# Comparative evaluation of positional accuracy in multiple implant using closed tray impression technique with different impression material: an invitro study

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### Abstract

**Background:** To evaluate positional accuracy in multiple implant using closed tray impression technique with different impression material.

**Materials & Methods:** Customized trays were utilized to create impressions using polyether and vinylsiloxane ether materials. Mann whitney U test was done. The results were analysed using SPSS software.

**Results:** The highest mean deviation from the master cast dimension was observed in the closed tray method.

**Conclusion:** In closed tray impression technique, both polyether and vinyl siloxanether showed same results.

Keywords: implant, closed tray technique.

# Introduction

The use of dental implants has greatly broadenend the scope of clinical dentistry, creating additional treatment options in complex cases in which functional rehabilitation was previously limited or inadequate .Dental implants have provided alternative treatments to conventional removable prosthesis for partially and completely edentulous patients. In implant prosthodontics an important factor for success with implant supported restoration is the passive fit between the superstructure and the abutments. Non passive prosthesis may result in mechanical and biologic consequences leading to loss integration and ultimately implant of failure.<sup>1</sup>Meticulous accurate implant and prosthodontic procedures are recommended asa means to attain the best possible result. The implant castis the foundation on which the prosthesis is indirectly fabricated. The use of the implant cast as a reference for extraoral implant framework fit facilitates the clinician' sevaluation of fit. The accuracy of the implant cast depends on the impression accuracy which in turn depends upon the type of impression material, the implant impression technique, die material accuracy and the implant master cast technique. Reproducing the intraoral relationship of implants through impression procedures is the first step in achieving an accurate, passively fitting prosthesis in case of implant

supported restorations. The transfer technique uses tapered copings and a closed tray to make an impression. The copings are connected to the implants, and an impressionis made and removed from the mouth, thereby leaving coping intraorally. Subsequently the copings are removed and connected to the implant analogs and then the coping-analog assemblies are inserted in the impression before pouring the definitive cast. The clinical situations which indicate the use of the closed tray technique are when the patient has limited inter arch space ,tendency to gagor if it is too difficult to access an implant in the posterior region of the mouth.<sup>2</sup> Hence, this study was conducted to evaluate positional accuracy in multiple implant using closed tray impression technique with different impression material.

# Materials & Methods:

Customized trays were utilized to create impressions using polyether and vinylsiloxanether materials. For the research, a total of 20 impressions were produced. The impressions were taken with closed impression technique. Comparing the x-y-z co-ordinates between the implant analogs in master casts fabricated by making impressions of master model using close tray techniques were done. Mann whitney U test was done. The results were analysed using SPSS software.

### **Results:**

The highest mean deviation from the master cast dimension was observed in the closed tray method. The difference was statistically non- significant at X axis, Y axis and Z axis analyzed using Mann whitney U test. The comparison of the different materials along the X axis, Y axis and Z axis was statistically non-significant when analyzed using Mann Whitney Testatp $\leq 0.05$ .

Table 1: closed group						
		Mean				
	GROUP	Deviation	Std. Deviation	P value		
DEVX	Closed	0.0175	0.02410	0.6		
DEVY	Closed	0.0138	0.03521	0.82		
DEVZ	Closed	0.0135	0.17520	0.64		

Mann Whitney U testatp≤0.05is significant

Table 2. http://esslon.material.m.closeu.technique							
	G2SGA	G2SGB	P value				
DEVX	0.012	0.035	0.5(NS)				
DEVY	0.0165	0.0075	0.6(NS)				
DEVZ	0.0852	-0.0542	0.42(NS)				

Table 2: impression	material in	closed	technique
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# Discussion

Endosteal implants distribute the physiologic loads ontothe surrounding supporting tissues. In natural teeth, the periodontal ligament compensates for minor inaccuracies of positioning of the abutments. However, the integrated implants are not mobile; therefore, it is important to ensure an accurate relationship on the definitive cast for fabrication of passive fit prosthesis. The primary purpose of the implant impression is to transfer the implant/abutment position from the oral cavity to the master cast. The impression material for implants should be rigid enough to hold the impression copings and minimize positional distortion during replica positioning.<sup>3</sup> Hence, this study was conducted to evaluate positional accuracy in multiple implant using closed tray impression technique with different impression material. In the present study, the highest mean deviation from the master cast dimension was observed in the closed tray method. A study by Burns et al (2003) evaluated a study to demonstrate the accuracy of open tray implant impressions comparing polycarbonate stock impression trays and rigid custom made impression trays to make implant fixture level impressions. Gold cylinder pairs, splinted by gold bars (reference frameworks) were constructed on an aluminium typodont. Polyether impressions were made of 2 pairs of Brånemark 3.75mm diameter fixtures mounted in an aluminium typodont, with 3 stock impression trays, 3 close-fit custom trays, and 3 spaced custom impression trays, by use of an open tray technique. The casts produced were assessed for accuracy by attaching the reference frameworks with alternate single screws and

measuring the vertical fit discrepancy of these reference frameworks to the analogs within the working cast using a traveling microscope. The results showed that the rigid custom trays produced more accurate impressions than polycarbonate stock trays.<sup>4</sup> In the present study, the difference was statistically non- significant at X axis, Y axis and Z axis analyzed using Mann whitney U test. The comparison of the different materials along the X axis, Y axis and Z axis was statistically nonsignificant when analyzed using Mann Whitney Testatp≤0.05. Another study by Lee H. (2008) evaluated the effect of subgingival depth of implant placement on the accuracy of implant impressions. A stone master model was fabricated with 5 implant analogs embedded. The vertical position of the shoulders of the implants was intentionally different among the implants. The vertical and horizontal distances of the casts were measured with for the master model. There was no effect of implant depth on the accuracy of the VPS group. However, for the polyether group, the impression of an implant placed 4 mm subgingivally showed a greater horizontal distortion compared to an implant placed more coronally. Adding a 4-mm extension to the retentive part of the impression coping eliminated this difference. <sup>5</sup>Marafie et al (2008) assessed the retention strength of impression materials to a tray material using different adhesive methods .Three common types of impression materials were selected: irreversible hydrocolloid, vinyl polysiloxane, and polyether. The impression adhesives were conventional adhesives which were categorized as paint on or spray on and self-stick dots for impression-to-tray retention was tested. Aluminium plates were fabricated. The appropriate conventional adhesive or the self-stick dots were applied to the plates. An in vivo pilot test was performed to measure the rate at which each type of material actually separated from the mouth during clinical procedure. Force at first separation was divided by plate area (peak stress). Five replications per test condition were made, and results were analyzed using ANOVA. It was concluded that use of the selfstick adhesive system provided significantly lower retentive strength to plastic tray material than chemical adhesives for irreversible hydrocolloid, vinyl polysiloxane, and polyether impression materials. <sup>6</sup>Assuncao et al (2008) evaluated the influence of surface abrasion of transfer coping to obtain a precise master cast for a partially edentulous restoration with different inclinations. A metal matrix measuring  $3.5 \times 2.0 \times 2.0$  cm3 was fabricated using anodized aluminum. Two implants with external connections of  $3.75 \times 10.0 \text{ mm2}$  were positionedat 90° and 65° in relation to the horizontal matrix representing a two-implant partially surface edentulous arch. A total of 30 impressions were made using open tray technique. Total 30 customized open impression travs were fabricated using autopolymerizing acrylic resin allowing uniform thickness of the impression material. Total 30 impressions were made using polyether as an impression material and all the impressions were poured with type v stone plaster. The implant analogue's inclination was recorded in degree of inclination for each specimen and compared with metal matrix implants inclination (M), using graphic computation software, which is the software often used for measurement of angles. The study concluded that technique TA presented more accurate master casts than TRS and TAA techniques.<sup>7</sup>Abrol (2017) compared the master casts obtained using different surface treatments on impression copings for single tooth implant placement. An acrylic resin dentulous model of maxillary arch was fabricated with an internal connection 4 mm x 10.5 mm implant in 16 region to simulate a clinical situation. A total of 60 samples were made (15 samples for each group). A total of 15 samples for Group I were prepared with untreated impression copings, 15 samples for Group II with impression copings treated and modified by application of tray adhesive only. Group III includes 15 samples which were fabricated with impression copings modified by making four vertical grooves on surface of impression coping and coated with adhesive. Group IV had 15 samples which were fabricated with impression copings sandblasted with 50 µm aluminisum oxide powder and coated with adhesive. Profile projector was used to evaluate the rotational accuracy of the implant analogs. It was

showed that sandblasted and adhesive coated impression copings showed minimum amount of rotation than those with vertical slots and adhesive coated impression copings. 8Auroy, Nicolas and Bedouin (2017) evaluated the torque resistance of impression copings after a direct impression, that is, the amount of rotational torque sufficient to induce irreversible displacement of impression copings in the impression material bulk once the impression has been made. A controlled twisting force was applied to each impression coping. A torque tester recorded the torque variation. Three elastomeric impression materials Aquasil Ultra Monophase DECA, Aquasil Ultra Xtra DECA and Impregum Penta Soft have been evaluated without adhesive, the adhesive bond between the impression coping and the surface of the impression material was always the first subjected to torque. When an adhesive was interposed at the interface, the cohesive bond of the adhesive was subjected to stress. The present investigation demonstrates that the polyether impression material is the direct impression material that showed the highest breakdown threshold for adhesive bonding when used without an adhesive. The use of an adhesive on impression copings leads to irreversible deformation of the interface at torque stresses well below the adhesive bond threshold of the same materials used without an adhesive.<sup>9</sup>

# Conclusion:

In closed tray impression technique, both polyether and vinyl siloxan ether showed same results.

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