

Attachments Used with Implant Supported Overdenture: A Review

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ABSTRACT

Attachment retained implant over dentures are functionally superior, effective and cost friendly alternatives to fixed implant dental prosthesis, as compared to conventional dentures, a wide variety of commercially available systems are employed to connect implants to over dentures. Attachments for both maxillary and mandibular over dentures provide good implant prognosis and predictable retention while simplifying implant treatment protocols, making implant dentistry accessible to a larger segment of the population.

Keywords: Attachment System; Dental Implant; Over denture

INTRODUCTION

Edentulism is considered as a poor health outcome, which may compromise the quality of life. The prosthetic management of the edentulous patient has always been a big challenge to dentistry. Conventional complete denture is the classical treatment plan for the edentulous patient. However, this treatment modality comes with several complications that usually occur on the lower denture; leading the researchers to focus more on the mandibular jaw. With the use of an implant retained denture, also known as an implant overdenture, the problem of stability and retention of a complete denture has been partially solved.

The Attachments Can Be Classified Into

Frictional, mechanical, frictional, and mechanical and magnetic attachments⁶

The retentive force of the locator, ball, and magnetic attachments is achieved through mechanical interlocking, frictional contact, or magnetic forces of attraction between the patrices and matrices⁷. Fabrication of attachments used to connect the denture and implants are done either by machine milling an alloy or custom cast from plastic patterns. Machine-milled attachments are usually used on the individual implant, while the use of custom-cast attachments in the bar design is widely popular. Satisfactory results have been shown in both designs, in terms of implant success and patient satisfaction⁸. Stud, Bar, Magnets, and telescopic attachments are the attachments used to retain implant over denture.

Stud attachment

Stud attachments consist of a female part which is frictionally retained over the male stud. It is then incorporated into the denture resin either by transfer coping system and the creation of a master cast incorporating a replica of the attachment or directly in the mouth using self-cured or light polymerized resin¹⁰. According to function, stud attachments are classified into resilient and non-resilient attachments. Resilient attachments protect the underlying abutments or implants against overload by permitting some tissue ward vertical and rotational movements. However, resilient attachments normally require a large space and can result in posterior mandibular resorption with the vertical movement of the

denture, while on the other hand, the non-resilient type do not allow any movement of the overdenture during function and were usually used when the interocclusal space was limited¹¹. The use of stud attachments in cases with V-shaped arches, where straight connection between the implants can affect the tongue space, is one of its main advantages¹².

Stud attachments include

O-rings attachment

It comprise of a titanium male unit and a rubber-ring female unit. It transfers the amount of stress to the abutments and offers an excellent shock resorbing effect during function¹⁴. (Rodrigues et al. 2009) evaluated the retention force of an O-ring attachment system inclined differently to the ideal path of insertion and concluded that, the retention was adequate for longer time and the retentive capacity of O-ring was affected by implant inclinations, when the O-rings attachments were properly placed parallel to each other¹⁵.

ERA attachment

It is an extra-radicular attachment that has two design systems. The first is a partial denture attachment, which is placed on the proximal (mesial/distal) aspects of artificial crowns, while the second is an axial (or over denture) attachment, which is either placed inside the prepared roots or the ERA implant abutment for over denture prosthesis. The abutments are of two types; first is the straight one piece abutment type and second is the two piece angulated abutment type (5°, 11° and 17 angles). Each ERA retentive system is available in four color codes, (white, orange, and blue, gray), that offers different degrees of retention from light to heavy. It is indicated when resiliency is necessary, as it provides vertical resiliency & universal stressrelief¹⁶.

Ball attachments

The ball and socket attachments consist of a male portion, which is a metal ball screwed into the fixture, where the female part is incorporated in the fitting

surface of the denture. The female part can be one of the following types:

- A. The O-ring, where the retentive element is rubber ring. As the rubber ring wears within a few weeks, it is better to have parallel implants.
- B. A metal part, as in dalbo system which permits less resilience, although the retentive forces are almost twice those obtained with the O-ring system.
- C. A spherical metal anchor in which the female part has a spring. These attachments are resilient and easily activated¹⁷.

Ball attachments are one of the simplest of all stud attachments that is commonly used because of their low cost, ease of handling, minimal chair side time requirements and their applications with both root and implant-supported prostheses¹⁸. Many authors agree that, the most common attachment used for unsplinted implants is the ball attachment. This attachment system is practical, effective, and has relatively low cost. Compared to bars, solitary balls were claimed to be less costly, less technique sensitive and easier to clean. Moreover, with the use of solitary ball attachments, the potential for mucosal hyperplasia was reduced. However, bars were shown to be more retentive¹⁹. In one of the studies that compared load transfer and denture stability in mandibular implant retained over denture retained by ball, magnet, or bar attachments, it was suggested that the use of ball attachment was advantageous in optimizing stress and minimizing denture movement. It was revealed that the stress on peri implant bone was greater with the clip/bar than that of ball attachment, when comparison was done between overdentures retained by ball and socket attachment and another design retained by two clips on a bar connecting the two implants, regarding the stresses on the peri implant bone.

Locator (self-aligning) attachment

It is an attachment system with self-aligning feature and dual retention; inner

and outer Locator attachments are available in different colors (white, pink and blue), each having different retentive value. Additional features include the extended range attachments, used to correct implant angulation up to 20 degrees²³. They are available in green, which has standard retention, and red, which has extra-light retention. The reduced height of this attachment is an advantage, especially for cases with limited interocclusal space or when retrofitting an existing old denture. A laboratory study investigating the properties of this attachment observed that, the short profile distance of locator may affect the load transfer to the implant. The rounded edge of the abutment helps in guiding the nylon male within the denture into place (self-aligning feature). Locator attachment can also accommodate divergent implants up to 20 degrees. A wide variety of abutment heights, angulations correction and different levels of retention are available, that helps to create the optimum overdenture restoration for each case. In a study done to evaluate the clinical performance as well as patient and clinician satisfaction on two different prosthodontic retention systems (locator and bar) for implant-over dentures in the mandible, it was revealed that the patient satisfaction was confusable in both groups; the locator system offered better soft tissues scores. However, the frequency of chronic inflammation around the implants was more around bars attachment group.

Magnet attachments

Magnetic retention one of the popular methods, where the removable prosthesis is attached to either retained roots or osseointegrated implants. The magnet is attached to the fitting surface of the acrylic resin base of the overdenture is usually Cylindrical or Dome-shaped. The magnetic keeper cast to a metal coping is either cemented to the root surface or screwed over the implant fixture. In the magnet system used for overdenture retention, the magnet is incorporated into the overdenture,

which is a neodymium-iron-boron alloy or a cobalt-samarium alloy. The ferromagnetic keeper is the second part of the magnetic system, which is screwed into the implants. Compared to that of the ball and bar-clip attachments, the retention force of magnet attachments in implant-retained mandibular overdenture treatment is less. In cases of a completely edentulous patient, the immediate loading of magnet attachment-retained mandibular implant overdentures is considered to be a viable treatment that increases retention, and stability of conventional dentures.

Bar attachments

The bar attachment usually includes a metallic bar, that splints two or more implants or natural teeth spanning the edentulous ridge between them and a sleeve (suprastructure) which is incorporated in the overdenture that clips over the original bar to retain the denture. A wide variety of forms of bar attachments are available; they could be either prefabricated or custom made. Based on the shape and the action performed, they are of two types. Bar joint that allows some degree of rotation or resilient movement between the two components. Spacers are provided, to ensure a small gap between the sleeve and the bar during processing.

Bar joints are subdivided into two types: single sleeve and multiple sleeves; the former has to run straight without allowing the anteroposterior curvature of the arch, so it is used in square arches, while the latter can follow the curvature of the arch and also enables the use of more than one clip. Bar units offer rigid fixation of the overdenture, permitting no movement between the sleeve and the bar. The prefabricated bars are less expensive and more solid with an equal cross section. Hence, they are preferred to milled bars. Prefabricated bars can be either round, ovoid or rectangular (U- shaped). Round bars provide more denture rotation than rectangular bars, thus producing less torque on implants. However, oval or U-shaped bar are preferred when using two

implants, as round bars require more frequent clip activation than U-shaped bars. The bar and clip attachments offer greater mechanical stability and more wear resistance than solitary attachments and are probably the most widely used attachments for implant-tissue supported over dentures. Moreover, short distal extensions from rigid bars can be achieved, which contribute to the stabilization, thus preventing the shift of the denture. Another advantage of bar attachment is that the forces are transmitted better between the implants, due to the primary splinting effect, load sharing, better retention and the least post insertion maintenance¹⁸.

Telescopic attachment

Telescopic crowns are also called double crown, crown and sleeve coping (CSC). These crowns comprise of an inner or primary telescopic coping, which is permanently cemented to an abutment, and an identical detachable outer or secondary telescopic crown, which is rigidly connected to a detachable prosthesis. The use of telescopic retainers has been expanded to incorporate implant retained prostheses to make use of their advantages. These retainers offer superior retention resulting from the frictional fit between the crown and therefore the sleeve and also provide better force distribution due to the circumferential relation of the outer crown to the abutment, which makes axial transfer of occlusal load produce less rotational torque on the abutment by improving the crown-root ratio, thus preserving the tooth and alveolar bone. Telescopic retainers are often classified into parallel sided crowns, tapered (conical shaped) crowns and crowns with additional attachments, according to wall design. One of the benefits of telescopic retained restoration is that the ease of removability, which conduce the patient for repeated cleaning and maintenance purposes. In addition to the present, the overdentures self-finding mechanism in telescopic constructions facilitated prosthesis insertion considerably.

This construction appeared to be an effective treatment modality for geriatric patients with serious systemic diseases such as Parkinson's diseases²².

CONCLUSION

Overdentures are shown to enhance the standard of life for edentulous patients and to contribute to the well-being of the patient's psychology. When full arch fixed implant prosthesis cannot be made, Implant-retained Overdentures offer better satisfaction than conventional dentures. The attachment retained implant-supported overdenture resolves the issues that come with the conventional denture. The attachment system is chosen depending upon the amount of retention needed, available inter arch space, manual dexterities of the patient, and skills of the dentist.

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