obtained with the original shade that was selected using a shade guide especially after finishing and polishing procedures.

## CONCLUSION

Mylar strip provided the smoothest surfaces followed by Sof-Lex followed by Shofu. The surface texture for the composite improved significantly when sealant is applied after finishing and polishing procedures.

## CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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