Research Article

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To Compare Elastic Recovery of Different Elastomeric Impression Materials on Chemical Disinfection and Autoclaving

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ABSTRACT

Background: The autoclavable impressions which are dimensionally stable are effective in controlling the cross-infection and contamination caused by patient's saliva and other oral secretions. The aim of present study is to compare the elastic recovery of different elastomeric impression materials on chemical disinfection and autoclaving.

Material and methods: The present study compared the elastic recovery of different elastomeric impression materials on chemical disinfection and autoclaving. Materials used were AFFINIS, SPEEDEX. The change in length was measured, and percentage deformation was calculated which ultimately provided the elastic recovery. Data was analysed using SPPS 22 version software. $P < 0.05$ was considered as statistically significant.

Results: In the present study when elastomeric impression material was autoclaved elastic recovery of SPEEDEX was better than AFFINIS. When elastomeric impression material was chemically disinfected elastic recovery of SPEEDEX was better than AFFINIS. When elastomeric impression material was remain untreated elastic recovery of SPEEDEX was better than AFFINIS.

Conclusion: Present study concluded that when autoclaved, chemically disinfected and untreated elastic recovery of SPEEDEX was better than AFFINIS.

Keywords: Elastomeric impression, AFFINIS, SPEEDEX, elastic recovery.

INTRODUCTION

In Dentistry there are four groups of impression materials: polysulfides, polyethers, condensation, and addition silicones. These materials present four viscosities: putty- (type 0), heavy- (type 1), medium/regular- (type 2), and light-body (type 3). For the clinical use the most important difference between these materials is their dimensional stability.[1] Impression making is the primary step in the process of fabrication of an indirect prosthetic restoration. Precision of the impression material in terms of dimensional stability, surface detail reproduction, and compatibility with gypsum products is an essential prerequisite for a successful restoration. Elastomers are known for accuracy among the available impression materials.[2] Elastomeric impression materials have simplified restorative procedures in today's dentistry. Surface detail reproduction has improved with evolution

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from reversible hydrocolloid (agar) to polysulfide, then to condensation silicone and finally to polyether and vinyl polysiloxane materials.[3] The ideal impression material should exhibit adequate mechanical properties to withstand stresses under various clinical scenarios. Elastomeric impression materials offer high elastic recovery and acceptable flexibility on removal of the impression from the mouth.[4] The aim of present study is to compare the elastic recovery of different elastomeric impression materials on chemical disinfection and autoclaving.

MATERIAL AND METHODS

Present study compared the elastic recovery of different elastomeric impression materials i.e. AFFINIS (Coltene) (light body consistency addition cured PVS impression material) and SPEEDEX (Coltene) (light body consistency condensation-cured silicone impression material) on chemical disinfection and autoclaving. Both materials were treated with disinfectant (SURFASEPT S.A, aldehyde free disinfectant solution, containing isopropyl alcohol - 70% w/w and chlorhexidine gluconate - 2.5% w/w) and steam autoclaving. The specimens prepared for elastic recovery were dumbbell shaped. These typical dumbbell-shaped specimens were created to exert a uniform pressure across the gripping surfaces. As the tension increases, it prevents slippage to favor failure of the specimens in the straight reduced section.[5] These specimens were prepared with the help of a metal die with a lower and upper member. The lower member had an aluminum mold of dimensions of 11.5 cm × 5 cm × 1 cm. It had an hour glass shape recess cut to a thickness of 1 mm. It also had two holes placed diagonally at two corners for seating the stops present in upper member. The upper member consisted of an aluminum lid covering the lower member. It had six escape holes for the excess material to flow so as to get a 1 mm consistent thickness of the specimen. The lid also had two stops placed diagonally on the two corners to get a stable stop while seating the upper member on the lower member. For measuring the elastic recovery, 30 specimens for each of the two test materials were prepared by placing the material in the lower member and cover it with the upper member, and over that a 5 lb weight was placed while the excess material flows out of the escape holes to get a consistent 1 mm thickness of the specimen. The samples were trimmed to the dimensions of an acrylic stencil (A - 3.8 cm, B - 0.9 cm, C - 0.6 cm, D - 0.4 cm) with the help of Bard Parker blade. The thickness was measured with a digital Vernier caliper to rule out any discrepancy. Hence, 10 specimens of each impression material, i.e., a total of 60 samples were prepared. The samples were divided into 3 groups which included the group 1 to be autoclaved, Group 2 to be disinfected, and group 3 was untreated group. These groups were further subdivided into 3 subgroups of AFFINIS, SPEEDEX and test materials. The silicone impression specimens which were allocated to the autoclave treatment group were placed on sterilization trays and underwent a standard autoclave cycle at 134°C for 18 minutes. For disinfection procedure, specimens were placed in chemical disinfectant SURFASEPT S.A for 10 min and then rinsed under the tap for 30 seconds. After the sterilization of all specimens, they were bagged and sealed for subsequent analysis within 24 hours. The prepared specimens were mounted on Instron universal testing machine by clamping the ends in the serrated jaws of the testing apparatus. Tensile load of 10 mm/min was applied. The elongation at break was measured in millimeters. After the specimen had been pulled to failure, the broken parts were fitted back together and the distance between the marks was measured using an electronic caliper with a resolution of 0.01 mm after 2 hours. The change in length (Δ L) was measured, and percentage deformation was calculated which ultimately provided the elastic recovery. Data was analysed using SPPS 22 version software. $P < 0.05$ was considered as statistically significant.

RESULTS

In the present study when elastomeric impression material was autoclaved elastic recovery of SPEEDEX was better than AFFINIS. When elastomeric impression material was disinfected elastic recovery of SPEEDEX was better than AFFINIS. When elastomeric impression material was remain untreated elastic recovery of SPEEDEX was better than AFFINIS.

Table 1: Comparison of elastic recovery of two elastomeric impression materials (%)

Group	Elastomeric material	Mean ± SD
Group 1	AFFINIS	96.4±0.543
	SPEEDEX	98.4±0.756
Group 2	AFFINIS	98.3±0.344
	SPEEDEX	98.7±0.432
Group 3	AFFINIS	99.1±.0279
	SPEEDEX	98.5±0.235

DISCUSSION

When an impression is removed from the mouth, the material must withstand the forces associated with separating the impression from the tooth and its surrounding tissues. The material located at or close to undercut areas could permanently deform on removal. Thus, elastic recovery is important in determining the accuracy of an impression material.[6]

Ideally, the maximum elasticity was observed in polyvinyl siloxanes (PVS) because of their good elastic recovery and resistance to deformation and high tear strength. PVS has a property to deform at much slower rates than other elastomeric impression materials and tear at points of less permanent deformation.[7] PVS represents best elastic recovery than polyether and polysulfide.[8] PVS is the impression material which can withstand sterilization procedure and yet can produce an accurate cast.[9]

In the present study when elastomeric impression material was autoclaved elastic recovery of SPEEDEX was better than AFFINIS. When elastomeric impression material was disinfected elastic recovery of SPEEDEX was better than AFFINIS. When elastomeric impression material was remain untreated elastic recovery of SPEEDEX was better than AFFINIS.

Johnson *et al.*[10] and Walker *et al.*[11] studied the effect of surface moisture on detail reproduction of elastomeric impressions and concluded that PE produced the best detail under moist conditions compared to polyvinyl siloxane (PVS) materials.

Lacy et al. measured the time-dependent accuracy of elastomeric impression materials and concluded that PVS were the most stable of all elastomers.[12]

The autoclavable impression material available in market is AFFINIS. This newly introduced PVS impression material is accurate and dimensionally stable for clinical use when steam autoclaved at 134°C for 18 min.[13]

CONCLUSION

Within the limitations of the present study it can be concluded that when autoclaved, disinfected and untreated elastic recovery of SPEEDEX was better than AFFINIS.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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