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EXPERIMENTAL INVESTIGATION OF EFFECT OF LIGHT-BODY MATERIAL SPACE ON THE ACCURACY OF CASTS RESULTING OF TWO-STAGE IMPRESSION TECHNIQUE IN TWO TYPES OF ADDITIVE SILICONE

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ABSTRACT

Background and aim: A precise impression making is a critical component to make fixed prostheses. Additional silicones are considered as accurate impression materials. The purpose of this study was to evaluate the effect of the light body space on the accuracy of the casts made by two-step impression technique in two additional silicones.

Materials and Methods: Two additional silicone impression materials used in this study were Elite HD (Zhermack, Italy) and Express (3M ESPE, USA). Impressions were made from a stainless steel master model using two-step technique. Thickness of light-body material (0.5, 1, 1.5 and 2 mm) was provided by using four copings and one group was used

without any space. Fifteen casts were made for each thickness, therefore, a total of 150 casts were provided. Casts were formed in Elite Rock Stone Type IV (Zermack, Italy) according to the manufacturer's instructions. Dimensions were measured for casts and master model with accuracy of 0.01 mm. Two-way analysis of ANOVA was used to evaluate the main and interaction effects of two studied variables, and one-way analysis of ANOVA was used to identify the simple main effect of these variables.

Results: The results showed that there were not any significant discrepancies in dimensions between the master model and final casts poured with both the additional silicone materials, or using two-step impression technique with/without light-body space, (P> 0.05).

Conclusion: This study showed that two-step putty wash impression technique using Elite HD or Express additional silicones resulted in excellent outcomes with or without light body spaces.

Keywords: Additional silicones, Dimensional accuracy of impression materials, Impression technique

1- INTRODUCTION

Impression to prepare replica of oral structures is an important part in fixed prosthesis (1-2). If the major cast in term of dimensional structures do not conform patient's mouth structure will lead to prosthesis with poor compliance, then we will be forced to repeat impression (1). This will cause an increase in the number of meetings with patients, increasing the economic costs and time-consuming treatment (3). There are many controversies regarding the effect of different materials and techniques to create the best and most accurate impression. Among different impression materials, additive silicon as one of the highest accurate and in terms of dimension with the most stable materials are introduced (4). In impression with additive silicon different techniques used (5). Some studies have shown that due to its high accuracy of additive silicone, type of used technique has not effect on the impression accuracy (6,7). However, some studies impression technique known as major factor in dimensional accuracy (8). The most common method of impression in fixed prosthodontics one-step and two-step with space. However, there is some space to increase the dimensional accuracy of impression (15-9).

A survey by Brian j Miller et al in 1998 in England the amount of surface defects in the form of silicon with two single-stage and two-stage impression technique was investigated. There is no statistical significant difference between the different

materials used in each of the techniques; however, there are statistical significant differences between one-step and two-step techniques. As the number of surface defects in a two-stage technique is far less. Finally, the researchers stated that the two-step impression technique is more accurate and appropriate than the one-step impression technique (16). Nissan et al in 2002 to determine the amount wash needed to produce casts with a maximum carefully carried out. The results showed that the size of the cast from impression with a thickness of wash 1 mm and 2 mm were prepared in comparison with thickness 3 mm is closer to the master model. These researchers announced two-step technique space 2 mm is best impression technique (17). Shah in 2004 dimensional stability of elastomer impression material includes a polyether and additive silicone evaluated. Based on study casts made from polyether and additive silicone has very high accuracy (18). Forrester-Baker et al in 2005 compared the dimensional accuracy of the three types of additive silicone. The results showed that dimensions were significantly different in the dimensions of metal model. However, dimensions of impressed cast of mold in comparison with the initial model did not show a statistically significant difference. Based on these findings, any dimensional changes in the impression process can be compensated during the shedding cast (19). In Caputi and Varvara in 2008 dimensional accuracy molds with four mono-phase impression technique, one-step and two-step technique Poti / light - body and innovative two-stage procedure consisting of injection mold were investigated. In this study, it was concluded that Poti / Light - Body two-step technique and injection two-step technique provide the best accuracy in the final cast (20).

A study by Mahshid et al in 2004, accuracy of 3 two-stage impression technique of space, two-step without space and one-step impression with Speedex material were investigated.

The results imply that there is a significant difference between the three techniques in all aspects. The two-step impression techniques with space in all aspects two other more accurate techniques, but undercut one-step is preferable than two-step impression technique without space (2). In other studies conducted in 2010 by Pereira and in 2011 by Alzarea et al additive silicon over the 4 week showed the best stability (29-28). Due to the fact, few studies of the effects of space wash or light body is examined on the accuracy of the final cast and in this regard is limited. This research plans in response to

controversies effects of the Light-Body on the final dimensional accuracy of the two-stage impression technique in two kinds of additive silicone (Zhermack, Italy) Elite HD and Express (3M ESPE, USA) examined.

2-MATERIAL AND METHODS

In this experimental study using laboratory model Schleier et al (22) designed a new model Fig and that this laboratory model (master model) with the following characteristics was made. Template contains a metal plate in the form of arch contains four basic and the second guide groove in the metal plate 4 mm and a depth of 1 mm is designed. A metal tray of stainless steel perforated metal plates was made with 2 bumps the size of the groove and the metal plates were bumps in the guide groove. As other is more than handle impression and the extraction of template from the mouth of the pattern was removed and the distance between the base dimensions given in Figure (1).

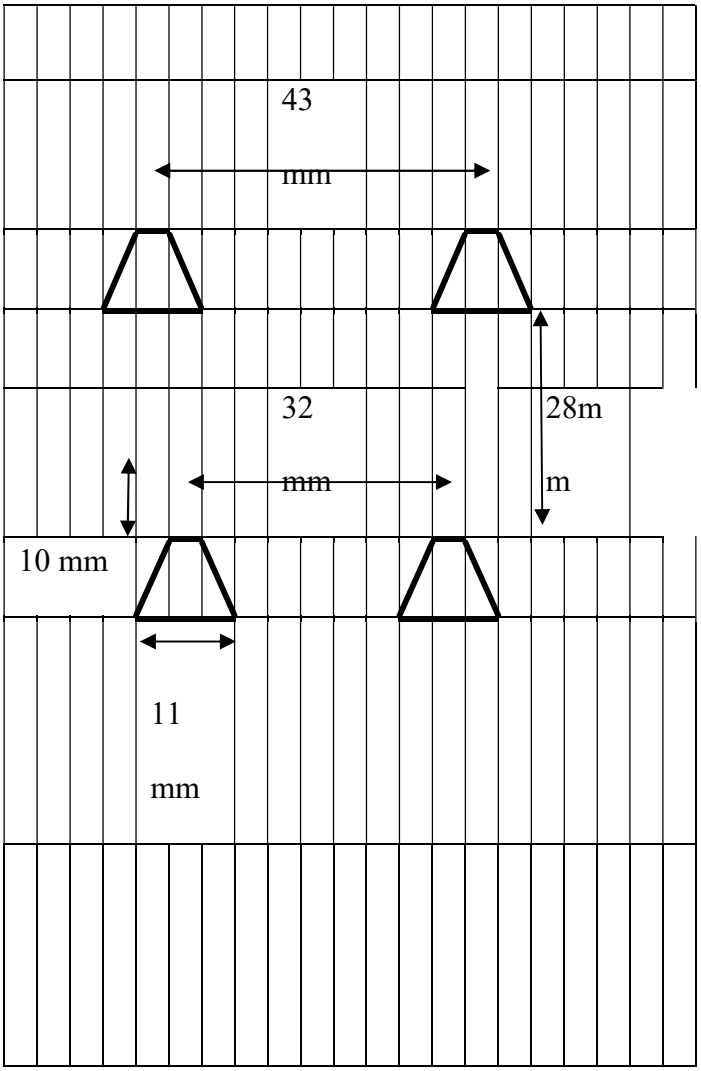

Figure 1: extraction of template from the mouth of the pattern was removed and the distance between the base dimensions given in

According to Schleier et al studied a narrow abutment contraction (taper) 6 degrees and 12 degrees to the vertical axis and intersecting grooves on the occlusal surface of the abutment created the center of this intersection as a reference point for measuring the base is ready to measured (4). Copings number of stainless steel with a thickness of 0.5, 1, 1.5 and 2 mm in diameter is considered. The copings using CNC computer design of the original model built computers and devices used to create a spacer on each abutment are considered (Figure 2) and shape (3).

Figure 2: Schematic view of the model

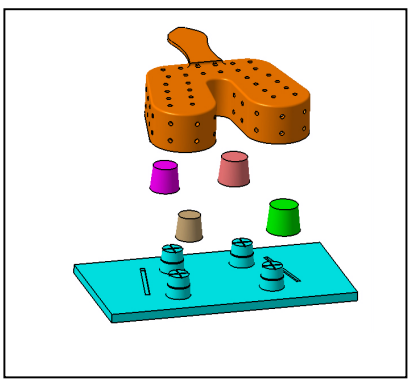

Figure 3: main model

3-RESULTS

Data analysis study currently under way ANOVA two-way ANOVA revealed the effect of each independent variable space Light-body material and additive silicon was not statistically significant. In addition, there was no significant interaction between these two variables together. This test showed that measuring none of the dimensions of casts resulting of two-step impression technique significant difference between the two types of additive silicone in the spaces 0.5, 1, 1.5 and 2 and without space matter Light-body models with standard dimensions does not exist. In other words, the dimensional accuracy of the technique in two types of additive silicone Elite HD and Express used in different areas of the Standard Model is not the same.

Table 1: Comparison distance between anterior pillars of the central criterion on the basis of casts resulting of two phases impression technique with different space Light-body matter in two types of additive silicone

Comparison groups	The distance between the anterior base of the central criterion on base (mm) Mean±SD	F	P.value*
Additive silicone Express without space Light-body	0.046 ± 31.979	3.82= F	0.25=P Non-significant
Additive silicone Express in space 5.0 mm Light-body	0.041 ± 31.980		
Additive silicone Express in space 1 mm Light-body	0.020 ± 31.981		
Additive silicone Express in space 1.5 mm Light-body	0.029 ± 31.977		
Additive silicone Express in space 2 mm Light-body	00.06 ± 31.982		
Additive silicone Elite HD without space	0.026 ± 31.981		
Additive silicone Elite HD in space 5.0 mm Light-body	0.038 ± 31.980		
Additive silicone Elite HD in space 1 mm Light-body	0.016 ± 31.977		
Additive silicone Elite HD in space 1.5 mm Light-body	0.013 ± 31.979		
Additive silicone Elite HD in space 2 mm Light-body	0.017 ± 31.978		
Standard Model	0.005 ± 31.985		

*one-way ANOVA

Table 2: Comparison distance between posterior pillars of the central criterion on the basis of casts resulting of two phases impression technique with different space Light-body matter in two types of additive silicone

Comparison groups	The distance between the posterior base of the central criterion on base (mm) Mean±SD	F	P.value*
Additive silicone Express without space Light-body	0.064 ± 42.840	1.99= F	0.24=P Non-significant
Additive silicone Express in space 5.0 mm Light-body	0.043 ± 42.838		
Additive silicone Express in space 1 mm Light-body	0.017 ± 42.833		
Additive silicone Express in space 1.5 mm Light-body	0.014 ± 42.838		
Additive silicone Express in space 2 mm Light-body	0.006 ± 42.837		
Additive silicone Elite HD without space	0.045 ± 42.839		
Additive silicone Elite HD in space 5.0 mm Light-body	0.056 ± 42.837		
Additive silicone Elite HD in space 1 mm Light-body	0.059 ± 42.836		
Additive silicone Elite HD in space 1.5 mm Light-body	0.022 ± 42.836		
Additive silicone Elite HD in space 2 mm Light-body	0.013 ± 42.840		
Standard Model	0.07 ± 42.840		

*one-way ANOVA

Table 3.3 Comparison distance between anterior and posterior pillars of the central criterion on the basis of casts resulting of two phases impression technique with different space Light-body matter in two types of additive silicone

Comparison groups	The distance between the anterior and posterior base of the central criterion on base (mm) Mean±SD	F	P. value*
Additive silicone Express without space Light-body	0.045 ± 28.398	1.21= F	0.29=P Non-significant
Additive silicone Express in space 5.0 mm Light-body	0.064 ± 28.437		
Additive silicone Express in space 1 mm Light-body	0.088 ± 28.441		
Additive silicone Express in space 1.5 mm Light-body	0.019 ± 28.379		
Additive silicone Express in space 2 mm Light-body	0.006 ± 28.392		
Additive silicone Elite HD without space	0.046 ± 28.417		
Additive silicone Elite HD in space 5.0 mm Light-body	0.042 ± 28.416		
Additive silicone Elite HD in space 1 mm Light-body	0.038 ± 28.418		
Additive silicone Elite HD in space 1.5 mm Light-body	0.043 ± 28.422		
Additive silicone Elite HD in space 2 mm Light-body	0.016 ± 28.391		
Standard Model	0.001 ± 28.397		

*one-way ANOVA

4- DISCUSSION

A precision mold for fixed prosthodontics is very important. For this purpose, the use of additive silicone impression materials is due to favorable physical properties and dimensional stability is common. Generally increase with two-stage impressions technique with silicon putty - wash is done. In this technique, the thickness of the wash is one of the factors that can affect the dimensional stability of the final cast. In the present study, the effect of thickness zero, 0.50, 1, 1.5 and 2 mm Light-Body material on the accuracy of the final cast was examined. For that Light-Body matter to provide the desired thickness, before the impression with putty matter four copings number with a thickness of 0.5, 1, 1.5 and 2 mm on each abutment was placed. This method results in Light-Body material thickness provide precisely the desired level. In two studies conducted by Nissan and Eames study the same methods were used (8, 17, 24).

Comparing the dimensions of the casts showed the effects of thickness zero, 0.50, 1, 1.5 and 2 mm Light-Body material is not too different from the carefully molded. In addition, in comparison with the standard model casts significant difference was observed which indicates the accuracy of the technique used. In confirmation of these findings, the study showed Nissan thicknesses of 1 mm and 2 mm of wash to be accurate casts. However, as observed by the investigator thickness of 3 mm wash material did not such precision (8). Eames study molded

with condensation silicone in the study that had been done, the effect thicknesses of 2, 4 and 6 mm of wash on the dimensional accuracy evaluated and it was determined wash with a thickness of 2 mm, which is a higher dimensional accuracy (24). Lewinstein in explaining the cause of decrease with increasing thickness precision molding wash expressed in high thicknesses, unequal contractions occur in the body wash, resulting in heterogeneous formats dimensional changes (25). It seems that this phenomenon when wash thick is more than 2 mm its effect will be revealed. However, Tjan reported spaces 2 to 6 mm have no impact on the plaster casts accuracy (26). Tjan findings probably due to conflict with other studies is different techniques and materials. The researchers used mono-phase technique in the study.

In the present study in a group, impression without copings was done. In other words, control over the thickness of Light-Body mater not applied. Measurement of casts size obtained in this group showed that the group with other groups. As well as the size of the standard model has no significant difference, which shows good efficiency, embedded in these groups. In two studies conducted by Hung and Idris observed in cases, there is no control on the amount of wash space and there is no statistical difference between accuracy of the two-stage technique with the space and one-step technique (6, 7). Based on the findings of studies conducted by these two researchers and the results of this study it can be concluded the dimensional accuracy of casts of additive silicone molds rather than be dependent on the type of technique is related to the type of impression material. Concurring with high precision impression additive silicone material, increasing silicon previous studies have classified among the most accurate impression materials (15, 18).

5-CONCLUSION

The results of this study showed that putty - wash additive silicon two-step impression techniques with accuracy without the space is desirable. The effect of Light-Body material thicknesses with controlled spaces 5 0.50, 1, 1.5 and 2 mm and the thickness of the wash material (without space) on the final dimensional accuracy are not different from each other and two Elite HD and Express additive silicone in two-stage impression technique are not different in terms of accuracy.

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