ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)
IJDSIR : Dental Publication Service
Available Online at:www.ijdsir.com
Volume – 7, Issue – 5, October – 2024, Page No. : 296 - 308

Evaluation of Effectiveness of Ultraviolet Radiation on Disinfection of Polyvinyl Siloxane Elastomeric Impression Material - An in Vitro Study

[1]Niveditha. N, Post Graduate, Department of Prosthodontics, Crown and Bridge, AECS Maaruti College of Dental Sciences, Bengaluru, Karnataka

[2]Subash M, Professor and HOD, Department of Prosthodontics, Crown and Bridge, AECS Maaruti College of Dental Sciences, Bengaluru, Karnataka

Corresponding Author: Niveditha. N, Post Graduate, Department of Prosthodontics, Crown and Bridge, AECS Maaruti College of Dental Sciences, Bengaluru, Karnataka

Citation of this Article: Niveditha. N, Subash M, "Evaluation of Effectiveness of Ultraviolet Radiation on Disinfection of Polyvinyl Siloxane Elastomeric Impression Material - An in Vitro Study", IJDSIR- October – 2024, Volume –7, Issue - 5, P. No. 296 – 308.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Aim: One potential route of contamination in dental practice is through oral microflora contaminating dental impressions. Nowadays, dental clinics commonly utilize elastomeric impression materials. This study aimed to assess the efficacy of a UV chamber in disinfecting addition silicone putty material. It evaluated exposure in different time interval at 240-280nm wavelength to determine its disinfection capability.

Methodology: One hundred and eighty specimens of Addition Silicone putty material, each with a square shape, were prepared for the study. These specimens were then categorized into three sets, corresponding to three different test organisms: Staphylococus aureus, Candida albicans, and Pseudomonas aeruginosa. Within each set, there were 60 specimens, further subdivided into four groups of 15 specimens each. The groups were labeled as follows: control (not exposed), Group I (exposed for 30 minutes), Group II (exposed for 40 minutes), and Group III (exposed for 50 minutes). Following UV light exposure, broth cultures of both control and test group specimens were plated on selective media suitable for the respective organism and then incubated. The growth of colonies observed on these plates represented the viable organisms remaining on the specimens after exposure to UV light. Colony counting was performed using a magnifying lens.

Results: Following the exposure period, the results indicated the complete eradication of Candida albicans and Pseudomonas aeruginosa after 40 minutes. However, Staphylococcus aureus demonstrated growth even after 30 and 40 minutes of exposure. It was only after a 50-minute exposure to UV light that total elimination of S. aureus was observed. Statistical

analysis was conducted using Kruskal-Wallis ANOVA and the Dunn's post hoc test.

Interpretation and Conclusion: Exposure to UV radiation adjusted within the range of 240nm to 280nm has been demonstrated to have a lethal effect on Candida albicans and Pseudomonas aeruginosa after 40 minutes of exposure, and on Staphylococcus aureus after 50 minutes. This suggests that UV radiation within this range can be deemed an effective, convenient, and time-saving method for disinfecting elastomeric impression materials.

Keywords: Oral microflora; Contamination; Disinfection; UV radiation

Introduction

Dental impressions, which are used to create a negative form of the human dentition teeth, hard and soft oral tissues are a crucial prerequisite for the successful manufacturing of different types of oral appliances[1]. Impression materials in dentistry are used to register the form and relation of teeth and surrounding oral tissues. The accuracy of impression material in terms of dimensional stability, detail reproduction is necessary for the precise fabrication of definitive restoration. Nowadays CAD/CAM systems are widely used for fabrication of indirect restorations. Even though they have technically improved, conventional impressions still play an important role in transferring information to dental laboratory[6].

During impression procedure, materials often come in contact with saliva and blood, which may get infected with infectious diseases5. This approach is justified by the fact that, on average, oral tissues are colonized with about 280 bacterial species, and 1 mL of a healthy person's saliva contains approximately 750 million microorganisms. For this reason, it is particularly important to properly disinfect all items that come into contact with the patient's oral cavity to reduce the risk of transmission of pathogenic microorganisms. Careful carrying out of this procedure is necessary to effectively remove any microbial contamination present in the oral cavity, saliva, and blood and transferred into impression material. At least 67% of dental materials received by dental laboratories, including dental impressions, were indicated to be contaminated by various microorganisms. The most common microbes identified on the impressions are Streptococcus species, Staphylococcus species, Pseudomonas species, Candida species, Escherichia coli species, Actinomyces species, Enterobacter species, and Klebsiella pneumonia[1].

There is a need for an effective system for prevention of cross contamination of the impression[3]. Various methods used like chemical disinfectants, autoclave, microwave are technique sensitive and time consuming. Some disinfectant solutions may cause significant changes in impression, particularly with over exposure[7]. Surface texture on the tissue surface of the impression may also affect the fit of the prostheses. Surface defects may be most commonly caused by the result of change in the properties of the material resulting from the disinfection procedure. Various methods have been employed to assess the surface texture using optical profilometer, surface profilometer (3D)(2D), surface roughness tester. Several studies have measured the surface roughness on gypsum casts obtained from impression. Various studies have proved that PVS impression materials have superior surface detail reproduction, long-term dimensional stability and no significant change in surface texture. PVS impression materials have been widely used in a variety of indirect procedures in prosthodontics. Favorable handling properties, good patient acceptance and excellent physical properties make them the material of choice in today's practice[4].

Effective disinfection of dental impressions is an indispensable requirement for the safety of dental personnel and patients. The ideal method should be effective, convenient, cheap, and environmentally friendly[1]. Recently, ultraviolet (UV) radiation has become an efficacious way of inactivating and killing the microorganisms while preserving the quality of material2. Ultraviolet rays have long been recognized as an effective method for killing microbes without requiring chemicals or heat. When microorganisms are exposed to UV rays at a particular wavelength (200-280 nm), their reproduction capability is destroyed and inactivation occurs at a faster rate, so that they no longer pose threat to humans[7]. The UV rays can kill or inactivate microbes identified on the impressions like Streptococcus species, Staphylococcus species, Escherichia coli species, Actinomyces species, and Pseudomonas species1. The microorganisms taken for this study are Staphylococcus aureus, Pseudomonas aeroginosa and Candida albicans as they are commonly seen in the oral cavity. This study aimed to evaluate the efficacy of ultraviolet radiation used for PVS impression material disinfection at different time intervals and to know the ideal time for UV disinfection.

Materials and Methods

Source of data

Samples of vinyl polysiloxane impression material were fabricated with dimensions 7mm×7mm×7mm in the Department of Prosthodontics, AECS Maaruti Dental College, Bangalore. The commercially available products for the study were

- Vinyl Polysiloxane Putty Impression Material
- Brain heart infusion broth
- Brain heart infusion agar
- Sabouraud dextrose broth
- Sabouraud dextrose agar.

Organisms used in this study were the clinical isolates of Staphylococcus aureus, Pseudomonas aeroginosa, and Candida albicans. Organisms were cultured on samples and are exposed to UV chamber and colony counting of organisms were performed in the Department of Microbiology, KLE Institute of Dental Sciences Bangalore.

Materials

1. Vinyl Polysiloxane Putty Impression Material (GC FLEXCEED)
2. Brain heart infusion broth (BHI Broth) HI MEDIA M210
3. Brain heart infusion agar (BHI Agar) HI MEDIA M211
4. Sabouraud dextrose broth HI MEDIA M033
5. Sabouraud dextrose agar HI MEDIA M1371
6. Normal saline (500ml)
7. 3 Strains of microorganisms

- Bacterial strain of Staphylococcus aureus
- Pseudomonas aeruginosa
- Fungal strain of Candida albicans

Methodology

Preparation of specimens

One hundred and eighty square shaped specimens of 7×7×7mm of polyvinyl siloxane material were prepared using plaster mold. All the specimens were sterilized by hot air oven. (Figure 1) Three sets of 60 specimens in each set were separated for three types of microorganisms. (Figure 2) ‘S’ for Staphylococcus aureus, ‘P’ for Pseudomonas aeruginosa, and ‘Ca’ for Candida albicans. Specimens in each set were further subdivided into 4 groups of 15 specimens. The groups were labeled as control ‘C’ (not exposed), Group I, Group II, Group III. The specimens named as SC, SI, SII, SIII; PC, PI, PII, PIII and CaC, CaI, CaII, CaIII. (Table 1)

Figure 1: Addition silicone putty material and specimens

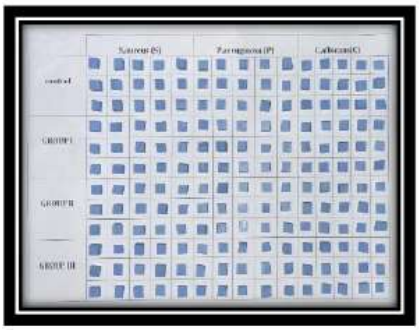


Figure 2: Total number of specimens

Procedure

Preparation of inoculums

Clinical isolates of Staphylococcus aureus, Pseudomonas aeruginosa, and Candida albicans were individually inoculated in brain heart infusion broth for bacteria and Sabauraud broth for fungus. The tubes were incubated at 37oC for 24hrs for both bacteria and fungus.

Table 1: Division of Test and Control Group Specimens (n= 15)

Groups	'S' Staphylococcus aureus	'P' Pseudomonas aeruginosa	'Ca' Candida albicans
Control not exposed to UV light	SC	PC	CaC
Group I: exposed for 30 minutes	SI	PI	CaI
Group II: exposed for 40 minutes	SII	PII	CaII
Group III: exposed for 50 minutes	SIII	PIII	CaIII

Step 1: Contamination of specimens

180 sterile test tubes were divided into 12 groups with 15 tubes in each group for the experimental groups mentioned in Table 1. Using sterile forceps, one specimen was transferred to each test tube. 1ml of appropriate broth was added in each tube using a micropipette. Inoculums of organism were added in respective group of test tubes using micropipette (1ml) and the test tubes were incubated at 37oC for 24 hours. (Figure 3,4 & 5)

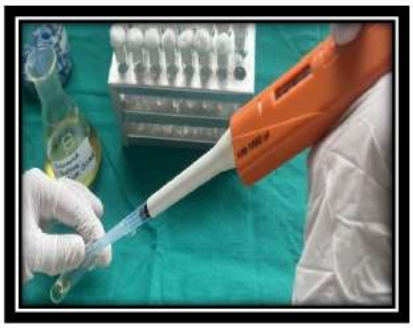


Figure 3: 1ml of broth added in test tube

Figure 4: samples ready for incubation

Figure 5: Incubation of specimens

Step 2: Transfer of specimens

After removing from incubator samples were washed and transferred to a new sterile test tube containing 1ml of normal saline using sterile forceps. (Figure 5)

Step 3: Exposure to UV Radiation

Samples from the test tubes were placed in three different test tube holders and they were exposed to radiation in UV Chamber at a distance of 5cm at three

different time intervals i.e. 30minutes 40minutes and 50minutes. The control specimens were not exposed to UV Radiation. After disinfection, samples were vibrated in vortex machine for 15 to 30 seconds so that microorganisms get suspended in the solution. (Figure 5, 6 & 7)

Figure 5: Samples transferred to 1ml of saline after rinsing in water

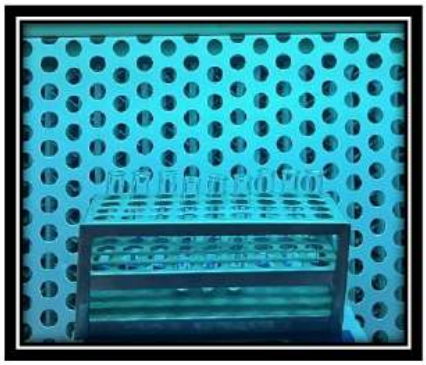


Figure 6: Samples exposed to UV light

Figure 7: samples vibrated on vortex

Grouping of specimens

A total of 180 specimens were fabricated and they were divided in 3 groups and further they were sub divided into 4 groups.

Plates of selective media, BHI Agar for bacteria and Sabauraud agar for fungus were prepared in Petri dishes. The plates were labeled as Control l, Group I, Group II, and Group III for each organism. The suspended organism in the solution were transferred on to the respective plate using 10µl micropipette. The plates were streaked using sterile cotton swab. (Figure 8) The Petri dishes were incubated at 37oC for 24hrs. Finally Colony forming units (CFU) were counted using colony counter machine and results were subjected to statistical analysis.

Figure 8: Inoculation done using cotton swab

Statistical Analysis

The sample size has been estimated using the GPower software v. 3.1.9.2. Considering the effect size to be measured (f) at 25%, power of the study at 80% and the alpha Error at 5%, the total sample size needed is 180. Each group will consist of 45 samples. [45 x 4 groups = 180 samples]. Descriptive analysis of all the explanatory and outcome parameters will be done using mean and standard deviation for quantitative variables and are presented in the form of Mean± SD, frequency and proportions for categorical variables.

In order to test the stated objectives data will be analysed using Dunn's post hoc test and ANOVA / Kruskal Wallis H Test and related sample tests depending on the nature of the distribution. Based on the significance p values inferences will be drawn. The level of

significance [P-Value] will be set at P<0.05. Post Hoc Comparisons will be carried out followed by ANOVA/ Kruskal Wallis H Test. ANOVA/ Kruskal Wallis test followed by independent sample t test/ Dunn's post hoc analysis will be used to compare the average efficiency of UV Chamber between 4 groups. Related sample tests are carried out based on three related time intervals.

Results

The current research aimed to assess the efficacy of UV chamber in disinfecting elastomeric impression material. It sought to determine the effectiveness of disinfection at 30, 40, and 50 minutes of UV light exposure.

Data collected reflected the remaining number of organisms on the samples post UV light treatment. The viability count of these organisms was determined by enumerating the colonies on selective media specific to each organism. All recorded values are presented in colony forming units per milliliter (CFU/ml) (figure 9, 10, 11)

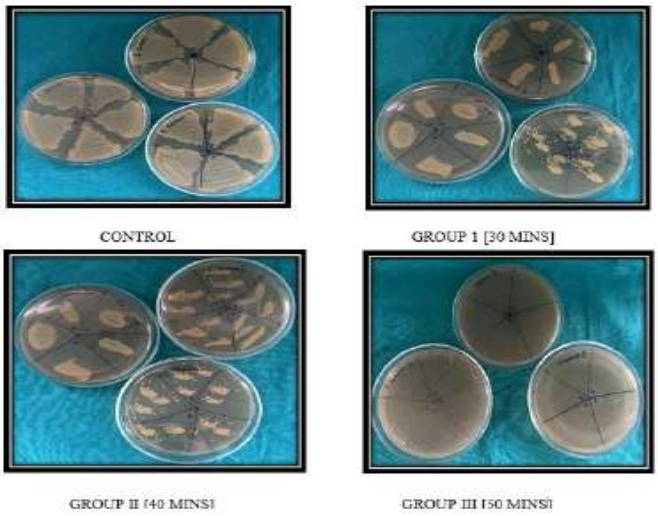


Figure 9: growth of S. aureus in selective media plates

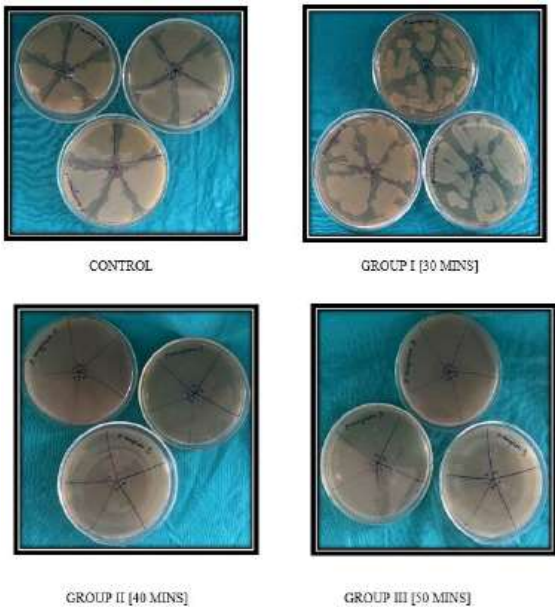


Figure 10: growth of P. aeroginosa in selective media plates

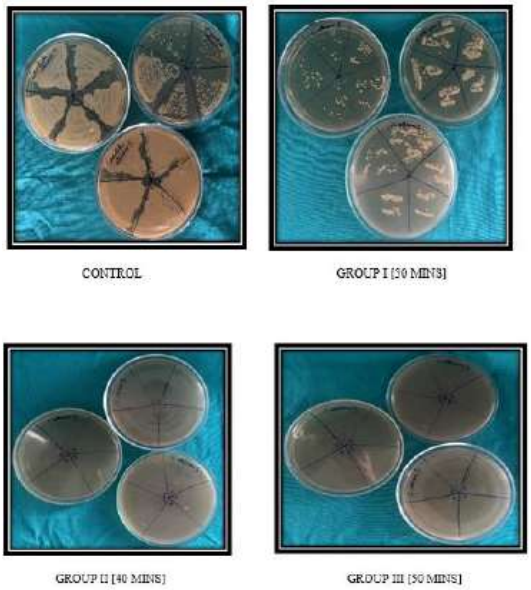


Figure 11: growth of C. albicans in selective media plates

The mean CFU/ml counts of control & test specimens of Staphylococcus aureus of all groups are represented in Table IV (Kruskal Wallis Test) and Table V (Dunn's post hoc Test)

The mean CFU/ml counts of control & test specimens of Pseudomonas aeroginosa of all groups are represented in Table VI (Kruskal Wallis Test) and Table VII (Dunn's post hoc Test)

The mean CFU/ml counts of control & test specimens of Pseudomonas aeroginosa of all groups are represented in Table VIII (Kruskal Wallis Test) and Table IX (Dunn's post hoc Test)

Further followed by graphs which represents all the group results in simplified manner.

Table IV: Comparison of mean CFUs (x 10^2) of Staphylococcus Aureus between 4 groups using Kruskal Wallis Test

Organism	Groups	N	Mean	SD	Min	Max	p-value
S. Aureus	Control	15	1560.00	1293.83	400	4000	<0.001*
	Group 1	15	98.40	39.71	48	180	
	Group 2	15	43.80	25.28	0	90	
	Group 3	15	0.00	0.00	0	0	

* - Statistically Significant

Table V: Multiple comparison of mean difference in CFUs of Staphylococcus Aureus b/w groups using Dunn's post hoc Test

Organism	(I) Groups	(J) Groups	Mean Diff. (I-J)	95% CI for the Diff. Lower	95% CI for the Diff. Upper	p-value
S. Aureus	Control	Group 1	1461.60	835.70	2087.50	<0.001*
		Group 2	1516.20	890.30	2142.10	<0.001*
		Group 3	1560.00	934.10	2185.90	<0.001*
	Group 1	Group 2	54.60	-571.30	680.50	<0.001*
		Group 3	98.40	-527.50	724.30	<0.001*
	Group 2	Group 3	43.80	-582.10	669.70	<0.001*

* - Statistically Significant

The mean CFUs of Staphylococcus aureus between 4 groups showed statistically significant at p<0.001. Multiple comparison of mean differences between groups revealed that Group 3 showed significantly least CFUs/ml as compared to Control, Group 1 & Group 2 and the mean differences were statistically significant at p<0.001 respectively. This was then followed next by Group 2 which showed significantly lesser mean CFUs/ml as compared to Group 1 & Control group and the mean difference was statistically significant at p<0.001. This was further followed next by Group 1 which showed significantly lesser mean CFUs/ml as compared to Control group and the mean difference was statistically significant at p<0.001. This infers that the mean CFUs of Staphylococcus Aureus was significantly least in Group 3, followed by Group 2, Group 1 and highest in Control group.

Table VI: Comparison of mean CFUs (x 10^2)of Pseudomonas Aeruginosa between 4 groups using Kruskal Wallis Test

Organism	Groups	N	Mean	SD	Min	Max	p-value
P. Aeruginosa	Control	15	1573.33	1179.87	600	4000	<0.001*
	Group 1	15	48.00	32.12	0	100	
	Group 2	15	0.00	0.00	0	0	
	Group 3	15	0.00	0.00	0	0	

* - Statistically Significant

Table VII: Multiple comparison of mean difference in CFUs of Pseudomonas Aeruginosa b/w groups using Dunn's post hoc Test

Organism	(I) Groups	(J) Groups	Mean Diff. (I-J)	95% CI for the Diff. Lower	95% CI for the Diff. Upper	p-value
P.Aeruginosa	Control	Group 1	1525.33	954.73	2095.94	<0.001*
		Group 2	1573.33	1002.73	2143.94	<0.001*
		Group 3	1573.33	1002.73	2143.94	<0.001*
	Group 1	Group 2	48.00	-522.60	618.60	<0.001*
		Group 3	48.00	-522.60	618.60	<0.001*
	Group 2	Group 3	0.00	-570.60	570.60	1.00

* - Statistically Significant

The mean CFUs of Pseudomonas aeruginosa between 4 groups showed statistically significant at p<0.001. Multiple comparison of mean differences between groups revealed that Group 3 showed significantly least CFUs/ml as compared to Control and Group 1 and the mean differences were statistically significant at p<0.001 respectively. This was then followed next by Group 2 which showed significantly lesser mean CFUs/ml as compared to Group 1 & Control group and the mean difference was statistically significant at p<0.001. However, there was relatively lesser mean CFUs in Group 1 as compared to Control group, but the mean difference in the mean difference in CFUs/ml was not statistically significant between Group 1 and Control group. This infers that the mean CFUs of Pseudomonas aeruginosa was significantly least in Group 3 and Group 2, followed by Group 1 and highest in Control group.

Table VIII: Comparison of mean CFUs (x 10^2)of Candida Albicans between 4 groups using Kruskal Wallis Test

Organism	Groups	N	Mean	SD	Min	Max	p-value
C. Albicans	Control	15	866.67	882.10	400	3000	<0.001*
	Group 1	15	20.67	9.61	0	40	
	Group 2	15	0.00	0.00	0	0	
	Group 3	15	0.00	0.00	0	0	

* - Statistically Significant

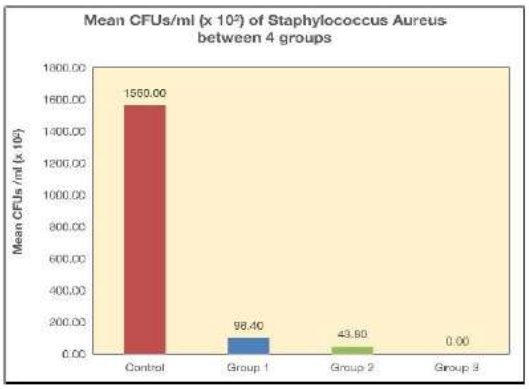
Table IX: Multiple comparison of mean difference in CFUs of Candida Albicans b/w groups using Dunn's post hoc Test

Organism	(I) Groups	(J) Groups	Mean Diff. (I-J)	95% CI for the Diff. Lower	95% CI for the Diff. Upper	p-value
C. Albicans	Control	Group 1	846.00	419.54	1272.46	<0.001*
		Group 2	866.67	440.20	1293.13	<0.001*
		Group 3	866.67	440.20	1293.13	<0.001*
	Group 1	Group 2	20.67	-405.80	447.13	<0.001*
		Group 3	20.67	-405.80	447.13	<0.001*
	Group 2	Group 3	0.00	-426.46	426.46	1.00

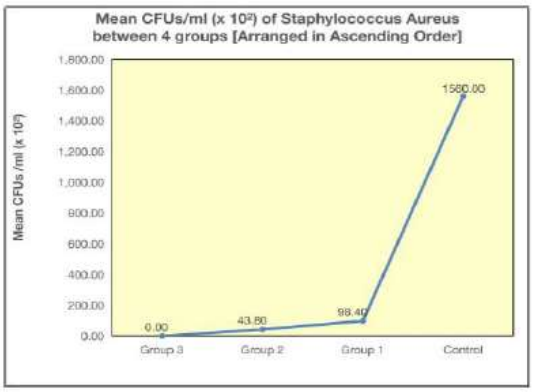
* - Statistically Significant

The mean CFUs of Candida Albicans between 4 groups showed statistically significant at p<0.001. Multiple comparison of mean differences between groups revealed that Group 3 showed significantly least CFUs/ml as compared to Control and Group 1 and the mean differences were statistically significant at p<0.001 respectively. This was then followed next by Group 2 which showed significantly lesser mean CFUs/ml as compared to Group 1 & Control group and the mean difference was statistically significant at p<0.001. However, there was relatively lesser mean CFUs in Group 1 as compared to Control group, but the mean difference in the mean difference in CFUs/ml was not statistically significant between Group 1 and Control group. This infers that the mean CFUs of Candida Albicans was significantly least in Group 3 and Group 2, followed by Group 1 and highest in Control group.

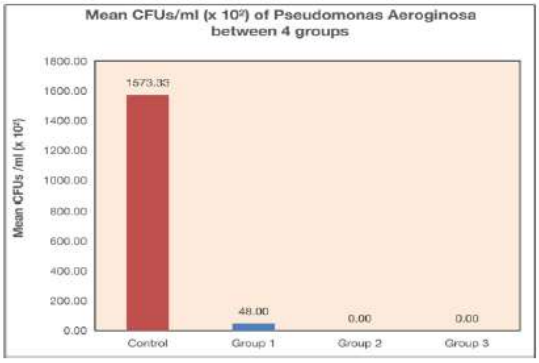
Graph 1:



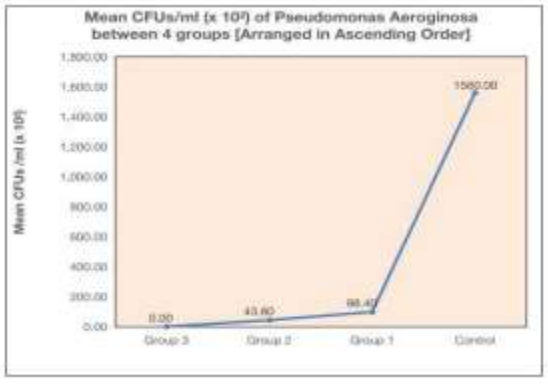
Graph 2:



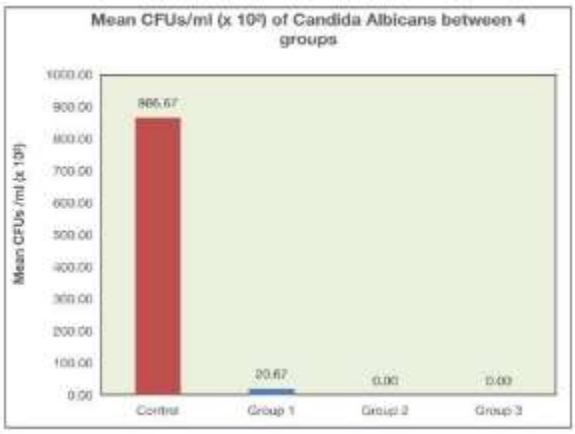
Graph 3:



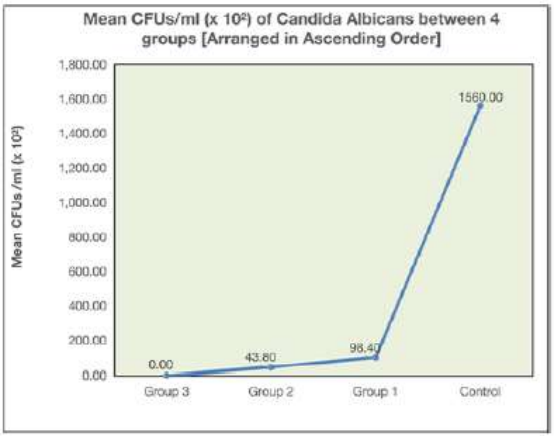
Graph 4:



Graph 5:



Graph 6:



Discussion

Impression procedures form the starting point in prosthodontic treatment. The risk of infections transmitted from patient to dental personnel by impressions contaminated by saliva, blood and plaque is a potential occupational hazard. The use of disinfection procedures by dental professionals is necessary to prevent such cross-contamination.[12]

AIDS, hepatitis, herpes and tuberculosis are very frequently passed to the physicians and nurses through patients and this issue is commonly encountered in dentistry. Dentistry may play a role in the transmission of infection through dental impressions. Instructing dentists about infection control may decrease the odds of infection transmission. Dental impression, a prerequisite for all dental procedures has direct contact with saliva and blood and thus is a potential source of cross infection. According to the British Dental Association, infection control is a core element of dental practice. An impression, if not disinfected, can cross-contaminate the entire laboratory area, allowing microorganisms to spread from the laboratory to the clinical practice. Although almost all of the respondents realized the importance of hand washing before and after the impression making, only half of them used the appropriate method of hand washing. Dental impressions contaminated with patient's blood and saliva cause contamination of the stone cast models. Moreover, microbiological examination of these casts in many studies has shown pathogenic microorganisms. A survey done on 400 Dental laboratories in USA found that that besides lack of knowledge about disinfecting procedures for impressions, dentists and labs disinfect impressions for longer than recommended durations because of the lack of awareness.[14]

The disinfection of impressions is a fundamental procedure in the routine dental practice. However, still "handling of dental impressions" has been paid with little or no attention and is a potent source of carrying diseases. Leung and Schonfeld, observed the transfer of microorganisms from the impressions to the plaster casts, leading to contamination of the laboratories of dental prosthesis. And, hence, the impressions must be considered fomites with the potential to transmit the diseases. Because of apprehension and distress about the infection control, disinfecting the impressions has become a cardinal issue in clinical practice.[2]

At least 67% of dental materials received by dental laboratories, including dental impressions, were indicated to be contaminated by various microorganisms. The most common microbes identified on the impressions are Streptococcus species,

Staphylococcus species, Pseudomonas species, Candida species, Escherichia coli species, Actinomyces species, Enterobacter species, and Klebsiella pneumonia[1].

There are many methods like chemical disinfectants, autoclave, microwave for disinfection procedure. Many commercially available disinfectants like gluteraldehyde are used for immersion disinfection. Some disinfectant solutions may cause significant changes in impression, particularly with over exposure. These solutions may be corrosive to metals, produce irritating vapors, depending on the disinfectant used. Hence, alternatives methods for disinfection of impressions have been suggested and practiced.[11]

UV chambers are commonly used for sterilization of dental instruments, they are available in most dental offices and laboratories. UVC irradiation may be used for microorganism inactivation via damage of the genetic material, which might cause malfunctions in cell replication. Its potential for dental impression disinfection has been investigated by Aeran et al. It was confirmed that UV radiation significantly reduced the number of colonies of oral pathogens grown on the surface of all the studied materials used for taking impressions from the patients (alginate, addition silicone, and polyether).[1]

The results demonstrate that the UV irradiation group (UV) achieved a marked and consistent complete eradication of E. coli, as evidenced by a colony-forming unit (CFU) count of 0 across all materials. On the other hand, the spray treatment group displayed effective microbial reduction, although with residual colonies present.[9]

Ultraviolet Light Chambers Action

UV light is absorbed by proteins and nucleic acids and kills microorganisms by the chemical reaction.

Use - purification of air in operating rooms

-To reduce bacteria in air, water

-storage of sterilized agents

Dose- all forms of bacteria and viruses are vulnerable below 3000 atm. Pressure. Disadvantage - low penetrating capacity -irritation (burns)

- When microorganisms are subjected to UV light, cellular DNA absorbs energy and adjacent thymine molecules link together.
- Linked thymine molecules are unable to position adenine on m RNA molecules during the process protein synthesis thereby replication of chromosome will be impaired.
- The damaged organism can no longer produce critical proteins or reproduce.
- UV light is used to limit airborne or surface contamination in a hospital room, pharmacy food service operation.[12]

Thus, disinfecting an impression with UV radiation is an easy and effectual method that protects the dentist and the dental auxiliaries who handles the impression. It also protects them from the harmful effects of the chemicals that are used in chemical disinfectants. UV disinfectant can be especially beneficial for disinfecting hydrophilic materials such as polyethers, alginate, and agar. The prosthesis made from acrylic resins can also be disinfected effectively with this method.[2]

Various factors that affect the effectiveness of Ultra-Violet light are time, intensity, humidity and direct access to the organism. Since dental prostheses do not get exposed from all areas, it is necessary that UV light must be reflected from many directions. While exposing an item frequent orientation increases the chances of killing microorganisms.[7]

Organisms Used in the Present Study

The microorganisms utilized in this study were Staphylococcus aureus (gram-positive), Pseudomonas

aeruginosa (gram-negative), and Candida albicans (fungus) which are commonly used to validate disinfection procedures and also commonly found in the oral flora.

The study reveals that exposure to U-V light drastically reduced the C. Albicans colonies compared with exposure to direct current glow discharge. It was observed that with greater wattage of U-V light tube in U-V light unit chamber, greater decrease in colony count was observed in lesser time of exposure.

To ensure statistical reliability, suspensions of each organism group were diluted to match 0.5 McFarland's turbidity, corresponding to 10^5 organisms/ml. Suspension dilution is necessary to facilitate colony counting; otherwise, resulting colonies would be too numerous to enumerate. Standard microbiological laboratory procedures were followed in this study to isolate and cultivate organisms. Care was taken to prevent specimen and experimental setup contamination. Colony counts were conducted using a colony counting machine. The study found significant microbial growth on plates from control group specimens after 24 hours of incubation for bacteria and 48 hours for fungi at 37°C.

Results showed that UV light exposure do have a lethal effect on micro organism that may contaminate elastomeric impression material. So, UV Chamber for disinfection and sterilization of elastomeric impressions can be considered as a cost effective, convenient and quick option. The effect of UV light exposure time tested in this study reveals that 40 to 50 mins of UV light exposure on impression material is effective to eradicate all the microorganisms.

Limitations

- As this study is an in vitro study accuracy might vary if in vivo study is done.
- The effect of UV light exposure time tested in this study on the mechanical properties, physical properties, dimensional accuracy and surface reproduction of the addition silicon elastomeric material needs further investigation.
- Microorganisms may vary in different clinical isolates.

Conclusion

Within the limitations of the study, the following conclusion can be drawn:

- UV Light exposure has been proven to have a lethal effect on Staphylococcus aureus, Pseudomonas aeruginosa, and Candida albicans grown on addition silicone putty material.
- Exposure to 254nm for 40 minutes resulted in complete elimination of Candida albicans and Pseudomonas aeruginosa strains, while exposure to 254nm for 50 minutes completely eliminated Staphylococcus aureus.

References

1. Wezgowiec, J.;Wieczynska, A.;Wieckiewicz, M.; Czarny, A.;Malysa, A.; Seweryn, P.; Zietek, M.; Paradowska-Stolarz, A. Evaluation of Antimicrobial Efficacy of UVC Radiation, Gaseous Ozone, and Liquid Chemicals Used for Disinfection of Silicone Dental Impression Materials. Materials 2022, 15, 2553.
2. Nimonkar SV, Belkhode VM, Godbole SR, Nimonkar PV, Dahane T, Sathe S. Comparative evaluation of the effect of chemical disinfectants and ultraviolet disinfection on dimensional stability of the polyvinyl siloxane impressions. J Int Soc Prevent Communit Dent 2019; 9:152-8.
3. Samra RK, Bhinde SV. Comparative evaluation of dimensional stability of disinfection with different

immersion disinfectant systems and ultraviolet chamber. Saudi Dent J.2018 Apr; 30(2): 125-141.

4. Mahalakshmi AS, Jeyapalan V, Mahadevan V, Krishnan CS, Azhagarasan NS, Ramakrishnan H. Comparative evaluation of the effect of electrolyzed oxidizing water on surface detail reproduction, dimensional stability and surface texture of poly vinyl siloxane impressions. J Indian Prosthodont Soc 2019; 19:33-41.
5. Kamble SS, Khandeparker RV, Somasundaram P, Raghav S, Babaji RP, Varghese TJ. Comparative evaluation of dimensional accuracy of elastomeric impression materials when treated with autoclave, microwave and chemical disinfection. J Int Oral Health 2015; 7(9):22-24.
6. Rabeeba P.K, Arundati N. Raj, Junu Henry, Basavaraj S. Salagundi, Vachan Poonacha, Mallikarjuna D.M. and Noufal Zainab (2020); Comparative evaluation of surface detail reproduction and effect of disinfectant and long-term storage on dimensional stability of vinylpolyethersilicone with polyvinylsiloxane and polyether impression materials- in-vitro study Int. J. of Adv. Res. 8 (Feb). 845-857] (ISSN 2320-5407).
7. Aeran H, Sharma S, Kumar V, Gupta N. Use of Clinical UV Chamber to Disinfect Dental Impressions: A Comparative Study. J Clin Diagn Res. 2015; 9(8):ZC67-ZC70.
8. Szeto, W.T., Yam, W.C., Huang, H., & Leung, D.Y. (2020). The efficacy of vacuum-ultraviolet light disinfection of some common environmental pathogens. BMC Infectious Diseases (2020) 20:127
9. Moufti, M.A., Hamad, M., Al Shawa, A. et al. Efficacy and design requirements of UV light cabinets for disinfection of exchangeable non-sterilizable “dental objects”. Sci Rep 13, 19755 (2023).
10. Farooqui R, Aras MA, Chitre V. An In Vitro Study to Compare the Surface Roughness of Two Polyvinylsiloxane Impression Materials Following Ultraviolet Irradiation or Chemical Disinfection. Int J Experiment Dent Sci 2020;9(2):52–55.
11. Anand V. A comparative evaluation of disinfection effect of exposures to ultra-violet light and direct current glow discharge on Candida Albicans colonies coated over elastomeric impression material: An in vitro study. J Pharm Bioall Sci 2013;5:80-4.
12. Vinaya Kumar G, Wadhwani A, Hajira N. Effect of UV disinfection on dimensional stability and infection control of elastomeric impression materials. CODS J Dent 2015;7:60-63.
13. Mantena SR. Mohd I, Dev KP, Suresh Sajjan MC, Ramaraju AV, Bheemalingeswara Rao D. Disinfection of Impression Materials: A Comprehensive Review of Disinfection Methods. Int J Dent Mater. 2019; 1(1): 07-16.
14. Wei Zhang, Huiling Mao , Guoqing Zhou. Effect of ultraviolet radiation combined with immersion disinfection of silicone impressions infected with hepatitis B virus and HIV. Biomedical Research 2017; 28 (14): 6377-6380.
15. Dr. Supriya Dahiya, Dr. Reena Mittal, Dr. Samarth Kumar Agarwal. A Comparative evaluation of the effect of chemical and ultraviolet disinfection on dimensional stability of polyvinyl siloxane impression material: An in-vitro study. Global journal for research analysis : Volume – 12 | Issue – 3 | March – 2023.
16. Eslami H, Sadr Haghighi AH, Hosseinifard H, Salehnia F, Fakhri E, Afshari F. Efficacy, Safety,

and Application of Ultraviolet Radiation for Disinfection in Dentistry: A Systematic Review. J Health Sci Surveillance Sys. 2022;10(3):238-249.

17. Hiroshi Ishida, Yukinori Nahara, Mitsuhiro Tamamoto, Taizo Hamada, The fungicidal effect of ultraviolet light on impression materials, The Journal of Prosthetic Dentistry, Volume 65, Issue 4,1991.
18. Prakash N, Parmar A, Pandey P, Mishra N, Mukhopadhyay G, Bais K, Acharya J. Disinfection of Dental Impressions with the Use of Clinical UV Chamber: A Comparative Study. J Adv Med Dent Scie Res 2019;7(10):177-183.
19. Al-Khafagy, Mohammad & Al-Yasiri, Israa & Al-Yasiri, & Al-nasrawi, Suhad. (2018). Disinfection Of Alginate And Silicon Impressions By Using UV And Blue Light. (In Vivo Study). 3. 1-8. Journal of Kufa for Nursing Science.
20. Al-Jabrah O, Al-Shumailan Y, Al-Rashdan M. Antimicrobial effect of 4 disinfectants on alginate, polyether, and polyvinyl siloxane impression materials. Int J Prosthodont. 2007 May-Jun;20(3):299-307. .
21. Junevicius, Jonas & Pavilonis, Alvydas & Surna, Algimantas. (2004). Transmission of Microorganisms from Dentists to Dental Laboratory Technicians through Contaminated Dental Impressions. Stomatol Balt Dent Maxillofac J. 6.
22. Aalaei Sh, Rezaei Adli A, Mansoorali MR, Gholami F. Dimensional Stability of Two Polyvinyl Siloxane Impression Materials in Different Time Intervals. J Dent Biomater, 2015;2(4):155-161.
23. G. Lynn Powell, Robert D. Runnells, Barbara A. Saxon, Brian K. Whisenant. The presence and identification of organisms transmitted to dental laboratories, The Journal of Prosthetic Dentistry, Volume 64, Issue 2,1990.
24. Karaman, Tahir & Öztekin, Faruk & Tekin, Samet. (2020). Effect of Application Time of Two Different Disinfectants on the Surface Roughness of an Elastomeric Impression Material. JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH. 14. 10.7860/JCDR/2020/44752.13828.
25. Azevedo MJ, Correia I, Portela A, Sampaio-Maia B. A simple and effective method for addition silicone impression disinfection. J Adv Prosthodont. 2019 Jun;11(3):155-161.
26. Dai T, Vrahas MS, Murray CK, Hamblin MR. Ultraviolet C irradiation: an alternative antimicrobial approach to localized infections? Expert Rev Anti Infect Ther. 2012 Feb;10(2):185-95.
27. Marya CM, Shukla P, Dahiya V, Jnaneswar A. Current status of disinfection of dental impressions in Indian dental colleges: a cause of concern. J Infect Dev Ctries. 2011 Nov 15;5(11):776-80.
28. Boylan RJ, Goldstein GR, Schulman A. Evaluation of an ultraviolet disinfection unit. J Prosthet Dent. 1987 Nov;58(5):650-4.
29. Godbole SR, Dahane TM, Patidar NA, Nimonkar SV. "Evaluation of the Effect of Ultraviolet Disinfection on Dimensional Stability of the Polyvinyl Silioxane Impressions." an in-Vitro Study. J Clin Diagn Res. 2014 Sep;8(9):ZC73-6.
30. Chen SY, Liang WM, Chen FN. Factors affecting the accuracy of elastometric impression materials. J Dent. 2004 Nov;32(8):603-9.