

Precision attachments- An overview

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Abstract

The awareness and demand for quality of dental treatment is relatively increasing in recent generation. Various options available for the replacement of partially missing teeth are over dentures, clasp retained removable partial dentures, removable partial dentures with precision attachments and implants. A removable partial denture with a retained attachment system is one of the treatment modalities which may assist prosthodontist to achieve better functions and aesthetics in substituting missing teeth and oral structures. An attachment is defined as “A mechanical device for the fixation, retention and stabilization of prosthesis.”

Keywords: Precision Attachment, Cast partial denture, Partial edentulism, Retention.

Introduction

The precision attachment denture has long been considered advantageous in dentistry as it combines fixed and removable prosthodontics in such a way as to create the most esthetic partial denture possible. Nevertheless they have in the past been largely ignored by most dental professionals for understandable reasons, notably cost and inadequate grasp of their application. Last decade with greater demand for complex and esthetic restoration and an increase in the popularity of implant has brought a concomitant increase in the popularity of attachment retained prosthesis. Precision attachments are two precious metal components which are manufactured to form an articulate joint [Fig. 1]. First component or matrix is a metal receptacle or keyway, which is positioned within the normal clinical contours of a cast restoration placed on the attachment or the second component or matrix is attached to the removable partial denture. They are designed to replace occlusal rest, bracing arm and retaining arm of the conventional clasp retained partial denture.^(1,2)

Synonyms Internal attachments, Frictional attachments, Slotted attachments, Parallel attachments, Key and keyway attachments.^(3,4)

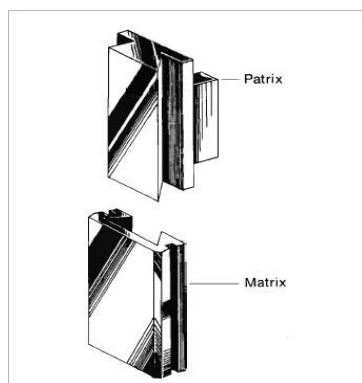


Fig. 1: Matrix and Patrix

History

The historical background of precision attachment work is somewhat obscure. Stair (1886) devised a unilateral PRD employing anterior and posterior telescopic abutment restoration.

The most important character with the development of precision attachment dentistry was Dr. Herman ES Chayes 1906 who developed the T shaped precision attachment.

1908 – 1910 He invented a parallelometer.

1912 – Designed Chayes attachment.

Ash (1912) introduced the split bar attachment system. Chayes also gave the stress breaker design which is essentially an attachment to which a hinge has been added, so allowing limited simple movement this design was later improved by McCollum.^(1,2)

Classification

- **Based on their method of fabrication and the tolerance of fit between the components.**
 - I. Precision attachment (prefabricated types) → prefabricated machined components with precisely manufactured metal to metal parts with close tolerance.
 - II. Semi precision attachment (laboratory made or custom made types) components usually originate as prefabricated or manufactured patterns (made of plastic, nylon or wax) or Hand waxed.²
 - **According to their relationship to the abutment teeth.**
 - 1) Intracoronaral / internal attachment → If the attachment resides within the body / normal contours of the abutment teeth.
 - 2) Extracoronaral / external attachment → If the attachment resides outside the normal clinical contours of the abutment crown / teeth.^(3,5)

Advantages of precision attachments

1. Improved esthetics and elevated psychological acceptance. [Fig. 2]

2. Compared to conventional clasp retained partial denture they give better retention and stability, less liable to fracture than clasp, less bulky.
3. Lateral forces in the abutment during the insertion and removal are eliminated and more axial force during functions are achieved.



Fig. 2: Improved Aesthetics with Precision Attachments

Disadvantages

1. Complexity of design, complex principles and procedures for fabrication and clinical treatment.
2. Expensive – increased overall cost of the treatment.
3. Requires high technical expertise for successful fabrication experience and knowledge on the part of dentist and laboratory technician are essential.
4. Increased demand on oral hygiene performance.⁽⁶⁾

Requirements

1. Occlusogingival length– minimum of 4 mm vertical space is required so that there is adequate space between plane of occlusion and gingiva.
2. Placement of attachments in the incisors can be difficult because of limited faciolingual width.
3. Adequate space between pulp and normal tooth contour is necessary for the intracoronal component of an internal attachment.^(2,4)

1. **Intracoronal Precision Attachment:** Intracoronal attachment were introduced in the late nineteenth century with substantial contribution from Dr. Herman ES Chayes.

Intracoronal precision attachment – prefabricated type: It comes as two component matrix and patrix. These are often accompanied by paralleling guide that fits into the dental surveyor as well as the device to activate the attachment after fabrication. Matrix (female) is waxed into the crown or bonded into a preparation in the tooth. Patrix (male) is attached to the framework usually by soldering. Type of retention is either friction or mechanical.

Intracoronal attachment based on retention

- 1) Passive attachment
- 2) Active attachment – Active friction grip attachment
Active snap grip attachment
- 3) Locked precision attachment

Advantages

- 1) Improved esthetics (particularly important in anterior part of mouth)
- 2) Point of force application to the teeth is more apical than for occlusal or incisal rest thus shortening the lever arm and decreasing torquing forces.
- 3) Point of application of thrust applied through the device lies as close as possible to the long axis of abutment i.e. most favorable position.
- 4) Natural self cleansing contours of teeth can be maintained

Disadvantages

- 1) Requires adequate faciolingual width / cervicoocclusal height to provide as large as frictional area as possible between the slot and flange.
- 2) Requires extensive preparation of the abutment teeth to obtain space for the keyway mechanism.

Various intracoronal attachments McCollum attachment, Stern attachment, Crismani attachment, Bakers attachment, Schatzmann attachment, Ney's attachment.^(7,8,9)

2. **Semiprecision Attachment:** There is a type of attachment usually referred to as a semiprecision rest attachment that utilizes an intracoronal rest seat and resilient lingual arm. First semi precision attachment was constructed by Gillete in 1923. According to Louis Blatterfein (1969). In designing of a semiprecision attachment 4 aspects of rest seat preparation may be taken into consideration: Occlusal form, Proximal form, Gingival floor form, Proximal surface placement.[Fig. 3]



Fig. 3: Semi Precision Attachments

Advantages

1. Laboratory fabricated precision attachment offers far greater adaptability to a wide variety of clinical

situations compared to prefabricated precision attachments.

2. Versatility for many clinical variation
3. Variation in tooth size and shapes are most easily accommodated.

Disadvantage

1. Long term wear is more
2. Lack of interchangeability of male and female attachment as there is no standardization of sizing as been in prefabricated parts.
3. Repair and replacement of custom attachments are more difficult as composed to prefabricated parts.

In 1979 Ira D Wisner discussed about two basic types of semi-precision attachment Locking and Non locking.^(2,4)

3. **Extracoronar Attachments:** It was introduced by Henry R Boos in the early 1900's and later modified by F Ewing Roach (1908). Extracoronar attachments are retaining devices having part or all of their mechanism outside the normal contour of the attachment tooth.[Fig. 4]



Fig. 4: Extracoronar Attachments with Crowns

Extracoronar attachments provide only retention but not the lateral force transmission (bracing) or occlusal force transmission (support) required from a removable partial denture retainer. Application of these attachments is in distal extension partial denture when a mechanical stress breaker is required. (Kennedys Class I and Class II).[Figure 5]

These attachments are employed to reduce the stresses on the abutment teeth and transfer them to the denture bearing areas.



Fig. 5: Extracoronar Attachment in Distal Extension

Classified by (Boitel 1978)

Rigid attachment

Resilient attachment

Bar attachment

Advantages

1. It does not alter the normal contour of the abutment, crown being entirely outside the tooth contour.
2. Easy insertion and greater freedom in design.
3. Do not require space within the contours of the abutment tooth hence can be used when there is insufficient buccolingual width to accommodate the intraoral attachment.

Disadvantages

1. Lack of occlusal stability
2. Improper control of force distribution between dentulous and edentulous area
3. Maintenance problems
4. Bulky, break or wear
5. Rebased problem.^(10,11,12)

4. **Magnets as Attachment:** Use of magnets started gaining popularity since 1960 – when magnets based on rare earth element was developed. These magnets were of small size having high strength. In recent years, there has been an increased interest in the use of magnets, the modern alloy are powerful and retain their magnetism for a long time. [Fig. 6]



Fig. 6: Magnetic Precision Attachments

Magnet used nowadays Samarium cobalt (Sm -co), Neodymium iron boron (Nd-Fe-B) – 20% strong per unit volume than the cobalt – samarium alloy, Samarium-iron-nitride.⁽¹³⁾

5. **Auxillary Attachment:** A wide variety of attachments fall into this category only a few most significant ones are: Screw and tube attachment, Key and keyway / Interlocks., Presso Matic or Isoclip, Sectional dentures, Bar connectors.⁽⁴⁾

Conclusion

The precision attachment in combination with other aspect of advanced partial denture construction offers us the possibility of making prosthesis that are esthetic, retentive, strong and problem free and that are

undetectable by and will not compromise the oral health of the our patients. The clinician who familiarize himself with precision attachments will add a new dimension to his treatment options and this will also broaden his referral base.⁽¹⁴⁾

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