



Comparison of accuracy of direct implant transfer with and without splitting obtained from impression made in advance stock tray and custom tray- an in vitro study

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Abstract

Background: The impression-taking technique is one of the most critical factors that not only prevents the shrinkage caused by polymerization but also enhances the accuracy of implant impressions.

Objective: The Objective of the study is to Compare accuracy of direct implant transfer with and without splitting obtained from impression made in advance stock tray and custom tray- an in vitro .

Methodology: Describe Detail in Methodology section

Result: There was statistically significant difference between marginal discrepancy of reference bar on the casts produced by custom tray impression on splinted transfer copings with other technique. The differences between other techniques (Groups IA, IB and IIB) were not significant. (P>0.05) The custom tray with shows less marginal discrepancy than the advance stock tray. The splinting technique shows less marginal discrepancy than the non splinting technique. The open custom tray with splinting showed more accuracy than other techniques. Statistically, the differences between other three techniques were not significant. All the impression technique were in the clinically acceptable range.

Conclusion: It was concluded that all the techniques and tray showed similar accuracy. The choice of impression technique should be made according to the clinical situation and operator's preference.

Keywords: implant, accuracy, stock tray, custom tray

Introduction

The success of implant-supported prostheses is directly related to the passive union between the prostheses connections and the implants themselves. Reproducing the intraoral relationship of implants through impression procedures is the first step in achieving an accurate, passively fitting prosthesis. [1,2,3]

Two types of impression are made for implants: Implant level impression and abutment level impression. Implant level impressions can be either

direct or indirect impression. In some studies comparing direct and indirect methods for dimensional stability of cast models, direct method was found to be more accurate. [4,5]

The open tray technique requires the use of custom impression tray. To achieve a more precise, faster, and easier impression of several dental implants, a new advance impression tray was developed which has a patented foil technology with a 15µm – thick plastic polyamide film on the occlusal surface

capable of being perforated by the impression transfer screws when they are positioned.^[3,4,5] This tray is known as mira implant impression tray. Further, impression copings can be splinted for making implant impressions. The principle of splint technique is to connect all the impression copings together using a rigid material to prevent individual coping movement during the impression making. Studies on implant impression techniques revealed that implant impressions made with custom tray are more accurate than conventional stock trays.^[5,6] The present in vitro study was undertaken to compare the accuracy of direct implant transfer with and without splinting obtained from impression made in advanced stock tray and custom tray.

MATERIALS AND METHOD

A clear acrylic resin edentulous model of mandibular arch was fabricated for the study. Two implant analogues (Cowellmedi Co. Ltd) were placed in the region of 33 and 43 of the acrylic resin model. Abutments (Cowellmedi Co. Ltd) were screwed to the implant analogue. Plastic patterns (Cowellmedi Co. Ltd) (cap) were screwed over abutments and connected with wax and casted in cobalt chromium alloy using conventional casting procedure to fabricate the reference bar. The accurate fit of the reference bar to abutments was verified by use of a travelling microscope. The transfer copings were splinted with dental floss (Icpa Health Products Pvt. Ltd) and autopolymerizing acrylic resin. The transfer copings were tied up with 4 complete loops of dental floss and splinted with autopolymerizing acrylic resin before making of the impression. Then, it was sectioned in the center and re-united with acrylic resin to minimize the polymerization shrinkage. Four experimental groups were created combining two impression trays and two impression techniques. For each group, ten impressions were made.

Group I – Impression made with mira implant impression tray

Group IA – Impression made with splinted impression copings

Group IB – Impression made with non-splinted impression copings

Group II – Impression made with custom tray

Group IIA – Impression made with splinted

impression copings

Group IIB – Impression made with non-splinted impression coping

Group I: A soft putty and light body elastomeric impression (Dentsply) material was used to make impression with advanced implant impression tray (Miratray Implant; Hager and Werken GmbH). **Group II:** A medium body (Monophase) elastomeric impression (Dentsply) material was used to make impression with custom tray. PVS adhesive (Dentsply) was applied to the custom tray.

Casts were poured with ADA type IV gypsum product (Die stone) (Kalabhai Karson Pvt. Ltd) as per manufacturer's instructions. After setting of die stone, transfer copings were unscrewed from implant analogs and casts with implant analogs were retrieved. All casts were stored at room temperature for a minimum of 24 hours before measurements were made. Accuracy of casts produced by different impression techniques was measured using the reference bar. One end of reference bar was screwed with the abutment and measurements were made on the other end. Vertical gap between abutment and bar was measured at the three points (Buccal, Lingual and Distal) of the non screwed end using the travelling microscope (Olympus Co. Ltd). Measurement of the screwed end was then performed after unscrewing it and screwing the other end in a similar manner.

Mean and standard deviation of specimens in each group was calculated. Comparison of marginal discrepancy caused by different implant impression techniques was done by one way analysis of variance followed by Post Hoc Tukey's analysis for pair wise comparison. Level of significance was set at the probability level of $P \leq 0.05$.

RESULT

Data obtained was tabulated and subjected to statistical analysis. One way analysis of variance (ANOVA) of mean values was performed to make multiple comparisons and Post Hoc Tukey's test for pair wise comparisons. The level of significance was set at $p \leq 0.05$.

Table 1 shows statistical analysis for marginal discrepancy of casts produced by different impression trays and techniques. On subjecting the

mean marginal discrepancy values to on one way analysis of variance (ANOVA), the value of P (0.009) indicates that there was significant difference

between marginal discrepancy of reference bar on the casts produced by different impression trays and techniques. (P<0.05)

Source of variance		Sum of Squares	df	Mean Square	F	Sig.
Impression tray and Technique	Between Groups	75.699	3	25.233	4.438	0.009
	Within Groups	204.706	36	5.686		
	Total	280.405	39			

Table 1- One Way Analysis of variance for marginal discrepancy of casts produced by different implant impression trays and techniques

*Level of significance P ≤ 0.05

	Mean Difference	Std Error	P VALUE
Group IA VS Group IB	0.16600	1.06642	0.999
Group IA VS Group IIA	3.16500	1.06642	0.026
Group IA VS Group IIB	-0.16700	1.06642	0.999
Group IB VS Group IIA	2.99900	1.06642	0.038
Group IB VS Group IIB	-0.33300	1.06642	0.989
Group IIA VS Group IIB	-3.33200	1.06642	0.018

Table 2- Post Hoc Tukey’s analysis for pair wise comparison of impression techniques and trays

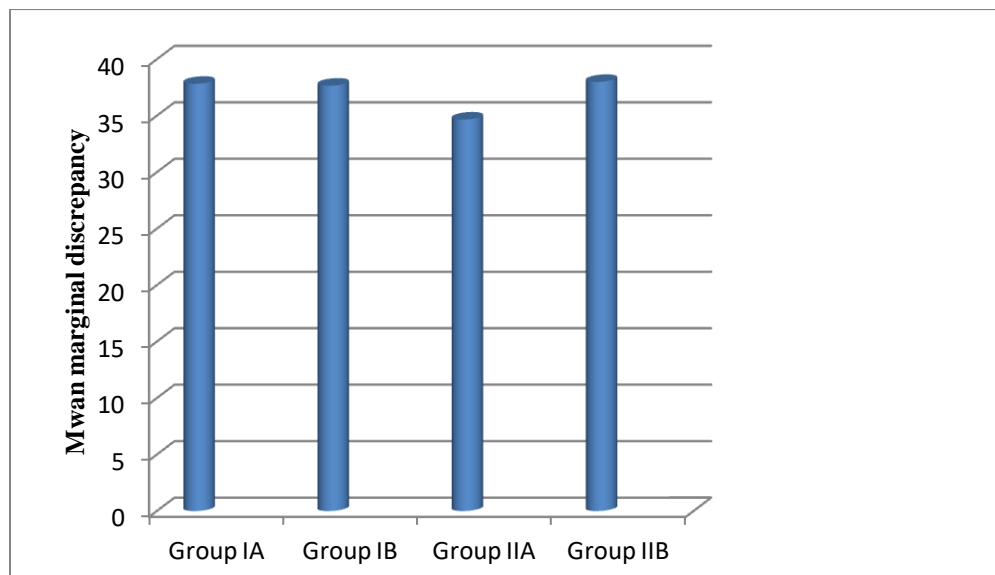
*Level of significance P ≤ 0.05

Group	N	Subset for alpha = 0.05	
		1	2
IIA	10	34.6630	
IB	10		37.6620
IA	10		37.8280
IIB	10		37.9950
Sig.		1.000	.989

Table 3- Summary of Post Hoc Tukey’s analysis for pair wise comparison of impression technique and trays

Means for groups in homogeneous subsets are displayed.

Table 2 and 3 show Post Hoc Tukey’s analysis for pair wise comparison of marginal discrepancy of casts produced by different impression trays and techniques. There was statistically significant difference between marginal discrepancy of reference bar on the casts produced by custom tray impression on splinted transfer copings (Group IIA) with other technique(Group IA, IIB and IIB). ($P < 0.05$) The differences between other techniques (Groups IA, IB and IIB) were not significant. ($P > 0.05$) (Graph 1)



Graph 1: showing difference between Technique of making impression

DISCUSSION

Studies related to impression making have focused on impression techniques and/or materials. Impression techniques are based on either the direct or indirect transfer of components, but different impression materials and trays can be used depending on the preferred impression method. At the present time, only few studies have been conducted to analyze the accuracy of the casts obtained with the advance stock impression tray in comparison with the conventional custom impression tray.^[7,8] Therefore, this study was taken up to compare the accuracy of direct implant transfer with and without splinting obtained from impression made in advanced stock tray (Mira tray) and custom tray.

The results of the present study indicate that custom tray impression technique for direct implant transfer was better than advance stock tray (Mira tray). This result was in consensus with the result of Juliana et al who concluded that the impression made with custom tray was more accurate than the mira tray.^[9] Jason et al also found that the impression executed with custom tray and stock tray showed a statistically significant difference. The custom tray impression show more accurate results than stock tray.^[10,11]

The reason for accurate impression of custom tray could be that the custom trays are more stable and allowed a homogenous thickness of the material and consequently more accurate casts.^[12,13] A disadvantage of the mira tray is that unlike the conventional custom tray, it is not individualized and it is not rigid. Because it has certain flexibility, it may

distort in the act of impression making if the tray size is not large enough; it, therefore, could interfere with anatomic structures and caused deformation of the cast.

In the present study splinted custom tray impression technique was found more accurate than non splinted custom tray impression technique. This result was in consensus with the results of previous studies. Previous researches also concluded that the direct splinted technique was the most accurate than other techniques. [14,15] Humphries et al, Hsu et al, and Herbst et al found no significant difference between the values obtained with acrylic resin splinted versus unsplinted copings in impression techniques. [16,17] Inturregui et al and Burawi et al reported that the splinted technique exhibited more deviation discussion from the definitive cast than the splinted technique. [18,19]

In the non splinted group the distortion mainly resulted from the polymerization related shrinkage of impression material. [4,5,10,18] The splinted transfer copings improve the stability of impression coping and due to this accuracy of impression is increased. [20,21]. The accuracy of splinted impression technique depends upon its resistance to deformation under the forces of impression. The splinting may provide stabilization of transfer copings under the torque from analog tightening and reduce rotational freedom within a resilient impression material. [22,23] Therefore a splinting procedure is recommended before making impressions of implant supported prosthesis to decrease the amount of distortion.

Yung K et al and Juliana M et al stated that in implant supported prosthesis marginal discrepancy ranging from 90 to 150 μ m is clinically acceptable. [24,25] Only 2 implant analogues were taken to compare splinting technique. The marginal gap measurements were made only once per reference point, which could have incorporated errors. Repeated measurements at the same point could have been made to confirm the reading.

CONCLUSION

The custom tray with shows less marginal discrepancy than the advance stock tray. The splinting technique shows less marginal discrepancy than the non splinting technique. The open custom tray with splinting showed more accuracy than other

techniques. Statistically, the differences between other three techniques were not significant. All the impression technique were in the clinically acceptable range. Therefore, it was concluded that all the techniques and tray showed similar accuracy. The choice of impression technique should be made according to the clinical situation and operator's preference.

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