Effect of Optiglaze Color on Wear Resistance of Heat Cure Acrylic Prosthesis

Najwah Yousuf Hameed¹, Atyaf Mseer Naser¹, Maha Kareem Jabbar¹

¹ College of Health and Medical Techniques - Baghdad, Middle Technical University, Baghdad, Iraq.

Corresponding author E-mail: nagwayousef2017@gmail.com

1. Introduction

For decades, acrylic resin polymethyl methacrylate (PMMA) was the most preferred material for denture manufacture due to its numerous benefits, involving good aesthetics, correct fit, oral environment stability, ease of laboratory and clinical manipulation, and low cost of equipment [1]. Nevertheless, it is not regarded as the ideal material owing to its poor mechanical and physical qualities, which make it prone to fracture and deformation [2]. Indentation of PMMA resin surfaces by various hard objects enhances the abrasiveness and wear of the acrylic base material. These events create an ideal habitat for fungal and bacterial colonization, which has been linked to a variety of oral and systemic illnesses [3]. As a result, evaluating the denture base materials’ mechanical properties is crucial in determining the influence of various strengthening components when added or treated [4]. Several attempts to increase the qualities of PMMA have been made, including strengthening it with specific components or treating it with glazing materials that have a noticeable improvement in the denture base resin materials’ properties [5]. A major difficulty with dentures is that they are subjected to abrasive wearing during their functions and cleaning (such as brushing). As a consequence, the surface hardness of the acrylic resin deteriorates with time, leading to increased chemical and mechanical wear of the denture base components [6]. Plaque buildup on denture base resins is also a source of worry. Bad denture maintenance and cleanliness cause rapid biofilm formation, which increases the risk of oral diseases like oral candidiasis and denture stomatitis [7]. Oral fungal infections are more common in elderly people who lack the skill to remove aggregated plaque from dentures [8]. Dentures reduce saliva and oxygen passage to oral tissues, resulting in an anaerobic and acidic situation which promotes the development of Candida and microscopic fungi [9]. Optiglaze color materials are a novel class of compounds that have a significant impact on the surface qualities of acrylic denture bases. Optiglaze color is a novel nano-filled substance designed exclusively to stain, glaze, and strengthen it with specific components or treating it with glazing materials that have a noticeable improvement in the denture base resin materials’ properties [5].
2. Materials and Methods

Thirteen acrylic specimens (20x10 mm length, 10mm diameter in dimension) according to device requirements were constructed with the aid of a custom-made cylindrical shape silicone mold from the acrylic resin of the heat cure by ordinary method for curing and flasking by the use of heat cure acrylic resin materials, Fig. 1. The specimens were distributed into 3 groups (with each group having 10 specimens) by surface treatment (Optiglaze color (GC Corporation, Tokyo, Japan)). The first group (control) consisted of ten cylindrical heat cure acrylic specimens that were completed and polished following the manufacturer's guidelines for materials without any surface treatment. The second group consisted of ten cylindrical heat cure acrylic specimens that were completed and glazed with (Optiglaze color) as a surface treatment, as directed by the manufacturer, and then put in a Lbo-Light Duo (GC) indirect composite light oven for 90 seconds [11]. The third group consisted of ten cylindrical heat cure acrylic specimens that were completed, polished, and glazed with (Optiglaze color) as a surface treatment according to the identical instructions as the second group. A wear rate test was performed on the three groups using specific equipment (Pin on desk wear testing device) developed at the university of technology Material, engineering department, and resistance laboratory-Iraq with great accuracy of results. It was made up of a pin that held the specimen and a stainless steel disk that rotated at 950 rpm. Previously and next to the testing procedure, the specimen was weighted, followed by fixing the specimen to the holder with a 10N load placed on a straight arm, and the device was turned on for ten min. (time of wear testing). The distance between the disc's center and the specimen's center was 65mm. He uses the following calculation to limit wear resistance: as wear resistance (gram/mm) = weight change/slide distance (slide distance=2 radius distance between specimen and disk centers) the number of the test’s cycles time [12]. Following each test, purifying of the disk necessity was done. Before the test, all specimens were sunk in distilled water for 48 hrs.

3. Results

3.1. Statistical analysis

3.1.1. Wear resistance test

The SPSS program version 20, from IBM Corp, was used to perform the statistical analysis of results. A total of (30) measurement of wearing resistance in (gram/mm) was measured for all samples for different three groups that were subdivided according to the surface treatment group A (control) finishing and polishing, group B finishing and polishing with glaze, and group C finishing with glaze process. Means and standard deviations of wearing resistance with minimum and maximum values were recorded for each group as shown in Table 1. And from Table 1 and Fig. 2, it showed the Descriptive statistics values of the wear resistance means value for three different groups of surface treatment, it showed the lowest mean of wear resistance values was scored by control group A (7.0883), while the highest mean of wear resistance values belonged to group C, that finished with glaze (8.7418), while we noted the mean value of the group B, that finished and polished with glaze (7.3235) has fluctuated between of the two groups A and C.

Fig 1. A) Wax specimens, B) Wax specimens in the dental flask

<table>
<thead>
<tr>
<th>Nomenclature</th>
<th>PMMA</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>GC</td>
<td>GC Corporation, Tokyo, Japan company</td>
<td>F</td>
</tr>
<tr>
<td>Mm</td>
<td>Millimeter</td>
<td>D.f</td>
</tr>
<tr>
<td>II</td>
<td>Fixed ratio</td>
<td>LSD</td>
</tr>
<tr>
<td>N</td>
<td>Newton</td>
<td>Sig.</td>
</tr>
<tr>
<td>No.</td>
<td>Number</td>
<td>RM</td>
</tr>
<tr>
<td>Std.</td>
<td>Standard</td>
<td>&lt;</td>
</tr>
<tr>
<td>Fig.</td>
<td>figure</td>
<td>Nm</td>
</tr>
</tbody>
</table>
ANOVA testing was used to see whether there was any level of statistically significant difference between and within groups as shown in Table 2. From this table, it has been found that the difference in wear resistance value for among three groups after the wear resistance test was statistically significant (P≤0.05) at (3.993) as a force.

Table 1 Descriptive statistics of the wear resistance for three different groups of surface treatment

<table>
<thead>
<tr>
<th></th>
<th>Control (A)</th>
<th>finishing and polishing with glaze (B)</th>
<th>finishing with glaze (C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mean</td>
<td>7.0883</td>
<td>7.3235</td>
<td>8.7418</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>1.2760</td>
<td>1.9495</td>
<td>7.6352</td>
</tr>
<tr>
<td>Minimum</td>
<td>5.15743</td>
<td>4.64169</td>
<td>7.22040</td>
</tr>
<tr>
<td>Maximum</td>
<td>8.50976</td>
<td>9.54125</td>
<td>9.79912</td>
</tr>
</tbody>
</table>

Further, multiple comparisons in Table 3 between groups were done by applying the least significant difference tests (LSD test) at a level of significance (0.05) to see the significant difference between each group. The result of the LSD test Table 3 viewed a non-significant difference (P≤0.05) between group A (controls) and group B (finishing and polishing with glaze). Also, it showed a significant difference (P≤0.05) between group A (controls) and group C (finishing with glaze), with a significant difference (p≤0.05) found between group B (finishing & polishing with glaze) and group C (finishing with glaze).
Denture foundation acrylic resin is polished by dental specialists using efficient processes. Acrylic dentures have been sealed with low viscosity denture surfaces, as shown in Table 1. These findings of our study agree with (Kuhar and Funduk, 2005) research that came to prove that the glazing materials might be used as a beneficial glossy sealant coating the acrylic denture to give good wear resistance and prevent the acrylic foundation from abrasion.  

Conclusion

Under the existing circumstances, it is reasonable to infer that:

1. The optiglaze color is a useful tool for achieving polished surfaces and lowering the rate of surface roughness.
2. Using simply the optiglaze color after finishing, it was feasible to produce polished surfaces.
3. Additional research is required to confirm the optiglaze color's clinical validity.

Acknowledgement

I would like to thank my family for helping get this work done.
Reference


