ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2023; 9(2): 478-480

www.oraljournal.com
Received: 20-04-2023
Accepted: 22-05-2023

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Retention and patient satisfaction with bar-clip, ball and socket and Kerator attachments in mandibular implant over denture treatment

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DOI: https://doi.org/10.22271/oral.2023.v9.i2f.1764

Abstract
Background: To evaluate retention and patient satisfaction with bar-clip, ball and socket and kerator attachments in mandibular implant overdenture treatment.
Materials and Methods: A total of 15 subjects were enrolled. Complete evaluation was done. Edentulous subjects received two implants in the inter-foramina region of the mandible. They were divided into 3 groups with 5 subjects in each group. The results were analysed using SPSS software.
Results: A total of 15 subjects were enrolled. At the end of six months, the retention force was higher in Group 3 (Kerator attachment) as compared to Group 1 (ball and socket attachment) and Group 2.
Conclusion: Group 3 (kerator attachment) exhibit higher retentive capacities than Group 1 and Group 2.

Keywords: Ball attachment, Implant supported overdenture, Kerator attachment

Introduction

Oral rehabilitation of edentulous and partially edentulous patients has been improved by the development of implants and their different prosthetic options [1]. Several clinical trials have proved that placement of implants in mandibular retained and/or supported overdentures results in a better quality of life compared to conventional complete dentures [1, 2]. Implant overdenture can either use splinted implants by bar attachments or un splinted implants by stud-type attachments [3, 4]. Many factors affect appropriate attachment selection, such as jaw morphology, inter arch distance, the desired retention, prosthesis type, inclination and number of implants, patient manual dexterity, financial options, and the availability for maintenance recall visits [5].

At present, implants are widely used to replace missing teeth or retention/support dentures. [6] The use of implant-retained overdentures in the maxilla and mandible is a successful option to the fixed implant prostheses. The types of attachments available in the market include non-splinted attachments (ball, magnet, locator, and double crown attachment) and splinted attachments (bar and clip attachment) [7, 8]. Complete dentures have been the standard of care for patients with long-term edentulism [9]. However, edentulous patients often experience problems with their mandibular complete dentures [10]. Lack of stability and retention of mandibular denture, together with decreased chewing ability, are the main complaints of such patients [11]. Therefore, the most widely used treatment plan is to place endosseous implants in the mandible to support an overdenture [11].

Bar attachment is used to splint implants with the lowest complications in the prosthetic superstructure and maximum patient satisfaction [12]. It offers stress-breaking action and cross-arch involvement, which allows occlusal forces to be shared between the abutments [13]. The ideal length of a single bar should range from 20 to 22 mm to accommodate two clips. It also requires an inter-arch distance of a minimum of 15 mm [14]. Hence, this study was conducted to evaluate retention and patient satisfaction with bar-clip, ball and socket and kerator attachments in mandibular implant overdenture treatment.

Materials and Methods

A total of 15 subjects were enrolled. Complete evaluation was done. Edentulous subjects received two implants in the inter-foramina region of the mandible. They were divided into 3 groups with 5 subjects in each group. Group 1 was ball and socket attachment, group 2 was bar and clip attachment and group 3 was kerator attachment. The retention force and satisfaction level with the attachments at baseline and after 6 months was measured. VAS questionnaire was taken. The results obtained were statistically analyzed using one-way ANOVA test. The results were analysed using SPSS software.

Results

A total of 15 subjects were enrolled. At the end of six months, the retention force was higher in Group 3 (Kerator attachment) as compared to Group 1 (ball and socket attachment) and Group 2. Patient satisfaction was equal in groups 1, 2 and 3 but the total number of interventions is significantly higher in the attachment bar. Significant differences are noticed in retention force among the three attachment types.

Table 1: mean retention

Retention (Newton)	Mean	P-value
At the time of loading		
Group 1	6.54	0.000) (S)
Group 2	7.05	
Group 3	8.29	
6 months after loading		
Group 1	6.00	0.001(S)
Group 2	5.57	
Group 3	7.96	

Table 2: Mean visual analog scale score

VAS score	Mean	P –value
At the time of loading		
Group 1	68.12	0.000 (S)
Group 2	64.52	
Group 3	76.28	
6 months after loading		
Group 1	60.52	0.002 (S)
Group 2	56.85	
Group 3	73.25	

S: Significant

Discussion

Retention is gained by mechanical connection (e.g. friction, magnetic) between an element contained both in the implant and the prosthesis [15]. There are various attachment systems on the market that differ in form and material, the most popular being the retaining bars and the individual 'ball-type' attachments [16]. The Locator attachment was first discovered in 2001 by 'Zest Anchors' (Escondido, CA,USA), this self-aligning attachment is strong enough and long lasting, wants a low prosthetic space, and has dual retention [17, 18]. The 'Kerator' system (Daekwang Co., Seoul, Korea) is a newer version of the 'Zest Anchors' Locator. This kind of attachment is especially designed for patient with lowest vertical space among all other attachments [19]. Hence, this study was conducted to evaluate retention and patient satisfaction with bar-clip, ball and socket and kerator attachments in mandibular implant overdenture treatment.

In the present study, a total of 15 subjects were enrolled. At the end of six months, the retention force was higher in Group 3 (Kerator attachment) as compared to Group 1 (ball and socket attachment) and Group 2. A study by Varshney N et al, after evaluation of prosthetic space, fifteen edentulous subjects received two implants in the inter-foramina region of the mandible and were divided into 3 groups with 5 subjects each, delayed loading protocol was followed in all the patients. At the end of six months, the retention force and satisfaction level was higher in Group 3 (Kerator attachment) as compared to Group 1 (ball and socket attachment) and Group 2 (bar and clip attachment) and patient satisfaction was equal in groups 1, 2 and 3 but the total number of interventions is significantly higher in the attachment bar. Analysis of variance with repeated measures showed significant differences in retention force among the three attachment types. Patient satisfaction was higher in Group 3 (Kerator attachment) in compare to Group 1 (ball and socket attachment) and Group 2 (bar and clip attachment) [20].

In the present study, patient satisfaction was equal in groups 1, 2 and 3 but the total number of interventions is significantly higher in the attachment bar. Significant differences are noticed in retention force among the three attachment types. Another study by Nassar et al., an epoxy model was constructed for a completely edentulous mandible. Two implants were placed according to prosthetically driven implant placement by a computer-guided surgical stent. Bar clips were digitally designed, 3D printed, and pressed into Poly Ether Ether Ketone (PEEK). Retention values were recorded using the universal testing machine at initial retention and after 1, 2, and 3 years of simulated usage. For proper sample sizing, 24 models and dentures (12 for each group) were used. An independent sample t-test and repeated measures analysis of variance were used to compare the data. There were statistically significant differences in retention between the PEEK and nylon bar clips at the beginning of the experiment ($p = 0.000$*). But after 3 years of simulated use, there was no significant difference in retention between the test groups ($p = 0.055$, NS). After 3 years of simulated use, the retention of PEEK clips decreased by -58.66% recording 17.37 ± 1.07 N, while the retention of nylon clip increased by $+2.99\%$ recording 16.56 ± 0.88 N. The digitally designed PEEK clip showed comparable retention results to the nylon clip after 3 years of simulated use. [21] Neshandar Asli H et al., conducted a prospective study on 54 eligible edentulous patients (48-74 years, 30 males and 24 females). After obtaining written informed consent and ethical approval, the patients filled out a questionnaire regarding their satisfaction with the overdenture. Data were analyzed by the generalized estimating equation (GEE) model at 5% level of significance. History of denture use (P=0.232) and number of implants (P=0.609) had no significant effect on the overall satisfaction of patients. The overall satisfaction was not significantly different between males and females (P=0.415). The effect of time passed since delivery and age on satisfaction level was significant, such that the overall percentage of satisfaction was higher at 3 months after delivery (P<0.001) and in older individuals (P=0.040). The satisfaction level of patients with mandibular implant-supported overdentures depended on the time passed since delivery and age of patients; number of implants (2 or 3) and history of denture use had no significant effect on patient satisfaction with the overdenture [22].

Conclusion

Group 3 (kerator attachment) exhibit higher retentive capacities than Group 1 and Group 2.

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How to Cite This Article
M Priya, V Khushboo, K Shalini, S Komuravelli, S Manjiri. Retention and patient satisfaction with bar-clip, ball and socket and kerator attachments in mandibular implant over denture treatment. International Journal of Applied Dental Sciences. 2023;9(2):478-480.