ORIGINAL ARTICLE

Evaluation of accuracy and time taken to make an open tray implant impressions with two techniques

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ABSTRACT

Implant dentistry's emergence and acceptance have provided physicians with a wide range of new options for fixed and removable rehabilitation. The eventual replacement of the lost tooth is the ultimate success, and this can be accomplished using recognized prosthodontic methods. The present study aims to evaluate the time and dimensional accuracy of implant definitive models with an open tray impression with two different techniques. Impression was made in two different techniques and the cast was poured and checked for the time taken and the accuracy of the impression. In IBM SPSS software version 23.0 all the results were statistically analyzed. An Independent *t*-test was performed for the parameters. No statistically significant difference was present ($P > 0.05$) when comparing the accuracy and time taken between the two groups. It is concluded that time taken and the misfit is less for modified open tray impression techniques when compared to the regular open tray impression.

Key words: Accuracy, discrepancy, implants, innovation, open tray impression, time

INTRODUCTION

For making a final prosthesis, a good impression is required, which replicates the intra-oral structures.[1,2] The accuracy of the master cast is also determined by the accuracy of the impression. Incorrect recording of impressions leads to mechanical and/or biological complications such as implant fracture, implant abutment fractures, screw loosening, screw fracture, and occlusal discrepancies,[3,4] increased plaque accumulation due to undesirable hard and soft-tissue reactions.[5-8]

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Obtaining a passive fit prostheses is optimal for the long-term success of any implant treatment. Long-term implant stability will be compromised by an ill-fitting prosthesis.[9] According to the literature supporting this hypothesis, clinically good fitting prosthesis will create a significant amount of misfit load but no loss of osseointegration.[10,11] Gaps <60 μm are difficult to measure clinically.[2,12] Basic impression techniques for implants are implant level impressions (open tray impression, closed tray impression), abutment level, and digital impression.

The aim of this *in vitro* study is to compare two impression techniques for evaluating the time and dimensional accuracy of implant definitive models with open tray impressions. Our team has extensive knowledge and research experience that has translated into high-quality publications.[1,2,13-37]

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MATERIALS AND METHODS

Model preparation

A mandibular edentulous styrofoam model was taken and three implants placed in between the mental foramen region [Figure 1]. The tentative implant locations should be marked on the cast based on the visible healing abutments. A single wax chimney was created around the implant sites. An acrylic special tray should be made to cover the entire edentulous ridge and also over the walls of the wax chimney [Figures 2 and 3]. Open tray impression copings should be placed on the implants and tightened (torqued) to 20 N-cm.

The copings should be splinted together with 23 gauge SS wire or dental floss and reinforced with pattern resin and an IOPA taken to verify [Figures 4-8]. The tray chimney should be sealed with wax such that the imprints of the implant copings indent the wax. Monophase material should be loaded in the tray and also between the copings it should be injected and the tray should be seated such that the copings and the marks made on the wax over the chimney align with one another. The wax roof over the chimney should be removed and the excess material inside the coping screw channel should be excavated with an explorer. The impression coping should be removed from the implant and tightened onto the lab analog. To achieve the right emergence profile in the restoration, a soft tissue mask and a silicone soft tissue replica are necessary. A low expansion type 3 dental stone has been used to make models for implant restoration.

Whereas in the new impression technique, a modified special tray should be made in which it covers the open tray implant copings and a small rectangular slot is placed on the labial side of the special tray [Figure 3]. Here the copings are not splinted to each other, Monophase impression is injected between the copings and impression is made and impression material which is covering the top portion of the impression copings should be scraped/removed and then the splinting of the impression copings to impression tray with the help of pattern resin. The pattern resin should encircle the copings and it is extended to the labial surface of the tray and is engaged into the rectangular slot. After setting the impression material, the coping screws are removed, a soft tissue mask is placed and a cast is poured.

The time taken for making these 2 impressions are recorded with the help of a stopwatch and the accuracy of the impression is evaluated by doing the jig verification of the control cast with the 2 experimental casts and checking for discrepancy under stereo electronic microscope in 3 areas [Figure 9].

Figure 1: Implants placed in a styrofoam model with implant open tray copings

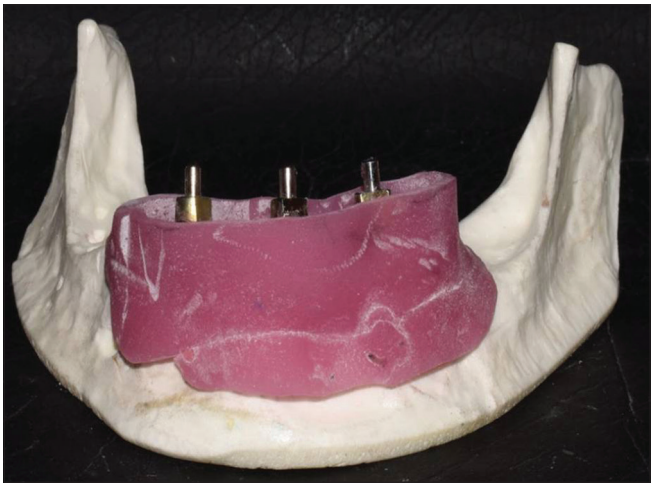

Figure 2: Conventional open tray made with polytray

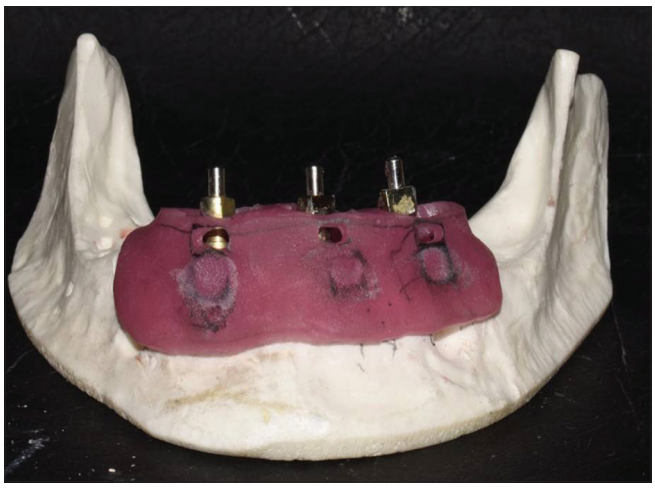

Figure 3: Modified impression tray made with polytray

RESULTS

The mean time for making a regular open tray impression time is 8.80 mins and the modified open tray impression technique is 6.88 mins and the *P*-value(>0.05) is found not statistically significant [Tables 1 and 2].

When discrepancy was evaluated on mesial,buccal and distal aspects, the mean discrepancy for regular open tray impression are .0980, .0686, .0986 and for modified open tray impression technique are .0880, .0350 and .0500 respectively and the *P*-value (>0.05) is found not statistically significant [Table 3 and Figure 8].

DISCUSSION

In the present study, the accuracy and time taken to make two open tray impression techniques were evaluated. The time taken for making a modified impression technique is less compared to the regular open tray impression; however, the statistics showed no significant differences between groups.

The results of this study, as measured by the vertical fit discrepancy, in both techniques showed 10 µm difference in medians. This is presumably of very little clinical consequence, mainly as it has been demonstrated that measuring gaps shorter than 60 µm is challenging clinically. In comparison to the original model, models made from an

Table 1: The time taken for making implant impressions for both the techniques

Conventional	New technique
8:51.85	7:11.67
9:11.54	7:56.13
8:9.49	6:63.72
8:91.21	6:81.41
9:05.67	6:86.84
8:65.81	7:03.72
8:98.56	6:75.84
8:66.79	6:66.71
8:65.26	6:71.44
8:43.19	6:76.57

Figure 4: Splinting of impression copings with floss

Figure 5: Splinting of impression copings to the custom tray with pattern resin

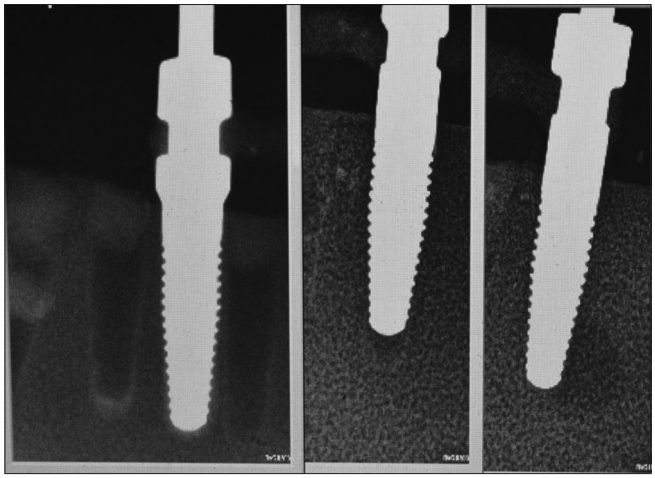

Figure 6: IOPA of the control model. IOPA: Intra Oral Periapical radiographs

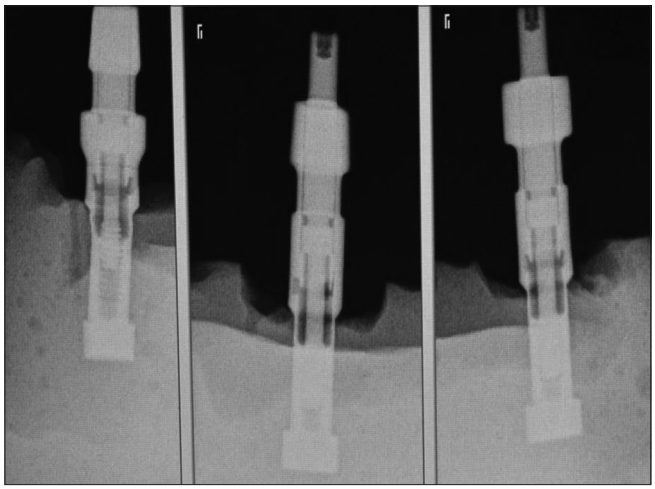

Figure 7: IOPA of the conventional implant open tray impression after pouring the cast. IOPA: Intra Oral Periapical radiographs

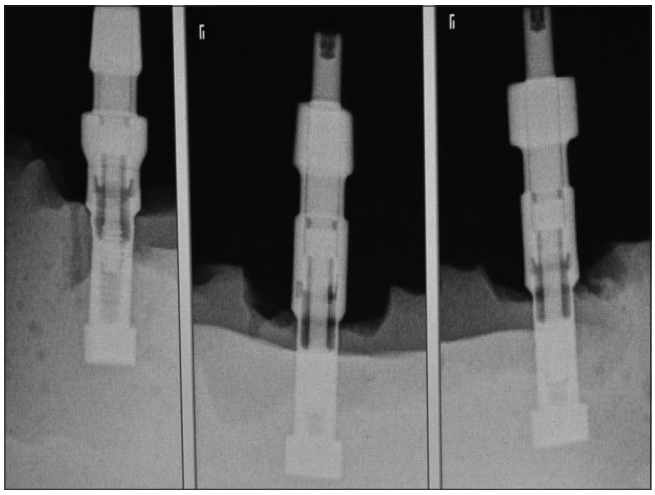

Figure 8: IOPA of the modified implant open tray impression after pouring the cast. IOPA: Intra Oral Periapical radiographs

Table 2: The average time taken for making both the impressions and the *P* >0.05 is found not to be statistically significant

Type of impression	Mean	SD	*P*
Regular open tray impression	8.80	13.664	0.803
Modified open tray impression	6.88	17.240	

SD: Standard deviation

Table 3: The marginal discrepancy of two different techniques on three different surfaces and the *P* >0.05 is found not to be statistically significant

Location	Groups	Mean	SD	*P*
Mesial	Regular impression	0.0980	0.01687	0.100
	Modified impression	0.0880	0.10983	
Buccal	Regular impression	0.0686	0.01345	0.478
	Modified impression	0.0350	0.00972	
Distal	Regular impression	0.0986	0.02035	0.104
	Modified impression	0.0500	0.01054	

SD: Standard deviation

open tray impression show a variation in distances between analogs in samples. The impression tray withdrawal path/pattern, which puts greater stress on the impression materials, could be the cause of increased distortion.

Despite the lack of a consistent finding for higher accuracy with one impression technique over the other impression technique, splinting or nonsplinting. Many studies indicate that for accurate implant impressions, splinting of copings technique is preffered than the nonsplinting technique. Some authors have mentioned problems such as distortion of materials used for splinting and fracture of the link between splinting material and implant open tray impression coping when using the splinting technique.[38] Some examined the implant impression accuracy in a variety of lab processes

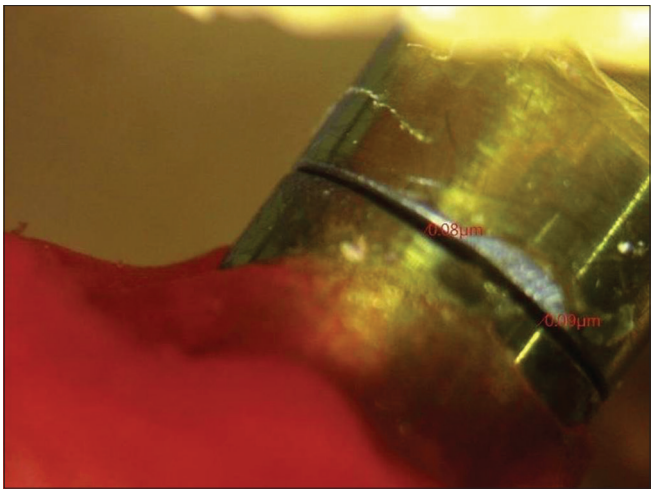

Figure 9: Marginal discrepancy is seen between the implant and the impression coping under the stereo electronic microscope of the cast, which is made of conventional open tray technique

and discovered that the nonsplinting technique was more precise during the impression-making process.[39,40]

CONCLUSION

The present *in vitro* study concludes that the time taken and accuracy for making an open tray implant impression is faster in the new modified technique when compared to the regular open tray impression.

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Conflicts of interest

There are no conflicts of interest.

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