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Original Research

Evaluation and Comparison of Efficacy Of 2% Gluteraldhyde and Ozone Water for Disinfecting Polyether and Polyvinyl Monophase Impression Material: An In Vivo Study

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ABSTRACT:
Aim: To evaluate the efficacy of 2% gluteraldehyde and ozone for disinfecting Polyether Monophase and Polyvinyl monophase impression material. **Materials and methods**: Ten healthy dentulous subjects irrespective of gender were selected. For each dentulous subject four impressions of maxillary arch were made with Polyvinyl siloxane and Polyether monophase impression material. First impression was kept as control. Second impression was disinfected with 2% gluteraldehyde for 10 minutes and third impression was disinfected by ozone water for 10 minutes. The colonies were observed based on standard method and technique under binocular microscope and the growth in broth were observed based on their turbidity with the help of colorimeter. **Results:** The intergroup comparison was done by using ANOVA test while the comparison between two groups was done by using paired t test. **Conclusion:** In this study 2% gluteraldehyde was found to be more effective in killing microorganisms. Ozone water showed least changes when compared to 2% gluteraldehyde and was effective in killing microorganisms so can be used as an alternative.
Key words: Gluteraldehyde, monophase impression material, Polyvinyl siloxane.

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INTRODUCTION

To duplicate oral condition and tooth morphology prosthetic dentistry relies on impression technique. However impressions also serve as a source of infectious microorganisms to those who handle it. Oral microbion carry plethora of both pathogenic and opportunistic organism which may get transmitted to the dental personel.

A variety of dental impression materials are available such as alginate, agar and elastomers. Four basic types of elastomeric impression materials are currently in use: Polysulphide, Polyether, Condensation silicones and Addition silicones.[1]

Decontamination of impression performed by rinsing under tap water has been reported an insufficient procedure and hence various methodologies were introduced for its sterilisation, without affecting its integrity.

Disinfection is generally a less lethal process as compared to sterilization. It eliminates virtually all recognized pathogenic microorganisms but not necessarily all microbial forms (bacterial endospores), on inanimate objects.[2]

2% gluteraldehyde has efficacy to destroy a wide range of micro-organisms and is effective against the Hepatitis B and HIV viruses. Their activity is reduced in the presence of organic matter, and they are corrosive at concentrations necessary for environmental disinfection.[3]

Ultraviolet rays have long been recognized as an effective method for killing microbes without requiring chemicals or heat. Multiple factors that affect the effectiveness of Ultraviolet light include time, intensity, humidity and direct access to the organism. [4]

According to microbiological research data, the ozone is capable of killing all the known types of gram-positive and gram- negative bacteria, including the Pseudomona aeruginosa and Eschericea coli, both of which are extremely resistant to antibiotics.[5]

The use of a dental impression ozone disinfection device provides a new method which needs no consumables, is time saving, requires limited space in the dental office and is environment friendly, minimizing environmental hazard through liquid waste generation. In addition, it does not show any surface differences when compared with the everyday-use disinfectants, an exceptionally important factor that leads to highly accurate prosthetic restorations.[6]

AIM OF THE STUDY

To evaluate the efficacy of 2% gluteraldehyde and ozone water for disinfecting Polyether and Polyvinyl Monophase impression material.

OBJECTIVES

1. To evaluate the colonization of microorganisms on Polyether and Polyvinyl impression of a dentulous patient (control).
2. To evaluate the efficacy of 2% glueraldehyde to disinfect Polyether and Polyvinyl impression for 10 minutes of a dentulous patient .
3. To evaluate the efficacy of ozone water to disinfect polyether and Polyvinyl impression for 10 minutes of a dentulous patient.

MATERIALS

A. Materials used for impression

1. Polyvinyl Siloxane Monophase impression material (Aquasil ultra monophase, Densply Caulk, medium body consistency, ISO 4823)
2. Polyether Monophase impression material (3M ESPE impregnum^{Tm} soft)
3. Plastic dentulous autoclavable maxillary stock trays (ABS).

B. Materials used for disinfection

1. 2% gluteraldehyde solution (Prime Dental)
2. Ozone water (Pristige clean home fruit and vegetable cleaner, POZ 1.0, 230 v/10 watts)

C. Instruments and reagents used for microbial procedure.

1. Petri dishes
2. Graduated conical flask (RANKEM 250 ml and 100 ml)
3. L- spreader
4. Dispensing micro pipette (50µml) (Axiva Sichem Pvt. Lmt.)
5. BOD incubator (REMI)
6. Phosphate buffer saline solution (MERCK Life Science Pvt. Ltd.) east Mumbai, India.
7. Culture media (TGYEA solid media) HIMEDIA Laboratories Pvt. Ltd., India.
8. Culture broth (TGYE broth) HIMEDIA Laboratories Pvt. Ltd., India.
9. Centrifugal machine (R8C Laboratory centrifuge, REMI Centrifuge, REMI motors, Mumbai, India)
10. Digital photo colorimeter (Electronics India)
11. Inoculating nichrome wire loop
12. Test tubes (BOROSIL ®)
13. Ethyl Alcohol (Pharmco AAPR UN117o)
14. Binocular microscope (100 X) Lawrence and Mayo.
15. Micro slides (PLAZA scientific industrial corporation, Delhi, India)

INCLUSION CRITERIA

Dentulous subjects irrespective of gender.

EXCLUSION CRITERIA

- Any infectious disease since 3 months.
- Systemic disease and psychological disorders.
- Missing teeth.
- Person on antibiotic

METHODOLOGY

1. Subject selection.
2. Impression making.
3. Disinfection control.
4. Microbial procedures.

METHODOLOGY

Subject selection:

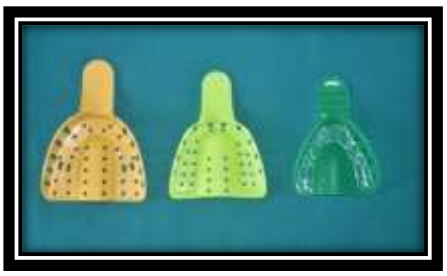
Ten healthy dentulous subjects irrespective of gender were selected from the OPD of Department of Prosthodontics, Crowns and Bridge and Implantology, Modern Dental College and Research Centre, Indore for making impressions of maxillary arch .

Impression making :

Polyvinyl siloxane impression-

For each dentulous subject three impressions of maxillary arch were made with Polyvinyl siloxane. Total 30 impressions were made with polyvinyl siloxane impression material.

The adequate size tray (fig 1) was selected and loaded with Polyvinyl Siloxane impression material (fig 2) without lifting the tip of catridge and placed into the patients mouth (fig 3) and impression was made (fig 4).



DENTULOUS MAXILLARY STOCK TRAYS

(fig 1)

POLYVINYL SILOXANE MONOPHASE IMPRESSION MATERIAL

(fig 2)

IMPRESSION OF MAXILLARY ARCH

(fig 3)

POLYVINYL IMPRESSION

(fig 4)

Polyether impression-

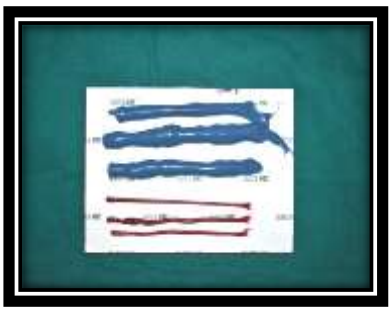
For each dentulous subject three impressions of maxillary arch were made with Polyether material.

The impression was made using autoclaved maxillary plastic dentulous stock trays. Total 30 impressions were made with Polyether impression material (fig 5).

POLYETHER MONOPHASE IMPRESSION MATERIAL (fig 5)

The adequate size tray was selected. Equal lengths of base and catalyst were dispensed onto the mixing pad (fig 6) and mixed with a broad stiff blade spatula to get a non- streaked homogenous mix. The material was loaded on impression tray and placed into patients mouth (fig 7) and the impression was made (fig 8).

Thus a total of 60 impressions were made from both the materials.



BASE AND CATALYST ON

IMPRESSION OF MAXILLARY ARCH

POLYETHER IMPRESSION

Disinfection control :

For each subject-

First impression was kept as control.

Second impression was disinfected with 2% gluteraldehyde for 10 minutes.

Third impression was disinfected with ozonated water for 10 minutes

Microbiological procedures:

After disinfection of each sample, it was washed with 10 ml of phosphate buffer saline solution.

The wash was collected aseptically. The wash was further subjected to centrifugation for 20 minutes at 2000 rpm. Leaving the sediment behind rest of the solution was decanted. Both the inoculants were incubated at 37 ºC for 24-48 hours in a BOD incubator to observe any kind of growth.

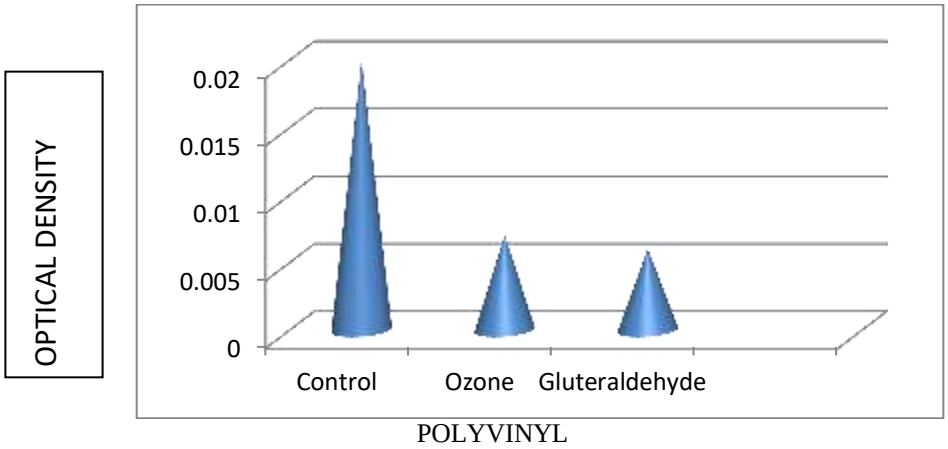
The reading observed was subjected to statistical analysis.

STATISTICAL ANALYSIS

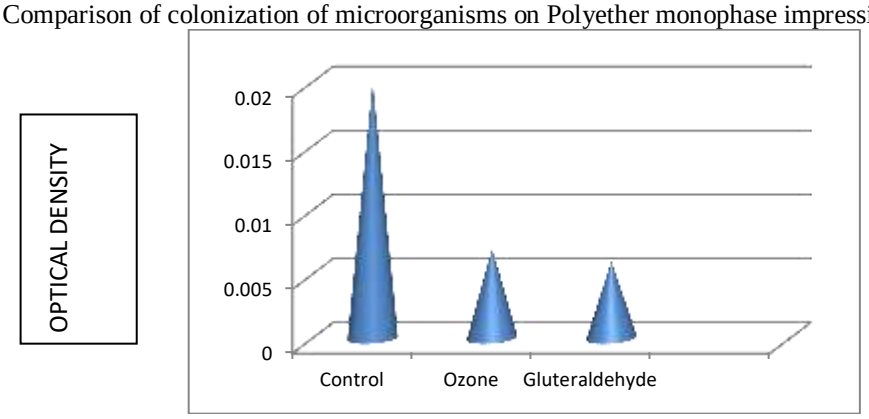
Test applied:-

ANOVA: single factor				
SUMMARY				
Groups	*Count*	*Sum*	*Average*	*Variance*
Control	10	0.1	0.01	4.44E-05
Ozone	10	0.27	0.027	2.33E-05
Gluteraldehyde	10	0.07	0.007	2.33E-05
ANOVA				
Source of Variation	*SS*	*df*	*MS*	*F*
Between Groups	0.00878	3	0.002927	46.61947
Within Groups	0.00226	36	6.28E-05	
Total	0.01104	39		

Graph 1: Comparison of colonization of microorganisms on Polyvinyl Siloxane monophase impression material.



Graph 2. Comparison of colonization of microorganisms on Polyether monophase impression material.



DISCUSSION

Surface disinfection of impressions is highly desirable to inactivate infectious agents to reduce the potential risk of transmission of disease to dental personnel without affecting its dimensional stability. In recent trends, elastomeric impression materials have revolutionized restorative procedures, as compared to inelastic impression materials. In this monophase or single viscosity technique, impression material is used with either automix or cartridge mix system and the material can be mixed more homogenously without incorporating any voids. Accuracy and dimensional stability of the dental impression material is of utmost importance. In recent trends, elastomeric impression materials have revolutionized restorative procedures, as compared to inelastic impression materials. The monophase materials have been formulated with sufficient shear thinning to be used both as low viscosity and high viscosity materials. In this monophase or single viscosity technique, impression material is used with either automix or cartridge mix system and the material can be mixed more homogenously without incorporating any voids.[7]

Different percentages of sodium hypochlorite is used for disinfection are 0.525%, 5%, 5.25%.Yilmaz H (2007)[4], Duseja S (2014)[7], Herrera SP(1986)[8], Soganci G(2018)[9]. Poulis (2016)[6] stated that environment friendly dental impression disinfectant (ozone) shows similar impression surface alterations with those of the immersion disinfectants examined. Abhinaya K (2018)[11] concluded that the ozone water showed comparatively least changes and defined lines when compared to 5.25% sodium hypochlorite, followed by 2% glutaraldehyde. Hence, ozone water can be used as an alternative disinfectant solution for clinical practice.

CONCLUSION

In this study sodium hypochlorite was found to be more effective in killing microorganisms than UV rays as it kills only surfaces microbes. It is necessary that ultraviolet light must be reflected from different directions. Ultraviolet light of 200-280 nm wavelengths is lethal to bacteria, bacterial spores, viruses, mold, mold spores, yeast and algae. Since the penetrating power of ultraviolet light is low, it is not readily absorbed by organic materials.[8]

Ozone as a new, environment friendly, alternative dental impression disinfectant seems to be highly promising, designating a time saving method, without the need of consumable materials, which can be applied in every dental office.

REFERENCES

1. Pandey A, Mehtra A. Comparative study of Dimensional stability and accuracy of various elastomeric materials. IOSR Journal of Dental and Medical Sciences. 2014;13(3):40-5.
2. Mohammad T.AL, Yasiri IKA, Hamed SJ. Disinfection Of Alginate And Silicon Impressions By Using UV And Blue Light. (In Vivo Study). Journal of Kufa for Nursing Science.2013;3(2):1-8.
3. Ahsan MR, Islam KZ, Begum J .Study on antimicrobial effect of disinfecting solutions on alginate impression materials. Update Dent. Coll.2013; 3(1):18-23.
4. Yilmaz H, Aydin C, Dogruman F, Gul B, Yilmaz C, Semiz M. Effect of disinfection on the dimensional stability of polyether impression material. J. Prosthodont. 2007;16(6):473-479.
5. Look JO, Clay DJ, Gong K and Harold. H.M. Preliminary results from disinfection of irreversible hydrocolloid impressions. J. Prosthet. Dent., 1990; 63(6): 701 - 7.
6. Poulis N, Prombonas A, Yannikakis S, Karampotsos T, Katsarou MS, Drakoulis N. Preliminary SEM Observations on the Surface of Elastomeric Impression Materials after Immersion or Ozone Disinfection. Journal of Clinical and Diagnostic Research. 2016 Dec.Vol-10(12): ZC01-ZC05.
7. Duseja S, Shah RJ, Shah DS, Duseja S. Dimensional measurement accuracy of recent polyether and addition silicone monophase impression materials after immersion in various disinfectants: An in vitro study. International J. Healthcare and Biomedical Research.2014;2(4): 87-97.
8. Herrera SP, Merchant VA .Dimensional stability of dental impressions after immersion disinfection. J Am Dent Assoc.1986 ;113(3):419-22.
9. Soganci G, Cinar D, Cagler A. Yagiz A. 3D evaluation of the effect of disinfectant on dimensional accuracy and stability of two elastomeric impression materials. Dental Materials Journal, 2018;37(4):675-684.
10. Abinaya K, Kumar BM, Ahila SC. Evaluation of surface quality of silicone impression materials after disinfection with ozone water: An in vivo study. Contemp. Clin Dent.2018;9(1):60-64.