



An in Vivo Evaluation of Prosthetic Implant Performances in Open and Closed Tray Implant Impression Techniques: A Clinical (Original Research) Study

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KEYWORDS

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ABSTRACT:

Background & Aim: Long term implant success is dependent on several factors including surgical and prosthetic factors. In prosthetic factors, impression technique plays a key role. This in vivo study was planned and aimed to evaluate the prosthetic implant performances in open and closed tray implant impression techniques.

Materials and Methods: In this study, all 16 patients were studied for implant prosthetic performances with 2 different implant impression techniques. Authors included both male and female patients in the age range of 26-41 years. Only single implant placement cases were selected in the study. In 8 patients, implant impression was done by open tray impression technique (Group 1). In next 8 patients, implant impression was done by closed tray impression technique (Group 2). Clinical absence of any soft tissue and hard tissue problem and presence of optimal chewing efficiency and esthetics was noted in terms of Satisfactory. Any alteration from these parameters were noted as Non-satisfactory and Questionable statuses as per their severity. Patients were recalled in their post operative phases and asked about the treatment and related performances. P value less than 0.05 was considered as significant ($p < 0.05$).

Statistical Analysis and Results: Statistical analysis was completed by statistical software; Statistical Package for the Social Sciences. Maximum 5 patients were noticed in the age range of 30-33 years and 34-37 years (each). P value was highly significant for 26-29 years (0.01). Minimum 3 patients were found in the age range of 38-41 years and 26-29 years (each). Total 8 male and 8 female patients were studied distinctively. In Group 1 ($n=8$), 5 patients were totally satisfied with open tray impression technique however; 2 patients were not satisfied and 1 was Questionable. In Group 2 ($n=8$), 4 patients were totally satisfied with closed tray impression technique however; 3 patients were not satisfied and 1 was Questionable. One-way ANOVA revealed highly significant p value (0.001).

Conclusion: In the present study, authors stated that implants with open tray technique showed superior performances as compared to closed tray technique. Suggestions of this study must be clinically correlated and verified prior to their clinical applications.



Introduction

Implant impression procedure have been extensively experimented by investigators in the recent pasts. Commonly open and closed tray impression techniques are being used worldwide for making implant impressions.^{1,2} Literature has well evidenced that both techniques can be used for making optimal impression but at the same time operator must be aware of their advantaged and disadvantages. Open tray technique are said to be accurate especially in the region of non parallel implant placements.^{3,4} Open tray technique usually allows impression with individual coping placement. Open tray technique is frequently used in clinically challenging situations like poor access/non-parallelism. Many researchers have stated that Open tray technique is a time consuming process and highly complex that closed tray technique. Closed tray technique is not that much accurate than earlier one. Closed tray technique is generally used with single and multiple parallel implant situations. Closed tray technique is considered comparatively simple and user friendly technique.⁵⁻⁷ Many of the clinicians have stated that closed tray technique has risk of locking the impressions at its place and therefore it can harm to underlying tissues and patient. Therefore, this in vivo study was planned and aimed to evaluate the prosthetic implant performances in open and closed tray implant impression techniques.

Materials and Methods

This study was conducted in the department of Prosthodontics of the institute in which total 16 patients were studied in details. All 16 patients were studied for implant prosthetic performances with 2 different implant impression techniques. Authors have conducted the study in the patients who have undergone for implant placement at the department of Prosthodontics and Crown & Bridge of the institute only. To avoid any possible gender bias, we included both male and female patients in the age range of 26-41 years. Only single implant placement (mandibular posterior region) cases were selected in the study. The sample selection was purely based on simple randomized techniques. One implant per patient strategy helped us in optimizing data quality and reliability in between samples. Various exclusion criteria included: heart issues, kidney diseases, pregnancy, anemia, and patients with poor oral hygiene habits, active smokers, gutka and other form of tobacco consumers, uncooperative patients. Primary inclusion criteria were single missing teeth in lower posterior arch with completely formed/healed underlying bone. Other inclusion criteria were satisfactory oral hygiene status. Before surgical placement procedure for implant, an all-inclusive history was noted including demographic details and

other related entities. Written and signed informed consent was taken from all participants. Local anesthesia administration was used appropriately in all cases to control intra-operative pain. In 8 patients, implant impression was done by open tray impression technique (Group 1). In next 8 patients, implant impression was done by closed tray impression technique (Group 2). Absence of any soft tissue and hard tissue problem/pain and other symptoms/mobility and presence of optimal chewing efficiency and esthetics was noted in terms of Satisfactory. Any alteration/deviation from these parameters were noted as Non-satisfactory and Questionable statuses as per their severity. Patients were recalled in their post operative phases and asked about the treatment and related performances. It was noted at first 9 months. Results thus obtained was compiled and sent for necessary statistical analysis. P value less than 0.05 was considered as significant ($p < 0.05$).

Statistical Analysis and Results

All the obvious findings and observations were gathered and sent for statistical evaluation using statistical software Statistical Package for the Social Sciences version 22 (IBM Inc., USA). The finalized data was subjected to suitable statistical tests to calculate p values and other statistical inferences. Patient's reactions feedbacks and replies were categorized as satisfactory, non-satisfactory and Questionable and analyzed further. For the ease of study, all the Patients were categorized into four age groups. Table 1 and graph 1 confirmed about the Age & Gender based statistical explanation of all patients. Maximum 5 patients were noticed in the age range of 30-33 years and 34-37 years (each). P value was highly significant for 26-29 years (0.01). Minimum 3 patients were found in the age range of 38-41 years and 26-29 years (each). Total 8 male and 8 female patients were studied distinctively. Table 2 stated about the fundamental statistical explanation with level of significance assessment using "Pearson Chi-Square" test and interpreted as satisfactory or non-satisfactory or Questionable statuses (open tray impression technique) after 9 month of loading procedures. Here Group 1 ($n=8$) samples are discussed for their relevant detailing. 5 patients were totally satisfied with open tray impression technique however; 2 patients were not satisfied and 1 was Questionable with open tray impression technique. P value was highly significant for performance analysis of 5 satisfied patients. Table 3 stated about the fundamental statistical explanation with level of significance assessment using "Pearson Chi-Square" test and interpreted as satisfactory or non-satisfactory or Questionable statuses (closed tray impression technique) after 9 month of loading



procedures. Here Group 2 (n=8) samples are discussed for their relevant detailing. 4 patients were totally satisfied with closed tray impression technique however; 3 patients were not satisfied and 1 was Questionable with closed tray impression technique. P value was highly significant for performance analysis of 3 non-satisfied patients. Table 4 showed and confirmed about the assessment amongst all 2 studied groups using one-way ANOVA. Several statistical parameters and factors have been seen and analyzed here like Degree of Freedom, Sum of Squares, Mean Sum of Squares, F. This revealed highly significant p value (0.001).

Table 1: Age & Gender based statistical explanation of contributing patients

Age Group (Yrs)	Male	Female	Total	P value
26-29	1	2	3	0.01*
30-33	2	3	5	0.30
34-37	4	1	5	0.10
38-41	1	2	3	0.50
Total	8	8	16	*p<0.05 Significant

Graph 1: Patients demographic allocation and associated details

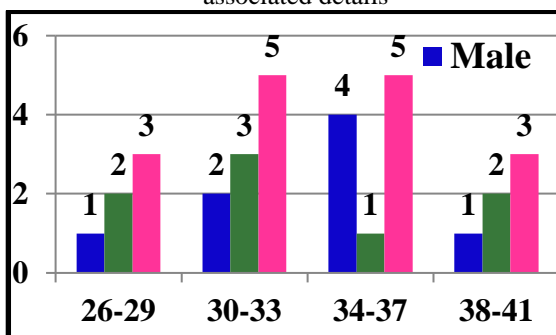


Table 2: Fundamental statistical explanation with level of significance assessment using “Pearson Chi-Square” test and interpreted as satisfactory or non-satisfactory or Questionable statuses (open tray impression technique) after 9 month of loading procedures (Group 1, n=8)

Status	n	St at. Mean	St d. Dev.	St d. Error	9 5 % C I	Pearson Chi-Square	d f	p value
After 6 Months								
Satisfactory	5	1.25	0.78	0.532	1.1	1.876	1	0.01*

Non-satisfactory	2	1.04	0.360	0.098	1.49	1.097	2	0.09
Questionable	1	1.01	0.230	0.940	1.2	1.904	2	0.08
*p<0.05 significant								

Table 3: Fundamental statistical explanation with level of significance assessment using “Pearson Chi-Square” test and interpreted as satisfactory or non-satisfactory or Questionable statuses (closed tray impression technique) after 9 month of loading procedures (Group 2, n=8)

Status	n	St at. Mean	St d. Dev.	St d. Error	9 5 % C I	Pearson Chi-Square	d f	p value
After 6 Months								
Satisfactory	4	1.17	0.875	0.876	1.36	1.988	1	0.34
Non-satisfactory	3	1.22	0.285	0.430	1.7	1.433	2	0.02*
Questionable	1	1.01	0.230	0.940	1.2	1.904	2	0.07
*p<0.05 significant								

Table 4: Assessment amongst all 2 studied groups using one-way ANOVA

Variables	Degr ee of Freed om	Sum of Squares Σ	Mean Sum of Squares mΣ	F	Lev el of Sig. (p)
Between 2 groups	4	1.894	1.765	1.2	0.001*
Within 2 groups	19	3.439	0.097	-	-
Cumulative	134.72	17.590	*p<0.05 significant		

Discussion

Dental impressions are usually primary step of fabricating rehabilitative prosthesis.^{8,9} An impression is negative imprint or replica of prosthesis bearing tissue



which is made at the time of crystallization of the material.^{10,11} Implant impressions are highly imperative and must be accurately captured to ensure maximum performance and durability of the prosthesis.^{12,13} Literature has well evidenced about several concepts and school of thoughts about the implant impressions and techniques. Open tray and closed tray impressions are highly popular and practiced in these regards.¹⁴⁻¹⁶ Gallucci and other colleagues have studied in detail about the Clinical accuracy outcomes of closed-tray and open-tray implant impression techniques for partially edentulous patients. Their inferences were highly comparable with our results and outcomes.¹⁷ Daoudi and other coworkers have experimented about the three implant level impression techniques for single tooth implant.¹⁸ Agarwal and other researchers have stated about the Dentist's Perspective for Open- or Closed-Tray Impression Technique.¹⁹ Osman and other clinician have experimented and studied in detail about the Implant impression accuracy of parallel and non-parallel implants: a comparative in-vitro analysis of open and closed tray techniques.²⁰ Their inferences were highly comparable with our results and outcomes. Kim and other workers had checked for -tray impression versus intraoral digital scan for implant-level complete-arch impression.²¹ Similarly Liu and other workers have studied in detail about the accuracy of Different Implant Impression Techniques.²² Their presumptions were highly equivalent with our results and outcomes. Asli and others have studied about the Three-dimensional accuracy of innovative implant-level impression techniques with plastic snap-on impression copings.²³ Yuvashree and other researchers have experimented about the Closed Tray Implant Impression Techniques Using Snap-On and Impression Analogues on a Clinical Radiographic Scale. They also favored the open tray technique as seen in our results.²⁴

Conclusion

Our study results undoubtedly demonstrated the clinical performances of implant prosthesis fabricated with 2 different impression techniques in studied patients. Within the limitations of the study authors concluded that open and closed tray implant impression techniques are viable techniques with their own limitations and contraindications. Nevertheless, implant's overall performance and durability depends on numerous interconnected factors and patient responses. In the present study, authors stated that implants with open tray technique showed superior performances as compared to closed tray technique. Recommendations of this study must be clinically correlated and verified prior to applying. However, authors expect few large scale studies to be conducted in these regards.

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