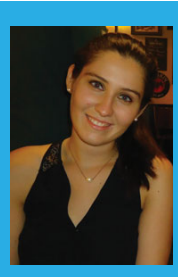
Dimensional changes of impression materials after 6 months storage period



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Introduction

Elastomers are the most commonly used impression materials in dentistry. Within this group, polyethers and polyvinilsiloxanes exhibit excellent dimensional stability against various storage conditions (Sinobad, et al., 2014).

The impression material selected should present dimensional stability and accuracy in the reproduction of details after disinfection or sterelization, allowing their storage for a long period of time (Nassar, Oko, Adeeb El-Rich & Flores , 2013; Sinobad, et al, 2014)..

Some microorganisms that develop in the oral cavity may cause incurable infectious diseases such as those responsible for hepatitis C or human immunodeficiency virus (HIV) (Gelson, Zanarotti, Fonseca, Santos & Cross, 1999; Amin, Al-Ali, Tarawneh, Taha, W., & Ereifij, 2009; Kumar Reddy, Karthigeyan, Punithavathy, Karthiik, & Manikandan, 2012). The prevalence of these diseases and their potentially harmful effects suggest a mandatory adherence to infection control procedures by dental laboratories and offices (Kumar, et al., 2014).

The ISO 4823: 2000 norm establishes the requirements that the elastomers must meet, and according to it, the maximum linear dimensional change should correspond to 1,5%.

Although most recent impression materials are typically associated with dimensional stability for extended periods of time, there are factors such as sterilization and disinfection that could affect it. Thus, it is important to evaluate the dimensional stability of these materials over the long term, because they can be used to reproduce models during the prosthetic treatment (Pant, Juszczyk, Clark, & Radford, 2008; Pimentel, Portugal, Vaconcelos Rock & Sampaio-Fernandes, 2014).

Aim

To evaluate the dimensional changes of the addition silicone Imprint, 4 Penta Putty (3M ESPE™, Seefeld, Germany) and polyether Impregum Penta (3M ESPE™, Seefeld, Germany) after disinfection or sterilization after a 6-month storage period of the samples.

Hypothesis

Alternative hypothesis

There is dimensional change in the addition silicone Imprint 4 Penta Putty (3M ESPE™, Seefeld, Germany) and polyether Impregum Penta (3M ESPE™, Seefeld, Germany) after disinfection or sterilization after a 6-month storage period of the samples.

Null Hypothesis

There is no change in the dimensional stability of the addition silicone Imprint 4 Penta Putty (3M ESPE™, Seefeld, Germany) and polyether Impregum Penta Penta (3M ESPE™, Seefeld, Germany) after disinfection or sterilization after a 6-month storage period of the samples.

Materials and Methods

Figure 1— Cilindric matriz and metal ring.

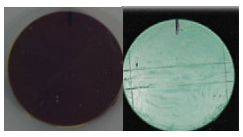


Figure 2— Polyether and addition silicone sample.

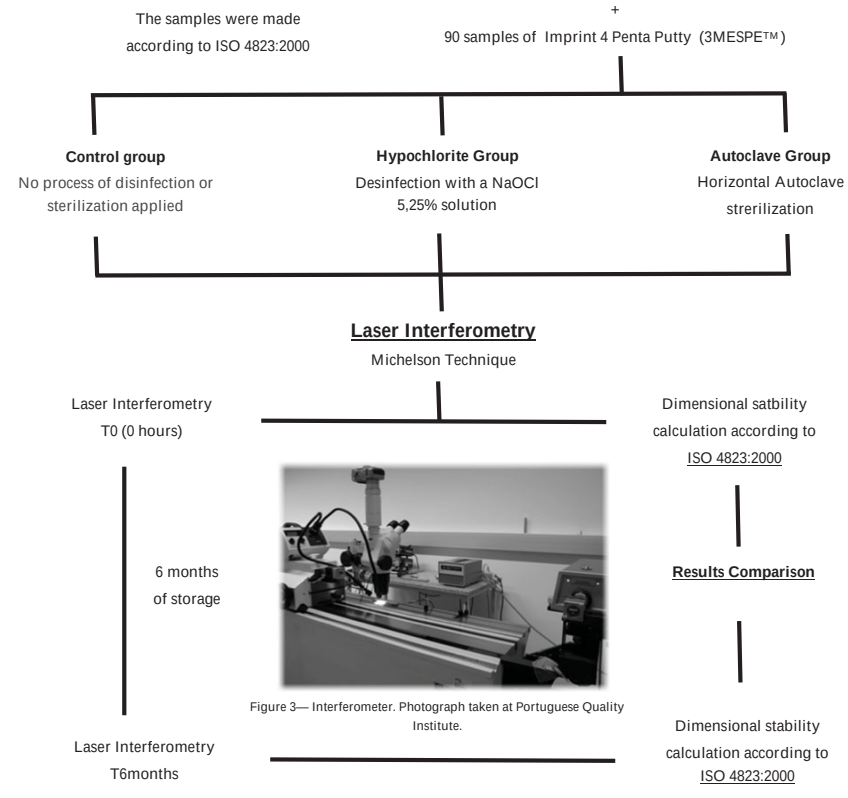


Figure 3— Interferometer. Photograph taken at Portuguese Quality Institute.

Results

$$dimensional\ changes\ (\%) = \frac{B - A}{A} \times 100$$

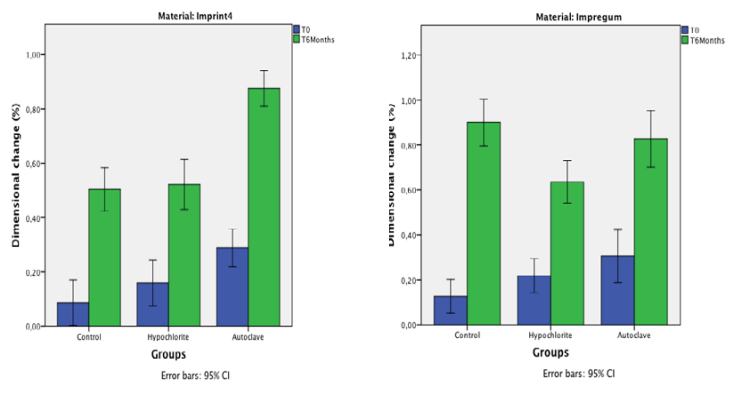
T-test for paired samples T6months—T0

		Mean	Stand. Deviation	Sig.
Impregum	**Control**	0.77	0.17	0.000
	Hypochlorite	0.42	0.19	0.000
	Autoclave	0.52	0.28	0.000
Imprint	**Control**	0.42	0.12	0.000
	Hypochlorite	0.36	0.09	0.000
	Autoclave	0.59	0.13	0.000

Table 1—T-test distribution for paired samples with a confidence interval of 95% for both materials.

P = 0,000 < 0,05

Statiscally significant expansion in all groups for both materials.



Graphic 1 and 2—Graphic representation of the dimensional changes at T0 ant T6months for both materials.

In the addition silicone, in both T0 and T6 months, the group that showed the lowest dimensional change was the control group, followed by the hypochlorite and autoclave groups.

In the polyether at T0 the group that showed the lowest dimensional change was the control, followed by hypochlorite and the autoclave. In the T6 months, the group with the highest dimensional change was the control group, followed by autoclave and then the hypochlorite.

Conclusion

The null hypothesis is rejected.

The polyether and addition silicone, in the long term, have dimensional changes when subjected to disinfection and sterilization.

The dimensional changes are verified to the fullest extent permitted by ISO 4823: 2000 (lower than 1,5%), which indicates that these are not clinically significant.

Despite of the results obtained in this research, new studies are needed.

Clinical Implications

The dimensional stability of impression materials subjected to disinfection, sterilization and long storage periods are critical to the success of the final prosthetic restoration.

The impressions can be used after 6 months of storage because there is no clinicaly significant dimensional change.

REFERENCES

Amin, W., Al-Ali, M., Tarawneh, S., Taha, S., Salch, M., & Ereifij, N. (2009). The effects of Disinfectans on Dimensional Accuracy and Surface Quality of Impression Materials and Gypsum Casts. Journal of Clinical Medical Reserach, 1(2), 81-89.

EN ISO 4823:2000 - Dentistry: Elastomeric impression materials, European Committee for Standardization.

Gelson, L. A., Zanarotti, E., Fonseca, R., & Santos Cruz, C. (1999). Effect of disinfectant agents on dimensional stability of elastomeric impression materials. The journal of prosthetic dentistry, 81, 621-4.

Kumar, R. N., Reddy, S., Karthigeyan, S., Punithavathy, R., Karthiik, K., & Manikandan, R. (2012). The effect of repeated immersion of gypsum cast in sodium hypochlorite and glutaraldehyde on its physical properties: An in vitro study. Journal of Pharmacy & BioAllied Sciences, 4(6), 353-357.

Nassar, U., Oko, A., Adeeb, S., El-Rich, M., & Flores, C. (Março de 2013). An in vitro study on the dimensional stability of a vinyl polyeter silicone impression material over a prolonged storage period. The journal of Prosthetic Dentistry, 109 (3), 172-178.

Pant, R., Juszczyk, A., Clark, R., & Radford, D. (2008). Long-term dimensional stability and reprodution of surface detail of four polyvinly siloxane duplicating materials. Journal of Dentistry , 36, 456-461.

Pimentel, L., Portugal, J., Vaconcelos, M., Rocha, P., & Sampaio-Fernandes, J. (2014). Influência no tratamento térmico na precisão de um silicone de adição autoclavável. Revista Portuguesa de Estomatologia , Medicina Dentária e Cirurgia Maxilo-Facial, 55(1), 43-48.

Sinobad, T., Obradovic-Djuricic, K., Nikolic, Z., Dodic, S., Lazic, V., Sinobad, V., et al. (2014). The effect of disinfectants on dimensional stability of addition and condensation silicone impressions. Vojnosanit Pregl, 71(3), 251-258.