Evaluation The Effect Of Addition Some Disinfectants Solutions On Compressive Strength Of Dental Stone

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Key words
Biodentine, push out , MTAD, QMi*x*

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Abstract

It's necessary to disinfectant the stone cast that poured in the impression to reduce the risk of bacteria & microorganism on the dentist technicians and patient .
In this study uses the sodium hypochlorite & chlorohyxidine as disinfectants solutions concentration were (5%) .
The purpose of this study is to evaluate the effect of addition these disinfectants solutions on compressive strength of dental stone type III .
A total number of the study stone specimens were 30 and they were divided in three groups, (10) specimens for each group .
The testing groups were prepared and divided into three groups according to the concentrations of sodium hypochlorite (5%) and chlorohyxidine (5%) :-
Group A : stone specimens were mixed with distilled water .
Group B : stone specimens were mixed with (5%) sodium hypochlorite solution .
Group C : stone specimens were mixed with (5%) chlorohyxidine .
The size of the specimen is (20mm) diameter and (40mm) length .
The shape of specimen is cylinder .
The test specimens are measured by (WDW. 200E) .
A brass mold in (20mm) diameter and (40mm) length was used to prepare the specimens .
The specimens were placed on the testing machine so the top and the bottom of the specimen were in contact with the steel flat rigid plates .
The specimens were crushed at a loading rate of (300/50 cm2) and (5mm/min) cross head speed .
The maximum load carried by each specimen was taken from a digital screen of the machine and calculation of compressive was obtained .
The results for the specimen showed that the addition of different disinfectants caused reduction in strength, which found high significant effect on the compressive strength when compared with control group .

Introduction

Dentists, dental assistants and laboratory technicians are always at risk of cross-contamination, especially those who do not wear gloves because of their sensitivity to latex rubber or due to the reduction in their working skills as a result of glove-wearing (5) .
On the other hand, several dental materials, instruments and pieces of

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equipments can't be easily sterilized . Thus a potential for bacterial cross-contamination between the dental operator and the prosthetic laboratory has been established, constituting a potential health hazard in prosthetic practice . At the same time, the dentist is faced with the possibility of contamination of the prostheses from the dental laboratory as well as a potential pathogenic hazard to both professional staff and patients (6) .

Dental impressions become contaminated with microorganisms from the patient's saliva and blood, which can cross-infect stone casts poured against them (7) .

A number of these microorganisms cause infectious diseases that may be incurable, such as those caused by the hepatitis C and HIV viruses (1) , practically sterilization of either the impression or gypsum cast is considered unacceptable because of its adverse effects on the properties of materials used in construction of the impression/cast system .

American Dental Association (ADA) and the Centers for Disease Control and prevention suggested methods for the disinfection of dental casts, including immersion in or spraying with a disinfectant (2) . The potentially damaging effects of the immersion technique, the difficulty in covering the entire surface of the cast with the spray disinfecting solution, and the inability to assume that every impression presented to the laboratory has been disinfected has led to the need for incorporating a disinfectant directly into the calcium sulfate hemihydrates .

In this study the sodium hypochlorite & chlorohyxidine disinfectant solutions were used concentrations to disinfect dental stone and to determine the effect of concentrations on compressive strength of dental stone .

Materials & methods :-

A total number of the study stone specimens were 30 and they were divided in three groups, 10 specimens for each group .

The testing groups were prepared and divided into three groups according to the type of disinfectant into sodium hypochlorite (5%) and chlorohyxidine (5%) ,

Group A : stone specimens were mixed with distilled water .

Group B : stone specimens were mixed with (5%) sodium hypochlorite solution .

Group C : stone specimens were mixed with (5%) chlorohyxidine solution .

Preparation of the sodium hypochlorite and chlorohyxidine

was done according to the manufacturer's instructions regarding the dilution, manipulation and storage and the mixing procedure employed in the preparation of all the test specimens followed the ADA specification No.25 for gypsum products (1975) . Prior to weighting the powder, the dry material was thoroughly remixed by completely stirring or by rolling the container end over end to ensure uniform distribution of all the ingredients .

All the test specimens were mixed according to the manufacturer's recommended W/P ratio .

Each (100gm) of dental stone powder was mixed with (30ml) of tested solutions .

Over a period of ten seconds, the standard mix was made by adding the dry powder to the recommended amount of the testing solutions in a clean rubber bowel .

The mixture was allowed to soak for an additional 20 seconds, and then mixed for 30 seconds to a smooth consistency by using a mechanical vacuum mixer .

Compressive strength values were determined according to the American dental association, 1972 (ADA) specification No.25 for gypsum.

A brass mold (20mm) in diameter and (40mm) length was used to prepare the specimens .

The mold was coated with a very thin layer of Vaseline before pouring the mixture to facilitate the removal of the specimens from the mold after setting .

The prepared mix was poured or spatulated down the side of the inclined mold .The mold was vibrated gently for 30 seconds .

The over filled mold was covered with a cement slab which was rocked into place and pressed firmly into contact with the

top surface of the mold to ensure parallel ends .
The constructed specimens were released the mold at one and half hour from the start of the mix .
These specimens were stored in air at room temperature for seven days before any testing to the sample .
The test for compressive strength was conducted on a compressive strength testing machine .
The specimens were placed on the testing machine so that the top and the bottom of the specimens were in contact with the steel flat rigid plates .
The specimens were crushed at a loading rate of 300/50 Kg/cm2, and 5 mm/min cross head speed .
The maximum load carried by each specimen was taken from a digital screen of the machine and calculation of the compressive strength value was obtained .

Results :

The results of the effect of the addition of different concentrations of sodium hypochlorite & chlorohyxidine disinfectant solution on the physical and mechanical properties of dental stone are as follows :
Mean values, standard deviation, standard error, minimum and maximum values are presentation table (1)
Show that the highest mean values of compressive strength were obtained in control group (30,458) .
While the lowest mean values of compressive strength showed in hypochlorite (19,604).
In table (2) showed that T- test statistically there was highly significant difference at ($p<0.001$) between (control group and chlorohyxidine) and (control group and hypochlorite), While statistically non-significant different between (chlorohyxidine and hypochlorite) that be ($p>0.05$) .

Discussion :

The results showed that the addition of different disinfectants solution which highly significant effect on the compressive strength when compared with control group .
The reduction in compressive strength of dental stone mixed with sodium hypochlorite & chlorohixdine is in agreement with the results of Saso et al (9) and Berko RY (3), they concluded effect of Medicine disinfectant solution on some physical and mechanical properties of dental stone .
The reduction in compressive strength could be attributed to the reduction in the inter crystalline cohesion (8) .
It may also be due to the alteration in the crystal morphology which could affect the ability of the crystals to intermesh and grow leading to improper intermeshing and reduction in inter crystal cohesion (4)
This study are agreement with study of Hussein, S & Salah, L (2011) .

Conclusion :

At (5%) concentration of different disinfectants, the dry compressive strength of the disinfected dental stone was high significantly affected when compared with control group .

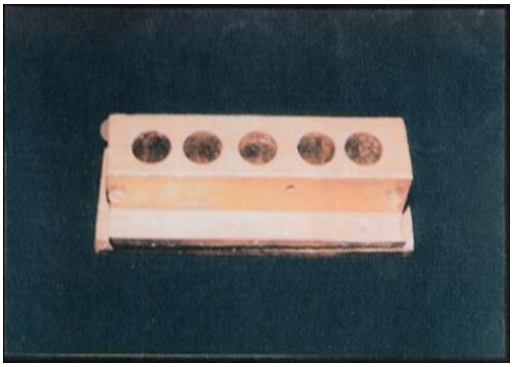

Fig (1)
Mold of Compressive strength

Fig (2)
Cement slab

Fig (3)
Dental stone type III

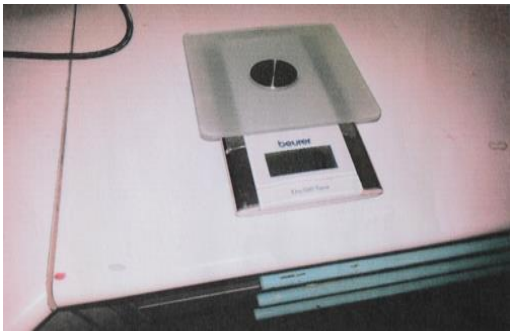

Fig (4)
Electronic balance

Fig (5)
Vibrator

Fig (6)
Compressive strength testing machine

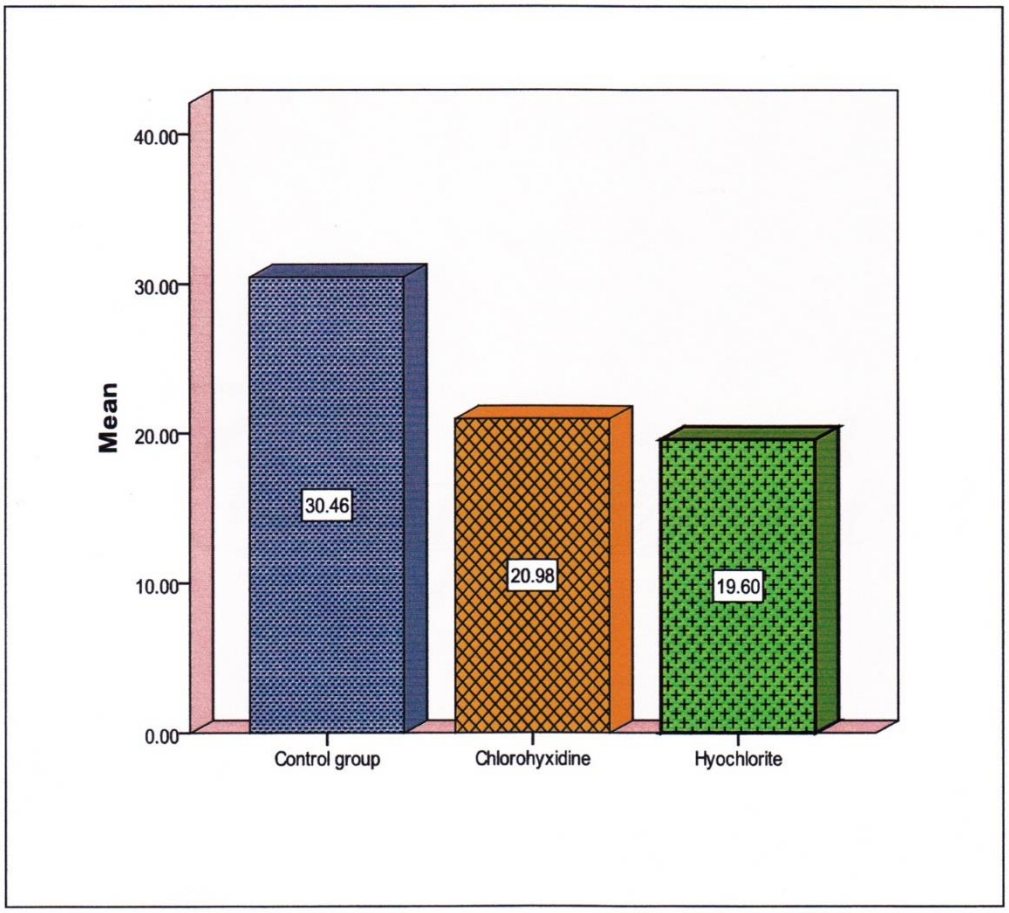

Fig (4-1): Bar chart for compressive strength of dental stone type III with different solutions

Table (1) : Descriptive Statistics of compressive strength

Groups	n	Minimum	Maximum	Mean	Std.Error	Sid.Deviation
Control	10	26.35	33.92	30.4580	.89696	2.83643
Chlorohyxidine	10	15.83	24.82	20.9780	1.05370	3.33208
Hypochlorite	10	19.11	20.29	19.6040	.17192	.54365

Table (2) t-test of compressive strength regarding use two types disinfectant solutions

Groups	P-Value	C.S
Control group-chlorohyxidine	P<0.001	(HS)
Control group-Hypochlorite	P<0.001	(HS)
Chlorohyxidine-Hypochlorite	P<0.05	(NS)

H.S = highly significant difference (P<0.001)
N.S = Non significant difference (P>0.05)

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