IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 16, Issue 10 Ver. IX (Oct. 2017), PP 35-46
www.iosrjournals.org

Evaluation effects of povidone iodine on some mechanical properties of soft liner materials

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Abstract
***Statement of problem**:-soft denture lining materials has a key role in modern prosthodontics because of their capability of restoring health of inflamed and distorted mucosa, and the patients suffer from the injury , fungal or bacterial after maxillo facial surgery also the patient needed obturator prosthesis after postsurgery in the mouth .*
***Purpose of this study** :- Evaluate the effect of incorporated povidone iodine in different volum into acrylic soft denture liner and to assessment the effect of this addition on some mechanical and physical properties .*
***Materials and methods**:-Atotal of 200 specimens were prepared from acrylic soft liner material incorporated into three volum (0.05ml,0.1ml and 0.2ml),and divided into five groups according to each conducting test(tensile strength,hardness,compressive strength ,absorption and solubility and color change) with 40 specimens for each test,then each group subdivided into :-*
** Control group consist 10 specimens for each test without any additions.*
**Experimental groups :contain thirty specimens after incorporated with povidone iodine (0.05ml,0.1ml and 0.2ml) 10 specimens for each volum.*
***Results** :-The results of this study showed that the highly significant decrease in the tensile strength and hardness for all volum,and highly significant increase the compressive strength and color change for all volum,also significant increase by 0.05ml and 0.1ml water sorption and 0.2ml water solubility after incorporated soft liner material with povidone iodine .*
***Conclusions**: - The incorporation of the povidone iodine effects on some properties of the soft lining material (tensile strength ,hardness,compressivestrength, water sorption and solubility and color change).*

I. Introduction

Soft denture liners have been introduced in dentistry long years ago. It represents polymeric materials which can be placed on the tissue surface of a hard denture base to absorb some of the load resulted from the masticatory forces and to act as a shock absorbers between the hard denture and the underlying supporting oral tissue [(1)]. The soft liner materials are used to replace the fitting surface of the denture when patients cannot tolerate the hard denture base. High resilience of these materials help in absorbing the impact energies of mastication and distributes them over a large area of tissues. They are used not only to reduce the mechanical abuse of the oral soft tissues but also to improve the masticatory function and comfort to the patient [(2).]

One of the main draw backs associated with using soft denture liner is their susceptibility to be colonized by pathological microorganism which can be enhanced by increased humidity and high temperature beneath the denture and by the surface characteristic and structure of the material[(3)].The chemical cleansing of the soft lining material of the denture was present to affect the properties of the relined material [(4)].
Povidone iodine is a macromolecular complex that is used as an iodophor and antibacterial effectiveness [(5)]. It is water –soluble does not irritate healthy or diseased oral mucosa, and exhibits no adverse side–effects, such as discoloration of tongue and teeth and change in taste [(6)].

Povidone –iodine solution its elemental iodine or its derivative [polyvinyl-pyrrolidone-iodine complex(PVP-iodine)]solution 10%are probably the most broad –spectrum and potent antiseptics available[(7)].The povidone iodine or poly vinyl pyrroliodine–iodine is a broad spectrum antimicrobial agent delivered in many forms including gels, lotions, ointments, powder and sprays. Compared to other similar compounds also it is highly soluble and less toxic making it's widely suitable for surgical asepsis and wound dressing. In dentistry it is used for pre procedural rinse to reduce bacteremia and microbial load in aerosols, root canal irrigant and intracanal medicament [(8)].The extent of systeimic absorption of the povidone iodine depends on the localization and the conditions of its use (mucos membranes, skin surface, area body cavities, wounds) [(6)].In this study povidone iodine was used by three volum (0.05ml,0.1ml and 0.2 ml) and incorporated into acrylic based soft denture liner to evaluate wheather this addition would significantly affect some of properties of the soft lining material such as tensile strength ,hardness,compressive strength, absorption and solubility andcolor change test.

II. Materials And Method

Experimental design:-

Acrylic based soft liner material (Vertex-soft heat polymerizing / Netherland) were incorporated into povidone iodine (PVP-iodine) solution [polyvinyl-pyrrolidone –iodine] complex 10% are probably the most broad -spectrum and potent antiseptics available [(7)].

Specimens grouping:-

Two hundred (200) specimens were prepared to be used in this study and were divided into five groups according to the test to be performed.Then each group (test) was subdivided into four subgroup according to the volum of the povidone iodine solution which was added. (control group without incorporation of povidone iodine and three volum of povidone iodine is used (0.05ml,0.1ml and 0.2 ml)incorporating into monomer of soft liner ,each volum 10 specimens were made as fallow:-

1-Control group 10 specimens for each test without any additions.

2-Experimental groups :contain thirty specimens after incorporated with povidone iodine (0.05ml,0.1ml and 0.2 ml) 10 specimens for each volum.

Preparation of tensile strength test specimens:

A metallic mold with dimension (80mm×9mm×3mm for length, width and thickness) [(9)] During the mold preparation ,the metal patterns were coated with separating medium and allowed to be dry ,the lower portion of the metal flask is filled with dental stone that is mixed according to manufacturer instructions at a mixing ratio of 20 ml of water to 100 g of powder with vibration to get rid of the trapped air .The pattern inserted to approximately one –half of their depth in the stone for easier removal.After setting ,the set stone and specimens were coated with separating medium and allowed to dry ,then the upper half to the metal flask was positioned on the top of the lower portion and filled with

dental stone ,again with vibrator .The dental stone was allowed to set for one hour then the metal flask was opened in order to remove the metal patterns.The portions of the metal flask were coated with separating medium to be ready for packing with soft liner material.

- **Proportioning and mixing of heat cure soft liner material :**

Dry, clean glass jar was used to mix the soft liner material which was mixed according to manufacturer instructions P/L ratio :(1.2g of the powder was mixed with 1ml of liquid).After that the mixture was covered and left until it reached dough stage .Separating medium was used to cover the two parts of the flask and left to dry.

- **Incorporation of povidone iodine with soft liner material :-**

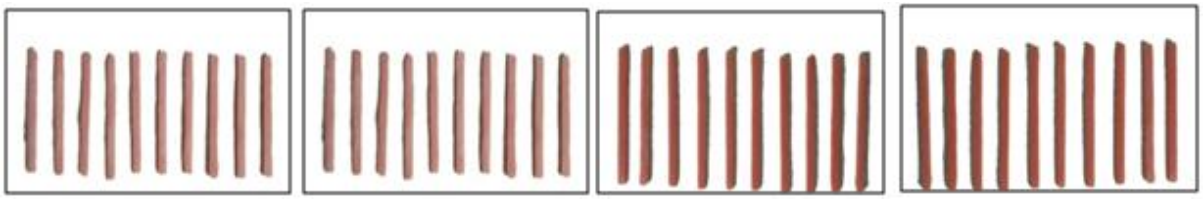
For experimental spaciemens of povidone iodine were incorporated into soft liner monomer in three different volum (0.05ml,0.1ml and 0.2 ml)by volume with the monomer.Then the resilient lining liquid was added to the powder and the material was mixed in according to the manufacturer instructions,the volume of the povidone iodine liquid that had been added to the monomer of soft liner was taking into account and subtracted from soft liner monomer volume to achieve correct P/L ratio table (1).

Table (1). volum of the monomer with povidone iodine solution

Acrylic powder	Liquid acrylic	Volum of the povidone iodine solution
1.2mg	1ml	Control group
1.2mg	0.95 ml	0.05ml povidone iodine
1.2mg	0.90 ml	0.1ml povidone iodine
1.2mg	0.80ml	0.2ml povidone iodine

- **Packing:-**

Separating medium was used to cover the two halves of the flask and left to dry,the soft liner dough was packed into the mold and polyethylene sheet used to cover it .The two halves of the flask were assembled and to ensure even flow of the soft liner gradual pressure was applied by hydraulic press, ($100Kg/cm^2$) for 5 minutes after that the press was removed,the flask was opened ,the polyethylene sheet was removed and sharp knife was used to remove the excess material. The separating medium was used again to coat the stone surface of the flask to dry then the flask was closed ,and placed under pressure for 5 minutes to ensure metal to metal contact .Then clamping was done and the clamped flask transferred to the water path for curing .curing was done as instructed by manufacturer (heating up to 70c and kept for 90 minutes then the temperature was raised up to 100c and kept for 30 minutes) [(10)] .Then the flask was allowed to cool at room temperature for 30 minutes followed by complete cooling of the metal flask with tap water for 15 minutes before deflasking.Then the flask was opened and the samples were removed and sharp blade was used to remove all the excess materials and fine grit sand paper and fine grit silicone polishing bur (vertex) was used to remove the flashes .Then the specimens placed into the distalled water for seven dys in the incubater at 37C◦ [(11)] Fig.(1).



A B C D

Fig (1) samples for tensile strength Acontrol B-(0.05) ml C(0.1ml), D(0.2ml)

- **Testing procedure:**

Objective method using Instron testing machine with grips suitable for the test specimens, Fig (2,3). The specimens was subjected to tensile load with cross head speed of 5mm/min using load cell with maximum load capacity of 1000 N.force at failure was recorded in Newton. The calculation of tensile strength was according to the following formula (ASTM specification 1986) [(12)]:-

Tensile strength (N/mm^2) =F/A(MPa)

F: Maximum load (N)

A: Cross section area (mm2)

Fig(2)instern testing machin Fig(3) testing sample

- **preparation of hardness test speciemens:-**

Aplastic model with the dimension of (30mm diameter),(3mm thickness [(13)].

At first, a flexible but hard silicone material (addition silicone duplicating material) was used to invest two plastic models on top each other to facilitate the removal and the replacement of the patterns and the specimens while maintaining the shape, and after silicone setting both pattern and silicone mould was invested in newly mixed stone as mentioned ,Fig. (4).

A- B- C- D-

Fig (4) samples for hardness test A control B-(0.05)ml C(0.1ml), D(0.2ml)

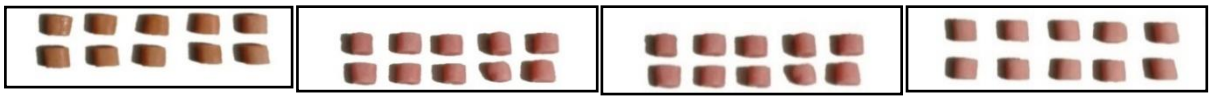
- **Testing procedure:-**

The shore A durometer was used to measure soft liner hardness .The testing value was taken as an average of different reading that were taken directly from the scale reading of durometer by using pointed dibbing tool. Fig (5).

Fig(5)Shore A durometer device

Preprationof Compressive strength test speciemens:

A metallic mold with dimensions of (12.7mm in diameter and 19mm in length) by investing brass cylinder to prepared mould [14].Following the conventional flasking technique used for construction the specimens was invested in 3mm thickness of heavy and flexible silicone impression material to facilitate specimens removal .The specimens with the silicone mould was invested in freshly mixed dental stone poured in the lower half of the flask .The pattern inserted to approximately one-half of their depth in the stone for easier removal .After setting the set stone and specimens were coated with separating medium and allowed to dry ,the upper half to the metal flask was positioned on the top of the lower portion and filled with dental stone ,again with vibration .The dental stone was allowed to set for one hour before the metal flask was opened in order to remove the metal pattern carefully .The portions of the metal flask were coated with separating medium to be ready for packing with soft liner material, Fig.(6) .



A- B- C- D-

Fig .(6) samples for compressive strength testA control B(0.05ml), C(0.1ml), D(0.2ml).

Testing procedure

The specimens were subjected to compressive strength load by using compressive strength machine Fig(7).The maximum load and deflection were measured and used to compare between the responses of the materials on loading . The cross head speed of 0.5 mm/minute using load cell with maximum capacity 250N ,the calculation of compressive strength was according to the following formula :-

Comoressivestrength =F/A=(MPa) F: Maximum load A: Cross section area

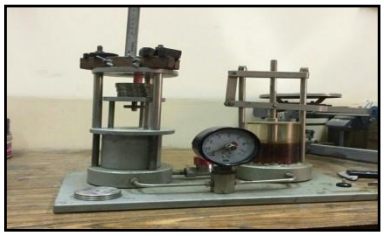
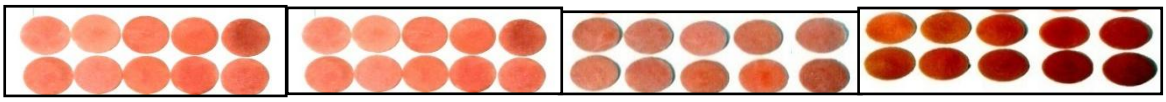


Fig.(7)compressive strength device

Prepration ofColor change test speciemens:-

A metallic round molds with compatible thickness (0.5±0.05mm)and suitable diameter (50±1mm) [15] were made by cutting metal disks into desirable shape and thickness using turning machine .Then flasking procedure by conventional method, Fig.(8).



A- B- C- D-

Fig (8) samples for testing procedure A control B(0.05ml), C(0.1ml), D(0.2ml).

Testing procedure:

Objective method using UV –visible spectrophotometer was used to evaluate color change by measuring the obsorbed light percentage,Fig(9).

Fig.(9) UV –visible spectrophotometer device

Preprationof Solubility and absorption test speciemens:-

A metallic molds with (50±1mm diameter and 0.5±0.05mm thickness)[(15)]Fig .(10)were made by cutting the metal into desirable shape and thickness using turning machine.

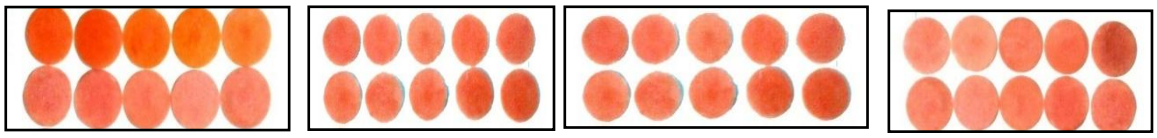


Fig. (10) samples for testing procedure Acontrol B-(0.5ml)C(0.1ml) D(0,2ml)

- **Testing procedure:**

After processing and finishing, all disc –shaped specimens were dried in a desiccators containing dried silica gel.The desiccators stored in an incubator at 37 c± 2c for seven days ,after that the specimens were removed at room temperature for one hour ,and then weighted with digital electronic balance.This cycle was repeated until constant weight was determined.This was considered to be the initial weight (W_1).

The specimens were immersed in distilled water for 7 days at 37^0C $\pm 2^0$C .After this period of time ,each disc was removed from the water with tweezer ,wiped with clean,dry hand towel until free from visible moisture, waved in the air for 15 seconds and weighed one minute after removal from the water .This weighted represents (W_2).

After that the specimens dried by the desiccators and they were weighted every 24 hours until a constant weighted (±0.5 mg)was obtained ,this weighted represents (W_3), Fig.(11). Water sorption and solubility measured as a relative sorption and solubility in (mg/cm^2).Calculations were made according to the following formulae:

Sorption (mg/cm^2)=w_2-w_1 /surface area. Solubility(mg/cm^2)=w_1-w_3/surface area.

Fig. (11) Digital electronic balance

III. Results And Findings

Tensile Strength test:

Table (2) represents summary statistics of studied readings such as [Mean, Standard Deviation, Standard Error, 95% confidence interval for mean values, and two extreme values, minimum, and maximum] .In this search showed that majority mean value of tensile strength test are recorded in controlled, while too low levels are accounted concerning incorporating in to acrylic based soft denture liner with povidone iodine material. In addition to that, results show that with increasing volums of treated povidone iodine decreasing of tensile strength test has recorded, Fig(12).

Table (2): Summary statistics analysis for" tensile strength" test in different groups incorporating Povidone Iodine in to acrylic based soft denture liner materials and controlled

Groups	No.	Mean N/mm	S.D.	S.E.	95% C.I. for Mean		Min.	Max.
					L.B.	U.B.		
Control	**10**	**2.651**	**0.227**	**0.072**	**2.488**	**2.814**	**2.330**	**3.020**
Povidone Iodine 0.05 ml	**10**	**1.868**	**0.082**	**0.026**	**1.809**	**1.927**	**1.720**	**1.950**
Povidone Iodine 0.10 ml	**10**	**1.500**	**0.115**	**0.037**	**1.417**	**1.583**	**1.300**	**1.700**
Povidone Iodine 0.20 ml	**10**	**1.127**	**0.123**	**0.039**	**1.039**	**1.215**	**0.925**	**1.320**

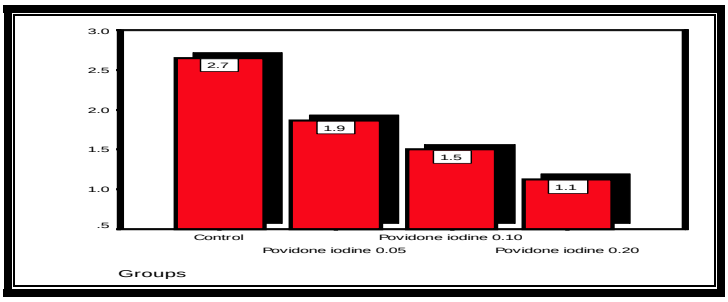


Fig (12): Bar Chart for mean values of(tensile strength test) in different groups incorporating Povidone Iodine in to acrylic based soft denture liner and controlled

One way ANOVA table(3) between different volum ,are presented to difference between groups in every volum was highly significant.Games Howell test between groups represented highly significant differences at P<0.01 among all probable comparisons.

Table (3): Pair wise Comparisons by (GH) test among "different groups" incorporating Povidone Iodine in to acrylic based soft denture liner and control group:-

Group (I)	Group (J)	Statistics		
		Mean Diff. (I-J)	Sig. (*)	critical values
Control	Povidone Iodine 0.05 ml	0.783	0.000	0.229
	Povidone Iodine 0.10 ml	1.151	0.000	0.236
	Povidone Iodine 0.20 ml	1.524	0.000	0.238
Povidone Iodine 0.05 ml	Povidone Iodine 0.10 ml	0.368	0.000	0.128
	Povidone Iodine 0.20 ml	0.741	0.000	0.134
Povidone Iodine 0.10 ml	Povidone Iodine 0.20 ml	0.373	0.000	0.151

Hardness test:

Table (4) show that majority mean value of hardness test are recorded in controlled, while too low levels are accounted concerning incorporating in to acrylic based soft denture liner with povidone iodine material.Fig(13).

Table (4): Summary statistics for hardness test in different groups incorporating Povidone Iodine in the acrylic based soft denture liners and controlled

Groups	No.	Mean	S.D.	S.E.	95% C.I. for Mean		Min.	Max.
					L.B.	U.B.		
Control	10	91.590	2.660	0.841	89.687	93.493	88.7	95.1
Povidone Iodine 0.05 ml	10	81.090	2.111	0.667	79.580	82.600	78.9	85.5
Povidone Iodine 0.10 ml	10	70.390	1.237	0.391	69.505	71.275	68.0	72.1
Povidone Iodine 0.20 ml	10	77.320	2.827	0.894	75.298	79.342	72.0	80.1

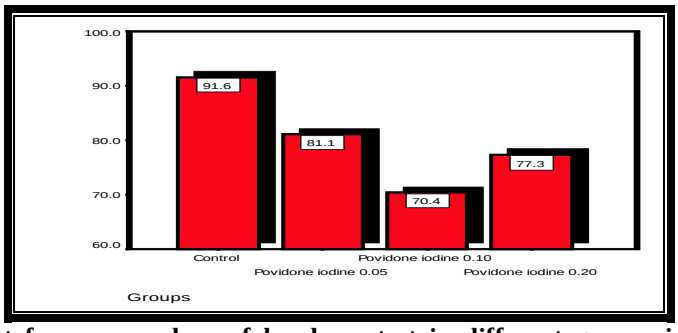


Figure (13): Bar Chart for mean values of hardness test in different groups incorporating Povidone Iodine in to (acrylic based soft denture liners materials) and controlled

One way ANOVA between different groups for every volums are presented in table (5).The difference between groups in every volum was highly significant. Many comparisons through applying GH method represented highly significant differences at P<0.01, as well as significant different at P<0.05 are reported between (0.05ml, and 0.20ml) volum.

Table (5): Pair wise Comparisons by (GH) test among different groups incorporating Povidone Iodine in to acrylic based soft liner materials and control group

Group (I)	Group (J)	Statistics		
		Mean Diff. (I-J)	Sig. (*)	critical values
Control	Povidone Iodine 0.05 ml	10.50	0.000	3.050
	Povidone Iodine 0.10 ml	21.20	0.000	2.731
	Povidone Iodine 0.20 ml	14.27	0.000	3.471
Povidone Iodine 0.05 ml	Povidone Iodine 0.10 ml	10.70	0.000	2.238
	Povidone Iodine 0.20 ml	3.77	0.017	3.178
Povidone Iodine 0.10 ml	Povidone Iodine 0.20 ml	-6.93	0.000	2.886

(*) HS: [Highly Sig]. at P<0.01; S: Sig. at P<0.05; Testing based on (GH) test

Compressive Strength test:

Table (6) observed that vast majority mean values are accounted regarding povidone iodine in (0.05ml, and 0.2ml) groups, while low level are recorded with (0.1 ml), even though too low level are recorded in controlled group Fig.(14)

Table (6): Summary statistics of compressive strength test of Povidone Iodine in to acrylic based soft denture liner and controlled

Groups	No.	Mean	S.D.	S.E.	95% C.I. for Mean		Min.	Max.
					L.B.	U.B.		
Control	10	1.945	0.054	0.017	1.906	1.983	1.882	2.056
Povidone Iodine 0.05 ml	10	3.180	0.138	0.044	3.081	3.279	3.006	3.401
Povidone Iodine 0.10 ml	10	2.653	0.139	0.044	2.554	2.753	2.373	2.848
Povidone Iodine 0.20 ml	10	3.168	0.176	0.056	3.042	3.294	2.884	3.481

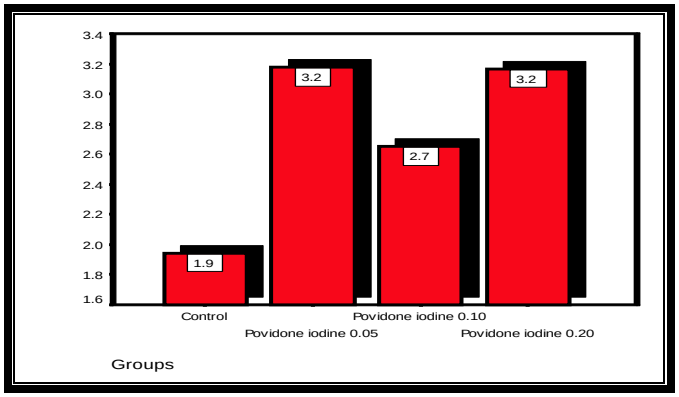


Figure (14): [Bar Chart mean values of compressive strength test] in different groups incorporating Povidone Iodine in to soft denture liners and controlled

Descriptive statistics and one way ANOVA of compressive strength test results are presented in table(7) .The difference between groups was highly significant. Applying LSD method are illustrated the statistical differences among all probable contrast's groups, and as follows:

Table (7): Pair wise Comparisons by (LSD) test among different groups incorporating Povidone Iodine with the acrylic based soft denture liner and control group

Group (I)	Group (J)	Statistics		
		Mean Diff. (I-J)	Sig. (*)	critical values
Control	Povidone Iodine 0.05 ml	-1.235	0.000	0.122
	Povidone Iodine 0.10 ml	-0.709	0.000	0.122
	Povidone Iodine 0.20 ml	-1.223	0.000	0.122
Povidone Iodine 0.05 ml	Povidone Iodine 0.10 ml	0.527	0.000	0.122
	Povidone Iodine 0.20 ml	0.012	0.842	0.122
Povidone Iodine 0.10 ml	Povidone Iodine 0.20 ml	-0.515	0.000	0.122

(*) HS: Highly Sig. at P<0.01; NS: No Sig. at P>0.05; Testing based on (GH) test

Water Sorption and Solubility test of povidone iodine:

Table (8) shows that high level mean values are accounted in povidone iodine (0.1ml) while low level are recorded in 0.2ml, even though too low level are recorded in controlled group Fig.(15).

Table (8): Summary statistics for Water Sorption and Solubility test in different groups incorporating Povidone Iodine into the acrylic based soft denture liner and controlled

Groups	No.	Mean	S.D.	S.E.	95% C.I. for Mean		Min.	Max.
					L.B.	U.B.		
Control	10	3.095	0.356	0.113	2.840	3.349	2.411	3.591
Povidone Iodine 0.05 ml	10	3.470	0.114	0.036	3.389	3.552	3.347	3.657
Povidone Iodine 0.10 ml	10	3.821	0.091	0.029	3.756	3.887	3.673	3.981
Povidone Iodine 0.20 ml	10	2.930	0.330	0.104	2.694	3.167	2.211	3.382

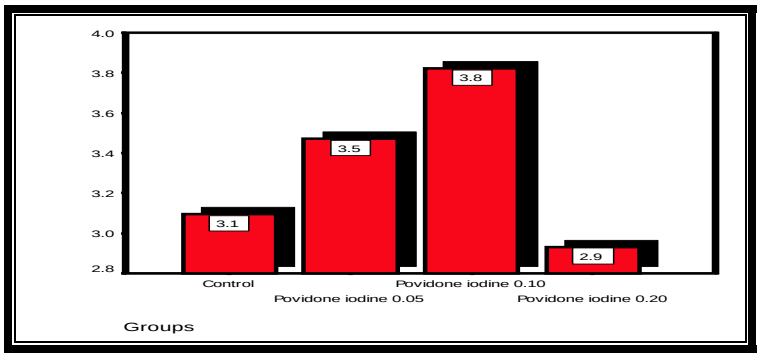


Figure (15): Bar Chart for mean values of Water Sorption and Solubility test in different groups incorporating Povidone Iodine in to acrylic based soft denture liners materials and controlled

In table (9) Results showed a significant differences at P<0.05, except comparison between controlled and incorporating povidone iodine of (0.2 ml), which has reported no significant different at P>0.05 .

Table (9): Pair wise Comparisons by (GH) test among to different groups incorporating povidone iodine in to the acrylic based soft liner and control group concerning water sorption and solubility test

Group (I)	Group (J)	Statistics		
		Mean Diff. (I-J)	Sig. (*)	critical values
Control	Povidone Iodine 0.05 ml	-0.376	0.038	0.357
	Povidone Iodine 0.10 ml	-0.727	0.000	0.354
	Povidone Iodine 0.20 ml	0.164	0.712	0.434
Povidone Iodine 0.05 ml	Povidone Iodine 0.10 ml	-0.351	0.000	0.131
	Povidone Iodine 0.20 ml	0.540	0.002	0.332
Povidone Iodine 0.10 ml	Povidone Iodine 0.20 ml	0.891	0.000	0.329

(*) HS: Highly Sig. at P<0.01; NS: Sig. at P<0.05; NS: No Sig. at P>0.05; Testing based on (GH) test

Color change test of povidone iodine:

Table (10)showed that high mean value are accounted with (0.2ml) rather than simply stating of different concerning with others treated groups, as well as, controlled group are recorded low level of color change Fig.(16).

Table (10): Summary statistics for color change test in different groups incorporating Povidone Iodine with the acrylic soft denture liner and controlled

Groups	No.	Mean	S.D.	S.E.	95% C.I. for Mean		Min.	Max.
					L.B.	U.B.		
Control	10	3.899	0.030	0.009	3.878	3.921	3.845	3.951
Povidone Iodine 0.05 ml	10	3.923	0.011	0.003	3.916	3.931	3.904	3.942
Povidone Iodine 0.10 ml	10	3.936	0.007	0.002	3.931	3.941	3.925	3.947
Povidone Iodine 0.20 ml	10	3.989	0.010	0.003	3.982	3.996	3.968	3.999

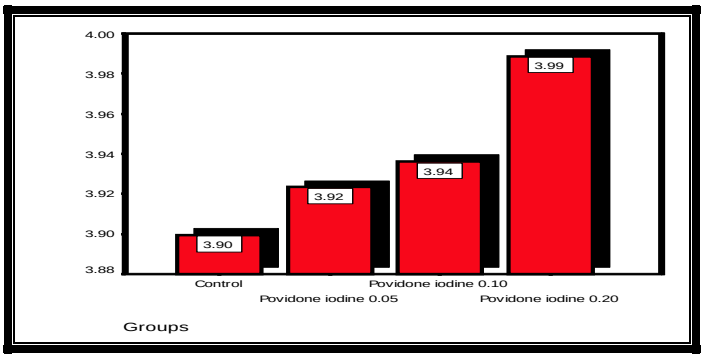


Figure (16): Bar Chart for mean values of color change test in different groups incorporating Povidone Iodine in to acrylic based soft liner and controlled

One way ANOVA between different groups for every volums are presented in table(11).The difference between groups in every volum was highly significant.

Multiple comparisons through applying GH method are illustrated the statistical differences among all probable contrast's groups, and as follows:

Findings show a minimal significant differences between all probable the pair wised of comparisons, as well as most comparisons are accounted in at least significant differences at $P<0.05$, except comparison between controlled and incorporating povidone iodine of (0.05ml), which has reported no significant different at $P>0.05$.

Table (11): Pair wise Comparisons by (GH) test among different groups incorporating Povidone Iodine in to acrylic based soft denture liner material and control group concerning color change test

Group (I)	Group (J)	Statistics		
		Mean Diff. (I-J)	Sig. (*)	critical values
Control	Povidone Iodine 0.05 ml	-0.024	0.133	0.030
	Povidone Iodine 0.10 ml	-0.037	0.015	0.030
	Povidone Iodine 0.20 ml	-0.089	0.000	0.030
Povidone Iodine 0.05 ml	Povidone Iodine 0.10 ml	-0.013	0.031	0.012
	Povidone Iodine 0.20 ml	-0.065	0.000	0.013
Povidone Iodine 0.10 ml	Povidone Iodine 0.20 ml	-0.053	0.000	0.011

IV. Discussions

Relining of denture is one of the most important methods for treatment of denture stomatitis and if denture and bacterials and fungal and injury after the maxillo facial surgery (immediate or definitive obturator),so antifungal drugs can be used to control the infections inside the patient mouth[16].

Tensile strength:-

Tensile strength provides information on the ultimate strength of the material in tension where as elongation provide data on the ability of a material to stretch before failure occure [17]. Material under tension usually elongate ,therefore a degree of elongation is important to optimize the benefits of soft liner .Rigid material usually have minimal elongation this is because of the higher intermolecular forces while plasticizer usually provide spaces between molecules ,this would allow for slipping of the chains to be packed that will affect on tension and elongation.Among the specimens fabricated , the povidone –iodine increased intermolecular spaces and lead to lower chemical bonding during polymerization and gave resilient material (table 2,3).Resilient material usually have increased elongation this is because of the less intermolecular force,however the presence povidone –iodine may increased intermolecular spaces,also povidone is a less cross –linked with acrylic soft liner which makes it less rigid and increased resiliency of experimental material compared with control material[9].

Hardness:-

One of the most complicated factors in the complete denture liners is hardness, since most of soft liner materials are not stable in a moist environment such as the mouth . In this study the shore A hardness was measured using Shore A durameter. The result of this study showed that high significant decrease in povidone iodine group compare with control group (table 4,5). This findings can be explained by the fact that added povidone –iodine into soft liner material may effect to the plasticizer ability for softening gel formation and its ability for polymeric chains penetration,it may act fillers that decrease soft liner hardness and resistance when dispersed inside it[10]. The findings is in agreement with study of others who showed that incorporation chlorhexidine diacetate into an acrylic gel soft liner and heat cured acrylic at concentrations of 5% and 10% result in significant decrease in the hardness for modified groups after 87 days incubation in water ,which causes soft liner to gain weight[18] .Other explanation is the high levels of residual monomer adversely affect acrylic resine properties like hardness this is in agreement with .

The decrease in the mean value of hardness for povidone –iodine groups could be the result of water absorption that may act as additional plasticizers that improve the resiliency of the material and cause decrease in hardness, and give more resiliency that benefit with the patient in suffer from sever undercut in the gap after extraction or postsurgery to the prosthesis of maxillo facial[19] .

Compressive strength:-

In the methodology of this research ,determination of the compressive strength of the experimental material in compression with the control material was established ,the material were prepared in acylindrical discs.During testing compressive load continued to compress cylindrical discs ,this design of testing is simulate in a degree ,compressive load during function of occlusion or mastication .During testing ,deflection of the materials under the load was used as a measured for the behavior of that materials[12]. Testing discs of the soft liner alone under compressive could help in describing more the behavior of the material specifically .By this test, the ultimate compressive strength as well as deflection value was determined. Povidone –iodine that is recorded by experimental material indicated more resilient properties .In this study ,the ultimate compressive strength as will showed that the compressive strength of the experimental material is significantly high than that of the control group material (table 6).This is attributed to the presence of povidone –iodine polymer which made the experimental material more resilient.So the povidone –iodine increase water sorption and gave more resilient to the experimental material in comparison with control material [20] . This study is agreement with the other work that showed reduce the molecular binding force between the reactant molecules and allows greater deformation upon stretching or flexion through exhibiting multiple micro fracture that weaken the silver nitrate loaded resin samples[21,22].

Water sorption and solubility:-

Ideal soft liner have low sorption and low solubility values[23].The clinical application of water sorption and solubility on the characteristics of this soft lining material related mainly to the dimentional stability and adhesion to the denture base

The findings of this study by incorporation povidone iodine into soft liner material result high significant increased in (0.05ml-0.1ml)and high significant decreased in 0.2ml concentration compare with control group(table 7).The result showed that there is a reduction in solubility in 0.2ml concentration value of each soft liner material and povidone –iodine .The results also showed that soft liner material at some stage has loss of plasticizer exceesed the water gain leading to an over all less of weight [24].

Other explanations could be attributed to the lower L/P ratio recommended for the control material when compared with that of the experimental material higher P/L ratio would produce dence specimens ,eventually load to less micro pockets of water ,this was inagreement with [25].Variations in the chemical

compositions could create some of structural spaces that might load higher water uptake ,moreover ,higher residual monomer expected from lower P/L ratio might be another factor ,this might give a chance for more residual monomer leached out that compensated by water during immersion process[24] . In this study the soft liner material showed highly significant in solubility value between experimental groupsand control group.(table 8).The results of incorporation povidone –iodine with soft liner material showed decrease in the mean value in the solubility in (0.2 ml) volum .Finally ,the diference in the solubility of the tested materials for both groups was significant ,but experimental group less solubility ,this is an indication that the povidone –iodine incorporated in the mixture of soft liner material lead to increase resilient and which increase solubility of material .

Color change:-

The measurements of color change in this study were made objectively by using a spectrophotometer which showed that a statistically highly significant increase in light absorption percentage with the increase of povidone iodine which was added to the soft lining material (table 10,11). This may be that the povidone – iodine will act as a fillers which tend to fill any space within the soft liner material ,there by increasing the amount of seattered and absorbed light by the specimens and decrease the amount of transmitted light .This findings is agreement with the work of[26].Which explained the presence silver nanoparticles in the polymer matrix ,as the silver nanoparticles have extraordinary efficient ability to absorb and scatter light due to their optical properties ,and also agreement with others that explained a single silver nanoparticles can inter act with light more efficiently than any known organic or inorganic colored particle with same dimensions ,so silver nanoparticles absorb more light energy than polymer matrix and appear more opaque([27] .

V. Conclusions

[1]. Tensile strength: The addition of three percentage (0.05ml,0.1ml and 0.2 ml) of povidone iodine into soft lining material results decrease in the tensile strength.
[2]. Hardness was decrease by addition povidone iodine intosoft lining material in all percentage.
[3]. Compressive strength: addition of povidone iodine increases the compressive strength for all percentages.
[4]. Water sorption and solubility :The addition of povidone iodine at 0.05 and 0.1 ml percentages results increase absorption of soft lining material ,while the addition of 0.2 ml percentage increases solubility of soft lining material .
[5]. Color change was increase by addition povidone iodine for all percentages.

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Dr. ISRAA MOHAMMED HUMMUDI. "Evaluation effects of povidone iodine on some mechanical properties of soft liner materials." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) 16.10 (2017): 35-46