

## Effect of Different Attachment Size on the Muscle Activity in Single Implant Retained Mandibular Over denture

<sup>1</sup>Mohamed Sobhy Mohamed and <sup>2</sup>Mohamed Abd-Elakher

<sup>1</sup>Associate Professor of Removable Prosthodontics, Faculty of Dental Medicine, Al-Azhar University (Cairo Branch - Boys).

<sup>2</sup>Associate Professor of Oral and Maxillofacial Surgery, Faculty of Dental Medicine, Al -Azhar University (Branch Cairo-Boys).

---

### ABSTRACT

**Purpose:** This study investigates the effect of two different attachment size in the single implant retained over denture on the muscle activity. **Materials and Methods:** Twenty completely edentulous patients were selected for the study with normal ridge size and divided into two groups. In all patients single implant was placed at the area of midline after cone beam taken. Three months later low profile ball abutment was attached to the implant in the first group and high profile ball abutment was attached to the implant in the second group followed by complete denture construction for each patient. After six weeks electromyography and masticatory efficiency for each patient was done. **Results:** The result of the present study showed no statistically significant difference between two groups. **Conclusion:** It is recommended to use low profile ball attachment instead of conventional ball attachment.

**Key words:** Single implant, over denture, muscle activity

---

### Introduction

Edentulism can substantially affect oral and general health as well as overall quality of life Bakke *et al.*, (2002). Patient satisfaction with dentures is influenced by various factors including denture quality, the available denture bearing area, the quality of dentist-patient interaction, previous experience with dentures, patient's personality and psychological well-being (Bakke *et al.*, 2002 and Sadowsky 2001). Oral rehabilitation of such patients with over denture retained by bilateral implant placed in the region of the canine area has greatly improved denture stability, retention and masticatory efficiency (Sadowsky, 2001). Difficulty to obtain complete parallelism between bilateral implant and excessive cost and the effect of the different angulations of the two implant on the retention of the overdenture may be considered as shortcoming of bilateral implant overdenture (Gulizio, 2005 and Heydecke *et al.*, 2005).

The oral rehabilitation by mandibular overdenture anchored on a single implant placed in the sympheseal area can be considered an economical therapeutic alternative to conventional complete denture for very old patients, the single implant resolve the problem of the high cost, achieve the same retentive properties, high durability and success rate. (Cordioli *et al.*, 1997 and Krennmair and Ulm, 2001).

The inter-arch distance and the condition of the edentulous ridge affect the type and the length of the abutment which appear in the oral cavity. Well developed ridge patients require minimum abutment length in order to maintain inter arch distance. However, in normal ridges patients the length of the abutment doesn't appear to affect the inter arch distance (Gulizio, 2005 and Alsiyabi *et al.*, 2005). The retention of the prosthesis will affect the integrity and activity of the muscle of mastication causing hyper activation or hypo activation which lead to several muscles disorders such as truisms, pain, para-functional habits and temporomandibular joint dysfunction syndrome (Trovato *et al.*, 2009 and Alsiyabi *et al.*, 2005).

So that this study aimed to investigate the effect of attachment size in single implant retained overdenture on muscle activity.

### Material and Methods

Twenty completely edentulous patients were selected for the study, they were clinically free from any systemic diseases with suitable inter arch distance and normal ridge relationship and form. The crest of the ridge were away from the sublingual foramen of at least 10 mm at the area of the midline and had sufficient thickness of bone at the area of midline to allow for implant surgery.

A preoperative cone beam CT was taken for ridge especially at the area of implant insertion to measure the bone height and width at the implant site and to detect any pathologic bony changes.

The patients were prepared for the surgery. The single implant was placed in the midline area, figure(1), after three months the implant was exposed and tested for the mobility and the ball abutment(2-3) mm [low

---

**Corresponding Author:** Mohamed Sobhy Mohamed, Associate Professor of Removable Prosthodontics, Faculty of Dental Medicine, Al -Azhar University (Cairo Branch -Boys).  
E-mail: dr\_m\_s999@yahoo.com

profile] was fixed in to the implant in the first group and the ball abutment(5-7) mm [conventional] was fixed in to the implant in the second group. figure(2) followed by complete denture construction then the patient was left six weeks as adaptation period followed by electromyography for the masseter and temporalis muscles during maximum contraction as well as during rest and masticatory efficiency were done for all patients with different types (apple, carrot and banana) of attachment in both groups.



**Fig. 1:** Single implant in place with cover screw.



**Fig. 2:** Low profile ball abutment was attached to the single implant.

#### *Results:*

##### *I. Electromyography:*

No statistically significant difference found between first and second group for the masseter and temporalis muscles during the maximum contraction and at the rest.

##### *II. Masticatory efficiency:*

With all types of food no statistically significant difference found between first and second group at all five measurements of the masticatory efficiency.

#### *Discussion:*

The patients were selected free from any systemic diseases to avoid any disease may affect healing, complicate the surgical procedures or prevent successful Osseo integration Burns, (2000).

Patients with inadequate bone height (away from the sublingual canal) or with inadequate bone width at the area of midline was excluded to prevent injury for the sublingual canal and there associating vessels and to provide adequate implant diameter and to enhance osseointegration (Karabuda *et al.*, 2008 and Wolfart *et al.*, 2008).

The preoperative cone beam CT was taken for each patient in the study because the bone dimension and vital structure appear in the cone beam with accurate dimensions Chan *et al.*, (2010).

Single implant was selected for this study because in some cases due to decreasing the functional demands to two implants in old patients, increasing the cost, decreasing the surgical procedure one the values obtained

with the patients' subjective satisfaction about the retention and fit of their dentures, functions such as speech and eating, and improved general facial esthetics were satisfactory and may not differ from those of prosthetic anchorage modalities that employ two implant (Cordioli *et al.*, 1997 and Krennmair and Ulm 2001).

The midline of the mandibular arch was selected for placement of the single implant because of the symphysis constitutes an excellent host site for an implant in terms of bone quantity and quality Wahab and Sadig, (2008). The electromyographic activity was recorded 6-12 weeks after denture insertion and use, during which the patient was inspected on periodic recalls to eliminate any pressure areas or sore spot and correct any occlusal disharmony (van Kampune *et al.*, 2004 and Mostafa and Ahmed 2009).

#### Conclusion:

Within the parameters and condition of this study the following conclusion was obtained; the using of low profile attachments give the same effect on masticatory efficiency and electromyographic activity as conventional ball attachment.

#### References

- Alsiyabi, S., A.D. Felton, L.F. Cooper, 2005. The role of abutment-attachment selection in resolving inadequate interarch distance: a clinical report. *J Prosthodont*, 14(3): 184-90.
- Bakke, M., B. Holm, K. Gottfredsen, 2000. Masticatory function and patient satisfaction with implant-supported mandibular overdentures: a prospective 5-year study. *Int J Prosthodont*, 15(6): 575-81.
- Burns, D.R., 2000. Mandibular implant overdenture treatment: consensus and controversy. *J Prosthodont*, 9(1): 37-46.
- Chan, H.L., K. Misch, H.L. Wang, 2010. Dental imaging in implant treatment planning. *Implant Dent*, 19(4): 288-98.
- Cordioli, G., Z. Majzoub, S. Castagna, 1997. Mandibular overdentures anchored to single implants: a five-year prospective study. *J Prosthet Dent.*, 78(2): 159-65.
- Gulizio, M.P., 2005. Effect of implant angulation upon retention of overdenture attachments. *J Prosthodont*, 14(1): 3-11.
- Heydecke, G., J. Penrod, Y. Takanashil, Y. Lund, Feine, J. Thomason, 2005. Cost-effectiveness of mandibular two-implant overdentures and conventional dentures in the edentulous elderly. *J Dent Res.*, 84(9): 794-9.
- Karabuda, C., M. Yaltirik, M. Bayraktar, 2008. A clinical comparison of prosthetic complications of implant-supported overdentures with different attachment systems. *Implant Dent.*, 17(1): 74-81.
- Krennmair, G., S. Ulm, 2001. The symphyseal single-tooth implant for anchorage of a mandibular complete denture in geriatric patients: a clinical report. *Int J Oral Maxillofac Implants*, 16(1): 98-104.
- Mostafa, M., M.H.M. Ahmed, 2009. Bilateral balanced occlusion versus lingualized occlusion in mandibular implant supported prosthesis, electromyographic and ultrasound studies. *Ain shams Dent J.*, 19 :23 .99p. 11-29.
- Sadowsky, S.J., 2001. Mandibular implant-retained overdentures: a literature review. *J Prosthet Dent.*, 86(5): 468-73.
- Stellingsma, K., P. Slagter, B. Stegema, 2005. Masticatory function in patients with an extremely resorbed mandible restored with mandibular implant-retained overdentures: comparison of three types of treatment protocols. *J Oral Rehabil*, 32(6): 403-10.
- Trovato, F., B. Orlando, M. Bosco, 2009. Occlusal features and masticatory muscles activity. A review of electromyographic studies. *Stomatologija*, 11(1): 26-31.
- Van Kampune, F.M., A. Van Der Bilt, M.S. Gune, F.A. Fontijn Tekomp, 2004. Masticatory function with implant-supported overdentures. *J Dent Res.*, 83(9): 708-11.
- Wahab, L.A., W. Sadig, 2008. The effect of location and number of endosseous implants on retention and stability of magnetically retained mandibular overdentures: an in vitro study. *Int J Prosthodont*, 21(6): 511-3.
- Wolfart, S., *et al.*, 2008. The central single implant in the edentulous mandible: improvement of function and quality of life. A report of 2 cases. *Quintessence Int.*, 39(7): 541-8.