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Original Research

Assessment of effect of disinfection methods on the dimensional stability of elastomeric materials

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ABSTRACT:

Background: Dental impressions can give rise to the transmission of microorganisms and infections. The present study was conducted to assess effect of disinfection methods on the dimensional stability of elastomeric materials. **Materials & Methods:** The present study comprised of four impression materials. A total 180 Impressions were subjected to following disinfecting treatments, T1: no treatment with a disinfectant solution, T2: immersion in 5.25% sodium hypochlorite solution for 10 minutes, T3: immersion in 2% glutaraldehyde solution for 30 minutes. **Results:** Materials used was Permlastic, 3M, Xantopren VL and Provil L. The mean value of first impression material was highest among all followed by fourth, second and third. **Conclusion:** Authors found that elastomeric materials had different reproduction capacities.

Key words: Elastomeric materials, impression, Disinfectant

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INTRODUCTION

Dental impressions can give rise to the transmission of microorganisms and infections. Impression materials that have been exposed to infected saliva and blood provide a significant source of cross contamination.¹ The function of dental surgeons as health professionals is to prevent disease in their field or, when disease sets in, to treat it.² Concern about cross-infections strongly increased after the rapid evolution of AIDS and hepatitis B, leading the American Dental Association (ADA) to publish guidelines about the control of infection in dental offices and laboratories. Among these instructions, such as the use of gloves, caps, masks, eyeglasses, and sterilization of all dental materials,

there is also concern about impressions, which, along with trays, are an important source of transmission between patients and dental laboratories.³

Because dimensional accuracy and reproduction of anatomic detail are important requisites for an impression used in the fabrication of dental castings, it is of interest to investigate the effect that disinfectants have on the accuracy and reproduction of fine detail of impressions. Impression materials disinfected by immersion, however may be subjected to dimensional changes which may have a direct effect on the prosthetic results achieved in dental practices.⁴

Gerhardt and Sydiskis⁵ observed that the materials differ widely in terms of absorption and retention of viruses. Thus, a specific disinfection procedure should be followed for each material. Similarly, Leung and Schonfeld⁶ reported that stone casts are potential sources of cross infection and alerted dental professionals to the need to disinfect these casts. The present study was conducted to assess effect of disinfection methods on the dimensional stability of elastomeric materials.

MATERIALS & METHODS

The study protocol was approved from institutional ethical committee. The present study comprised of four impression materials. A total of 180 impressions were obtained from a master model (Columbia Dentoform Corp., New York, N.Y.) After preparation of individual trays, the materials were manipulated according to manufacturer instructions

and impressions obtained by the 1-step technique directly on the master model. After removal and careful inspection, impressions were subjected to one of the following disinfecting treatments, based on ADA recommendations: T1: no treatment with a disinfectant solution, T2: immersion in 5.25% sodium hypochlorite solution for 10 minutes, T3: immersion in 2% glutaraldehyde solution for 30 minutes.

After the resting period, impressions were immediately poured with type IV die stone. (Durone, Dentsply, Petrópolis, Brazil). The impression was separated from the stone cast 1 hour after pouring and readings were taken 24 hours later. Selection of the impression samples and the testing procedures were randomized. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of materials

S. No	Trade name	Manufacturer	Composition
1	Permlastic	Kulzer, Germany	PS
2	3M	3M ESPE, Germany	PDS
3	Xantopren VL	3M ESPE, Germany	PDS
4	Provil L	3M ESPE, Germany	PVS

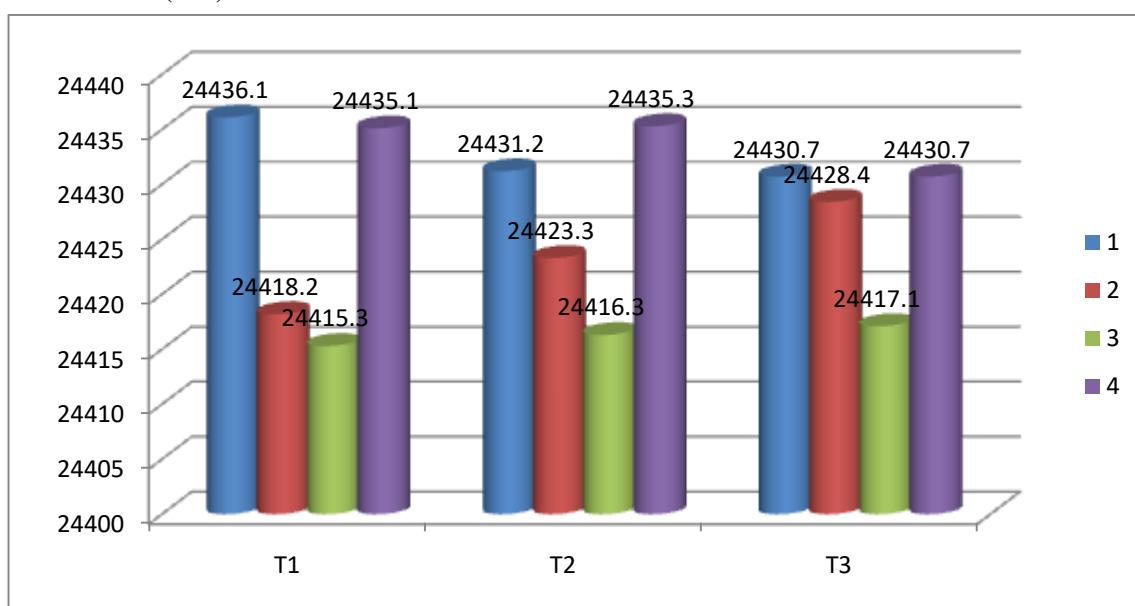
Table I shows that materials used was Permlastic, 3M, Xantopren VL and Provil L.

Table II Mean values (mm) of the measurements of the stone casts

Time	1	2	3	4	Level of significance
T1	24436.1	24418.2	24415.3	24435.1	0.023
T2	24431.2	24423.3	24416.3	24435.3	0.82
T3	24430.7	24428.4	24417.1	24430.7	0.54

Table II, graph I shows that mean value of first impression material was highest among all followed by fourth, second and third.

Graph I Mean values (mm) of the measurements of the stone casts



DISCUSSION

Major advances in impression materials and their application have occurred during the last decade, with greater emphasis being placed on rubber impression materials than on dental compound, zinc oxide-eugenol, and agar and alginate.⁷ The application of dental impression compound has also decreased with the increased use of rubber impression materials, however, impression compound is useful for checking cavity preparations for undercuts and for making impressions of full crown preparations where gingival tissues must be displaced.⁸ It softens on heating and hardens on cooling. Majorly used for making preliminary impression for completely edentulous mouth.⁹ The present study was conducted to assess effect of disinfection methods on the dimensional stability of elastomeric materials.

In this study, materials used was Permlastic, 3M, Xantopren VL and Provil L. Peutzfeldt et al¹⁰ conducted a study to investigated the effect of disinfection methods on the dimensional stability of 6 elastomeric materials. Impression materials were submitted to the following treatments: immersion in 5.25% sodium hypochlorite solution for 10 minutes, immersion in 2% glutaraldehyde solution for 30 minutes, and no immersion (control). After treatments, impressions were poured, and respective stone casts were measured with a Nikon Profile projector and compared with the master model. The elastomeric materials had different reproduction capacities, and the disinfecting treatments did not differ from the control.

We found that mean value of first impression material was highest among all followed by fourth, second and third. David G. Drennon et al¹¹ examined improved gypsum casts for surface roughness and line-detail reproduction after the immersion disinfection of elastomeric impression materials in an acid glutaraldehyde, an alkaline glutaraldehyde, and a phenol. Impressions were made of a surface roughness standard ($R = 3.08 \text{ pm}$) that was custom made to include engraved grooves. Mean surface roughness values for all casts of all combinations of disinfectant treatments, impression materials, and improved gypsum stones were obtained with a surface analyzer. Data examined by an analysis of variance indicated that the addition silicone and polyether impression materials provided a surface roughness similar to the precision displacement specimen standard. The acid glutaraldehyde disinfectant demonstrated enhanced line detail reproduction compared with the standard. Addition silicone and polyether impression materials combined with the acid glutaraldehyde provided the model system closest to the mean surface roughness of the reference standard. These combinations revealed differences in the surface roughness reproduction among the represented improved dental stones.

5.25% sodium hypochlorite solution for 30 minutes caused expansion of the impressions, whereas immersion in

quaternary ammonia and aldehyde solution did not cause significant dimensional changes. Johnson et al, among others, warn that polyether is particularly sensitive to immersion and that disinfection by immersion is contraindicated for this material.

Owens and Goolan¹² recommend that polyethers should not be immersed for periods exceeding 5 hours, because they may expand. Care should also be taken with condensation reaction silicone impressions, which may contract because of the loss of subproducts. When sterilization is imperative, as in the case of patients with HIV or hepatitis, the best option is the use of an addition silicone.

CONCLUSION

Authors found that elastomeric materials had different reproduction capacities.

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