Effect of repeated disinfection with madacide disinfectant solution on detail reproduction of dental stone

Ramzi Younan Berko B.D.S, M.Sc

Abstract:

Dental care providers are exposed to a wide variety of infections agents. This study investigated the effect of repeated applications (spaying or immersion) of disinfection on dental stone surface (reproduction ability) with medacide disinfection solution. Results demonstrated a significant reduction in the reproduction ability with both methods of disinfection. However the spraying method had less effect than the immersion method of disinfection.

Key words:

Medacidc, disinfection solutioin, dental stone surface.

Introduction:

Dental personnel are aware of the risk of transmission of infection from contaminated impressions which present a potential reservoir of microbial particles [1,2], therefore all impression should be handled in the same way as impressions taken from a high risk patient [3,4].

The problems associated with disinfecting the surface of an impression material whose major ingredient is water is of justifiable concern [5]. Also it was stated that the disinfection of dental impression is a weak point in the dental hygiene chain since not all impression materials could be disinfected without adversely affecting the properties of the materials [6].

Leung and Schonfield [7] and Gelson et al [8], had demonstrated that microorganism can be transferred and recovered from stone cast which have been separated from contaminated impressions. Cross contamination of dental cast requires only one placement of the acrylic resin record base on the dental cast which is the item that transferred numerous times between the dental laboratory and the dental office [9,10].

Chemical disinfectant solution was suggested to be used to disinfect the stone model, although this agent must have no adverse effect on the properties of the stone cast, which could be disinfected by various methods [11].

The effect of spraying method of disinfection on the properties of the stone cast has been conducted by Stern et al [12]. While the immersion method of

* Assistant lecturer n the Department of Prosthetic Dentistry, College of Dentistry, Al-Anbar University.

disinfection was conducted by Sarma and Neiman [13] and Bass et al [14] and they reported that some disinfectant could adversely affect certain properties of the stone cast, also improvement of other properties may be noticed with specific disinfectant.

Modern disinfection uses chemicals to destroy microorganisms. Synthesis of new and more effective chemicals and their newly established applications in disinfection has led to "Cold Sterlization" [13]. Recently a newly and powerful disinfectant solution has been generated under the name of "Madacide", the product was approved by US(EPA and FDA).

Spraying of set stone samples with madacide disinfectant solution for one time was found to had no effect on the detail reproduction, while immersion of the samples in the same solution for one time produced a minute non significant difference on the detail reproduction [15].

The purpose of this study was to evaluate the effect of repeated immersion or spraying the stone cast with madacide disinfectant solution on the reproduction ability of the dental cast.

Materials and Methods:

A berspics test block was made nearly similar to the ADA specification for detail reproduction[16], which has seven 60° angle grooves with the width of 0.1mm and a depth of 0.02mm, with a cross line passing through these grooves along the test block. Rubber rings with the dimensions of 20mm height and 30mm diameter were used to pour the stone mixture over the test block.

Types III dental stone (new Hi-stone, Japanese) was mixed with distal water at Powder/liquid ratio of 0.33. One minute hand mixing was used in order to have a smooth consistency, at 120 rounds per minute. Upon completion, the mixture was poured in the rings which were fixed over the test block into which the intersection of 0.1mm wide line with the cross line is in the center of the ring. The block with the ring being vibrated gently during pouring the mixture. The ring with the specimen was separated 30 min from the start of mixing.

The evaluation and observation were made on six specimens for each method of disinfection, the evaluation was conducted by three evaluators 7 times each in separated day at 24 hrs interval. The evaluation was made in random order and the evaluators were unaware of the type of the specimen being evaluated. The evaluation is made on basis of 1-4 scoring system.

Score I: The 0.1mm line was continuous and clear for full width of the ring.

Score II: The 0.1mm line was continuous and clear for more than half-width of the ring.

Score III: The continuity and clearness of the 0.1mm wide line was less than the half-width of the ring.

Score IV: The 0.1mm wide line fail to reproduce along the width of the ring

Before the immersion or spraying of the specimens with madacide disinfectant solution, they were evaluated as a control, later on the specimens were sprayed or immersed in the disinfectant solution for the recommended time before the evaluation. After each evaluation the specimens were kept in a dissicator until the next time of disinfection.

A newly generated disinfectant solution "Madacide" was used to disinfect the stone sample either by spraying or immersion the samples in the disinfectant solution. The disinfection time is 10 minutes which is the recommended time of the manufacture.

Results and Discussion:

The means of the scores for each day for all the evaluators was collected and divided by three in order to have one mean for each day.

One way analysis of variance showed that there was a significant effect Table (1), while using t-test between each day with the mean of the control (before disinfection) was found to be not significant for the 1st, 2nd and 3rd day of disinfection and significant for the rest days. (For spraying group).

Table 1: Mean and Standard Deviation data for the spraying method with ANOVA test

	Control	1st day	2nd day	3rd day	4th day	5th day	6th day	7th day
Mean	1	1	1	1.245	1.277	1.440	1.553	1.887
SD	0	0	0	0.120	0.254	0.255	0.254	0.537

S.O.V	SS	d.f	MS	F	P
Between	30.80	2	15.4	11.49	S P<0.05
Within	2.8306	21	0.13479		
Total	33.630				

While for the immersion group one way analysis of variance also showed a significant effect Table (2), when using t-test between the control with each time of disinfection revealed a non significant difference only for the 1st time of immersion when compared with the control and a significant for the rest.

Table 2: Mean and Standard Deviation data for the immersion method with ANOVA test

	Control	1st day	2nd day	3rd day	4th day	5th day	6th day	7th day
Mean	1	1	1.500	1.610	1.720	2.050	2.220	2.277
SD	0	0	0.165	0.190	0.255	0.191	0.191	0.254

S.O.V	SS	d.f	MS	F	P
Between	16.3863	2	8.193	6.31	S P<0.05
Within	2.7274	21	0.1298		
Total	191137				

The explanation of this reduction in the reproduction ability is not available, since there is no published data concerning the effect of this method of disinfection on the reproduction ability. But it may be attributed to change in the flow or wetability properties of the stone, or it may be due to erosion of the line reproduced as a result of repeated disinfection by the chemical disinfectant [13, 17]. The effect of immersion of stone sample in the madacide solution was found to be similar to the effect of other disinfection solution (Glutaraldehyde, Iodophore, iodine and sodium hypochlorite), as it was stated by Sarma and Neiman [13].

Conclusion:

From this study it was concluded that repeated spraying or immersion of the stone sample do affect the reproduction ability of the dental stone significantly, however spraying methods has less effect than the immersion methods of disinfection.

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