



Accuracy of implant impressions obtained from different types and viscosity of silicone impression materials

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ABSTRACT

Background: An impression is a negative imprint of an oral structure that is used to create a positive reproduction of the structure for use in prosthesis or dental restoration manufacturing, or as a permanent record. The present study was conducted to assess the accuracy of implant impressions obtained from different types and viscosity of silicone impression materials.

Materials & Methods: Two dental implants holes were drilled in the lower lateral incisor in both sides in the lower edentulous cast, two implants fixtures size 12mm/Ø4 of Dentium Company inserted in the drilled holes. Three types of impression technique used and the evaluation of the accuracy of the impression technique with different impression materials were tested. Group I: closed tray technique (Monophase A-silicone impression material, Heavy/light body A-silicone type impression material and putty/light body C-silicone type impression materials) (n=10). Group II: Open tray technique (Monophase A-silicone impression material, Heavy/light body A-silicone type impression material and putty/light body C-silicone type impression materials) (n=10). Group III: Snap-On Impression technique (Monophase A-silicone impression material, Heavy/light body A-silicone type impression material and putty/light body C-silicone type impression materials) (n=10).

Results: The inferential statistical results between different groups are highly significant ($P < 0.05$).

Conclusion: When it comes to impression materials, condensation silicone impression material is less accurate than monophase addition silicone impression material. For implant impressions, more silicone impression material is advised. When it came to imprint technique, Snap-On technique outperformed open and closed approach in terms of three-dimensional transmission. The Snap-On impression technique's three-dimensional precision was on par with the open-tray technique's. With monophase and heavy body type A, the accuracy of the open-tray impression technique was higher than that of the closed-tray technique.

Keywords: Dental implant, silicone impression, Putty

INTRODUCTION

An impression is a negative imprint of an oral structure that is used to create a positive reproduction of the structure for use in prosthesis or dental restoration manufacturing, or as a permanent record.^{1,2} A high level of detail and accuracy in the impression is required to appropriately relate an implant abutment or implant analog to other structures in the dental arch.³ The open tray impression approach is regarded as a direct imprint technique that enables the dentist to unscrew the impression's retaining screw, allowing the impression to be removed entirely along with the coping.⁴ Although the impression process for a closed tray is different from an open tray one in that the dentist cannot remove the screw holding the impression coping since it is concealed by the impression materials.^{5,6}

Another method, known as the snap on impression technique, is a hybrid that makes use of both of the previously discussed methods. Elastomeric imprint materials are typically utilized in implant applications.⁷ These are silicone, polysulfide, and polyether. Impressions materials in various viscosities, such as monophase, heavy body, and light body silicone, as well as condensation silicone.⁸ The present study was conducted to assess the accuracy of implant impressions obtained from different types and viscosity of silicone impression materials.

MATERIALS & METHODS

Two dental implants holes were drilled in the lower lateral incisor in both sides in the lower edentulous cast, two implants fixtures size 12mm/Ø4 of Dentium Company inserted in the drilled holes. Three types of impression technique used and the evaluation of the accuracy of the impression technique with different impression materials were tested. Group I: closed tray technique (Monophase A-silicone impression material, Heavy/light body A-silicone type impression material and putty/light body C-silicone type impression materials) (n=10). Group II: Open tray technique (Monophase A-silicone impression material, Heavy/light body A-silicone type impression material and putty/light body C-silicone type impression materials) (n=10). Group III: Snap-On Impression technique (Monophase A-silicone impression material, Heavy/light body A-silicone type impression material and putty/light body C-silicone type impression materials) (n=10). Impression copings were removed and parallelism gauges attached to the implant then CBCT was taken for all casts using SOREDEX CBCT machine. A demand system software measuring the distances between the parallelism gauges in 4 points, the measurements compared by one way ANOVA Table with multiple comparison LSD tests applied. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Descriptive Statistics of (Monophase A-, Heavy/light body, putty/light body) C-silicone type impression materials by use 3 different technique

Parameters	Mean	SD
CO	18.36	0.13
MO	18.13	0.43
MC	18.28	0.57
MI	18.39	0.18
HAO	18.21	0.19
HAC	18.25	0.21
HAI	18.24	0.35
HCO	18.29	0.15
HCC	18.37	0.16
HCI	18.32	0.11

Table I shows that the inferential statistical results between different groups are highly significant ($P < 0.05$).

Table II Open tray technique ANOVA test between control group and different material groups

LSD OPEN TECH				
		Mean Difference (I-J)	SD	P value
MO	HAO	-.057	0.82	0.75
	HCO	-.082	0.94	
HAO	HCO	-.026	0.97	

Table II shows that the inferential statistical results between different groups are non-significant ($P > 0.05$).

Table III Closed tray technique ANOVA test and LSD between control group and different material groups

LSD OPEN TECH				
		Mean Difference (I-J)	SD	P value
MC	HAC	0.0072	0.24	0.65
	HCC	-.156	0.21	
HAC	HCC	-.164	0.28	

Table III shows that the inferential statistical results between different groups are non-significant ($P > 0.05$).

Table IV Snap on impression technique ANOVA test and LSD between control group and different material groups

LSD MI TECH				
		Mean Difference (I-J)	SD	P value
MI	HAI	0.025	0.48	0.89
	HCI	-.0176	0.19	
HAI	HCI	-.104	0.57	

Table IV shows that the inferential statistical results between different groups are non-significant ($P > 0.05$).

DISCUSSION

The abutment analogues on the working castings must relate in the same way as the implant abutments intra-orally in order to provide a stress-free implant supported prosthesis.⁹ Thus, the key to guaranteeing precise fitting of the finished prosthesis is taking accurate impressions and creating the cast.¹⁰ The framework could be divided into sections and put back together if it is not passively seated, but this would take time and provide a weaker and more complicated prosthetic framework.¹¹ Research evaluating implant imprint accuracy against tools like measuring microscopes, strain gauges, Vernier callipers, or micrometers could only quantify in two dimensions.¹²

The present study was conducted to assess the accuracy of implant impressions obtained from different types and viscosity of silicone impression materials.

We found that the inferential statistical results between different groups are highly significant ($P < 0.05$). Akça and Cehreli¹³ found that the angular and positional accuracy of the Snap-On closed-tray technique with stock tray and vinyl polysiloxane impression material were similar

to the open-tray and same impression material²⁸. Also reported similar or even less three-dimensional displacement for the Snap-On technique in comparison to the direct technique.

Jameel et al¹⁴ evaluated the accuracy of implant impressions obtained from different types and viscosity of silicone impression materials. (Addition silicone monophase, addition silicone (heavy/light body) and condensation silicone (putty/light body)). Descriptive statistical analysis show that the best result of the dimensional accuracy obtained with monophase A-silicone type impression material when compared with the other types of materials used.

Teo et al¹⁵ compared the three-dimensional accuracy of indirect plastic impression copings and direct implant-level impression copings from three implant systems (Nobel Biocare [NB], Biomet 3i, and Straumann [STR]) at three interimplant buccolingual angulations (0, 8, and 15 degrees). Two-implant master models were used to simulate a three-unit implant fixed partial denture. Test models were made from Impregum impressions using direct implant-level impression copings (DR). Abutments were then connected to the master models for impressions using the plastic impression copings (INDR) at three different angulations for a total of 18 test groups (n = 5 in each group). Three-way analysis of variance showed that the implant system had a significant effect on 3D distortions and absolute angular distortions in the x- and y-axes. Interimplant angulation had a significant effect on 3D distortions and absolute angular distortions in the y-axis. Impression technique had a significant effect on absolute angular distortions in the y-axis. With DR, the NB and 3i systems were not significantly different. With INDR, 3i appeared to have less distortion than the other systems. Interimplant angulations did not significantly affect the accuracy of NBDR, 3iINDR, and STRINDR. The accuracy of INDR and DR was comparable at all interimplant angulations for 3i and STR. For NB, INDR was comparable to DR at 0 and 8 degrees but was less accurate at 15 degrees.

CONCLUSION

Authors found that when it comes to impression materials, condensation silicone impression material is less accurate than monophase addition silicone impression material. For implant impressions, more silicone impression material is advised. When it came to imprint technique, Snap-On technique outperformed open and closed approach in terms of three-dimensional transmission. The Snap-On impression technique's three-dimensional precision was on par with the open-tray technique's. With monophase and heavy bodytype A, the accuracy of the open-tray impression technique was higher than that of the closed-tray technique.

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