

The effect of using Olive Oil as a separating medium on the tensile strength of processed cold and heat –cure acrylic Denture base materials (A comparative study)

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Abstract

Objective : study the effect of olive oil separating medium on the tensile strength of cold and heat processed acrylic denture base materials and compared with those processed with cold mold seal separating medium.

Materials and methods: Forty sample were prepared from heat-cure acrylic resin and cold-cure acrylic resin denture base. The study includes 4 groups of samples depending on the type of processing and type of separating medium that are used in curing process. Each group of them contains 10 samples ⁽³⁻³⁾.

Results: The results showed that there is no significant differences have been observed between olive oil and cold mold seal samples in respect to tensile strength of heat or cold cure acrylic denture base materials, while there is a significant difference between heat and cold- cure specimens regarding tensile strength.

الخلاصة:

الهدف من البحث: هو دراسة تأثير استخدام زيت الزيتون كمادة عازلة على مقاومة الشد للأكريل الراتنجي المعالج (حراريا وذاتيا) ومقارنتها مع العينات التي تم استخدام بديل رقائق القصدير المعدنية كمادة عازلة لها. المواد والطرق: تم تحضير 40 عينة من الأكريل الراتنجي المعالج (حراريا وذاتيا) تتضمن الدراسة 4 مجاميع من العينات اعتمادا على نوع طريقة البلمرة للأكريل الراتنجي ونوع المادة العازلة المستخدمة, كل مجموعة تحتوي على 10 عينات. أظهرت النتائج عدم وجود أي فروقات معنوية ملحوظة إحصائيا بين عينات زيت الزيتون وبديل رقائق القصدير المعدنية فيما يتعلق بمقاومة الشد للأكريل الراتنجي المعالج (حراريا وذاتيا), بينما كانت هناك فروقات معنوية ملحوظة إحصائيا بين عينات الأكريل الراتنجي المعالج حراريا وعينات الأكريل الراتنجي المعالج ذاتيا فيما يتعلق بمقاومة الشد.

Introduction:

In spite of the development of various denture base materials, acrylic resin remains the principle choice.⁽¹⁾ due to its desirable properties excellent esthetic, adequate strength, low water sorption and solubility relative lack of toxicity, ability to repair and ⁽¹⁾ simple processing techniques. ⁽²⁾

Heat activated polymethy methacrylate resins are the most widely used resins for the fabrication of complete dentures. ⁽³⁾ While the cold-cure acrylic is chemically activated and not require the application of thermal energy and therefore may be completed of room temperature ⁽⁴⁾. It revealed lower strength properties than that of heat-cured type due to lower degree of polymerization of it with high residual monomer which act as plasticizer and lower its strength properties. ⁽⁵⁾

During acrylic resin processing, the mold must be separated from the surface of the gypsum to prevent liquid resin from penetrating into the gypsum, and water from the gypsum seeping in to the acrylic resin. ⁽⁶⁾ Many materials are used for dental stone separation when dentures are being invested in a flask ⁽⁷⁾.

Many authorities consider that tin foil is the best separating medium, however it is difficult to apply, tedious, and time-consuming. As a result, the solution is sometimes referred to as a tin-foil substitute have been developed ⁽⁸⁾.

Al-musawi (2005) used glycerin as a separating medium and studied its effect on the processed acrylic resin denture base ⁽⁹⁾.

Al-Taai (2006) used olive oil as a separating medium and studied its effect on some physical and mechanical properties of processed acrylic resin denture base ⁽¹⁰⁾. Then Bassam A. Hanna (2012) Used detery isolate separating medium and study the effect of it on the surface roughness of the tissue surface of acrylic denture base when compared with tin-foil and cold mold seal separating media ⁽¹¹⁾.

Poly(methyl methacrylate) has adequate tensile and compressive strength for complete or removable partial denture applications. ⁽⁶⁾

In the present study, tensile strength was evaluated when using olive oil as a separating medium and compared with those using cold mold seal as a separating medium.

Materials and methods:

A dumbbell-shaped samples was prepared from wax in a metal mould in dimensions of (75,12.75,2.50±0.03) length, width, and depth respectively according to ADA specification. (figure1)



Figure 1: Acrylic tensile strength sample

Forty sample were prepared from heat and cold-cure acrylic resin denture base. The study includes 4 groups of samples depending on the type of acrylic resin and separating medium that are used in curing process. Each group of them contains 10 samples.

Group1= heat curing acrylic resin with cold mold seal separating medium

Group2= heat curing acrylic resin with olive oil separating medium.

Group3= cold curing acrylic resin with cold mold seal separating medium

Group3= cold curing acrylic resin with olive oil separating medium.

By using Instron testing machine (Instron, corporation/195 Canton, Mass), tensile strength was tested, equipped with grips suitable for holding the test sample. Set at a cross head sped of 0.5mm/min with a chart speed 20mm/min. the load was measured by a tensile load cell with a maximum capacity (200kg). the recorded force at failure was measured (kg) which were converted in to (N). the values of tensile strength were calculated by the following formula ^(8,13,14).

$$T.S. = \frac{F}{A}$$

Where:

T.S= tensile strength (N/mm²)

F= force at failure (N)

A= area of cross section a failure (mm²)

Results

In table (1) for tensile strength, some of descriptive statistics are listed, the results showed that the highest mean tensile strength value was obtained in heat cure-acrylic resin with olive oil separating medium (group2), while the lowest mean tensile strength value was obtained in the cold-cure acrylic resin with cold mold seal separating medium(group3).

One way ANOVA with LSD test indicates a significant difference at ($P < 0.05$) between cold cure acrylic resin groups and heat cure acrylic groups, while there was no significant difference at ($P > 0.05$) between cold cure acrylic resin groups which processed against olive oil or cold mold seal separating media. Also there was no significant difference between heat cure-acrylic resin groups which processed against olive oil or cold mold seal separating media.

Table 1: Descriptive and inferential statistics of tested samples.

Groups	mean	SD	SD
Group1	79.65	3.26	1.0
Group2	79.79	2.40	0.76
Group3	62.52	1.51	0.48
Group4	62.82	1.86	0.59

Table 2: LSD (★ = Significant $P < 0.05$) of tested samples.

Groups	P- value			
	G1	G2	G3	G4
Group1		0.951	0.001★	0.005★
Group2			0.001★	0.005★
Group3				0.698
Group4				

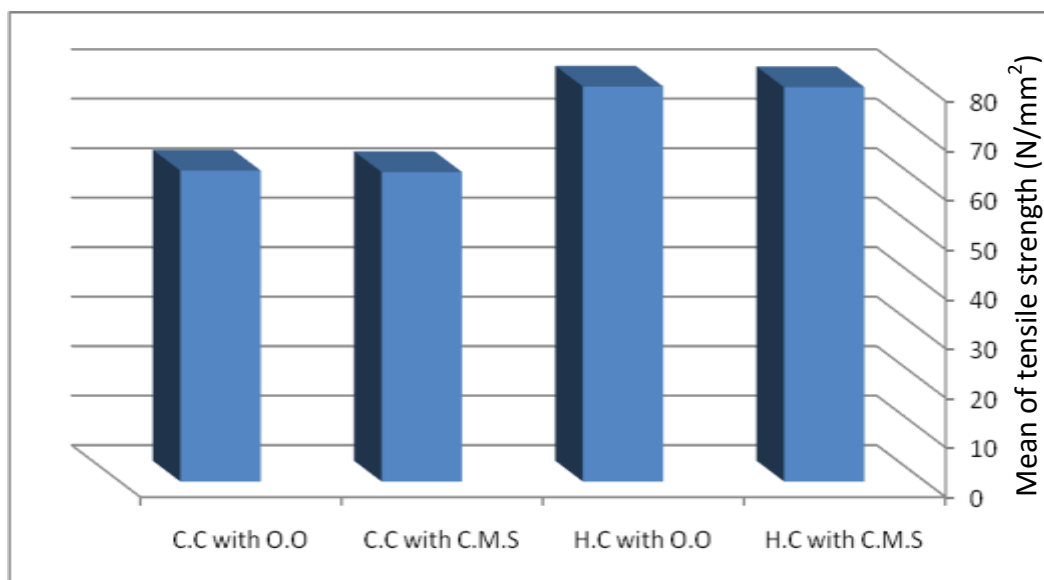


Fig. 2: Bar chart for tensile strength of heat and cold cured acrylic resins as influenced by different types of separating media.

Discussion

Cold-cure acrylic samples in general showed less tensile strength than heat-cure acrylic samples. This behavior could be attributed to two reasons.

The first is lower degree of polymerization of cold-cured acrylic resin with high residual monomer which act as a plasticizer and lower its strength properties. The same results were obtained by ^(8,13). Also these findings are agrees with ⁽⁶⁾. Who reported that the principal difference between room temperature-processed and heat-processed dentures is that more residual monomer is present in the room temperature-processed denture, which functions as a plasticizer, and, initially, lower values for the properties usually results. Also ^(3,15) stated that the highest residual monomer level is observed with chemically accelerated denture base polymers. While the second reason is that cold-cure acrylic resin is more porous than heat-cure acrylic resin which may responsible for the reduction of tensile strength these results agree with ^(3,13) who stated that the tensile strength of porous samples was inferior to that of dense PMMA.

On the other hand, the results showed that there was no significant difference between samples of cold-cure acrylic resin which processed against olive oil or cold mold seal and samples of heat-cure acrylic which processed against olive oil and cold mold seal.

Conclusion

From the results of the present study, it can be concluded that there was no significant differences have been observed between olive oil and cold mold seal samples in respect to tensile strength of heat and cold cure acrylic resin and olive oil can be use as a separating medium safely.

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