The Effect of Different Types of Separating Medium On Some Physical Properties of Processing Acrylic Denture-base with Two Investment Materials: A comparative Study

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المستخلص

الهدف: لبيان تأثير تبلمر الراتنج الاكريلي يجب فصل سطح القالب عن سطح الجبس لمنع سائل الراتنجي الاكريلي من اختراق الجبس من ناحية ودخول الماء الموجود في الجبس من التسرب إلى الراتنج الاكريلي من ناحية أخرى وكذلك للتقليل من الخشونة الموجودة على أسطح قوالب الجبس التي يمكن أن تخترق وتلتصق إلى قاعدة الطقم الاكريلكي وبالتالي توثر سلباً على قوة الطقم الاكريلي وتسبب لـه الكثير من الخدش والتكسر. ولتفادي ولمنع مثل هذا الالتصاق، يجب استعمال مادة عازلة جيدة والمعتاد هو استعمال رقائق القصدير المعدنية التي تعدّ من أحسن أنواع المواد العازلة في مجال صناعة الأسنان ولكن لصعوبة استعمالها، تمّ استعمال البديل وهو الجليسيرين وكبديل صوديوم ختم القالب وتمّ إجراء مقارنة بين هده الأنواع في هده الدراسة.

المنهجية: أخذت (٦٠) عيّنة موزعة على مجموعتين رئيستين حسب عملية الطبخ (المعالجة) الراتنج الاكريلي المعالج ذاتياً وحرارياً مع مادة الجبس. قسمت بالتالي إلى (٥) عينات بالإعتماد على نوع المواد العازلة المستعملة ونوع مادة الجبس وتمّ قياس الصفات الفيزيائية وهي قابلية الامتصاص وقابلية الذوبان.

النتائج: أظهرت النتائج أنّ رقائق القصدير أثبتت فعاليتها العالية وأنها الأفضل كمادة عازلة. بينما الجليسيرين وبديل صوديوم ختم القالب لم يكن بينهما أي فروقات إحصائية معنوية ملحوظة بقياس قابلية الذوبان والامتصاص.

التوصيات: أولاً تعدّ مادة رقائق القصدير هي الأفضل كمادة عازلة فيما يتعلق بقابلية الامتصاص والذوبان لمادة الراتنج الاكريلكي وثانياً إمكانية استعمال الجليسيرين كمادة عازلة تعطي نتائج جيدة ومقنعة وذلك لسهولة الحصول عليها وتوفرها.

Abstract

Objective(s): In the present study, glycerin is used as a substitute for tin-foil and cold mold seal (Alginate mould seal) in the process of curing heat and cold-cure acrylic resin denture base against stone and plaster.

Methodology: 60 specimens were prepared from heat-cure acrylic resin and cold-cure acrylic resin denture base. The study includes 12 groups of specimens depending on the type of processing, investment material and type of separating medium that are used in curing process. Each group of them contains 5 specimens for each test.

Some of physical properties of the processed acrylic denture base that (water sorption and solubility) have been compared with those processed using tin-foil and tin-foil substitute.

Results: The results have shown that tin-foil is still the best separating medium that is used due to the best properties obtained when using tin-foil as a separating medium, while no significant differences have been observed between glycerin and cold mold seal specimens in respect to water sorption and solubility of the testing groups.

Recommendations: that glycerin can be considered as a satisfactory separating medium for both heat and cold-cured acrylic denture base resins, especially because it is easy to get, easy to use and cheap.

Key words: separating medium; acrylic denture base; physical properties; water sorption and solubility.

Introduction

The relatively rough surface of gypsum mould may be penetrated by acrylic denture base resin and adhere to it, to prevent this, a separating medium must be employed.

Separating media are materials used for filling the porous surfaces to effect easy separation of other materials which are later poured against them [1]. When polymers first used as denture base materials for construction of prosthesis, the gypsum mould was coated with a thin layer of tin-foil [2-,4] as hardened plaster or stone is absorbent and this must be neutralized or the free monomer will be drawn from the acrylic dough when later is packed into the mould results in a weak improperly contoured, unaesthetic and poorly fitting processed denture base [5]. Therefore; the resin must be carefully protected during processing from the gypsum surfaces in the mould spaces for two reasons:

1. Any water incorporated into the resin from the gypsum during processing will definitely affect the polymerization rate and the color of the resin, the denture produced will craze readily because of the stresses formed by

the evaporation of water after the processing, particularly if the resin is not cross-linked.

2. Dissolved polymer and free monomer must be prevented from soaking into the mold surface. If any liquid resin penetrates into the investing medium, portions of the gypsum material will be joined to the denture after polymerization, with the result that it will be virtually impossible to separate the investing material from the resin [2, 6].

The process of tin-foiling a waxed denture is tedious and time consuming. An alternative method of preventing the gypsum surface from absorbing the liquid acrylic resin is to paint the mold with a liquid tin-foil substitute to seal the pores of the artificial stone. Tin-foil substitute is available and used successfully if all wax residue are thoroughly cleaned [6]. In the present study glycerin is used as a separating medium.

The present study aims to evaluate some physical properties of the processed acrylic resin and compared to those processed with cold-mold seal and tin-foil separating medium.

Methodology

Instruments and Equipment

1. Stainless steel moulds
2. Thermostatically controlled curing unit (Kavo Gmbh; West Germany)
3. Dessicator.(Germany)
4. Electronic balance (Sartorius b 13100 Germany)
5. Metal dental flask(Buffllo.N.X.;U.S.A)

Materials*:*

Table 1. Materials used in this study

Type of material	Trade name	Manufacturer	Batch number
Pink heat-cure acrylic resin	Major Base 2	Italy	ISO 1567, type I, class I ADA no. 12
Pink cold-cure acrylic resin	Major Repair 2	Italy	ISO 1567, type II, class I ADA no.12
Trihydroxy alcohol	Glycerin	Malaysia	(2,7323-M)
Dental stone	ZETA	Industria zingardi s.r.l. Italy	15067 Novi ligure
Dental plaster	Al-AHLIYAH Co.	Iraqi	Quality registed ISO 9002
Cold Mould Seal	P.D. pink color 1 1b separating film	Switzerland	Products Denatures S.A. 807317
Tinfoil	Tinfoil	DENTAURUM PFORZHEIM	Starke 0.01 mm

Figure 1. Types of separating media used in the study

Methods: Grouping the Specimens:

An experiment study was done on (60) specimens were prepared from heat-cure acrylic resin and cold-cure acrylic resin denture base.

The study includes (12) groups of specimens depending on the type of processing, investment material and type of separating medium that are used in curing process. Each group of them contains (5) specimens for each test as shown in Figure (2).

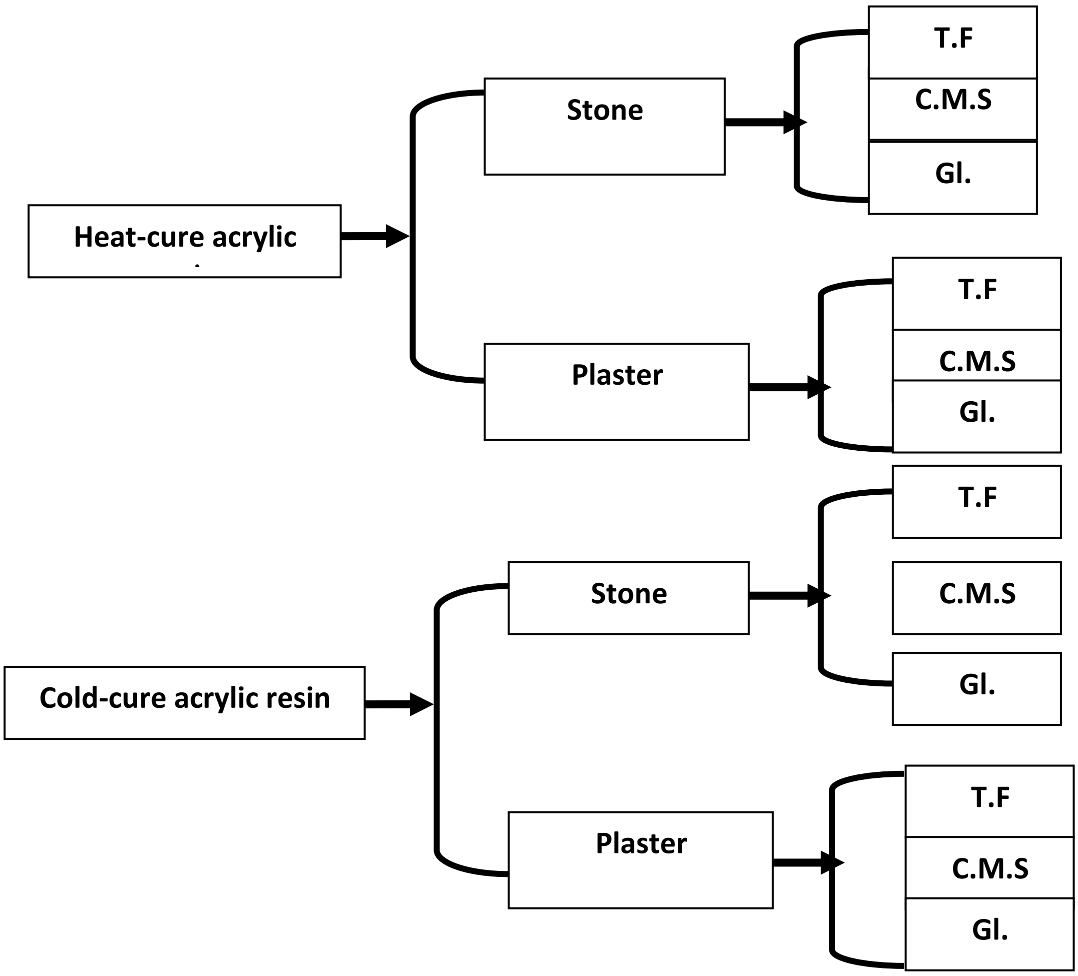

Figure 2. A diagram illustrates the design of the study

Specimens Preparation:

The conventional flasking technique was followed in the mould preparation, according to the required measurements of the adopted specimens. Each metal block was coated with the separating medium (cold mold seal) (7). Slurry stone was prepared according to the manufacturers' instruction (W/P ratio is 25 ml/100g) and poured into the lower half of the dental flask, then immerse the metal block in the slurry stone. After setting of the stone, a layer of cold mold seal separating medium was applied on Pink major base of heat-cure acrylic denture base resin was mixed according to the manufacturers' instruction and the major repair of cold-cure acrylic denture base resin was mixed and the major repair of cold-cure acrylic denture base resin was mixed according to manufacturers' instructions also (2.5:1) by volume as shown in table (2).

Table 2. Powder to liquid ratios and curing cycles of the acrylic denture base materials

Materials	Powder : liquid ratio (by volume)	Curing cycle
Major base (heat-cure acrylic)	3 : 1	Water bath for 1 ½ hour at 74°C + 30 min. at 100°C (ADA specification No. 12(1999), British specification(1989).
Major Repair 2 (cold-cure acrylic)	2.5 : 1	Flasks containing the self-cured resin were left in a bench pressure curing for 2 hours at 23°C ± 5°C (Walter and Gloysher, 1972)

In case of using sodium alginate cold mould seal or glycerin the curing cycles used for both heat and cold-cure acrylic denture base are presented in Table (2). Polishing was accomplished using bristle brush and rag wheel with pumice in lathe polishing machine till glossy surface was obtained.

Water Sorption Analysis:

From stainless steel discs, acrylic specimens were prepared with dimensions of (50 ± 1 mm in diameter and 0.5 ± 0.1mm thickness), according to ADA specification No.12 . The disks were dried in a desiccators containing silica gel (freshly dried at 130°C) at [37°C ± 2°C for 24] hours then removed to a similar desiccators at room temperature for one hour, then weighted.

The cycle was repeated until constant weight was attained, that is until the weight loss of each disk was not more than 0.5mg in every 24 hour period. The disks were then immersed in distilled water at [37 ± 1°C for 24]hours, after that time the disks were removed from the water with tweezers, wiped with a clean dry hand towel, until free from visible moisture, waved in the air for (15 seconds) in room temperature and weighted 1 min. after removal from the water. This was considered to be the initial weight of the (W1) Specimens then were immersed in distilled water using filter paper and the weight of the specimen was recorded (W2) at each occasion. The final value (average of two determinations) was rounded to the nearest 0.1mg/cm^2. The value for water sorption was calculated as follows for each disk: according to (ADA specification, no.12).

$$\frac{W_2 - W_1}{S.A} = S$$

W_1 = conditioned weight (mg).
W_2 = weight after immersion (mg).
S.A = Surface area (cm^2) that mean [1/2(50)^2*22/7]=1. 023 cm^2.
S = Sorption (mg/cm^2).

Solubility Analysis:

After the final weighing (as described in the water sorption analyzing). The disks were reconditioned to constant weight in the desiccators at[37 ± 2°C] as was done in the previous section. The soluble matter lost during immersion was determined to the nearest 0.01mg/cm^2 as follows for each disk: The final value (average of two determinations) were rounded to the nearest 0.01 mg/cm^2, when the final value falls midway between two numbers, the even number were recorded (ADA specification no. 12).

$$\frac{W_1 - W_3}{S.A} = SO$$

W_1 = Conditioned weight (mg).
W_3 = Reconditioned weight (mg).
S.A = Surface area of the specimen (cm^2). that mean [1/2(50)^2*22/7] =1. 023 cm^2.
SO = Solubility (mg/cm^2).

Results

Descriptive and inferential statistics with original data of weight used for (water sorption and solubility) test of heat and cold-cured acrylic resin specimens which invested in plaster and stone moulds as influenced by different types of separating media that are (tin-foil, cold mold seal and glycerin) were studied then compared between the results of them to evaluate the glycerin as a separating medium. In table (3;4;5 and 6) represent the conditioned weight W1 (mg) of the specimens for hot -cure and cold -cure acrylic denture base samples processed in stone and plaster and lined with different types of separating medium.

Table 3. Data concerning the range of W1 (conditioned weight) of the specimens in (mg) for heat-cured acrylic resin denture base samples processed in stone and lined with different types of separating medium

List	Tin-foil separating medium	Cold-mold-seal separating medium	Glycerin separating medium
1	0.0529	0.0546	0.0578
2	0.0512	0.0563	0.0595
3	0.0522	0.0537	0.0585
4	0.0518	0.0551	0.0601
5	0.0522	0.0556	0.0589

Table 4. Data concerning the range of W1 (conditioned weight) in (mg) for cold-cured acrylic resin denture base samples processed in stone and lined with different types of separating medium

List	Tin-foil separating medium	Cold-mold-seal separating medium	Glycerin separating medium
1	0.0512	0.0655	0.0657
2	0.0524	0.0643	0.0595
3	0.0543	0.0596	0.0663
4	0.0537	0.0638	0.0672
5	0.534	0.0650	0.0659

Table 5. Data concerning for the range of W1 (conditioned weight) in (mg) for heat-cured acrylic resin denture base samples processed in plaster and lined with different types of separating medium

List	Tin-foil separating medium	Cold-mold-seal separating medium	Glycerin separating medium
1	0.0512	0.0646	0.0653
2	0.0523	0.0652	0.0594
3	0.0524	0.0598	0.0662
4	0.0538	0.0648	0.0679
5	0.0524	0.0668	0.0658

Table 6. Data concerning the range of W1 (conditioned weight) in (mg) for cold-cured acrylic resin denture base samples processed in plaster and lined with different types of separating medium

List	Tin-foil separating medium	Cold-mold-seal separating medium	Glycerin separating medium
1	0.0512	0.0648	0.0653
2	0.0533	0.0649	0.0592
3	0.0534	0.0596	0.0662
4	0.0537	0.0638	0.0679
5	0.0558	0.0650	0.0658

r heat-cured acrylic resin denture base samples processed in stone and lined with different types of separating medium

List	Tin-foil separating medium	Cold-mold-seal separating medium	Glycerin separating medium
1	0.0522	0.0655	0.0655
2	0.0533	0.0647	0.0593
3	0.0524	0.0596	0.0662
4	0.0537	0.0638	0.0677
5	0.0534	0.0660	0.0658

Table 8. Data concerning the range of W2 (weight after immersion) of the specimens in (mg) for cold-cured acrylic resin denture base samples processed in stone and lined with different types of separating medium

List	Tin-foil separating medium	Cold-mold-seal separating medium	Glycerin separating medium
1	0.0523	0.0655	0.0655
2	0.0534	0.0655	0.0595
3	0.0527	0.0596	0.0663
4	0.0547	0.0648	0.0676
5	0.0534	0.0657	0.0658

Table 9. Data concerning the range of W2 (weight after immersion) of the specimens in (mg) for heat-cured acrylic resin denture base samples processed in plaster and lined with different types of separating medium

List	Tin-foil separating medium	Cold-mold-seal separating medium	Glycerin separating medium
1	0.0520	0.0645	0.0655
2	0.0523	0.0642	0.0595
3	0.0623	0.0696	0.0667
4	0.0537	0.0648	0.0674
5	0.0534	0.0655	0.0658

Table 10. Data concerning the range of W2 (weight after immersion) of the specimens in (mg) for cold-cured acrylic resin denture base samples processed in plaster and lined with different types of separating medium

List	Tin-foil separating medium	Cold-mold-seal separating medium	Glycerin separating medium
1	0.0520	0.0645	0.0652
2	0.0523	0.0644	0.0591
3	0.0533	0.0596	0.0662
4	0.0527	0.0638	0.0670
5	0.0524	0.0650	0.0658

Table 11. Data concerning water sorption test in (mg/cm2) for heat-cured acrylic resin denture base samples processed in stone and lined with different types of separating medium

List	Tin-foil separating medium	Cold-mold-seal separating medium	Glycerin separating medium
1	0.0527	0.0127	0.0578
2	0.0523	0.0244	0.0591
3	0.0533	0.0196	0.0562
4	0.0527	0.0238	0.0570
5	0.0524	0.0250	0.0558

Table 12. Data concerning water sorption test in (mg /cm2) for cold-cured acrylic resin denture base samples processed in stone and lined with different types of separating medium

List	Tin-foil separating medium	Cold-mold-seal separating medium	Glycerin separating medium
1	0.0512	0.0655	0.0657
2	0.0523	0.0644	0.0691
3	0.0533	0.0596	0.0662
4	0.0527	0.0638	0.0670
5	0.0524	0.0655	0.0658

List	Tin-foil separating medium	Cold-mold-seal separating medium	Glycerin separating medium
1	0.0524	0.0656	0.0667
2	0.0523	0.0644	0.0693
3	0.0537	0.0696	0.0662
4	0.0528	0.0648	0.0677
5	0.0529	0.0665	0.0659

Table 14. Data concerning water sorption test in (mg/cm2) for cold-cured acrylic resin denture base samples processed in plaster and lined with different types of separating medium

List	Tin-foil separating medium	Cold-mold-seal separating medium	Glycerin separating medium
1	0.0522	0.0646	0.0690
2	0.0523	0.0644	0.0693
3	0.0528	0.0656	0.0675
4	0.0529	0.0658	0.0677
5	0.0529	0.0645	0.0669

Table 15. Data concerning the range of W3 (reconditioned weight) of the specimens in (mg) for heat-cured acrylic resin denture base samples processed in stone and lined with different types of separating medium

List	Tin-foil separating medium	Cold-mold-seal separating medium	Glycerin separating medium
1	0.0526	0.0646	0.0657
2	0.0525	0.0652	0.0595
3	0.0529	0.0556	0.0662
4	0.0527	0.0648	0.0675
5	0.0528	0.0650	0.0668

Table 16. Data concerning the range of W3 (reconditioned weight) of the specimens in (mg) for cold-cured acrylic resin denture base samples processed in stone and lined with different types of separating medium

List	Tin-foil separating medium	Cold-mold-seal separating medium	Glycerin separating medium
1	0.0522	0.0648	0.0652
2	0.0526	0.0658	0.0596
3	0.0523	0.0596	0.0672
4	0.0527	0.0638	0.0673
5	0.0524	0.0656	0.0658

Table 17. Data concerning the range of W3 (reconditioned weight) of the specimens in (mg) for heat-cured acrylic resin denture base samples processed in plaster and lined with different types of separating medium

List	Tin-foil separating medium	Cold-mold-seal separating medium	Glycerin separating medium
1	0.0522	0.0646	0.0652
2	0.0523	0.0642	0.0590
3	0.0523	0.0598	0.0662
4	0.0527	0.0659	0.0670
5	0.0524	0.0655	0.0658

Table 18. Data concerning the range of W3 (reconditioned weight) of the specimens in (mg) for cold-cured acrylic resin denture base samples processed in plaster and lined with different types of separating medium

List	Tin-foil separating medium	Cold-mold-seal separating medium	Glycerin separating medium
1	0.0524	0.0655	0.0658
2	0.0534	0.0642	0.0592
3	0.0533	0.0696	0.0662
4	0.0527	0.0638	0.0677
5	0.0524	0.0650	0.0658

Table 19. Data concerning solubility test in (mg /cm2) for heat-cured acrylic resin denture base samples processed in stone and lined with different types of separating medium

List	Tin-foil separating medium	Cold-mold-seal separating medium	Glycerin separating medium
1	0.0627	0.0527	0.0678
2	0.0626	0.0542	0.0694
3	0.0638	0.0533	0.0667
4	0.0629	0.0558	0.0677
5	0.0638	0.0536	0.0669

Table 20. Data concerning solubility test in (mg /cm2) for cold-cured acrylic resin denture base samples processed in stone and lined with different types of separating medium

List	Tin-foil separating medium	Cold-mold-seal separating medium	Glycerin separating medium
1	0.0630	0.0670	0.0687
2	0.0646	0.0642	0.0697
3	0.0638	0.0653	0.0669
4	0.0649	0.0658	0.0677
5	0.0638	0.0646	0.0668

Table 21. Data concerning solubility test in (mg/cm2) for heat-cured acrylic resin denture base samples processed in plaster and lined with different types of separating medium

List	Tin-foil separating medium	Cold-mold-seal separating medium	Glycerin separating medium
1	0.0624	0.0676	0.0667
2	0.0646	0.0652	0.0699
3	0.0638	0.0658	0.0669
4	0.0639	0.0658	0.0678
5	0.0638	0.0656	0.0667

Table 22. Data concerning solubility test in (mg/cm2) for cold-cured acrylic resin denture base samples processed in plaster and lined with different types of separating medium

List	Tin-foil separating medium	Cold-mold-seal separating medium	Glycerin separating medium
1	0.0622	0.0676	0.0690
2	0.0636	0.0655	0.0699
3	0.0638	0.0658	0.0689
4	0.0639	0.0668	0.0688
5	0.0639	0.0669	0.0697

In Table (23) for water sorption test represent some of descriptive statistics are listed, the results showed that the highest mean water sorption value was obtained in cold-cure acrylic resin with plaster investing material and glycerin separating medium (0.60380), while the lowest mean water sorption value was obtained in control group, hot-cure acrylic resin with stone investing material and tin-foil separating medium (0.51021).

Table 23. Descriptive and inferential statistics for water sorption of hot and cold-cured acrylic resins invested in plaster and stone as influenced by different of separating medium

Cure Tech.	Statistics	Plaster			Stone		
		T.F	C.M.S	Gl	T.F	C.M.S	Gl
Hot	Mean	0.52260	0.57010	0.60380	0.51021	0.54880	0.59190
	SD	0.015349	0.012618	0.012497	0.0069089	0.015782	0.018729
	Max.	0.554	0.591	0.620	0.521	0.570	0.621
	Min.	0.507	0.552	0.582	0.501	0.525	0.568
Cold	Mean	0.55050	0.60460	0.70011	0.51530	0.65560	0.66820
	SD	0.012430	0.013680	0.012801	0.010457	0.033241	0.042031
	Max.	0.567	0.632	0.720	0.535	0.685	0.710
	Min.	0.529	0.585	0.682	0.502	0.595	0.595

Figure 3. Bar chart of water sorption mean values, plaster and stone of hot and cold cured acrylic resins as influenced by different types of separating media

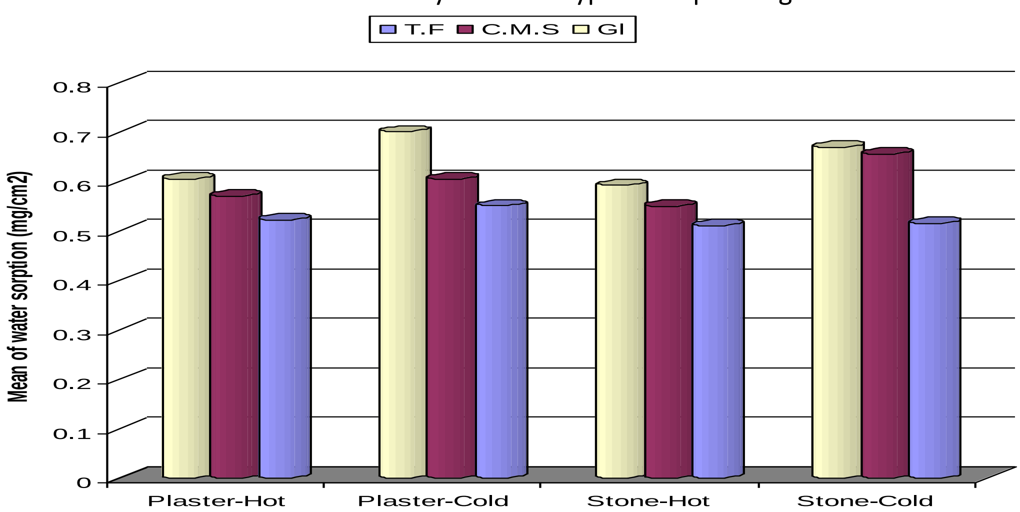

Table 24. Descriptive and inferential statistics for solubility of hot and cold-cured acrylic resins invested in plaster and stone as influenced by different types of separating media

Cure Tech.	Statistics	Plaster			Stone		
		T.F	C.M.S	Gl	T.F	C.M.S	Gl
Hot	Mean	0.02376	0.02981	0.03411	0.02053	0.02866	0.03066
	SD	0.002695	0.002325	0.004170	0.0005322	0.001955	0.003039
	Max.	0.0310	0.0330	0.0382	0.0213	0.0316	0.0358
	Min.	0.0214	0.0263	0.0289	0.0197	0.0256	0.0276
Cold	Mean	0.05103	0.05463	0.05879	0.04247	0.05091	0.05571
	SD	0.001514	0.003125	0.002039	0.003350	0.002205	0.003415
	Max.	0.0532	0.0602	0.0620	0.0517	0.0547	0.0610
	Min.	0.0490	0.0493	0.0560	0.0400	0.0480	0.0495

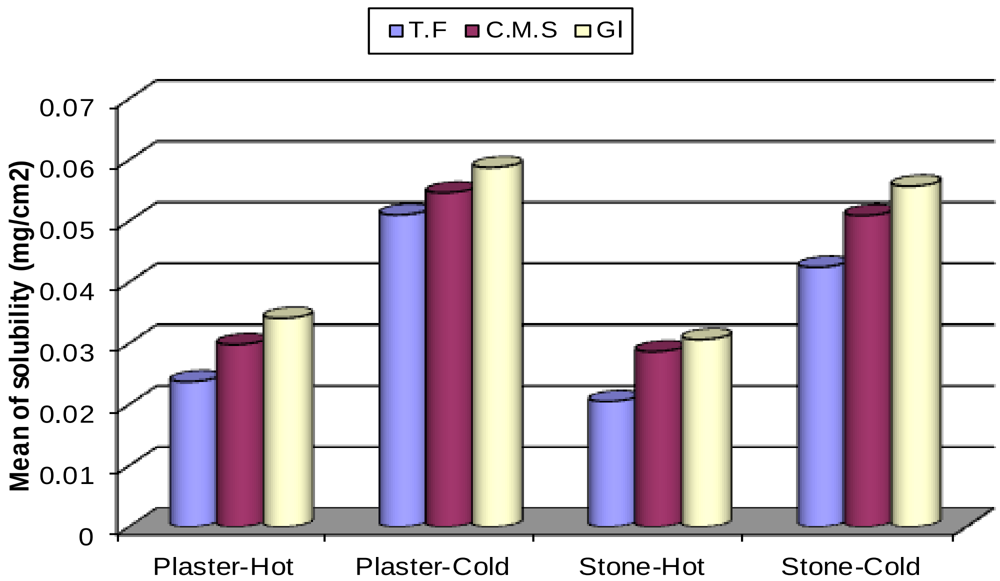

Figure 4. Bar chart 2 of solubility mean values, plaster and stone of hot and cold cured acrylic resins as influenced by different types of separating media

Discussion

Separating medium is one of the important factors in dental prosthesis success, due to its effect on the physical and mechanical properties of the processed acrylic denture base materials. In the present study, glycerin was used as a separating medium in the process of curing heat and cold-cure acrylic resin denture base against stone or plaster.

Water Sorption:

One way ANOVA with LSD of multiple comparisons (part B) test between tested groups in each curing technique are indicated, the results indicates a significant difference at ($P < 0.05$) between different separating medium, except for a non-significant difference at ($P > 0.05$) between hot-cure acrylic resin with stone investing material and tin-foil separating media (control group) and hot- cure acrylic resin with plaster investing material and tin-foil separating media. In the LSD significant test showed statistically significant differences between most of the groups examined except between the heat-cure invested against plaster lined with glycerin and cold-cure against plaster lined with cold-mold seal, heat-cure against stone lined with were non glycerin and cold-cure invested in plaster lined with cold-mold seal which significant statistically.

Mean value of water sorption by heat-cure acrylic denture base resin processed against stone lined with tin-foil was the least for all groups examined when the values were compared with the values obtained from heat-cure processed against stone lined with cold mold seal and glycerin. Similar results were obtained when heat-cure was processed against plaster, this may be due to that the cold- mold seal and glycerin films are permeable to water from the gypsum mould to enter the resin during processing unlike tin-foil. On the other hand mean values of water sorption by cold-cured specimens were generally higher than those obtained for heat-cured specimens and the highest mean value was for cold-cured invested against plaster lined with glycerin, which was statistically significant when compared to the values obtained for cold-cure processed against plaster lined with cold-mold seal and tin-foil. This is in agreement with (Wozniak WT et al; 1981) they stated that the self-cured acrylic stained more than heat-cured acrylic, which may be attributed to the greater porosity of self-cured acrylic resulting in an increased surface area exposed to solutions [(8)].

Also this is in accordant with (Stafford GD et al; 1980) when they record the water sorption of (Trevalon) heat and (Detrys Sc) cold- cured acrylic as (0.58 and 0.60) mg/cm2 respectively. The mean values for water sorption by heat-cured and cold-cured acrylics processed against stone and plaster lined with glycerin are within the limits given by ADA specification No. 12 (1999), the gain in weight by the resin must not be greater than 0.7 mg/cm2 [(9-10)].

Others obtained higher values for water content in heat-cure processed against alginate separating medium (cold-mold seal) than those obtained for similar specimens processed against tin-foil, as the structure of the resins processed against cold- mold seal is modified enough to permit greater water content (Fairhurst CW and Rryge G; 1954) and (Bevan EM and Earnshow R, 1968) [(11-12)].

When we make a comparison between groups of plaster and stone investing materials which have the same separating medium and processing technique, it appears that, the groups of plaster investing materials has the highest value of water sorption than those of stone and this is due to the fact that, plaster is more porous than stone which make it more permeable to water to the acrylic denture base materials during processing this is in agreement with result of (Sweeney WTT; 1958) [(13)].

The results are in contrast to (Craig RG and Powers, 2002) they stated that, resins processed in a mould lined with tin- foil substitute is saturated with water during processing and consequently, does not absorb more water during storage in it [14].

Solubility:

In Table (24) for solubility test represent some of descriptive statistics are listed, the results showed that the highest mean solubility value was obtained in cold-cure acrylic resin with plaster investing material and glycerin separating medium (0.05879), while the lowest mean solubility value was obtained in control group, hot-cure acrylic resin with stone investing material and tin-foil separating medium (0.02053).

One way ANOVA with LSD of multiple comparisons (part B) test between tested groups in each curing technique are indicated, the results indicate a significant difference at ($P<0.05$) between different separating medium, except for a non-significant difference at ($P>0.05$) between hot-cure acrylic resin with stone investing material and cold mold seal separating media and hot -cure acrylic resin with plaster investing material and cold mold seal separating media.

The solubility mean value for specimens processed from heat-cure invested against stone lined with tin-foil recorded the lowest value, while similar cold-cure specimens lost more weight which is due to lower degree of polymerization of cold-cure and presence of higher content of residual monomer which make the solubility higher.

(Bevan EM and EarnshowR; 1969) and (Faraj SAA; 1977) they obtained similar results in heat-cure prepared in mould lined with tin-foil and Alginate separating medium. Also all cold-cure specimens showed higher weight loss than heat-cure specimens, [15-16].

In regard to specimens processed in moulds lined with glycerin the solubility mean value is higher than the other groups processed in molds lined with tin-foil and cold-mold seal. The results show no statistically significant differences between the values obtained from heat-cure specimens prepared in molds lined with glycerin and cold-mold seal but there was a statistically significant difference between the values obtained by tin-foil group of specimens on one hand and the glycerin and cold-mold seal groups of specimens on the other hand, this is due to the degree of sealing supplied by each separating medium provided. The results are in agreement with those obtained by (Fairhurst CW and Ryge G;1955) they found that heat-cured denture base resin specimens prepared in mold lined with tin-foil lost less weight on drying than the specimens prepared in moulds lined with Alginate separating medium this finding is in agreement with the findings obtained by (Fairhurst CW and Ryge G;1955)(17); and (American Dental Standers ; 1999; Phillips RW; 1989; Phillips, 1996; ADA; 1981) [18-21].

Recommendations:

According to the early study the result recommends the following:

1. Tin-foil is the best separating medium concerning water sorption, and solubility in heat and cold-cure acrylic specimens processed in plaster and stone moulds.

2. Glycerin can be used safely as a separating medium for heat and cold-cure acrylic invested against stone and plaster if we consider the amount of water absorbed.

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