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Minimal Pressure versus Selective Pressure Impression Technique Used For Mandibular Two Implants Over denture Construction: Radiographic Evaluation

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ABSTRACT purpose: to compare between two different impression concepts of two implant assisted complete mandibular overdenture regarding the residual alveolar bone height changes.

Materials and Methods: Ten healthy complete edentulous patients were selected and Then, divided into two equal groups; group I received minimal pressure impression technique and group II received selective pressure impression technique then constructed conventional complete denture for each patient. Each patient received two implants in the canine areas by flapless technique. After three months direct picking up were made. Standardized periapical radiography evaluations of peri implant bone height changes were performed immediately, 6 months, and 12 months following picking up of attachments.

Results: When comparing vertical bone loss between two groups at different observation times, there was a statistically significant increase in VBL in Group I than Group II

Conclusions: The selective pressure impression technique group II may be considered more beneficial regarding the preservation of peri implant marginal alveolar bone.

KEY WORDS: impression technique,minimal pressure, selective pressure, two implants; Locator; Overdenture attachments; Implants overdenture.

I. INTRODUCTION

The conventional treatment for completely edentulous patients is complete denture. Edentulous patients may have major difficulties while using their conventional full dentures because of lack of stability, support and retention also because the related chewing capacity compromised.

Endosseous implants had already proven useful for rehabilitation for completely edentulous patients. The rehabilitation of edentulous mandible with implant overdentures (MIO) is now a popular treatment modality with world-wide acceptance due to its improved retention, stability, function, proprioception and acceptable level of comfort. It is a common practice to rehabilitate the mandible with two implant overdentures (IODs) and studies have shown that two implants may be sufficient for clinical success[(1)].

Various types of retentive attachments with a wide range of function are available for attachment for implant overdentures. **Preiskel** [(2)] classified attachments forimplant overdentures as studs, magnets, telescopes and bars for which the selection criteria include prosthesis type, number, distance, inclination, and position of implants, functional expectations and financial capabilities of the patients [(3)].Prosthetic rehabilitation of completely edentulous arch starts with a good impression which leads to a good prosthesis. Impression is basically an interaction between tissue and impression material[(4)].

Various impression techniques have been classified by different authors [(5)]mucostatic (minimal pressure), mucocompressive (functional), and selective pressure impression technique. Mucostatic (minimal pressure) technique: records denture-bearing tissues in static, undisturbed form by using readily flowing material such as impression plaster. Mucocompressive impression (functional impression) techniquerecords the tissues in their functional form to provide denture stability during function. Selective pressure theory: it combines the principles of both pressure and minimal pressure techniques. This principle of impression making is based on the belief that certain areas of the maxilla and mandible are by nature better adapted for withstanding extra loads

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from the forces of mastication. These tissues are recorded under slight placement of pressure while other tissues are recorded at rest or relieved with minimal pressure.

The objective of this study was to answer the question: Is the impression technique used for recording the completely edentulous mandible affect the bone surrounding the two implants used for assisting the mandibular overdentures?

The null hypothesis was no difference between both techniques (minimal pressure), and (selective pressure) impression techniques regarding their effect on the vertical bone loss VBL surrounding the two implants used for assisting the mandibular overdenture.

II. MATERIAL AND METHODS

Ten healthy complete edentulous patients, ranging in age from 55 to 60 years, were selected for this study. According to the ethical committee at Mansoura University's Faculty of Dentistry, all patients accepted an informed permission form for their participation in this study. All patients were free of any systemic disorders, that determined by a physician's medical history and clinical examination, for at minimum one year, they had an edentulous maxilla and mandible, all patients had atrophied edentulous mandible with healthy firm mucosa evaluated by panorama x-ray and normal maxillofacial relationship "Angle's class I ".

A traditional CD is constructed maxillary and mandibular conventional CD were created for each patient in an appropriate stock tray, after primary maxillomandibular impression making. The patients were randomly classified into two equal groups according to the impression technique used for recording the completely edentulous mandible as follow:

Group (I): Patients received mandibular implant overdentures constructed using minimal pressure impression technique (Figure.1) [(6)].

Group (II): Patients received mandibular implant overdentures constructed using selective pressure impression technique (Figure.2) [(5)].

Then Final impressions in both groups were poured and master casts were obtained. and jaw relation transfer to semi-adjustable articulator by face-bow record (Bio art, Pearson, USA), the artificial teeth were set according to lingualized occlusion scheme, after clinical try in, the denture was flasked, finished, and polished in conventional manner. Patients received denture and were followed-up for one month to verify denture occlusion and adaptation. The mandibular CD was duplicated. The duplicated denture was used during double scanning by cone beam computer tomography (CBCT) with modification of the intaglio by adding gutta-percha opposing to two canine areas. Images were loaded into 3-dimantion image planning software (i- CAT Vision®) to design position and angulation of implants virtually. A mucosal supported stereolithographic surgical guide with two metal sleeves and anchor pins was printed according to implant planned sites. A dose of antibiotic and prophylaxis was administered 1 hour preoperatively. Under local anesthesia (Mepacrine-L, Alex Co., Egypt), Universal Surgical Kit was used to perform full sequence drilling through the anchored guide [(7)].

Each patient received two implants (4mm diameter *13mm length) The intaglio of the denture opposite to implants were relieved and relined with tissue conditioner as relieved, the patient was instructed for soft diet and home care with frequent recall and follow-up. After three months, healing abutments were screwed for one weeks then the Locator attachments were screwed to internal hex. Rubber dam sheets in a circle around on the head of each attachment. Metal house with black nylon inserts for Locator were placed on attachments (Figure.3) and the denture was modified to include attachments with caps without rocking [(8)].

The pickup was done by adding auto-polymerized acrylic resin (Acrostone, Egypt) in modified intaglio of the denture and under patient's occlusion. After complete polymerization, excess released from pre prepared lingual vents and the fitting surface was trimmed. Laboratory black inserts in female housings were replaced by medium plastic retention inserts, then periapical radiograph was taken to assess the attachment. The patient was instructed for home care and regular follow-up. standardized intraoral digital periapical radiography evaluations were performed immediately, 6 months and 12 months following locator attachment.

Walter et al. [(9)] and **Heckmann et al.** [(10)] showed how to measure peri-implant marginal bone height changes. The vertical distance was measured between the inferior margin of the implant /abutment junction (taken as reference point) (point A) and the most coronal bone to implant contact (the first bone to implant contact) (point B). The distance between point (A) and point (B) indicated VBL in mm (AB line) mesial and (AB line) distal. The peri-implant alveolar bone loss in the 1st 6 months was measured by subtracting AB line length of T0 from AB line length of T6 and the 2nd 6months was measured by subtracting AB line length of T6 from AB line length of T12 at mesial and distalsurface of each implant. The mean

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readings of mesial and distal were calculated and were statistically analyzed then tabulated. The peri-implant alveolar bone loss after 12 months equals the sum of bone loss at 1st and 2nd six months.

III. RESULTS

When comparison of VBL between different intervals for group I there was no significant difference is found in VBL between at all observation times as verified by Wilcoxon signed rank (P>.05). Although VBL increased with the advance of time. P=0.059. VBL in the 1st 6 months was 0.35mm and in the 2nd 6 months was 0.45mm.

When comparison of VBL between different intervals for group II there was a significant difference is found in VBL between at all observation times. VBL significantly increased with advance of time as verified by Wilcoxon signed rank (P>.05). P=0.036. VBL in the 1st 6 months was 0.31mm and in the 2nd 6 months was 0.19mm.

Comparison of VBL between both groups **(Table.1),** showed that at the 1st 6 months there is no statistically significant difference is found in VBL between both groups as verified by Mann Whitney test. While in comparison of VBL between both groups at the 2nd 6 months GII recorded low VBL statistically than G (I) only after the 2nd six months (P>.005) as verified by Mann Whitney test.

IV. DISCUSSION

Firstly, the values of the peri implant VBL in the two groups for 12 months were within normal accepted ranges as VBL not exceed 0.8 mm in group I (minimal pressure impression technique) and 0.5 mm in group II (selective pressure impression technique). This rate of bone loss remains within the normal rate. This was in a line with **Smith et al.** [11] who reported that the values for bone loss generally are accepted as less than 1.5 mm for the firstyear post loading of the implants that is a natural feature and consistent with successful treatment.

This result may be due to the accurate fit of the denture base constructed by the two impressions techniques used in this study. The success of complete dentures largely depends on accuracy of impression.

The results of this study showed insignificant increase in peri implant VBL in Group I (minimal pressure impression technique) during the second 6 months of study. The study by **Kydd et al.** [12], they found that when the mucosa is stressed under the pressure of mandibular overdenture bases during function, the fluid interchanged with the surrounding unstressed mucoperiosteum. Subsequently, the mucoperiosteum of the residual ridges demonstrated a reduction in thickness [13]. As a result of mucosal thickness reduction and denture intrusion which was more in mucostatic technique, the stresses are concentrated over the implant abutments due to the difference in resiliency between the implants and ridge mucosa [14]. Such stresses are increased as the resiliency of mucosa increases [14,15]leading to an increase in denture base deformation over implant abutments with increasing VBL.

On the other hand, the peri implant VBL in Group II (selective pressure impression technique) was decreased significantly during the second 6 months of study. This can be explained be better distribution of load and less chance of residual bone resorption when using the selective pressure technique, which will decrease the movement of overdenture base that result in less stresses on the implants. This was in a line of study of **Al- Ahmad et al.** [16], whom suggest that the use of a tray with relief and escape holes for selective pressure impression of an edentulous mandible, results in a pressure distribution in which impression pressure at the alveolar crests is decreased.

When comparing between the two groups regarding the mean peri implant VBL during each interval of study, it revealed insignificant difference during the first six month follow up periods. This may be due to the use of high viscosity final impression material (zinc oxide) in both groups. We used it to decrease the variability between groups. The fact that zinc oxide is viscous material put an increased amount of pressure on the mandibular arch during impression making in both techniques despite the difference in tray design as reported by **Masri et al.** [17]. The authors studied the pressure exerted under a simulated mandibular edentulous impression at different locations using commonly used impression materials and for impression tray configurations. They concluded that for making mandibular edentulous minimal pressure impressions, low-viscosity impression materials are recommended. Tray modification was not important in changing the amount of pressure produced for the low-viscosity impression materials. This made the difference in VBL statistically insignificant for the first six month.

Finally, G (I) (minimal pressure impression) showed a statically significant higher values of peri implant VBL than G (II) (selective pressure impression) during the second 6 months

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and one year of study. This may be due to the minimal soft tissue abuse and residual bone resorption with selective pressure impression group. **Frank** [18] stated that while making impression, one should apply pressure selectively only in certain areas, which can withstand the forces of mastication to minimize the possibility of soft-tissue abuse and bone resorption. This result was in a line with **Uludag et al.** [19] who say that the masticatory stresses distributed to the mandible depend on several variables among which the differences in impression procedures. Because of resilience difference, equitable load sharing between the implants and mucosa may be related to the selected impression. Several authors addressed the debate regarding the pressure applied while making the impression for complete dentures.

Also, **Felton et al.** [20], preferred the selective-pressure technique (71%). As this technique attempts to place stress on areas that can best resist functional forces of the denture bases. **Frank** [18] has shown that least displacement will occur when an impression tray has relief space and escape holes.

V. CONCLUSIONS:

In view of the results of this study, it can be concluded that the selective pressure impression technique may be considered more beneficial regarding the preservation of peri implant marginal alveolar bone.

Table 1: Comparison between the mean peri-implant VBL of the two groups in each interval.

Group	VBL_T0_T6 M (min-max)	VBL_T6_T12 M (min-max)	VBL_T12 M (min-max)
Group I	0.35 (0.20-0.50)	0.45 (0.30-0.60)	.61 (.40-.70)
Group II	0.31 (0.20-0.40)	0.19 (0.10-0.40)	0.50 (0.30-0.70)
Mann-Whitney	.436[b]	.000[*]	.000 [*]

N=10 implants

Fig (1): Mandibular custom tray fabricated for minimal pressure impression technique.

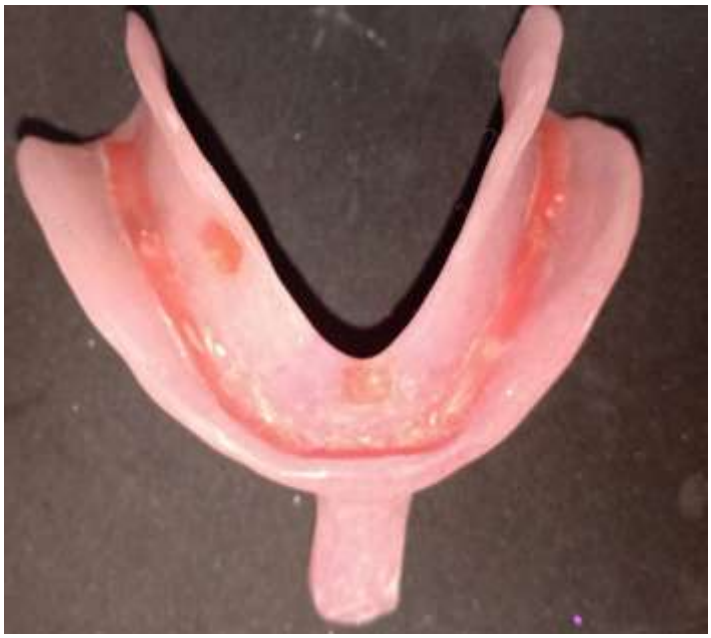

Fig (2): Mandibular custom tray fabricated for selective pressure impression technique.

Fig. (3): The intaglio surface of mandibular overdenture with the picked-up metal housings of locator attachement.

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