



Research Article

Study of retention ability of different implant retained overdenture associated attachment systems

Authors

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Abstract

Background: *Overdenture supported implant attachment system is most commonly used in edentulous patients. Problem associated with implant success includes prosthetic problems, severely resorbed mandibular ridge etc. Present work is aimed to evaluate stability and retention capability of different implant retained overdenture.*

Materials and Methods: *An overdenture was made on an edentulous mandibular model with heat cured polymethyl methacrylate resin. These overdentures were fabricated and shaped to accept three different attachment systems which divided into three groups; Group I, Group II and Group III i.e. ball/o ring attachment, Hader bar and clip attachment and locator implant over denture attachment stud type respectively. These all attachments were checked for retention force both before as well as after thermocycling (AT)*

Results: *Group I showed 52.12 and 49.10 mean retention force value before thermocycling (BT) and after thermocycling (AT) respectively. Whereas BT and AT values of retention force for Group II (bar and clip attachment) was 79.10 and 70.67 respectively. These values for locator stud attachment i.e. Group III were 40.14 BT and 38.21 AT. The difference among BT and AT in all groups was significant ($P < 0.01$).*

Conclusion: *As data observed, ball o ring and bar clip attachments were observed to be superior over locator stud attachment.*

Keywords: *Overdentures implant, mandibular ridge, attachment system, bar and clip.*

Introduction

Dental practitioners in their practise period experienced many edentulous patients have problem of compromised maxillary and mandibular ridges. In this situation, it becomes very challenging for a specialist to fabricate prosthesis that possess good retention as well as satisfied the patient's expectation. Successful

incorporation of implant with patient's oral functions as well psychological acceptance of the dentures by the patient is vital part to attain constructive outcome of overall denture treatment^[1].

Now a day's, dental implants are most commonly used especially in older age which is best alternative for missing one or two teeth. One of

the problems faced in edentulous patients is severely resorbed mandibular ridge which results in poor retention and stability of dentures consequently causes psychological problems. Literature suggested that conventional mandibular dentures are not good enough to restore masticatory function which in turn affects oral as well masticatory function^[2]. This problem can be overcome by prosthetic management using implant-retained overdentures^[3,4]. These implants were also observed to be effective in patients with resorbed ridges^[5].

Different types of overdenture are commercially available but regular long period of use of the same pose some problems. Several types of attachments can be employed with implant overdentures like magnets, Ball/O-ring, bar(s)/clip(s) and Locator attachments. It is very important to plan overdentures cautiously for the adequate stability, finest shape, form, appearance, and comfort^[6]. Main factors that affecting attachment systems selection are the inter-arch space, stress distribution between implant and mucosa, and the amount of retention and resistance needed^[7].

Retention is a major factor in patient satisfaction, can be defined as a superiority inherent to a prosthesis that acts to resist the forces of dislodgement along the path of placement^[8]. Thus, the attachment system must offer a retentive force that is strong sufficient to prevent overdenture displacement^[9], and mechanical and frictional contacts can be the root of retentive forces^[10]. As well, the performance of implant-supported overdentures depends on the retentive capability of the attachment system in use^[11]. Though, the recent literature on retentive force and wear of attachment systems is comparatively scarce^[12]. The retention element is observed to be an integral part of a soft liner of a normal acryl denture. Retention is guaranteed by a hole in a soft liner which is undersized to the diameter of IA. This allows us to form insertion which generates an implant-silicone rubber frictional connection. Effectively selected geometry and precise material

properties of silicone allow the course of elastic strain of the element in harmony with the resilience of mucosa in the bearing area^[13]. So, the aim of this study was to compare the effect of different attachment system used in implant retained overdenture.

Materials and Method

Edentulous male patients, ranging from 47 to 65 years of age were assigned in current research. It comprised of edentulous mandibular models which were prepared with heat cured polymethyl methacrylate resin. Two implant replicas were placed in the intraforaminal region with dimension of 4.1 mm diameter and 10 mm length. Acrylic resin mandibular overdentures were fabricated and provision was made to obtain three different overdenture attachment systems i.e. prefabricated ball/o ring attachment, Hader bar and clip attachment and locator implant overdenture attachment stud type.

Each patient was subjected to routine medical and dental investigations. Cone Beam Computed Tomography (CBCT) was used for preoperative radiographic planning of the implant sites.

Employing a general testing machine, each of the patients were subjected to 100 pulls each to dislodge the overdenture from the acrylic model, and the force values as shown on the digital indicator used, thus obtained data were recorded before as well as after thermocycling (AT).

Statistical Analysis

Thus obtained data were subjected to statistical analysis. P value less than 0.05 was considered significant.

Results and Observation

There were three group i.e. Group I, Group II and Group III assigned for different attachment system which involve patient with ball/o ring attachment, Header bar and clip attachment and locator stud attachment respectively.

Results of this study depicted in **table no 1**. Group I showed 52.12 and 49.10 mean retention force

vale before thermocycling (BT) and after thermocycling (AT) respectively. Whereas BT and AT values of retention force for Group II (bar and clip attachment) was 79.10 and 70.67 respectively.

These values for locator stud attachment i.e. Group III were 40.14 BT and 38.21 AT.

The differences in the mean values among the treatment groups are great enough and data is statistically significant difference ($P < 0.01$).

Table 1: Mean values of retention for different attachment system

Group I (Mean \pm SD)		Group II (Mean \pm SD)		Group III (Mean \pm SD)	
BT	AT	BT	AT	BT	AT
52.12 \pm 2.08	49.10 \pm 1.21	79.10 \pm 1.25	70.67 \pm 2.78	40.14 \pm 0.97	38.21 \pm 0.89
P<0.020		P<0.010		P<0.05	

Discussion

The implant supported overdentures are best option for the treatment of edentulous mandible [14]. Satisfactory retention is necessitating for patient satisfaction, hence it is very important to select attachment systems based on good retention and stability by clinician [15] thus promoting chewing function as well as patient comfort and compliance. A hole milled in acrylic denture facilitates the utilization of elastic properties of silicone rubber very efficiently and thus it lowers the load of both implant and tissues around the implant. This attachment used to steady the denture, while the occlusion forces are transferred mainly by the denture base to the tissues of the bearing area. Similarly, in the present work three overdenture implants i.e. ball/o ring attachment, Hader bar and clip attachment and locator stud attachment placed in three different groups and checked for their retention force, as according to done by Dutt et al., [16]; Mohamed Y Abdelfattah and Mohammed K Fahmi [17]; Chung et al [5]. Several studies have been done on the assessment of the ball and bar attachment systems. [18,19] On the other hand, there is a lack of clinical study which examines the Locator attachment system [20].

It was observed that among the implant included in study, ball/o ring attachment and Header bar and clip attachment showed good mean retention force (BT as well as (AT) as compared to Locator. Bar and clip attachment exhibited the uppermost peak as well as the highest mean retention force at the end of the study. The Locator attachment

showed a decrease in retentive potential after an early peak. Van Kampen et al [21] calculated initial retention force, loss of retention force after 3 months of function and post insertion maintenance and problems linked with the utilization of bar-clip and ball attachments in mandibular overdenture treatment. They observed that functional trouble in the ball attachment group were comparatively infrequent, simply convenient and observed in 4/36 attachments. The bar-clip attachments known to be have no maintenance problems at all.

It was observed that the success rate of implants not only depends on attachment system but also on bone quality and quantity and arch morphology more significantly influence implant survival rates [22]. In the present study differences in the mean values among the treatment groups are great enough and data is statistically significant difference. This observation is in accordance with Trakas and colleagues [23], which reported that the correct placement of the implants affects the maintenance of the attachment systems.

Conclusion

Thus present study suggested that ball o ring and bar clip attachments were observed to be superior over locator stud attachment. They have relatively high retention values of BT and AT as compared to Locator.

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