



## **RADIOGRAPHIC EVALUATION OF THE TEETH POSITION INFLUENCE ON IMMEDIATELY LOADED SINGLE IMPLANT RETAINED COMPLETE MANDIBULAR OVERDENTURE.**

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### **ABSTRACT**

This study was conducted to evaluate the influence of teeth position on immediately loaded single implant retained complete mandibular overdenture.

Ten completely edentulous patients were selected. For each patient complete maxillary and mandibular conventional complete denture were constructed. Patient were divided into two groups according to position of posterior teeth Group I : Patients wearing complete denture with posterior teeth arranged at the crest of the ridge. Group II : Patients wearing complete denture with posterior teeth arranged at neutral zone area . For each patient single implant was inserted in the mandible in the midline with ball and socket attachment. Mandibular complete dentures were converted to mandibular overdenture immediately after implant insertion . Radiographic measurements were done to evaluate ridge height at the canine regions by cone beam computerized tomography CBCT at time of insertion ,six ,twelve eighteen , twenty four months for each implant of the two groups . The data were collected and statistically analyzed using spss and one way anova test .

The results showed the tooth positioning at the neutral zone has a statistically non significant difference with the crest of the ridge regarding the radiographic features investigated on immediately loaded mandibular single implant overdenture .

### **INTRODUCTION**

Complete denture construction is one of the most challenging work in dentistry. The most common complaint of elderly patients is the loose lower denture. During function like chewing and speech, the lower denture dislodges. It is a major source of embarrassment to these patients. Psychologically also they are affected by this problem. In order to achieve retention and maintain stability, with acceptable level of function<sup>(1)</sup>

The mandibular overdenture retained by implants in the interforaminal region appears to maintain bone in the anterior region of the mandible .Mandibular implant overdentures appear to show higher patient satisfaction scores than complete dentures, even with patients who have undergone preprosthetic surgery. When the anchorage system or number of implants is varied, there may be no significant differences in satisfaction with moderately resorbed edentulous patients restored with mandibular implant overdenture<sup>(2)</sup>.

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For successful implant overdenture treatment planning prosthetic space analysis should be taken under consideration for selection of the prosthetic components of the implant attachment system. At least 13-14 mm interocclusal space is required for bar supported overdenture considering teeth size, denture base thickness, bar thickness for the rigidity, the space from the mucosa to the bar for hygiene and the soft-tissue thickness. Minimum space requirement for ball attachment is 10-12 mm and for locators is 8.5 mm. Inadequate space for prosthetic components can result in an overcontoured prosthesis, excessive occlusal vertical dimension, fractured teeth adjacent to the attachments, attachments separating from the denture, fracture of the prosthesis and overall patient dissatisfaction<sup>(3)</sup>.

Occlusal concepts aiming at denture stability often position the mandibular teeth perpendicular to the edentulous ridge. Placement of the denture teeth directly over the edentulous posterior crest reduces moments of force and improves support under vertical forces. The mandibular edentulous posterior ridge resorbs in a medial direction in early stages then resorbs laterally with the later stages. Setting up of teeth over the crest of the ridge means that positions the central fossa of the posterior mandibular teeth more medial than that of the natural teeth predecessors in early stages of bone loss, but more facial in than the natural tooth position with the advancement of bone loss. The buccal position of maxillary teeth causes instability and poor esthetic appearance of the denture<sup>(4)</sup>.

Pound recommended that the lingual surfaces of mandibular posterior denture teeth should occupy an area bounded by two lines originating from the mesial surface of the mandibular canine and extending posteriorly to the lingual and buccal aspects of the retromolar pad<sup>(5)</sup>.

Lammie suggested that mandibular posterior denture teeth should be arranged over the buccal shelf to provide increased tongue space and to

facilitate the development of vertical facial polished surfaces, against which an effective facial seal can be achieved and maintained. Wright believed that posterior mandibular denture teeth should be arranged directly over the center of the denture stress-bearing area. These location may not correlate with the crest of the edentulous ridge, particularly in the presence of severe ridge atrophy<sup>(6)</sup>.

The neutral zone concept set the teeth to occupy the position of their natural tooth predecessors where the forces of the tongue counteract the forces of lip and cheek<sup>(7)</sup>.

## PATIENTS AND METHODS

Ten completely edentulous patients were selected from the outpatient clinic of removable prosthodontic department, Faculty of Dental Medicine Al Azhar University. Patients fulfilling the following criteria were eligible for inclusion in the study: Men aged between 50 and 65 years. Patient being able to understand and cooperate with the requirements of the study, Angel's class I jaw relation, Patient with normal tongue size and behavior, Patient with adequate interarch space (about 12 mm between the soft tissues and the occlusal plane). Patient with enough bone for an implant length of 10 mm and a diameter of 3.7 mm, which was assessed clinically and radiographically.

Smokers, drug or alcohol addicts, those with any health condition precluding surgery, physical reasons that could affect follow-up, or psychiatric problems, and those who had undergone radiotherapy to the head and neck that may affect the implant area were excluded.

Patients participated in the study were divided into two groups:

**Group I:** patients receive complete denture with posterior teeth arranged at the crest of the ridge.

**Group II:** patients receive complete denture with posterior teeth arranged at the neutral zone

One screw-type two piece immediately loaded implants with 10 mm length and 3.75 mm diameter from the system were used in this study for each patient with ball and socket attachment were inserted at the symphysis of the mandible. After the healing period the denture was modified to receive the attachment.

Follow up visits were carried out every 6 months for two years after denture insertion for radiographic and clinical evaluations to collect data from the patients and regular occlusal adjustment were performed if needed.

Cone beam CT radiograph were taken for each patients of the two groups before surgery, immediately after implant placement and every six months for two years after surgery. Bone height at the canine area was evaluated. canine area was determined by 33 percent from the midline of a distance between tangent of the posterior end of the ramus and midline .

Statistical analysis was performed using S-plus statistical software (SPSS-Release 18) for windows. P values less than 0.05 are considered to be statistically significant in all tests.

**RESULTS**

As shown in table (1) and figure (2) the mean difference in ridge height at the canine area for group I after 6 months of follow up period was 0.36 mm with SD 0.11 and for group II it was 0.29 mm with SD 0.05 (p value 0.28). There is no significance difference..

From implant insertion to 12 months of follow up period the mean difference in ridge height for group I was 0.42 mm with SD 0.06 and for group II it was 0.31 mm with SD 0.08 (p value 0.58). There is no significance difference.

From implant insertion to 18 months of follow up period the mean difference in ridge height for group I was 0.45 mm with SD 0.09 and for group II it was 0.37 mm with SD 0.06 ( p value 0.17). There is no significance difference .

From implant insertion to 24 months of follow up period the mean difference in ridge height for group I was 0.48 mm with SD 0.04 and for group II it was 0.40 mm with SD 0.09. (p value 0.14).There is no significance difference.

**TABLE (1)** Comparison between the two studied groups according to bone height at the canine area.

Time	Group I (Crest of the ridge)			Group II (neutral zone)			p value	Sig
	(Mean difference)	±	S.D	(Mean difference)	±	S.D		
Time of insertion	---	±	--	--	±	--	--	--
6 Months	0.36	±	0.11	0.29	±	0.05	0.28	N.S
12 Months	0.42	±	0.06	0.31	±	0.08	0.0588	N.S
18 Months	0.45	±	0.09	0.37	±	0.06	0.17	N.S
24 Months	0.48	±	0.04	0.40	±	0.09	0.14	N.S

**DISCUSSION**

Patients suffering from temporomandibular joint disorders were excluded as these problems influence the masticatory muscle activity. Age of the patients was ranged from 55 to 60 years for fast adaptation to the new denture .Screw design of implant was used due to its resistance to shear stresses which are a pre-request for successful osseo integration.

CBCT was used in this study due to its accuracy, since the success rate of dental implants depends on the way annual bone loss is calculated. The process of measuring marginal bone level on radiographs has a precision of 0.2mm (or more) owing to variations in exposure geometry, exposure time and observer perception. Therefore, the value of the annual loss may vary considerably, especially when short intervals are considered when the plain radiography is used<sup>(8)</sup>.

The results of this study show that marginal and ridge loss in both study groups was within the normal range after 24 months observation time. Although

there is difference between the two groups however it is not significant. Marginal bone loss is known to be influenced by multiple phenomena, but some key questions remain unanswered. Marginal bone loss is influenced by numerous variables related to surgical trauma, prosthetic considerations, implant design, bone substratum, patient habits, implant-abutment connection and the general health of the patients<sup>(9)</sup>.

Klinge described an MBL >2 mm at delivery of the prosthetic device in comparison with initial radiographs, in combination with bleeding on probing, as a “red flag” for the clinician to evaluate the need for an intervention to achieve peri-implant health<sup>(10)</sup>.

The results show that marginal bone loss has no significant relation with tooth position, this is in agreement with Darwish et al<sup>(11)</sup>. A significant correlation between bone loss, plaque index and pocket depths of dental implants<sup>(12)</sup>.

Plaque and gingival index are related to the smoothness of implant surfaces, and the patient homecare, which affect the long-term success of implants<sup>(13)</sup>.

The lower values of resorption of bone around implant of neutral zone group may be explained by the generation of offset forces during function in the crest of ridge group which direct the denture in unfavourable positions causing compression and bone resorption around implant. The same explanation may be applied in the neutral zone group, however due to harmony with the surrounding musculature the offset force was decreased the ball attachment act as a fulcrum of movement in all direction due to the elasticity of the rubber ring of the metal house & the configuration of attachment shape, and the compressibility of posterior denture bearing mucosa<sup>(14)</sup>. Overdenture may be totally supported by implant, or supported by both implant and mucosa as here, which seems to be the major cause of bone resorption in both groups.

## CONCLUSION

The tooth positioning at the neutral zone has better radiographic effect on immediately loaded mandibular single implant overdenture than that

on the ridge crest but there is a non-significant difference between the two groups.

## REFERENCES

1. Arjun K, Venugopal L, Vaddavalli S, Sujan K. Effect of polished surfaces of lower complete denture on its stability. *J Adv Rec Advan Appli Sci*. 2013;1:3-10.
2. Sadowsky S. Mandibular implant-retained overdentures: A literature review. *J Prosthet Dent*. 2001;86:468-73.
3. Bansal S, Aras M, Chitre V. Guidelines for treatment planning of mandibular implant overdenture. *J Dent Imp*. 2014; 4:86-90.
4. Misch C. *Dental Implant Prosthetics*. 2nd ed. Missouri: Elsevier; 2015. 954 p.
5. Naser M, Mohajerfar M, Ejlal M, Tvakolizadeh S. Evaluation of Pound concept in determination of mediolateral mandibular posterior teeth position. *J Dent Mater Tech*. 2017;6:7-10.
6. Srivastava V, Gupta N, Tandan A, Kaira L, Chopra D. The neutral zone: Concept and technique. *J Orof Res*. 2012;2:42-7.
7. Aysha S, Shetty K, Kanji M. Utilizing the neutral zone: Concept and technique for stabilizing complete denture—case report. *Int J Oral Health Dent*. 2015;1:201-3.
8. Geraets W, Zhang L, Liu Y, Wismeijer D. Annual bone loss and success rates of dental implants based on radiographic measurements. *Dentomaxillofac Radiol*. 2014;43:20140007.
9. Galindo-Moreno P, Leon-Cano A, Ortega-Oller I, Monje A, O'Valle F, Catena A. Marginal bone loss as success criterion in implant dentistry: beyond 2 mm. *Clin Oral Implants Res*. 2015;26:e28-34.
10. Klinge B. Peri-implant marginal bone loss: an academic controversy or a clinical challenge? *Eur J Oral Implantol*. 2012;5 S13-9.
11. Darwish M, Nassani M, Baroudi K. Effect of neutral zone technique on marginal bone loss around implant-supported overdentures. *Int Soc Prev Commun Dent J*. 2015;5:57-62.
12. Lopez-Piriz R, Morales A, Giménez MJ, Bowen A, Carroquino R, Aguilar L, et al. Correlation between clinical parameters characterising peri-implant and periodontal health: A practice-based research in Spain in a series of patients with implants installed 4-5 years ago. *Oral Med Oral Pathol*. 2012;17:e893-e901.
13. Gulati M, Govila V, Anand V, Anand B. Implant Maintenance: A Clinical Update. *Int Sch Res Notices*. 2014; 2014:8.
14. Chen I, Brudvik J, Mancl L, Rubenstein J, Chitswe K, Rai-grodski A. Freedom of rotation of selected overdenture attachments: an in vitro study. *J Prosthet Dent*. 2011;106:78-86.