AL-AZHAR
Dental Journal
For Girls

The Official Publication
of The Faculty of Dental
Medicine For Girls,
Al-Azhar University
Cairo, Egypt.

Print ISSN 2537-0308 • Online ISSN 2537-0316

ADJ-for Girls, Vol. 5, No. 3, July (2018) — PP. 313:318

Clinical and Radiographic Evaluation of Implant Ball Retained Mandibular Complete Overdentures with Lingualized Balanced Occlusion•

Aboalmawaheb I. Ahmed(1) Reda M. El Kholy(2); Mostafa Abdel-kawy Younos(3)
and **Mostafa Abo-Serie Ali(3)**

Codex : 36/1807

azhardentj@azhar.edu.eg

http://adjg.journals.ekb.eg

ABSTRACT

Ten completely edentulous patients were selected. Each Patient had received conventional maxillary and mandibular complete denture with balanced lingualized occlusion. After adaptation period each patient had stage one surgery for placing two implant fixtures, in the cuspid area anterior to the mental foramina. The two endosseous root form (3.7 diameter and 13 mm length) fixtures were left submerged for a period of three months for osseointegration. The implant fixtures were uncovered, healing abutments were used and after two weeks the steps for modification of the patient existing denture were started and the metal housing was secured to the fitting surface of the mandibular denture by a chemical curing acrylic resin. Then the patients recall after 3, 6, 9, 12 months for evaluation. The clinical evaluation includes recording of probing depth (mm), bleeding index scores, gingival recession (mm) and the radiographic evaluation includes bone resorption on the mesial and distal side of the implant. The results showing that a significant increase ($p \leq 0.05$) in all the clinical parameters and amount of bone resorption from the base line till 12 months. The result concluded that: Balanced lingualized occlusion recommended for implant complete overdenture as enhancing stability and retention of the denture which essential for maintenance of implants. Clinical evaluation of implant ball retained overdentures with balanced lingualized occlusion not differs from base line scores also, the bone loss was within the accepted values so the ball attachments is recommended for retention of complete overdenture option.

KEYWORDS

Overdenture, implant, ball attachment, lingualized balanced occlusion.

• Extracted from thesis.

1. Consultant of Prosthodontics in Ministry of Health
2. Professor of Prosthodontics Faculty of Dental Medicine, Al-Azhar University (Cairo).
3. Assistant Professor of Prosthodontics And Head of Prosthodontics Department. Faculty of Dental Medicine, Al-Azhar University (Assiut).

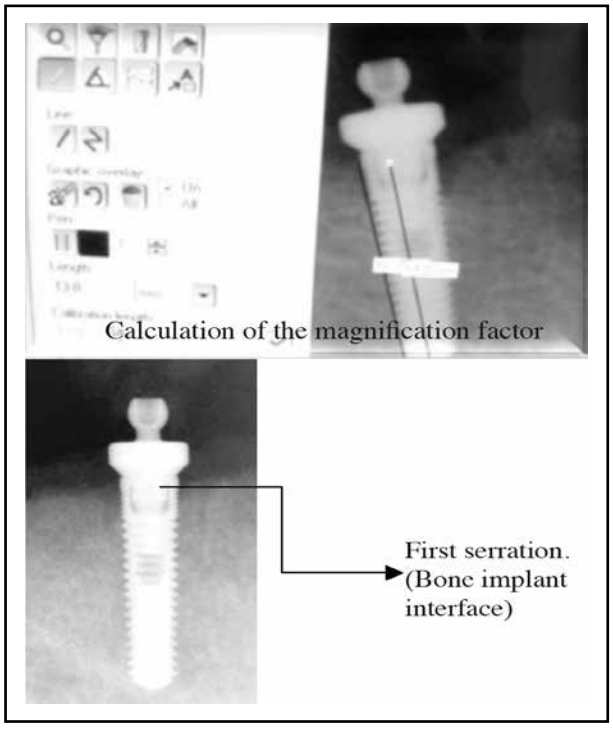
INTRODUCTION

Overdentures have been shown to improve the quality of life for edentulous patients and to contribute significantly to the patients' psychological well-being.[1] Patient exhibits satisfaction with the implant-retained overdenture rather than conventional complete dentures, where the dental implant improves the retention of complete mandibular dentures. [2] One of the factors which influences the amount of forces transferred to the implant is the type of attachment used to connect the denture to the implant.[3] Stud attachment provides varying degree of resiliency in both vertical and horizontal directions, more favorable load transfer to bone, less costly, less technique sensitive and easier to clean. [4] Mandibular implant over-dentures with ball attachment allowed the patients to apply significantly larger bite force, high chewing efficiency and good masticatory function. [5] The dynamic contact of teeth has an effect on stability of denture bases, comfort and function experienced by patients. [6,7] Obtaining consistent mandibular stability has long been a challenge for dental professionals. [8] The balanced lingualized concept has recommended because of its lack of complexity in execution, minimal reshaping of the cusps and reducing axial and/or lateral loads to the dental prosthesis.[9] The success of oral implant treatment relies on the presence and maintenance of bone adjacent to implants. The monitoring of radiographic bone level changes provides valuable insight into the longevity of oral implants. There are no differences in clinical and radiographical state of patients treated with an overdenture on two or four implants during a 5-year evaluation period. [10, 11] It is necessary to design an adequate occlusal pattern for prosthesis supported by dental implants; other biomechanical factors interfere directly in the stresses transmitted to the bone through the prosthesis supported by implants as quality of the bone, muscular power, size and shape of the implant, type of the antagonistic arc and mastication habits.[12]

MATERIAL AND METHODS

Ten completely edentulous male patients were selected according to the inclusion criteria. Free from any systemic disease, at least six months was elapsed after the last extraction of teeth, Non-smokers, Patients without T.M.J troubles or abnormal oral habits and the residual ridges had enough height, width and covered with healthy muco-periostium. Each patient received conventional dentures with balanced lingualized occlusion. After adaptation period patients had stage one surgery for placing two implant fixtures, in the cuspid area anterior to the mental foramina. The two endosseous root form implants were left submerged for a period of three months for osseointegration. The implants were uncovered, the steps for modification of the patient existing denture were started and the metal housing was secured to the fitting surface of the mandibular denture by a chemical curing acrylic resin. All patients were satisfied with their overdentures, no mobility was detected and all implants gave a solid ringing sound on percussion indicating direct contact between the bone and implants. The patients were left one month for adaptation of overdenture after delivery. The implants were evaluated after the adaptation period clinically and radiographically after 3, 6, 9, 12 months. The clinical evaluation of the patients included recording of probing depth, bleeding index scores, gingival recession scores. The pocket depth was measured at 4 sites (mesial, distal, buccal, and lingual) around each implant using a calibrated periodontal probe. The depth of the peri-implant sulcus was measured of each implant by using graduated periodontal probe. Be sure that there is a strict parallism between the probe and the long axis of the abutment. The bleeding index was expressed following the scores of the Plaque and bleeding indices Where they express **score 0** = no plaque / bleeding, **score 1** = plaque / bleeding detected by running a probe across the smooth marginal surface of the implant, **score 2** = plaque / bleeding seen by visual inspection, **score 3**= lots of plaque / spontaneous bleeding. Gingival recession index was measured at four sites (mesial, distal, buccal, and lingual) around each implant using a

calibrated caliper. The bone loss was measured by the same method of [13] where a periapical x-ray radiograph based on the paralleling technique. A slide scanner set used to digitize the radiograph with the help of vista scan computer software was used to manipulate the digital images and measure the bone adjacent to the implant surface. For each image mesial and distal measurements were made from the inferior edge of the implant collar (as the reference point of measurements) to bone implant interface. Bone loss was calculated by measuring from the implant collar to the bone implant interface level is the base line measurement. The subsequent measures are determined by subtracting the second measure from the previous measures. Extension cone paralleling technique, the film holder consists of bite block, directing rod and a guide ring. The bite block contains a slot into which x-ray film sensor is positioned. Standardized periapical x-ray film sensor by film holder with ball abutment impression cope fixed to the holder by chemical cure acrylic resin. The ball abutment impression cope fixed on the ball implant abutment to ensure the same angle of the x-ray beam everytime The guide ring accepts the x-ray tube in intimate contact with guide ring boundaries.



RESULTS

The results and data of the clinical and radiographic evaluation were calculated and statistically analyzed with t-Paired sample test ($p \leq 0.05$). The results were summarized as (mean values ± standard deviations). The paired sample t test showed that there were significant increase ($p \leq 0.05$) of pocket depth, bleeding index, amount of gingival recession recorded and amount of bone loss after 1 to 12 months of implant overdenture and there is a non- significant($p \geq 0.05$) increase recorded between subsequent periods. In the results in spite there is a presence of significant bleeding index and probing depth In spite of absence of a significant bone resorption, also the very low frequency of bleeding upon probing and the mean probing depth less than three mm indicated the presence of healthy peri-implant tissue as shown in tab. (1,2,3,4).

Table (1) *Test of significance of the pocket depth between different follow up periods.*

Time	Paired Differences			t	P-value
	Mean	Std. D.	Std. E. Mean		
M1 - M3	0.06	0.18	0.03	1.906	NS
M1 - M6	0.06	0.20	0.03	1.853	NS
M1 - M9	0.08	0.24	0.04	2.178	*
M1 - M12	0.14	0.27	0.04	3.216	*
M3 - M6	0.12	0.13	0.02	5.464	*
M3 - M9	0.14	0.22	0.04	3.989	*
M3 - M12	0.19	0.28	0.04	4.389	*
M6 - M9	0.02	0.15	0.02	.922	NS
M6 - M12	0.08	0.23	0.03	2.158	*
M9 - M12	0.06	0.19	0.029	1.964	NS

Table (2) *Test of significance of bleeding index between different follow up periods.*

Time	Paired Differences			t	P-value
	Mean	Std. D	Std. E		
M1 - M3	0.02	0.29	0.06	0.225	N.S
M1 - M6	0.06	0.43	0.09	0.607	N.S
M1 - M9	0.16	0.46	0.10	1.626	N.S
M1 - M12	0.24	0.45	0.09	2.427	*
M3 - M6	0.07	0.48	0.11	0.679	N.S
M3 - M9	0.18	0.55	0.12	1.477	N.S
M3 - M12	0.25	0.40	0.09	2.842	*
M6 - M9	0.11	0.30	0.06	1.627	N.S
M6 - M12	0.18	0.42	0.09	1.917	N.S
M9 - M12	0.07	0.55	0.12	0.591	N.S

Table *(3) Test of significance of the gingival recession between different follow up periods.*

Time	Paired Differences			t	P-value
	Mean	Std. D.	Std. E		
M1 - M3	0.02	0.09	0.01	1.503	NS
M1 - M6	0.01	0.15	0.02	0.537	NS
M1 - M9	0.09	0.15	0.02	3.714	*
M1 - M12	0.14	0.17	0.03	5.186	*
M3 - M6	0.04	0.13	0.02	1.688	NS
M3 - M9	0.11	0.16	0.06	4.435	*
M3 - M12	0.16	0.16	0.03	6.357	*
M6 - M9	0.08	0.19	0.03	2.525	*
M6 - M12	0.13	0.19	0.03	4.132	*
M9 - M12	0.05	0.16	0.03	1.996	NS

Table (4) *Test of significance of the amount of bone resorption between different follow up periods.*

Time	Paired Differences			t	P-value
	Mean	Std. D.	Std. E.		
M1 - M3	0.007	0.03	0.01	1.157	NS
M1 - M6	0.008	0.04	0.01	0.444	. NS
M1 - M9	0.10	0.05	0.01	8.796	*
M1 - M12	0.21	0.06	0.01	15.622	*
M3 - M6	0.01	0.03	0.01	1.962	NS
M3 - M9	0.04	0.01	0.01	3.989	*
M3 - M12	0.07	0.04	0.01	5.464	*
M6 - M9	0.09	0.05	0.01	8.552	*
M6 - M12	0.10	0.03	0.01	10.392	*
M9 - M12	0.11	0.036	0.008	13.252	*

DISCUSSION

Gingival and bleeding indices showed an increase during the follow up period and it is noted after 6 months of loading, this is in agreement with.[14,15] It is generally agreed that plaque accumulation could induce negative mucosal response. It is recorded that the peri-implant mucosal response should not be included in the criteria for implant success because it has not been shown to be an important factor in achieving or maintaining osseointegration. But many researchers consider the mucosal response is to be correlated to marginal bone loss and loss of osseointegration .This controversy explain to a limit the presence of significant bleeding index and probing depth In spite of absence of a significant bone resorption, also The very low frequency of bleeding upon probing and the mean probing depth less than 3 mm indicated the presence of healthy peri-implant tissue as recorded by. [16-18]

The forces placed on the bone and mucosa is completely different between implant-supported

and mucosal-supported prostheses. The implants may serve to retain bone by applying tensional forces, while the mucosal- borne prosthesis may accelerate bone resorption due to compressive forces. [19, 20] The average crestal bone loss recorded after one year for implants was less than 0.6 mm. This is in line with other studies. [21-23] This might reflect bone adaptation to balanced loads as a result of balanced lingualized occlusion and high stability of the overdenture. The mean bone loss in the first year of loading was (0.33-0.6) mm for combined mesial and distal sites. The mean bone loss for the first year of loading similar to those reported in. [24]

CONCLUSION

The dental implant is a good treatment option as it provides a good support for the complete dentures with the muco-periostium. Balanced lingualized occlusion scheme is recommended for implant complete overdenture option, due to enhancing the stability and retention of the denture which in turn essential for maintenance of dental implants and improving the muscle activities. Clinical evaluation of implant ball retained overdentures with balanced lingualized occlusion not differs from base line scores also, the bone loss was within the accepted values so the ball attachments is recommended for retention of complete overdenture option.

REFERENCES

1. Klemetti E, Chehade A, Takanashi Y, Feine S. J: Two-Implant Mandibular Overdentures: Simple to Fabricate and Easy to Wear .J Can Dent Assoc 2003; 69:29–33.
2. Walter M, Marre´ B, Eckelt U: Prospective study on titanium bar-retained overdentures: 2-year results. Clin. Oral Impl. Res. 2000: 11: 361–69.
3. Heckmann S, Werner W, Meyer M, Weber H , Wichmann M: Overdenture attachment selection and the loading of implant and denture- bearing area. Part 2: A methodical study using five types of attachment. Clin. Oral Impl. Res. 2001; 12, 640–647.
4. van Kampen F, van der Bilt A, Cune M, Bosman F: The Influence of Various Attachment Types in Mandibular Implant-retained Overdentures on Maximum Bite Force and EMG. J Dent Res. 2002; 81:170-173.
5. Gartner J, Mushimoto K, Weber H, Nishimura I: Effect of osseointegrated implants on the coordination of masticatory muscles: A pilot study. J Prosthet Dent 2000;84:185-93.
6. Allen F, McMillan: Food selection and perceptions of chewing ability following provision of implant and conventional prostheses in complete denture wearers. Clin. Oral Impl. Res.2002; 13, 320–26
7. Stellingsma K, Slagter A, Stegenga B, Raghoebar G: Masticatory function in patients with an extremely resorbed mandible restored with andibular implant-retained overdentures: comparison of three types of treatment protocols. Journal of Oral Rehabilitation 2005; 32, 403–10.
8. Williamson R, Williamson A, Bowley J, Toothaker R:Maximizing mandibular prosthesis stability utilizing linear occlusion,occlusal plane selectionand centric recording. J Prosthet Dent 2004;13:55-61.
9. Kim Y , Oh T , Misch C , Wang H: Occlusal considerations in implant therapy: clinical guidelines with biomechanical rationale. Clin. Oral Impl. Res. 2005; 16, 26–35.
10. Visser A, Raghoebar G, Meijer H, Batenburg R Vissink A: Mandibular overdentures supported by two or four endosseous implants A 5-year prospective study. Clin. Oral Impl. Res. 2005; 16, 19–25.
11. Glauser R, Zembic A, Ruhstaller P, Windisch S:Five-year results of implants with an oxidized surface placed predominantly in soft quality bone and subjected to immediate occlusal loading . J Prosthet Dent 2007; 97: S59-S68.
12. Amsterdam M. and Weisgold A.: Periodontal Prosthesis: A 50-year perspective.Alpha.Omegan.2000; 9: 23 - 30.
13. Wyatt C.; Bryant S.; Avivi-Arber L; Chayter D. and Zarb A.: A computer-assessed measurement technique to assess bone proximal to oral implants on the intraoral radiographs. Clinic. Oral Impl. Res. 2001; 12: 225 –229.
14. Pecora E.; Ceccarelli R.; Bonelli M. and Alexander H.: Clinical Evaluation of Laser Microtexturing for Soft Tissue and Bone Attachment to Dental Implants. J. Implant Dent. 2009; 18: 57 – 66.
15. Stephan G.; Vidot F.; Noharet R. and Mariani P.: Implant-retained mandibular overdentures, a comparative pilot study of immediate loading versus delayed loading after two years. J. Prosthet. Dent. 2007; 97: 138- 145.

16. Smith E. and Zarb A: Criteria for success of osseointegrated endosseous implants. J. Prosthet. Dent.1998; 62: 567.

17. Teixeira R.; Sato Y.; Akagawa Y. and Kimoto T.: Correlation between mucosal inflammation and marginal bone loss around hydroxyapatite-coated implants: a 3-year cross-sectional study. Int. J. Oral Maxillofac. Impl. 1997; 12:74 – 81.

18. Rungcharassaeng K.; Lozada J.; Kan J.; Kim J.; Campagni W. and Munoz C.: Peri-implant tissue response of immediately loaded, threaded, HA-coated implants: 1-year results. J. Prosthet. Dent. 2002; 87:173 - 81.

19. Wyatt C. and Zarb A.: Bone level changes proximal to oral implants supporting fixed partial prostheses. J. Clinic. Oral Impl. Res. 2002; 13: 162 – 168.

20. Wyatt C.: The effect of prosthodontic treatment on alveolar bone loss: a review of the literature. J. Prosthet. Dent. 1998; 80: 362 – 366.

21. Behneke A.; Behneke N. and d'Hoedt B.: A 5- year longitudinal study of the clinical effectiveness of ITI solid-screw implants in the treatment of mandibular edentulism. Int.J.of Oral & Maxillofac. Impl.2002; 17: 799–810.

22. Bischof M.; Nedir R.; Abi Najm S.; Szmukler-Moncler S. and Samson J.: A five-year life-table analysis on wide neck ITI implants with prosthetic evaluation and radiographic analysis: results from a private practice.Clinic.Oral Impl. Res.2006; 17: 512–520.

23. Hartman A. and Cochran L.: Initial implant position determines the magnitude of crestal bone remodelling. J. of Periodontology. 2004; 75: 572 –577.

24. Weber P.; Crohin C. and Fiorellini P.: A 5- year prospective clinical and radiographic study of non submerged dental implants. J. Clinic. Oral Impl. Res. 2000; 11: 144 – 153.