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CASE STUDY

IMPLANT SUPPORTED OVERDENTURE ATTACHMENTS

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ABSTRACT

Attachment retained implant overdentures are functionally superior to conventional dentures and are effective and cost saving alternatives to fixed implant dental prostheses. A wide variety of commercially available systems are used to connect implants to overdenture. Attachments for both maxillary and mandibular overdentures provide an acceptable implant prognosis, predictable retention while simplifying implant treatment protocols, making implant dentistry available for a larger segment of the population.

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INTRODUCTION

Prosthetic management of edentulous patient has long been a major challenge for dentistry. Adaptation to wearing complete denture is a complex process and must be considered from both somatic and psychologic standpoints. The necessity of suffering from uncomfortable dentures was eliminated by the introduction of dental implants in the early 1980s.Dentures that are retained and stabalized by implants and may be removed by the patients are termed implant retained or stabalized denture. The retentive elements are housed within the denture and attached to the abutment, which is then secured to the implant fixture. The attachment systems are considered the pillars of overdenture treatment. An overdenture attachment permits movement during function and removal from the mouth. Ideally, the attachment should offer the possibility of controlling the degree of retention provided (Misch, 2008). A wide variety of commertially available attachment systems are used to connect implants to overdentures either by spliting and unsplinting the implants, most commonly used include stud, bar, magnetic and telescopic attachments.

Review of Literature

An attachment is defined as a mechanical device for the fixation, retention and stabilization of a prosthesis, a retainer consisting of a metal receptacle and a closely fitting part; the former (the female matrix component) is usually contained within normal or expanded contours of the crown of the abutment tooth and the latter (the male patrix component), that is attached to a pontic or the denture framework. The anatomic situation of mandible, desired level of retention, hygiene maintainence capability, parallelism of the implants and cost consideration are important factors in choosing appropriate overdenture attachment type. The selection of the attaching mechanism for an implant retained over denture depend on : cost effectiveness, amount of retention needed, expected level of oral hygiene, amount of available bone, patient's social status, patient's expectation, maxilla mandibular relationship, inter-implant distance, and status of the antagonistic jaw (Trakas *et al*., 2006). The attachments used to retain implant overdenture include stud, bar, magnets and telescopic attachments.

Stud attachments

Stud attachments consists of a female part which is frictionally retained over the male stud and incorporated into the denture resin either by the means of a transfer coping system and the fabrication of a master cast incorporating a replica of the attachment or directly in the mouth using selfcured or light polymerized resin (Kakar, 2001).

The stud attachments are classified according to function into

1. Resilient and
2. Nonresilient attachments.

Resilient attachments- Permit some tissue ward vertical and rotational movements, thus protecting the underlying

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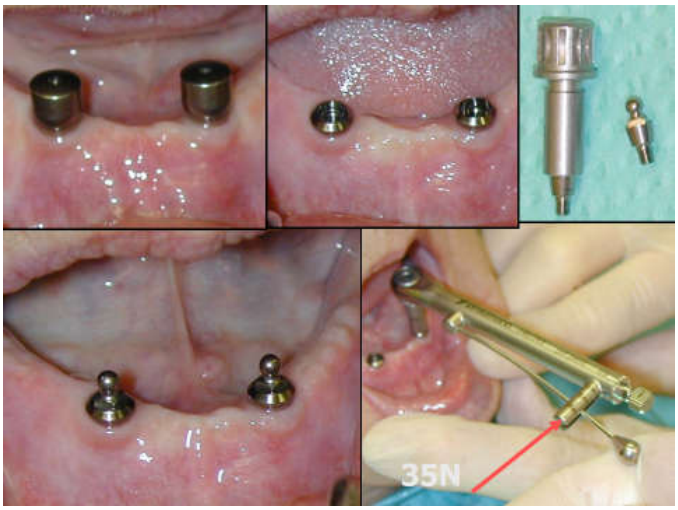
abutments or implants against overload. However, resilient attachments usually require a large space and might cause posterior mandibular resorption with the vertical movement of the denture. Non-resilient attachments- Do not permit any movement of the overdenture during function and were commonly employed when the interocclusal space was limited (Brewer and Fenton, 1973). One of the main advantages of stud attachments is the ability of its use in cases with V-shaped arches where straight connection between the implants can affect the tongue space (Walton *et al*., 2002; Heckmann *et al*., 2001).

Stud attachments include

O ring attachment

O-rings attachment consists of a titanium male unit and an easily replaceable rubber-ring female unit that is retained in a metal retainer ring. It transfers the amount of stress to the abutments and provides an excellent shock resorbing effect during function. (Winkler *et al*., 2002)

The two rubber O-rings for the ball abutments form the matrix, being the receptacle component. The matrix designs are incorporated within the undersurface of the overdenture and they are adjustable and/or replaceable



ERA attachment

It is an extra-radicular attachment with two design systems. The first is a partial denture attachment for placement on the proximal (mesial/distal) aspects of artificial crowns, while the second is an axial (or over denture) attachment, either for placement inside the prepared roots or the ERA implant abutment for over denture prosthesis. Each ERA retentive system is available in four color codes, (white, orange, and blue, gray), that provide different degrees of retention from light to heavy. It's indicated when resiliency is required as it provides vertical resiliency and universal stress relief.

Ball attachments

The ball and socket attachments consist of a metal ball (male portion) which is screwed into the fixture, where as the female part is incorporated in the denture.

The female part may be one of the following types:

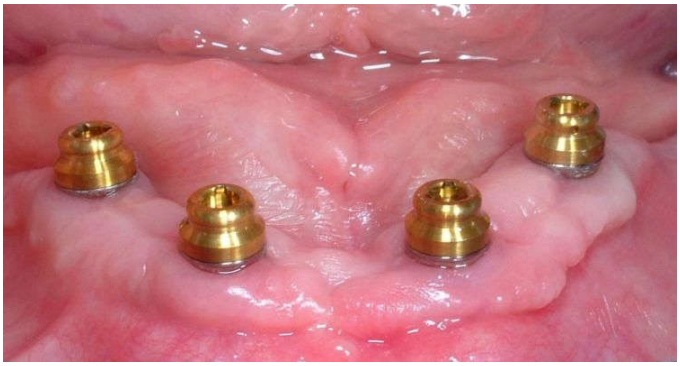
(a)- The O-ring in which the retentive element is a rubber ring. It's better to have parallel implants otherwise the rubber ring will wear within a few weeks.
(b)- A metal part as in dalbo system. This permits less resiliency but the retentive forces are almost twice those obtained with the O-ring system.
(c)- A spherical metal anchor in which the female part contains a spring. These attachments have advantage of being resilient and easily activated (Jiménez-Lopez, 1999).

Ball attachments are among the simplest of all stud attachments widely used because of their low cost, ease of handling, minimal chair side time requirements and their possible applications with both root and implant-supported prostheses (Budtz-Jorgensen, 2001). Moreover, the potential for mucosal hyperplasia was more reduced with ball attachments. One of the studies done, that compared load transfer and denture stability in mandibular implant retained over denture retained by ball, magnet, or bar attachments, suggested that the use of ball attachment was advantageous in regards to optimizing stress and minimizing denture movement. Another study was done to compare the retention of bar/clip, ball and magnet attachment in mandibular implant retained over denture. The ball and socket attachment recorded the highest value followed by the bar/clip then the magnet attachment [27]. In comparison, done between over dentures retained by ball and socket attachment and another design retained by two clips on a barconnecting the two implants, regarding stresses on the peri implant bone. The result revealed that stress on peri implant bone was greater with the clip/bar than that of ball attachment.

Locator attachment

The locator attachment system is an attachment system with self-aligning feature and has dual retention (inner and outer). Locator attachments come in different colors (white, pink and blue) and each has a different retentive value. Additional features are the extended range attachments, which can be used to correct implant angulation up to 20 degrees. The reduced height of this attachment is a advantagous for cases with limited interocclusal space. A laboratory study investigated the properties of this attachment founded that short profile distance of locator may affect the load transfer to the implant .The rounded edges of the abutment help to guide the nylon male within the denture into place (self-aligning feature) . A variety of abutment heights, angulations correction and different levels

of retention are available that help to create the optimum overdenture restoration for each case.



Magnet attachments

Magnetic retention is a popular method of attaching removable prosthesis to either retained roots or osseointegrated implants. The magnet is usually cylindrical or dome shaped attached to the denture. The magnetic keeper casted to a metal coping cemented to root surface or screwed over the implant fixture .The magnet system used for over denture retention incorporates the magnet into the overdenture which is a neodymium-iron-boron alloy or a cobalt-samarium alloy. The second part of the magnetic system is the ferromagnetic keeper which is screwed into the implants. The retention force of magnet attachments in implant-retained mandibular overdenture treatment is markedly less than the retention force of ball and bar-clip attachments (Van Kampen *et al*., 2003). The immediate loading of magnet attachment-retained implant overdentures is considered as a viable treatment option in cases of complete edentulous patient that increase retention and stability conventional dentures.

Bar attachments

The bar attachment consists of a metallic bar that splints two or more implants or natural teeth spanning the edentulous ridge between them and a sleeve (suprastructure) incorporated in the over denture which clips over the original bar to retain the denture. The bar attachments are available in wide variety of forms, they could be prefabricated or custom made.

Bar joints are subdivided into two types:

a) Single sleeve and
b) Multiple sleeves;

The single sleeve has to run straight without allowing the anteroposterior curvature of the arch, so it is used in square arches. On the other hand the multiple sleeves can follow the curvature of the arch. It also enables the use of more than one clip. Bar units provide rigid fixation of the over denture allowing no movement between the sleeve and the bar. The prefabricated bars are preferred to milled bars as they are less expensive and more solid with an equal cross section and are either round, ovoid or rectangular (U-shaped). Round bars offer more denture rotation than rectangular bars, so produce less torque on implants. However, Round bars require more frequent clip activation than U-shaped bars. Therefore oval or U-shaped bar are preferred when using two implants. The bar and clip attachments are probably the most widely used attachments for implanttissue supported over dentures as they offer greater mechanical stability and more wear resistance than solitary attachments. In addition short distal extensions from rigid bars can be achieved which contribute to the stabilization and prevent shifting of the denture. The assumed advantage of bar attachment is better transmission of forces between the implants due to the primary splinting effect, load sharing, better retention and the least post insertion maintainance (Van Kampen *et al*., 2003).

Telescopic attachment

Telescopic crowns are also known as a double crown, crown and sleeve coping (CSC). These crowns consist of an inner or primary telescopic coping, permanently cemented to an abutment, and a congruent detachable outer or secondary telescopic crown, rigidly connected to a detachable prosthesis. The use of telescopic retainers has been expanded to include implant retained prostheses to make use of their enormous advantages. These retainers provide excellent retention resulting from frictional fit between the crown and the sleeve. They also provide better force distribution due to the circumferential relation of the outer crown to the abutment which make axial transfer of occlusal load that produce less rotational torque on the abutment by improving the [12]crown

root ratio so preserving the tooth and alveolar bone. According to wall design telescopic retainers can be classified into parallel sided crowns. tapered (conical shaped) crowns and crowns with additional attachments. Telescopic retained restoration has the advantage of the ease of removability. This encourages the patient for repeated cleaning and maintenance purposes. Moreover, the over dentures self-finding mechanism in telescopic constructions facilitated prosthesis insertion considerably.

Conclusion

Attachment retained implant overdentures have become a routine alternative to traditional removable dentures and a lower cost alternative to more complex fixed dental implant prosthesis. An obvious advantage to placing attachments, is cost savings by decreasing laboratory fees and reducing chair time, but more importantly, it may be a more accurate method of attachment placement by giving the clinician complete control of attachment placement and elimination of inaccuracies caused by laboratory transfers. Innovative dental materials and techniques which simplify the technical processes involved in restorative implant dental treatment present clinicians another incentive to offer these valuable services to a greater number of patients who would benefit from implant dentistry.

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