

EVALUATION AND COMPARE BETWEEN THE SURFACE ROUGHNESS OF ACRYLIC RESINE POLISHED BY PUMICE, WHITE SAND AND BLACK SAND.

(تقييم ومقارنة بين تأثير مادة البومس, الرمل الأبيض والرمل الأسود على الخشونة السطحية لمادة الاكرليك الراتنج)

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Abstract:

All scratches and rough areas must be removed to develop a high gloss on acrylic resin. So polishing techniques are meant to remove excess material and to smooth roughened surface, making the denture smooth and glossy without changing its contour.

The purpose of this study was to evaluate and compare the effect of using of pumice as a reference polishing material (on hot cured acrylic) with the effect of using the white sand and black sand as a polishing material. Thirty hot cured acrylic samples were prepared , numbered and divided into three groups. Each group consist of 10 specimens.

The result of this study showed that acrylic specimens polished with black sand exhibited higher surface roughness than acrylic specimens polished with white sand and pumice as follow.

الخلاصة :-

استخدمت في هذا البحث مادة الاكرليك المعالج بالطريقة الحرارية والمستعمل في صناعة الأطقم السنية المتحركة. حيث تم تحضير ثلاثون عينة من هذه المادة وتم تقسيم العينات إلى ثلاث مجموعات : المجموعة الأولى ضمت (10) عينات تم تلميعها بواسطة مادة ال (Pumice) والتي تعتبر المادة الرئيسية التي تستخدم في تلميع الأطقم المتحركة .

المجموعة الثانية ضمت (10) عينات تم تلميعها بواسطة الرمل الأبيض (White Sand) .

المجموعة الثالثة ضمت (10) عينات تم تلميعها بواسطة الرمل الأسود (Black Sand) .

بعد عملية التلميع تم قياس الخشونة السطحية للعينات بواسطة جهاز قياس الخشونة (البروفيلومتر) (The Profilometer Surface Roughness Device)

وقد أظهرت النتائج الإحصائية زيادة في الخشونة السطحية بالنسبة للعينات التي تم تلميعها بواسطة الرمل الأسود (Black Sand) عن العينات التي تم تلميعها بالرمل الأبيض (White sand) والعينات التي تم تلميعها بمادة البومس (Pumice) بالتتابع.

Introduction :

A rough surface on dental restorations may be uncomfortable and good oral hygiene maintenance became difficult because of food debris and plague can easily cling to it. So smooth surface offers little retention for food debris, epithelium cells and bacteria, thus reducing the risk of plague formation preventing negative effects on teeth and periodontal tissues. ⁽¹⁾

Acrylic resin is used for the fabrication of various dental prostheses, so proper finishing of dental materials are important aspects of clinical restorative procedures and

smooth and highly polished surface are utmost importance for patient comfort and denture longevity. ⁽²⁾

Pumice was the commonest fine abrasive used in dentistry. Pumice used as an agent for finishing acrylic sample which was considered a useful polishing agent. ⁽³⁾ The finishing and polishing of denture base material using brushes with pumice slurry and it had been used as a control group. ⁽⁴⁾

This study was undertaken to evaluate the effect of Iraqi material (black sand) and (white sand) as a materials of polishing system on the change in surface roughness of hot cure acrylic denture base resin specimens and comparing their effects with the pumice polishing material as a control group.

Materials and Methods:

Samples Preparation :

Hot cure acrylic samples preparation :

Wax plate 80 x 10 x 3.0mm in dimensions was prepared and fixed into flat glass plate. Stone slurry was prepared (33ml water/100gm powder) and poured in the lower half of flask. ⁽⁵⁾ Before the stone in the lower half of the flask was harden, the glass plate, which is larger than the surface area of flask, was loaded and wax plate placed over the stone, so that the level of the wax plate would be with the level of stone.

When the stone reached its initial set, it was coated with the separating medium (cold mold seal) . Then the upper half of the flask was positioned on the lower half and a second mix of dental stone was poured into the flask and kept under the hydraulic press. After completing the setting of the stone, wax elimination, was done by immersing the flask in boiling water for 4 minutes. Then the flask was opened , washed with boiled water to remove the remaining wax. Then it was allowed to cool, the flask opened again and the surface of the mold was coated with the separating medium. Hot cure acrylic powder was mixed with the liquid in a proper polymer monomer ratio of 3: 1 by volume for 45 seconds at room temperature, the container was left until it reached the dough stage, (when the mixture separates from the wall of container) (ADA specification No. 12 for denture base resins, 1972).

The mixture was packed into the stone mold, covered with polyethylene sheet, the two halves of the flask were closed together, and then the flask assembly was placed into the hydraulic press 20 bars to allow the resin dough to flow evenly through out mold. The flask was opened, the flow material and the polyethylene separating sheet was removed. Then the halves of the flask were finally closed together, press metal-to-metal, contact and held for 5 minutes before clamping was done. The flask was transferred to a thermostatically controlled water bath for curing the acrylic denture base resin.

The fast technique involves processing the resin at 74 C° for 1.5 hours and then increases the temperature of the water bath to boiling for an additional 1 hour. ⁽⁶⁾

Following the completion of polymerization cycles, the flask was removed from the water bath and left on the bench to cool for 30 minutes. Subsequently, the flask should be immersed in cool tap water for 15 minutes. ⁽⁷⁾

Finishing of the acrylic resin sample:

The acrylic plates were then removed from the flask and hand finished using progressively finer grades of silicon carbide paper (grades 120 to 40 um) with continues draining water.

Each acrylic plates was cut into equal square plates with an acrylic separating disk to obtain the final measurement of 10x10x2.5mm (length, width and thickness).

The thickness of 2.5mm represents the average thickness of acrylic denture base, while the length and width coincide for suitable measurement in the surface roughness water at 37 C° temperature for one week before the beginning of the experiment.

Sample grouping :

Thirty samples were divided into three groups:

Group one : 10 samples were polished by pumice + water (control group) .

Group two : 10 samples were polished by white sand + water .

Group three : 10 samples were polished by black sand + water

Polishing procedures:

The Sample test was fixed in the dental lathe unit . The space between the sample and the brush was fixed (1-2mm) . The speed of dental was fixed at low speed which was (1425 r. p. m.). Time of polishing process for reach specimen was 2 minute .

The amount of water added to each of these polishing materials (pumice, white sand and black sand) was 2ml measured by using plastic disposable syringe.

Surface Roughness Test:

The study specimens were examined by the profilometer surface roughness device after polishing with each material (pumice and black sand) , the surface roughness of each sample was measured .

The sample surface was fixed in a very flat position to the horizontal base of the profilometer by glue , and the stylus (profilometer`s needle) was moved across the surface of each sample twice times in two different directions for a distance of 1.7 millimeter according to apparatus design. The data was collected and obtain from the screen part of the profilometer which was subjected to statistical analysis.

Results

Table (1) shows the surface roughness values of acrylic specimens polishing with (Pumice as a control group) , (White Sand) and (Black Sand).

Statistical analysis showed that the surface roughness was influenced polishing material used in polishing procedure as shown in table (2) that shows the mean, standard deviation , standard Error with ANOVAs test shows the significances .

Table (3) shows the dependent Variable: LSD test

Figure (1) shows the mean of the surface roughness between the pumice ,white sand and black Sand.

Discussion :

Pumice is used as a polishing agent on harder materials depending up on its particle size. It is the commonest substance used for the preliminary polishing of acrylic .⁽⁸⁾

The pumice must be wet to minimize the generation of heat which will to warp non-metallic materials and to wear way the brush, keep the work well covered with pumice and not allow the denture to be forced out of the hand by the motion of the brush.⁽⁹⁾

The profilometer which have been used in this study appeared to be the ideal instrument for studying surface roughness of dental samples (teeth, acrylic) because the profilometer registered graphically.⁽¹⁰⁾ The pumice used with water in this study for polishing acrylic specimen gave smoother surface . This is in agreement with⁽¹¹⁾ .

The results were statistically signification, there were an increase in the surface roughness of black sand group then that of control group polished by pumice. This is may be due to variation in mechanical and physical properties of the material that have been used as a

polisher. This is in agreement with the work of ⁽¹²⁾ and may be due to the moderate and quickly broken up grains and high percentages in their content of abrasive particle .⁽¹³⁾

Pumice in this study which has been used as a control group showed a decrease in the means of surface roughness than black sand. From the study of Maalagh etal. ⁽¹⁴⁾ who concluded that the different types of provisional materials required different techniques to obtain the smoothest finished surface. It is agree also with the study ⁽¹⁵⁾ that used the (black sand) and porcelnite to evaluate their effect on the acrylic resin specimens against the conventional pumice polishing powder.

Table (1): The surface roughness values of acrylic specimens polishing with (Pumice as a control group) , (White Sand) and (Black Sand)..

Specim-en No.	Roughness value of the specimens polished with the pumice (Control Group)	Roughness value of the specimens polished with the (White Sand)	Roughness value of the specimens polished with the (Black Sand)
1	1.156 (µm)	1.237(µm)	1.657 (µm)
2	0.872 (µm)	0.986(µm)	1.021 (µm)
3	0. 639(µm)	0.791(µm)	0.864 (µm)
4	0.647(µm)	0.820(µm)	0.923 (µm)
5	1.295(µm)	1.461(µm)	1.891 (µm)
6	0.719(µm)	0.987(µm)	1.235 (µm)
7	0.782(µm)	0.912(µm)	1.042 (µm)
8	0.872(µm)	0.891(µm)	0.987 (µm)
9	0.908(µm)	1.002(µm)	1.076 (µm)
10	1.024(µm)	1.236 (µm)	1.413 (µm)

Table (2): statistical analysis of surface roughness according to the polishing materials groups, shows the mean, standard devotion , standard error with ANOVAs test shows the significances .

Studied groups	No.	Mean	Std. deviation.	Std. Error	Mini	Maxi	ANOV A test (P-value)	Sig.
Pumice(control group)	10	0.89140	0.21516	6.80E-02	0.639	1.295	0.038	S
White Sand	10	1.03290	0.21279	6.73E-02	0.791	1.461		
Black sand	10	1.21090	0.33979	0.10745	0.864	1.891		
Total	30							

**Table (3): Dependent Variable: Surface Roughness (UM)
LSD**

(Polishing Material Groups)		LSD test	
		P-value	Sig.
Pumice (Control)	White Sand	0.239	NS
Pumice (Control)	Black Sand	0.011	S
White Sand	Black Sand	0.141	NS

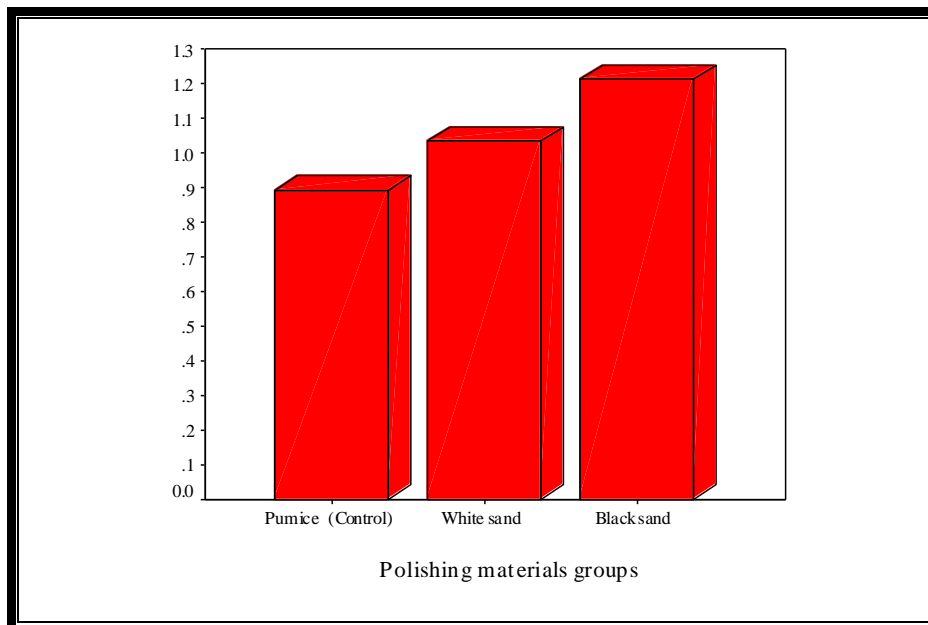


Figure (1):The mean of the surface roughness between the pumice ,white sand and black Sand.

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