

REVIEW ARTICLE

ATTACHMENTS FOR IMPLANT SUPPORTED OVERDENTURES

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ABSTRACT

Objective - The main aim of this review article is to discuss advantages, disadvantages and complications in implant supported overdentures (ISOs) as treatment in edentulous patients. Materials and Method: We performed a Medline search and review of pertinent articles on the mentioned subject from 1986 to 2011. Results and Conclusions: Implant supported overdentures constitute an accurate and predictable treatment option and achieve a higher patients' satisfaction.

This type of treatment constitutes a cheaper treatment than fixed prostheses and in some patients, with loss of lip support or with an interocclusal space larger than 15 mm, the choice of implant supported overdentures seems to prevent future aesthetic or phonetic problems.

Keywords: Implant, Overdenture, attachments

INTRODUCTION

Teeth loss may be due to trauma, caries, periodontal diseases and congenital defects. Loss of teeth has a negative impact on masticatory function, esthetics and self-image. As a normal phenomenon residual alveolar bone undergoes resorption after extraction. Edentulous patients with severe resorption may experience a problem with conventional complete denture treatment because of impaired load bearing capacity. These include pain during mastication, loss of retention and stability of complete denture. To overcome these problems the overdenture concept came into existence in the year of 1960s. Treatment of edentulous patients with implant-retained removable prosthesis has been shown to provide a predictable and successful outcome that overcomes the functional deficiencies associated with conventional dentures. Clinically, placing implants in the edentulous mandible has become a standard treatment for patients who are not satisfied with conventional complete dentures. According to McGill consensus statement on

overdentures, evidence exists suggesting that a 2-implant overdenture should become the standard care for treatment of the edentulous mandible. This implant supported treatment option has reported a survival rate of 94.5- 100 %. Most of these attachments are compatible with the majority of implant systems. All available attachment systems are designed to prevent vertical movement of the denture, and can be used as an isolated attachment mounted directly to the implant or attached to a bar system. The choice of the attachment is dependent upon the retention required, jaw morphology, anatomy, mucosal ridge, oral function, and patient compliance for recall. Clinicians have selected different attachment systems based on factors such as durability, patient demand, cost effectiveness, technical simplicity, and retention¹. Attachments can be classified depending on its function as a) rigid, if they do not allow any denture dislodgements, or b) resilient, when they allow translation, rotation, axial or hinge over posterior axes movements or a combination of them because of their flexibility. With rigid attachments, the implant will receive 100% of occlusal load, whilst, with resilient attachments, occlusal load will be supported by implant, denture or fibromucous. Currently, the most used attachments are:

Bar Attachments - It is now proven fact that bar type of attachments provides good retention and stability. The disadvantages of this attachment system are:

- Vertical dislodgement, bar type attachments show maximum stress generation around implants
- Fabrication is technique sensitive
- Higher cost
- Maintenance of hygiene is difficult which can lead to problems like mucosal irritation
- Frequent loosening of retentive clips.

The ideal length of a single bar should be minimum of 20-22 mm to accommodate two clips. Hence, while placing implants one should keep this aspect in mind. Shorter bar attachments cannot provide adequate retention and support.

Ball Attachment System- It contains the matrix part in the denture and the matrix part in the implant. They are indicated for the simplicity and low price and it has

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a better score on retention and patient satisfaction. Problems encountered with ball attachment are the implant should be parallel to each other and there must be enough vertical height for the patrix part (inter arch space must be adequate for attachment height).

To overcome the problem of angulation and limited inter-arch space, Locator Attachment has come in to existence. In this locator attachment the matrix part is placed in the implants and patrix part is placed in the denture. The matrix is composed of a Locator abutment made of Titanium with a Titanium-nitride coating. It is inserted into an implant and torqued with a specific torque wrench. This locator attachment has a restriction to certain degrees of angulation without compromise of the retention and can function well in reduced inter arch space when compared to ball attachment. The patrix is a Locator cap with an interchangeable nylon insert.

The patrix engages the matrix to provide a sufficient retention force to stabilize and retain the overdenture. Clinically, the patrix is embedded in the overdenture and the matrix remains intraorally. The patient is able to manually engage. There are 5 main advantages to the Locator system advertised by the manufacturer.

1. It has a low vertical height compared to other systems allowing the clinician to use it in areas of restricted vertical space. It is important to consider that its diameter is larger than most other attachment systems which can represent a limitation.
2. The self-aligning design allows for the patrix and the matrix to attach together without precise alignment, which makes the connection easier to execute by the patient.
3. The Dual Retention is patented and has been incorporated in the clear, pink and blue nylon inserts to increase the retention surface area ensuring long lasting retention life in the 0° to 10° situation.
4. The rotational pivoting action allows a resilient connection for the prosthesis. This feature reduces the amount of retention loss. The nylon remains in contact with the abutment while the metal cap moves over the nylons

Finally, they can be used in non-parallel implant situations. The clear, pink and blue can compensate for up to 10° of divergence from vertical (20° between implants) while the green and red inserts can be used for up to 20° of divergence from vertical (40° between implants). The internal extension is absent from the green and red insert to compensate for the angulation and disengage the overdenture. Selecting An Adequate Retention System.

1. Depending on upper and lower jaw: in the mandible

it will be easier to place parallel implants, thus, ball or Locator attachments would be indicated. In the maxillary, implants divergent emergency, worse bone quality and the use of short implants due to sinus proximity, will mandate the use of bar attachments

2. Depending on the arch form: bar attachments will be indicated in wide arches. On the other hand, in narrow arches using ball or Locator attachments would be indicated.
3. Depending on bone reabsorption rate and implants length: if implant is at least 10 mm long, it can be used as unsplinted, but if it less than 10 mm long it will be indicated that the implant be splinted with bar attachments. According to Jemt and Lekholm⁵, there were more failures (24%) in implants less than 10 mm long.
4. Depending on implant location: if implants are placed quite far from each other, it will not be indicated to use bar attachments due to increase of bone stress.

MATERIAL AND METHODS

We performed a Medline search and review of pertinent articles on the subject in a period from 1986 to 2014. After a selection process, we have included some comparative studies based on the efficacy of different attachment systems, complications associated with ball, bar and locator attachments.

RESULTS AND DISCUSSION

A. Maxillary Treatment Choices. ISO will be indicated in severe bone reabsorption, as it might compensate the loss of lip support avoiding air or saliva lost when speaking as it often occurs with fixed implant rehabilitations. Due to biomechanical requirements and worse bone quality, treatment options are just two: four or six-implant-supported overdentures, with an antero-posterior extension as wider as possible. Preferably, implants should be splinted with a bar without cantilevers that follow the arch shape to avoid fractures. On the other hand, there are some clinicians who prefer using a Locator system (Fig. 3), although this fact is less documented in the literature.

Slot et al. ⁹, in a meta-analysis to evaluate the most successful maxillary treatment, concluded that six implants and a bar followed by four implants and a bar and last, four implants and ball attachments, constitute the most successful treatment B) Mandibular Treatment Choices. If there are good or excellent anatomical conditions with an inverted “U” shape alveolar ridge,

without great bone reabsorptions, with support and lateral stability and basic patient demands, the ideal choice would be a splinted or unsplinted two-implants-supported overdenture.

Implants should be parallel, perpendicular to the occlusal plane, and be situated at the same height to avoid faster wear in the highest or more leaning implant. Another option would be to use a splinted three implant-supported overdenture that will limit denture rotation dislodgement. Geckili et al. in a 3-year follow-up study, of patients wearing mandibular three-implant supported overdentures, found 100% of survival rate. If there are severe or moderate anatomical conditions, with great bone posterior alveolar ridge reabsorptions and retention, support and stability loss, as well as high patient's demand, it will be indicated to use a splinted or unsplinted four-implant supported overdenture. In 2011, Burns et al. concluded that the greatest retention was found with four splinted implants with a bar although patients show

a higher satisfaction with ball attachments in a survey of 30 patients treated with four-implant supported overdenture and ball or bar attachments.

ISOs with five or more implants will be indicated on fixed implant-supported rehabilitation, although there are some clinicians who might use these types of overdentures in square-shaped arches. Comparative studies by Rashid et al. and Assunção et al. , in patients wearing conventional dentures and ISOs, they concluded that: ISOs produced less bone reabsorption, had greater retention and stability and that they possess a better chewing function, thus increasing patients' satisfaction and improving their quality of life.

Ueda et al. performed a 24-years follow-up study in patients wearing a mandibular ISO with bar or ball attachments, obtaining 85.9% of survival rate and concluded that ISOs constitute a long-term success treatment.

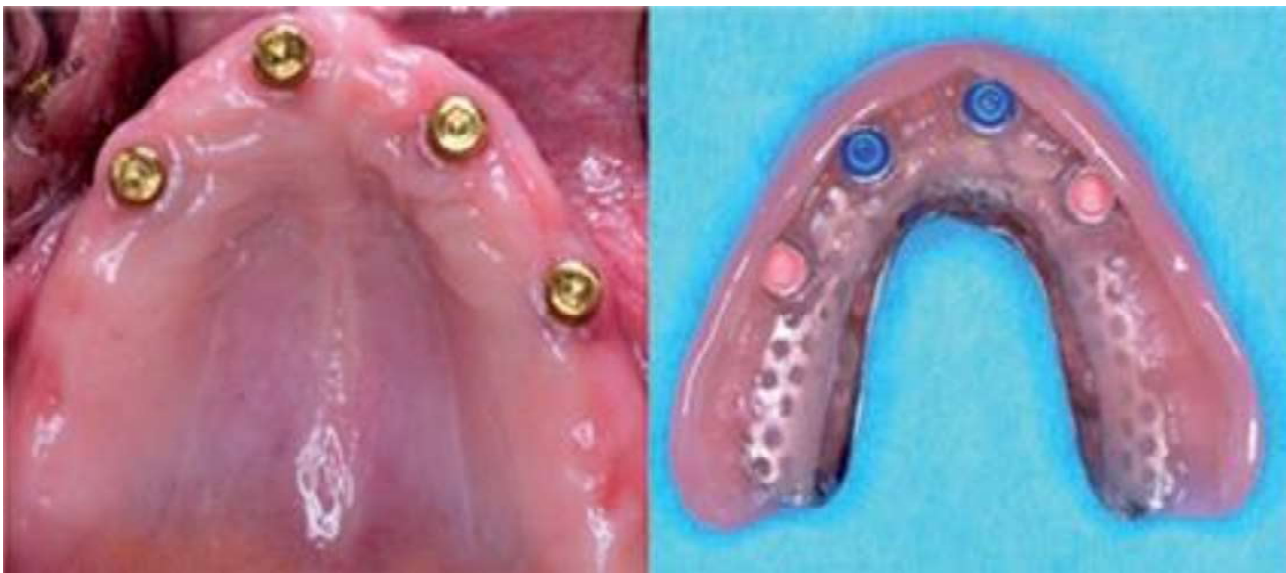


Fig. 1: Maxillary overdenture with four implants and Locator's attachments



Fig. 2: Mandibular overdenture with six implants behaving as a fixed denture but with easier hygiene

In an in vitro study, Sadig et al. concluded that Locator attachments had greater retention and stability than ball or magnetic attachments. Van Kampen et al. also argued that magnetic attachments had a weaker retention and needed more maintenance than ball or bar attachments. According to Kleis et al. Locator attachments need a greater maintenance due to their progressive loss of retention. On the other hand, Cakarer et al. claimed that Locator attachments show less complications and that they possess better maintenance outcomes than ball or bar attachments.

Menicucci et al., in a comparative study with different attachment systems, reported that bar attachments produced a greater marginal bone stress than ball attachments. Maxillary overdenture with four implants and Locator's attachments. Mandibular overdenture with six implants behaving as a fixed denture but with easier hygiene

A study was carried out in the Department of Oral and Maxillofacial Surgery, Istanbul University, Dentistry Faculty. The population of this study, constituted of 36 patients (16 male, 20 female) who have been treated with implant supported mandibular or maxillary overdentures. The implants were placed between the time periods from 2004 to 2009. The age of the patients ranged between 43 and 89 years with a mean age of 66.3 years. Patients with adequate bone volume and with a complete edentulous mandible or maxilla were included in the study. Patients with uncontrolled systemical health problems were excluded. The patients agreed with a written informed consent.

The individuals have been randomly assigned to the ball, bar and Locator attachment groups. Bilaterally balanced occlusion was performed on all of the prosthesis. Once treated, each patient's information was updated regularly according to the frequency of recall visits. The complications encountered, were associated with the overdentures, attachments and implants. Fractured overdentures, replacements and/or activations of O-rings and retention clips, implant failures, hygiene problems, mucosal enlargements, attachment fractures and retention loss in the attachments were recorded. A total of 21 complications (14 in ball group, 7 in bar group) were observed.

The distribution of patients with regard to the complications is summarized in table 1. Nineteen patients were present without any complication. On the other hand, seventeen patients were present with various complications associated with attachment types, prostheses or implants.

Several studies evaluated the ball and bar attachments regarding the retention force and prosthetic

complications. Sadowsky⁷ reported that solitary ball attachments appear to be less costly and less technique sensitive. However, ball attachments seem to be less retentive than the bar design. Naert and colleagues¹⁶ reported that single attachments provide lower retention than do bars for fixation of overdentures.

Kiener and colleagues¹¹, evaluated the prosthetic complications with implant supported overdentures in the maxilla. The most frequent finding was retightening of the bar screw and adjustments of the bar retainers. In a multicenter study on overdentures which were splinted with 2 implants, the need of clip activation was reported as 62% of the study group and clip fracture was reported in 33% of the patients. Within the limitations of this study, it is concluded that all the attachment systems were useful. No significant difference was observed between the attachment systems regarding the implant failure, replacement of the attachment fragments and fractured overdentures. However ball and bar attachment fragments required more service. On the other hand Locator attachment was found more advantageous to ball and bar systems, regarding the rate of complications in clinical practice. Further studies are still needed, including the comparison of ball, bar and Locator attachment systems used in implant overdentures.

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