JOURNAL OF ENGINEERING annals OF FACULTY OF ENGINEERING HUNEDOARA

RETENTION FOR IMPLANT SUPPORTED OVERDENTURES

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Abstract
When placed in the mouth, a removable prosthesis is subjected to a number of forces which tend to withdrawal it along its axis of insertion. Retention is the force that opposes this tendency. In ideal situations, overdentures should have good stability and border seal to provide retention. Unfortunately, in practice, the ideal situation does not always apply. Anatomical variations and tissue loss related to aging dictate the type of overdenture to be used. Retention systems have been devised in order to achieve a better prosthetic result.
Keywords
Overdenture, attachment, friction

1. RETENTIVE MECHANISMS

There are several types of retentive mechanisms available, including the ball/o-ring, bar(s)/clip(s), magnet, and other types of mechanical attachments.

The choice has largely been determined by practitioner preference with bars/clips being one of the mechanisms frequently selected to support/retain overdentures. When bars are used, it has been proposed that the bar be fabricated so it is parallel to the plane of occlusion [1].

Ideally, the retentive mechanism should be positioned so it cannot be seen through the visible portion of the denture base, does not interfere with proper positioning of prosthetic teeth, and does not excessively enlarge the denture base.

2. BAR ATTACHMENTS

Bar attachments (Fig. 1, Fig. 2) have been used for most of the twentieth century They can be divided into two groups, those allowing slight movement between the components, the bar joins and the comparatively rigid bar units. Bar attachments lend themselves to implant prosthodontics. The retention characteristics are favourable and they are robust and effective retainers.

This type of rehabilitation usually requires a minimum number of two implants. In the case of mandibular overdentures, the bar and clip retention system is frequently used. This system ensures the fixation and support of the prosthesis in the anterior area, but also allows protection from oclusal forces when chewing forces are applied on the posterior part of the prosthesis.

The bar, as a mesostructure is cemented or screw retained to the implants in order to join them and provide retention to the overdenture.

The Dolder bar or the round bars are used mostly in cases where implants are interforaminal because they allow the prosthesis to rotate around the axis of the bar.

Fig. 1

Fig. 2

3. BAR JOINTS

Bar joints allow some movement between the two components. They can be subdivided into two types:

- Single sleeve bar joints:

The Dolder bar joint is an excellent example of this type of attachment. This well-tried bar is produced from wrought wire, pear shaped in cross-section and running just in contact with the oral mucosa between the abutments. An open-sided sleeve is built into the impression surface of the denture and engages the bar when the denture is inserted. A spacer is provided with this bar joint to allow a degree of movemet potential.

- Multiple sleeve bar joints

The retaining sleeves are relatively short. This allows the bar to follow the curvature of the ridge as well as to be adapted to its vertical contours. This type of approach has proved to be very versatile and has become very popular with implant supported overdentures.

Although friction between the sleeves and the bars may be improved by activating the sleeve, there are many possibilities of combining this system with others like Ceka attachments, Presso-matic, Isoclip and 3-D-O-Ring.

4. STUD ATTACHMENTS AND MAGNETS

Stud shaped attachments have served as overdenture abutments for several decades. Most are straight-forward to use and possess favourable retention characteristics. Nowadays, they have applications to both root and implant supported prostheses.

For the purpose of description, stud attachments are divided into two groups:

- Extraradicular, in which the male element projects from the root surface of the preparation or implant.
- Intraradicular, in which the male element forms part of the denture base and engages a specially produced depression within the implant.

In selecting an attachment, it should be appreciated that space must exist for these units to be surrounded by a reasonable thickness of acrylic resin, otherwise the denture will be weakened.

Examples of stud attachments:

The Ceka system (Fig3, Fig.4):

The basic idea is simple: a spring pin which snaps exactly into a conical female. Together, they make up the Ceka Attachment. It was developed 35 years ago as an esthetic alternative to the traditional clasp, and ensures stable retention. Once the spring pin "clicks" into the female, the patient knows that the prosthesis is properly seated.

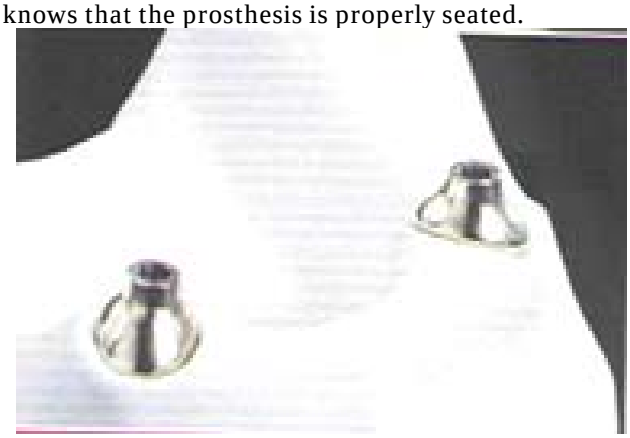

Fig.3

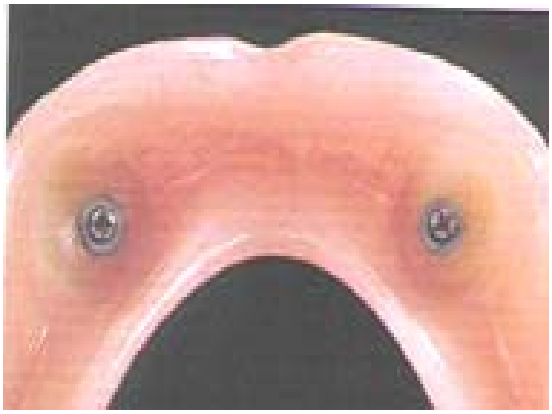

Fig. 4

Overdenture using O-Ring:

The o-ring abutment is fabricated from titanium alloy and available in variable cuff heights that incorporates a coronal spherical geometry which snaps into a rubber o-ring in the denture or partial denture acrylic base.

The Rothermann system:

It consists of a short stud with a retaining groove. Retention provided by a C-shaped ring designed so that the free ends of the clip engage the deepest portion of the retaining groove. The stud comes with a central core of solder for easy attachment to the coping

The Gerber system:

Stud type, matrix, patrix, resilient and non-resilient designs

Magnets:

Magnetic retention systems have been used in prosthodontics for some 60 years. The early types of magnets could not be reduced in size in order to allow their application for overdentures. The introduction of rare earth alloys with a high field strength and an intrinsic coercivity many times that of earlier alloys allowed the production of magnets that were not much larger than stud retainers. Space was always a problem with magnet retainers and this lead to several designs in order to fit all the necessary components. The magnets are placed in the denture and the flat keeper on the abutment root. A disadvantage of this system is the corrosion of the ferromagnetic alloys.

5. TELESCOPIC OVERDENTURES

The implant abutments are covered with occlusally converging primary cast copings. Support and frictional retention for the prosthesis is provided either by secondary cast copings fitting over the primary copings and incorporated as an integral part of the denture base.

The retention and stability of the overdenture is achieved trough the friction between the primary coping and the secondary coping in the overdenture.

6. BASE REINFORCEMENT

When the denture base will be thin or there are heavy occlusal forces present, it may be prudent to reinforce the denture base with a metal mesh/framework incorporated into the denture base or use a metal base.

Evaluating prosthetic tooth wear on an existing prosthesis provides an indication of the magnitude of forces present. When aggressive wear facets are noted on the prosthetic teeth of an existing denture, a hostile environment is likely to be present and the use of reinforcement may be advisable.

It is also important to remember that patients who have implants can place greater occlusal force on the prosthesis than they could with their conventional complete denture. However, the maximal occlusal force applied by patients with mandibular implant overdentures was found to be less than the force developed by patients with teeth and patients who have fixed complete dentures.

7. COMPARISON OF RETENTIVE MECHANISMS

When bars are used, a casting is required which increases cost and complexity. Bars have been found to provide greater retention than balls/o-rings which may be important with patients exhibiting high functional activity and the need for maximal retention. One study [2] indicated that o-rings provided significantly better retention and stability than magnets.

Bars and associated retentive devices require more space within the denture base than do o-rings. When implants will be used separately (not connected), the ball/o-ring mechanism or metal cap/stud type of design has frequently been used.

All mechanisms are subject to retention deterioration over time and the need for regular adjustment/replacement.

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