International Journal of Chemical and Biochemical Sciences
(ISSN 2226-9614)

Journal Home page: www.iscientific.org/Journal.html

Evaluation of Patient Satisfaction with Mandibular Overdenture Retained by Immediate Loaded Two Implants using O-t Equator, Ball and Socket Attachment Systems

Elbaz RR[1], Abdulhakim AF[2], Karam AA[3], Baraka OA[4]

[1]*Assistant Lecturer, Removable Prosthodontic Department, Faculty of Dental Medicine, Al-Azhar University, Egypt.*

[2]*Lecturer, Removable Prosthodontic Department, Faculty of Dental Medicine, Al-Azhar University, Egypt.*

[3]*Lecturer, Removable Prosthodontic Department, Faculty of Dental Medicine, Al-Azhar University, Egypt.*

[4]*Professor, Removable Prosthodontic Department, Faculty of Dental Medicine, Al-Azhar University, Egypt.*

Abstract

This study compared the effect of OT Equator attachment and Ball and Socket attachment on patient satisfaction using mandibular two-implant overdentures. Patients and Methods: From the removable prosthodontics department clinic, Faculty of Dental Medicine (Boys, Cairo, Egypt), Al-Azhar University, 12 completely edentulous patients randomly chosen. The patients divided into two groups: group I received two immediately loaded implant-supported overdentures with OT Equator attachment. In contrast, group II received two immediately loaded implant-supported overdentures with ball and socket attachment. Patient satisfaction was measured using the Arabic version of the oral health impact profile (OHIP) for edentulous patients. The measurements were performed after six months (T1) and after 18 months (T2). Statistical analysis was done using SPSS software version 20.0. Data distribution of normality was done by using the Shapiro-Wilk test. The Mann-Whitney U test used to compare the means of the two groups. Results**:** It was found that there was no significant difference between the attachments in terms of patient satisfaction. Conclusion**:** The immediate loading of implants proved to be a successful treatment modality for the rehabilitation of completely edentulous patients with a minimum of two implants placed in the interforaminal region to support an overdenture. Both attachments showed non-significance regarding patient satisfaction.

Keywords: Attachment systems, Mandibular implant overdentures, Patient satisfaction

Full-length article **Corresponding Author*, e-mail: *radyelbaz5@gmail.com*

1. Introduction

Mandibular dentures typically suffer from loss of retention because bone resorption is substantially greater in the mandible than in the maxilla of edentulous individuals [1]. As it offers superior retention and stability than the typical complete denture, implant overdenture is regarded as an appropriate treatment choice for edentulous patients [2]. The implants can also lessen bone resorption while also enhancing the patient's psychological state and masticatory power [3]. It is recommended that a two-implant overdenture become the standard for treating edentulous mandibles because it is comfortable and provides improved security [4]. Several commercially available attachment systems are available to attach overdentures to implants [5]. Many distinct types of attachment assemblies are frequently used: telescopic, magnetic, bar, and stud attachments [6]. The OT-Equator attachment is completely durable because it allows a large range of movement in various directions for denture movement and lowered stresses that were conveyed to the nylon component and improved the loading of the remaining ridge mucosa [7-8].

The OT-Equator attachment permits compensation of implant divergence up to 30°, which may be advantageous in cases of severe mandibular atrophies and when axial implant insertion is in jeopardy without bone repair [9]. Ball attachments are the most basic sort of attachments for usage in clinical settings with overdentures supported by implants or teeth [10]. Ball attachments may be more affordable, less technique-sensitive, less reliant on implant position, easier to clean and replace, easier to adjust and control the amount of retention, possibly requiring less interarch space, and better able to distribute functional forces [11]. Completely edentulous patients typically have function and comfort outcomes assessed using self-administered questionnaires, such as satisfaction with retention and stability, phonetics, comfort, mastication, appearance, and social activities [12].

The oral health-related quality of life (OHRQoL) questionnaire is usually elected for evaluating the oral health impact profile (OHIP) as the most popular questionnaire. It is a crucial tool for determining the social effects of oral illnesses and for assessing dental care [13].

The OHIP is a 49-item profile that assesses how oral health issues affect several aspects of function. Seven aspects of daily life and interpersonal relationships. functional restriction, bodily discomfort, psychological unease, physical impairment, mental illness, social disability, and handicap [14]. A study was conducted on eighteen fully edentulous participants and were treated with a single implant overdenture opposing to a maxillary complete denture. They received two retentive attachments (ball and Equator) and outcomes were assessed after the 1-week (initial) and 3 months (final) periods. When compared to baseline, there was an improvement in patient satisfaction using both attachments, whilst no difference was observed between initial and final periods. Similarly, no significant differences were observed when comparing the ball and Equator at the initial (P = .330) and final (P = .08) periods [15]. Another study was performed including 26 patients with edentulous mandibles and maxillae. According to Izard's arch shape, classification patients were divided into 2 groups.15 Patients with U-shaped arches had two implants and patients with V-shaped arches received four implants in their mouth.

78 implants were placed. After 2 to 4 months of healing, all patients received implant-supported overdenture prostheses. Patient satisfaction was found to be similar with both groups. All patients in both groups were more comfortable after treatment than before [16]. A study was performed to measure Patient satisfaction by using a visual analog scale-based questionnaire (VAS). Patients were divided into two groups, Group I: an OT equator with a smart box attachment (OT) was used. Group II, ball and socket attachments (BS) were used. Participants rated their general satisfaction, speaking, chewing, comfort, retention, and oral hygiene with their dentures using a 100-mm VAS anchored at the extremes left and right with the words "highly dissatisfied" and "highly satisfied," respectively. It was concluded that within the limitation of this study, an OT equator with smart box attachment is preferable to ball and socket attachment systems [17]. These studies were conducted to evaluate the effect of opt equator on patient satisfaction an immediate loaded implant in comparison to ball and socket attachments.

2. Materials and Methods

From the Removable Prosthodontics Department Clinic, Faculty of Dental Medicine, (Boys, Cairo), Al-Azhar University, 12 completely edentulous patients were randomly chosen, with mean age of 52 years free from any systemic diseases that might affect implant placement. Ethical approval was obtained from Research Ethics Committee, Faculty of Dental medicine Al-Azhar University under the No. (EC Ref No.: 645/267C). For each patient, an acrylic complete denture was designed according to the conventional steps for complete denture construction with bilateral balanced occlusion principle. Primary impression-making was recorded by using compound impression material (Hiflex, India) while secondary impression making was done by using special trays with border molded by using green stick compound (Perfectin, Aragentina), then the impression was recorded using zinc oxide eugenol (Cavex, Holland).

Mounting of the maxillary casts was done using an ear face bow (Bio art, Brazil) and transferred to the semi-adjustable articulator (Bio art, Brazil) then centric relation was recorded and teeth setting (Eray, Eralar, Turkey) was done. The waxed-up dentures were checked then the mandibular trial denture bases were duplicated for construction radiographic stent. The lab work was continued until the dentures were finished and polished. It was inserted in the patient′s mouth. Esthetics, retention, stability and occlusion were verified. Post insertion instructions were given; patients were instructed to wear the dentures until adaptation was acquired. For all patient's oral antibiotic (Augmentin 1gm (GSk-United Kingdom)) was prescribed prior to the implant surgery for 5 days twice daily. The conventional surgical stent which designed on the duplicated trial mandibular denture bases and processed to transparent heat cured acrylic resin (Acrostone, Egypt) to produce a radiographic stent. Two condensed gutta percha (HTMdent-China) were attached on the canine region to aid in radiographic location of canine area.

Panoramic radiograph (Dentsply, Germany) was used for the radiographic determination of the osteotomy sites at inter canine region with the radiographic stent in the patient's mouth. The surgical guide stents were converted into surgical stent. The prospective implant sites were marked on the stent and perforated with round carbide bur at low speed. After giving the patient topical anesthesia (I-Gel-USA), a bilateral mental nerve block and lingual infiltration anesthesia (Mepivacaine 3%-Egypt) was given. An initial penetration was made through the cortex of the bone using a round bur through the hole of the stent, which represented the planned position of the implant. A crestal incision done by a scalpel number 15 on the crest of the ridge at the canine-premolar region for all patients. A periosteal elevator was used to elevate the periosteum and to reflect the flap labially and lingually. Needlepoint pilot drill was used to initiate the osteotomies at 800-1000 RPM with copious amount of saline solution.

Following the sequence of the drills in the selected surgical kit until reach to selected diameter and length of implant (implant length 10 mm, implant diameter 3.5 mm). Two dental implants fixtures (nucleoss, menderes, izmir, turkiye) were inserted at the osteotomy site according to guide stent after checking parallism of the osteotomy site. Healing caps were screwed to the implants. Flab repositioned and sutured. The mandibular denture was relived over implant, tissue conditioning applied and denture inserted. The patient was recalled after 7 days for implant loading. After surgery, analgesics (Diclofenac Sodium 75mg) once - daily and when needed, were prescribed for all patients after surgery. All patients were instructed to rinse three times daily with 0.2% Chlorhexidine mouthwash and clean the attachments with the brush. A soft diet was recommended for seven days. The patients were divided randomly into two groups (6 patients for each group).

2.1 Group I Patients

After seven days of surgery, sutures were removed. OT-Equator attachments (Nucleoss, Menderes, and Izmir, Turkey) were screwed into the fixtures and tightened using

an equator driver (fig: 1). Metallic cap with pink nylon insert was placed over the male part of the attachment, and then its place was transferred to the denture by the aid of marker paste. Space was created in the fitting surface of the denture base correspond to implant site using a large carbide bur mounted to a straight hand piece. After blocking of undercut under both attachments direct pick up of the metal cap to the denture-fitting surface was accomplished by self-cure acrylic resin (Acrostone, Egypt). Reline was made in the holes created into the denture-fitting surface and the denture was inserted into patient's mouth, then the patient was instructed to close in correct occlusion. After the setting of acrylic resin, the denture with the metal cap (overdenture) was removed from the mouth, inspected, and the excess material was removed with a round bur.

2.2 Group II Patients

Ball attachments (Nucleoss, Menderes, and Izmir, Turkey) screwed to the fixtures and tightened using a ball driver. Metallic caps placed over male part of the attachment and pick-up technique was carried-out as discussed before.

2.3 Patient's satisfaction evaluation

The oral health-related quality of life was evaluated using the Arabic version of the oral health impact profile for edentulous patients (OHIP-EDENT) [18]. Denture wearing status recorded after completion of the questionnaire, at baseline, 6 and 18 months of overdenture loading for each group. The questionnaire data included:

1- FL=Functionallimitation (Difficulty chewing any foods, Food catching in your dentures, Dentures not fittingproperly)
2- P1=Physical pain (Painful aching in your mouth, Uncomfortable to eat any foods, Sore spots in your mouth, Uncomfortable dentures)
3- P2 = psychological discomfort (worried by dental problems, Self-conscious)
4- D1= Physical disability (Avoid eating some foods, Unable to eat, Interrupts meals)
5- D3= Social disability (Avoiding going out, Less tolerant to partners or family, Irritable with other people)

Scoring: 0= Never 1= Hardly ever 2=Occasionally 3= fairly often 4= Very often

The data was collected, tabulated, and statistically analyzed using SPSS© Statistics Version 20 for Windows. The data distribution of normality was done by using the Shapiro-Wilk test. The test showed a normal distribution of data, The Mann-Whitney U test was used for statistical analysis. The significance level was set at $P \leq 0.05$.

3. Results and discussion

3.1 Results

The Mann-Whitney U test results revealed that regarding the attachment type the difference between the two attachment groups wasn't statistically significant significant ($p>0.05$) for all variables after 6 months and 18 months of follow-up periods.

3.2 Discussion

Case selection and diagnosis is the key to success with implant procedures, as with all dental procedures. The patients were selected free from any metabolic disease like diabetes or any terminal disease, which may influence the healing or cause potential infection of the implant recipient site and lack of osseointegration. CBCT was used in this study to select the implant site due to its ability to visualize the bone in both axial and coronal sections. Morphology and height of alveolar ridge can be accurately displayed, showing the buccolingual thickness, and the mesiodistal width. The absence of magnification and distortion encountered in panoramic x-ray even the digital one is a critical feature [19]. A two-implant overdenture provides an excellent alternative to a conventional complete denture. These studies concluded that there were no significant differences in survival rates, clinical outcomes, masticatory performance and patient satisfaction for mandibular overdentures supported by two or four implants in the inter foraminal region [20]. In this clinical trial, the implants were loaded immediately. Placement of the prosthesis into occlusion within the first week following implant surgery is called immediate loading.

Immediate loading can provide excellent primary implant stability especially in mandibular intra-foraminal space. Immediate loading can also reduce the number of postoperative visits. This is considered comfortable to the patient [21]. Each patient in-group I received mandibular overdenture retained by OT-Equator attachment. it is a brand-new line of low-profile attachments that have been effectively used to treat patients who had limited diameter implants and overdentures held in place by two implants [22]. In this study, each patient in-group II received mandibular overdenture retained by ball and socket attachment. In this clinical trial study, there was no significant difference between ball and socket attachment and OT Equator attachment after 6 and 18 months. These results are in accordance with Taha et al. [15] who concluded that no significant difference in patient satisfaction when comparing ball& socket attachment with OT Equator attachment. Patient satisfaction with speech and mastication of the mandibular overdenture in this clinical trial was not significant between ball& socket and OT Equator attachment.

These results agree with Nahla et al. [15] who showed that no significant differences were observed when comparing the ball and Equator attachment systems. These results also agree with Karabuda et al. [16] who showed that no significant differences were observed when comparing the ball and bur attachment systems. The findings of this clinical trial, however, did not agree with a randomized clinical trial by Aunmeungtong et al. [23] that compared the clinical outcomes of overdentures supported by two mini dental implants with Equator attachments, Equator users reported being more satisfied overall. It may be due to four mini dental implants in the edentulous arch are considered to be more stable than two standard implants. Multiple mini dental implants might be better for compensating any fulcrum or tipping problems that can occur with two conventional implants positioned in the canine area. These results did not agree with Magda and Mai [17] study which reported that patients expressed greater happiness with the OT equator than with ball attachments over the follow-up period. It may be due to short follow up periods and difference in the company is manufacturing of attachments.

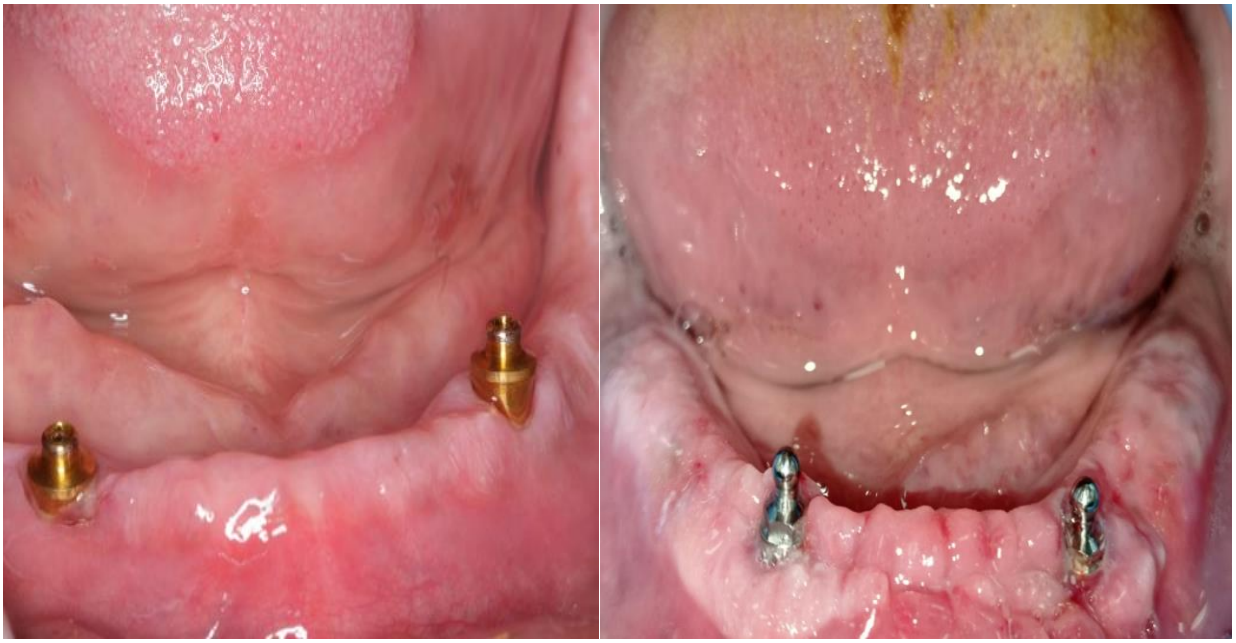

Figure 1: Fully seated implant with OT-Equator (left), ball male attachment (right)

Table 1: Comparison of patient satisfaction regarding the attachment type after 6 months

	OT Equator (mean ± SD)	Ball& socket (mean ± SD)	Z-value	P-Value
Function	2.33±0.82	2.0±0.63	0.79	0.431 ns
Physical pain	2.16±0.75	1.83±0.41	0.86	0.389 ns
Psychological discomfort	1.67±0.86	1.83±0.41	-0.55	0.583 ns
Physical disability	1.83±0.75	1.67±0.52	0.27	0.784 ns
Psychological disability	1.67±0.82	1.83±0.41	-0.55	0.583 ns
Social disability	1.83±0.45	1.5±0.55	0.44	0.662 ns

*; statistically significant. ns; non-significant.

Table 2: Comparison of patient satisfaction regarding the attachment type after 18 months

	OT Equator (Mean± SD)	Ball& socket (Mean± SD)	Z-value	P-Value
Function	1.17±0.75	0.83±0.41	0.86	0.388 ns
Physical pain	1.33±0.52	1.17±0.41	0.53	0.594 ns
Psychological discomfort	1.33±0.97	1±0.63	0.86	0.386 ns
Physical disability	1.33±0.97	1±0.63	0.86	0.386 ns
Psychological disability	1±0.63	0.83±0.41	0.42	0.673 ns
Social disability	0.67±0.52	0.67±0.52	-0.09	0.922 ns

*; st atistically significant. ns; non-significant

4. Conclusion

Within the limitations of this study, it can be concluded that immediate loading of implants proved to be a successful treatment modality for rehabilitation of completely edentulous patients with minimum of two implants placed in the interforaminal region to support an over denture. Both attachments showed no significant regarding patient satisfaction.

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