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Impact of Sorts Disinfection and Cleansing Material on Hardness of Different Types of Denture Base Material

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Abstract

Dentist, dental technician and assistants are faced a several kinds of microorganisms during w like bacteria, fungi and viruses .So, we can prevent cross contamination by using either chemi or mechanical disinfection. The aim of the research was to measure the effect of different ty of chemical disinfection on the hardness of two types of denture base resin, heat activated acr and nylon (flexible). A total number of 80 denture resin specimens (40 specimens from h activated acrylic and 40 specimens from flexible resin) were prepared. Each type of specin was subdivided into 4 groups. Three groups were divided according to the type of dent disinfectants (1%sodium hypochlorite, 1% povidine/iodine, Kin solution) and the fourth wh considered as control group was immersed in distilled water. All specimens were immersed testing solution for 90 minutes at 37^0C. The hardness of the specimens before and a immersion was tested using Shore D machine. Our study showed that the mean value hardness test for poly methyl methacrylate higher than polyamide and there need aid n significant Contrast in the resistance of the surface to scratches and indentation between dive sorts of thermoplastic resin after using chemical disinfectant and denture cleansers w comparison with control group for each type of denture base resin. The resistance to indentat of different types of denture base would not affected by short time immersion in chemi disinfectant.

Key words: Ceramic laser, Bonding.

Introduction:

Dentist and dental staff are faced to a several kinds of pathogenic microbes. The utilization of successful contamination control methods in the dental office and dental lab could forestall cross-contamination on dentists, dental office staff, dental specialists and the patients. [1] At dental clinic and during repair or adjustment dental prosthesis, they might be contaminated with bacteria, viruses, Also growths. [2] In dental clinic the operators could use for aseptic method different technique either mechanical or chemical cleaning and could be mixed of the two methods. [3] Technique should not affecting the denture properties. [4] Poly-methyl methacrylate (PMMA) resin has been the material of choice for the fabrication of removable dentures due to its numerous advantages including optimal aesthetics, biocompatibility, favorable physical and chemical properties as well as ease of fabrication and repair.

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However, PMMA resin suffers from an inherent disadvantage which is the allergic hypersensitivity reaction of some patients and technicians to the material. This is due to the continuous leaching out of the methyl methacrylate monomer (MMA) which also results in compromising the mechanical properties of the resin. Recently, thermoplastic resin polymers (nylon or polyamide) became a popular alternative to PMMA resin [5]. Nylon, that is suitable solidified material, might make greatly advantageous therapy for the individuals patients for whom acrylic prostheses are not suitableness. This incorporate patients who show rehashed crack for dentures and the individuals that demonstrate tissue responses of a turned out hypersensitive way.[6]. Flexible resin is a crystalline polymer whereas amorphous polymer is for poly methyl meth acrylate. Along these lines there will be pretty much requested parallel pressing of the long chain atom which will be because of solid engaging constrains between those chains. This crystallinity represent the nylon aspects of

absence of solvency On solvents, secondary heat resistance, also elevated amount of intensity with flexibility.[7] The point about our research should assess those impact from claiming distinctive sorts of chemical disinfection on the hardness of 2 types of denture base resin ,heat activated acrylic & nylon (polyamide).

Materials and methods:

Eighty specimens were constructed from 2 types of material used for construction the denture base, forty specimens constructed from heat cure acrylic (Supracryl plus, Dental resin, Czech Republic)**,** and forty specimens constructed from flexible resin (IRIS, Color K_2, Size L, QTY10, China)**,** (and each material were subdivided into four categories according to chemical disinfection material ,consist from 10 specimens. (Table 1).

Preparation metal design

Rectangular shape of metal was constructed with size of (10mmx65mmx2.5mm) width, length and thickness consecutively with regarding to ADA specification no.12, 1999[8], used to prepare eighty specimens. Mixed stone put inside flask and 3 metal patterns were placed inside, after completely setting of stone we coat the metal pattern and stone with separating medium and put the second part of the flask and coated with 2nd layer of stone. After setting we open the flask and remove the metal pattern.

Heat cure acrylic specimens preparation

Conventional molding technique was used to prepare PMMA specimens. The first group consist from [40] specimens were prepared from heat cure acrylic, the mixing is work regarding to produces guidelines for a liquid/powder proportion (1:3) by volume and wait until it reach dough stage.[8]. The paste was removed and loaded into stone mold formerly coated with separating medium then together closed the 2halves of the flask and put beneath the hydraulic press, with slow pressure to permit the material to flow inside the mold space .At last the two halves of the flask were shut together metal with metal and held for 5min under clamp after that putting inside water bath. . To curing those acrylic specimens in short cycle fasting method includes 74C ^{0}for you quit offering on that one hour ,then elevated the temperature to 100C^0 for one hour only [9]. At that point those flask might have been cleared out to cool gradually to 30minutes preceding deflasking and the specimens were evacuated starting with those mold. [8,9].

Flexible resin specimens preparation

For fabricating specimens of polyamide (flexible) denture base material, injection molding system was used. Rectangular Metal pattern were invested in injection molding flask and sprued with modeling wax in a manner that each pattern was connected with the sprue so that polyamide denture base material could flow into each mold space **fig(1)**. After spruing, the flask was counter poured. The flask was kept for dewaxing after setting of dental stone, and the metal were removed to obtain the mold space.

Flask was closed and tightened with the screws and was placed on the bench press fig (3**)**.The cartridge of polyamide denture base resin was kept in the heating unit and heated according to manufacturer's instruction (300°C for 20 min) and then was placed on the flask. The pressure was applied to the cartridge from bench press so that the material flew into the mold space through sprues. Once processed, the flask was allowed to bench cool for 2 h. Specimens were ground fig (2).

Each type of acrylic resin were subdivided into four groups according to disinfection solution Table (1)

a-Group a (Control group):immersed into distilled water.

b-Group b: immersion into 1%sodium hypochlorite (Baghdad Com.Iraq).

c-Group c: immersion into 1% povidone/ iodine(MEGAVIE Pharma ,Lebanon).

d-Group d: immersion into Kin solution(Laboratories KIN S.A ,Spain),fig(3) . The specimens were. immersed disinfection solution except control group ,for 90minutes at 37C^0 then test the hardness.

Surface hardness was measured using shore D test machine fig (4) (DIN ISO 7619 DIN EN ISO 868 DIN 53505 ASTM D 2240) (electrometer/Germany) Hardness steel rod was 1.1mm-1.4mm diameter with a30 ^{0} conical point with0.1mm radius tip. Shore D, like many

other hardness tests, measures the depth of an indentation in the material created by a given force (44.48N) on a standardized presser foot and the final value would be taken after 15 second from indentation., three indentation were made on each specimens, and the mean was taken. The descriptive analysis of the results including mean, standard deviation and standard error were calculated and by using Analysis of Variance (ANOVA) and student (t-test) the statistical analysis was performed.

Results:

The descriptive analysis of the results including mean ,standard deviation and standard error were calculated and by using Analysis of Variance (ANOVA)and student (t-test)the statistical analysis was performed.

The results of the effect of different types of the disinfectant and denture cleanser on the surface hardness of heat cure acrylic and flexible resin, before and after immersion in comparison to the surface hardness for samples that were immersed in distilled water were illustrated in (table 2, 3, 4, 5, and 6).

The surface hardness mean value of heat activated acrylic was higher than polyamide denture base before and after using disinfectant solution fig (5).

Discussion:

The research supported the hypothesis said that different disinfection material that used for denture base resin during short time of immersion would not cause any effect on the surface indentation of denture base resin [(10)]. Because of the porosity of the surface of the acrylic resin that will provide good area of microorganism proliferation and area for contamination that menaced the wellbeing of the human [(11)]. In this research we utilize 2sorts of denture base conventional heat cure acrylic and polyamide flexible denture base (nylon) and Shore D hardness test was used.

PMMA conventional resins were reported to have higher hardness values at baseline compared to polyamides which was attributed to higher fibrous content of polyamides resins and lower modulus of elasticity and this result was accepted with [(13)] The different types of disinfected material include 1%sodium hypochlorite, 1%povidone/iodine, Kin solution when compared with distilled water, there are no significant difference found between groups during testing. The average value of PMMA showed higher hardness qualities the point when contrasted with flexible denture base. This outcome attributable to the presence of monomer and high level of monomer –polymer ratio. In addition, the present of cross-linking factors play important role. Polyamides (nylon) showed lower hardness qualities and these results might be attribute to absent of monomer and also the lower amounts of cross-linking factors, the present of these factors may influence surface hardness. The results exhibit that heat cure poly methyl meth acrylate is less flexible than polyamides resin. [(12)] Briefly the difference in chemical composition between two types and method of polymerization and physical properties all factors that effect on the hardness value between these 2 kinds of resins. The result of our research approve that the hardness value before and after immersion of the 2 kinds of thermoplastic resins and there was minimal changes but no significant difference (p---) effect on hardness value between control type that immerse the specimens in distilled water and another types after immersion in disinfectant material for the same application time 90minutes at $37C^0$. The research agreed with the result obtained by Asad T.et al. [(14)] who immerse the specimen of acrylic resin for 24hour in disinfectant material and the result was no significant effect on hardness value. Also the research accepted by Cristiane F.et al. [(15)] that they found that the immersion of specimen for 60min will not change in the hardness value. The research not accepted by Faiza Amin. Et al. [(16)]that use the same concentration of sodium hypochlorite 1% because they use for long time of immersion 60days, that is mean the time of immersion would play important role and effect on the surface of the prosthesis. Also the research was not supported

by Durkan R et al. [(17)] that after repeating immersion of denture base ,the hardness value decreased for both PMMA and Polyamides resin regardless of the kind of solution used.

Conclusions:

There was difference in hardness value between conventional heat cure acrylic and flexible resin. We found that mean value of hardness for heat cure acrylic before and after immersion was higher than flexible resin. Also we found that the resistance to indentation of different types of denture base would not affected by short time(90 minutes) immersion in cleaning and disinfection material**.**

Fig. (1): wax sprues attached to metal patterns.

Fig. (2): samples after polymerization.

Fig(3):denture cleaning tablets/KIN

Fig. (4): Shore D hardness test machine

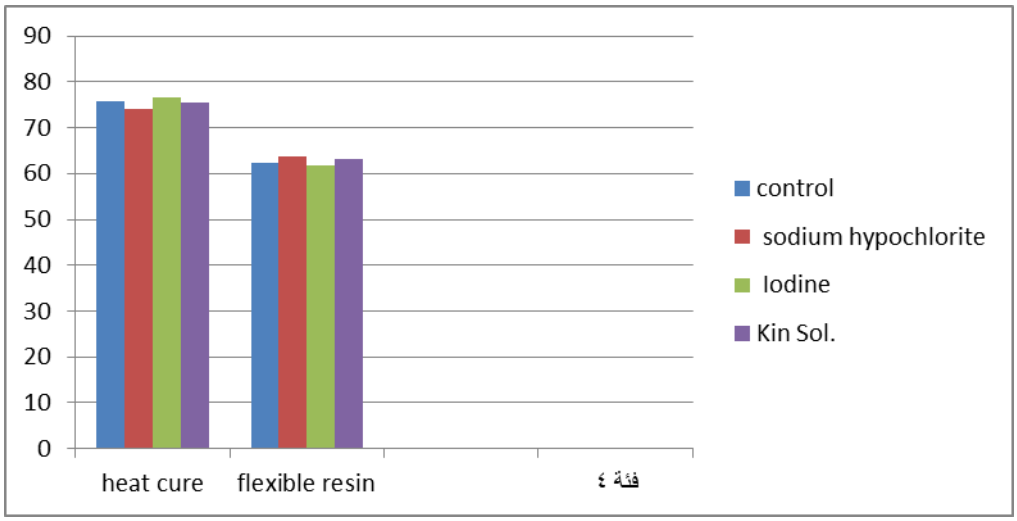

Fig. (5): mean value(average) of hardness test for two types of denture base(heat cure and nylon)before and after immersion

Table (1): experimental groups and immersion time

Categories	Aseptic Solution	90minutes
Group a	Distiled water	90minutes
Group b	1%sodium Hypochlorite	90minutes
Group c	1%povidone/ Iodine	90minutes
Group d	Kin solution	90minutes

Table (2): average (mean value) of hardness test, No. of samples and standard deviation for specimens for two types of denture base before and after immersion.

Categories of	Sorts on	NO	Average	St.
Disinfectant Group a	Denture base	Of samples	(mean)	Dev.
	Heat cure	10	75.8	3.359
Distilled water	Flexible	10	62.47	3.459
	Heat cure	10	74.1	2.233
Group b	Flexible	10	63.76	0.870
	Heat cure	10	76.7	2.359
Sodium hypochlorite	Flexible	10	61.78	2.139
	Heat cure	10	75.6	1.173

Table (3): ANOVA- test between different groups before and after immersion with disinfection material for heat cure acrylic.

Heat cure Acrylic	Su. Of Sq.	D. F.	Average Square	F –test	P –value	Sign.
Among groups	34.9	3	11.633	2.0038	0.1308	N.S*
Within groups	209	36	5.805			
Total	243.9	39				

Table (4): t- test (student, s test) for surface hardness measurements between control group and the other types after treatment with disinfectant material for heat cure acrylic.

Categories of heat activated resin	t-test	Sign.
Group a & b	0.099	N. S.
Group a& c	0.248	N. S.
Group a& d	0.430	N. S.*

P>0.05 N.S. *

Table (5): ANOVA- test between different groups before and after immersion with disinfection material for flexible resin.

Flexible	Su. Of Sq.	D.F.	Average squares	F-test	P –value	Sign.
among groups	22.002	3	7.334	1.512	0.227	N.S.*
Within groups	174.525	36	4.847			
Total	196.527	39				

Table (6): t- test (student, s test) for surface hardness measurements between control group and the other types after treatment with disinfectant material for flexible resin.

Categories of (Flexible resin)	t-test	Sign.
Group a & b	0.13393	N. S.
Group a& c	0.29914	N. S.
Group a& d	0.28388	N. S.

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