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Precision Attachments: A Review

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***Abstract*---**The lack of sta¬bility and retention together with a decrease in chewing ability are the commonly problems experienced by many edentulous patients with their den¬tures and removable partial dentures. To overcome this problem and the desire to balance between func¬tional stability and cosmetic appeal gave rise to the development of Precision attachments. Precision attachments are small interlocking devices to connect prosthesis and abutments that offer a variety of solutions to the challenge of balance between functional stability and cosmetic appeal. Precision attachments have wide applications, used in fixed removable bridge, removable partial dentures, overdentures, implant retained overdentures, and maxillofacial prosthesis. This article discusses about the various precision attachments used in treating edentulous and partially edentulous patients.

***Keywords*---**stability, retention, precision attachment.

Introduction

The precision attachment is sometimes called as a connecting link between fixed and removable partial dentures as it incorporates features common to both types of construction. Precision attachment can be described as a retainer used in fixed and removable partial denture construction consisting of a metal receptacle and a closely fitting part, the former is usually contained within the normal or expanded contours of the crown of the abutment tooth, and the latter is attached to a pontic or to the denture frame work.[1] Precision attachments are two precocious metal

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components which are manufactured to form an articulate joint. 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 of patrix, 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.[2,3]

Synonyms

Internal attachment, parallel attachment, frictional attachment, key and key way attachment, slotted attachment[4,5]

Indications

- Movable joints in fixed movable bridge work.
- As stress breaker in free end saddles and bridges.
- Intracoronal attachments as effective direct retainers for removable partial dentures.
- As a connector for sectional dentures.
- Sections of a fixed prosthesis may be connected with intra coronal attachments.
- To lock a connector joining saddles in the opposite side of the arch.
- As contingency devices for the extension or conversion of existing dentures.
- Where fixed dentures are contraindicated due to periodontal condition.
- In the esthetic zone where extracoronal direct retainer adversely affects the esthetics.
- To retain hybrid dentures

Contraindications

- In patients who are sick and the senile (prosthesis with attachments must be inserted).
- Along one precise path of insertion, the patient must possess an average degree of manual skill.
- Patients with severe periodontitis.
- Patients with abnormally high caries rate.
- Where there is inadequate space (teeth that are very narrow faciolingually).

Advantages

- Improved esthetics and elevated psychological acceptance of the prosthesis → conventional clasp assemblies and rests may be visible and unaesthetic. Clasp arm direct retainers placed on canine and premolar abutments may be esthetically objectionable, and appropriate use ofattachments may eliminate the need for facial clasp arm and improving esthetics.
- Compared to conventional clasp retained partial denture, they give better retention and stability, less liable to fracture than clasp, less bulk, and reduced incidence of secondary caries.

- Cross arch load transfer/force transmission and prosthesis stabilization may also be improved with attachments particularly when rigid precision attachments are used.
- Lateral forces in the abutment during the insertion and removal are eliminated, and more axial forceduring functions is achieved as force application is more close to the fulcrum of the tooth than in case of occlusal rest or incisal rest ; therefore, decreased lever arm reduces non-axial loading and decreases torquing forces and rotational movement of the abutment.
- Precision attachments provide better vertical support and better stimulation to the underlying tissue through intermittent vertical massage
- In case of distal extension base, removable partial denture prosthesis attachment positioned between the abutment and extension bases incorporates broken stress philosophy that limits the potentially damaging forces (stress transfer) imparted to the abutment as these attachments permit vertical, horizontal/rotational movement of the denture bases during function relative to the abutment.

Disadvantages

- The tooth may have to be extensively prepared to provide required space to accommodate intracoronal attachment.
- The attachment is subject to wear as a result of friction between metal parts. As wear occurs, male portion fits more loosely thus permitting excessive movement and threat of injury to abutment teeth.
- The extra coronal type of retainer extends out from the tooth near the gingival border, so there may be gingival irritation followed by usual inflammatory sequel.
- The extracoronal type of attachment must occupy the space immediately adjacent to abutment tooth, which is precisely where a replacement tooth should ideally be positioned.

Classification used in literature

1. MC Mensor (1973): An attachment classification according to shape, design, and primary area of utilization of attachment
2. Gerardo Beccera and others (1987)
   a. Intradental attachment
      • Frictional
      • Magnetic[8-10]

   These are contained in part within the crown or root structure of a natural tooth.
   b. Extradental attachments.
      • Cantilever attachment.
      • Bar attachment.
3. Good kind and Baker (1976)[11-13]
   a. Intracoronal
      • Resilient.
      • Non-resilient.
   b. Extracoronal

- Resilient.
- Non-resilient.

Classification

Based on their method of fabrication and the tolerance of fit between the components. Precision attachment (prefabricated types): A precision attachment is fabricated from milled alloys. They are generally intracoronal and non-resilient. Their advantages include consistent quality, controlled wear, and easier repair. They have standard parts which are interchangeable.[3] Precision attachment can be described as a retainer used in fixed and removable partial denture construction consisting of a metal receptacle and a closely fitting part, the former is usually contained within the normal or expanded contours of the crown of the abutment tooth, and the latter is attached to a pontic or to the denture framework. Precision attachment are prefabricated, they are made of precious metal, and fit of two working elements is machined to very close tolerances and hence is more precise than laboratory fabricated attachment.[6]

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. According to their relationship to the abutment teeth [Figure 1]:

- Intracoronal/internal attachment: If the attachment resides within the body/normal contours of the abutment teeth.[14]
- Extracoronal/external attachment: If the attachment resides outside the normal clinical contours of the abutment crown/teeth.
- Radicular/intraradicular stud type attachments: These attachments are connected to a root preparation. The female or male is soldered or cast to a root cap coping.

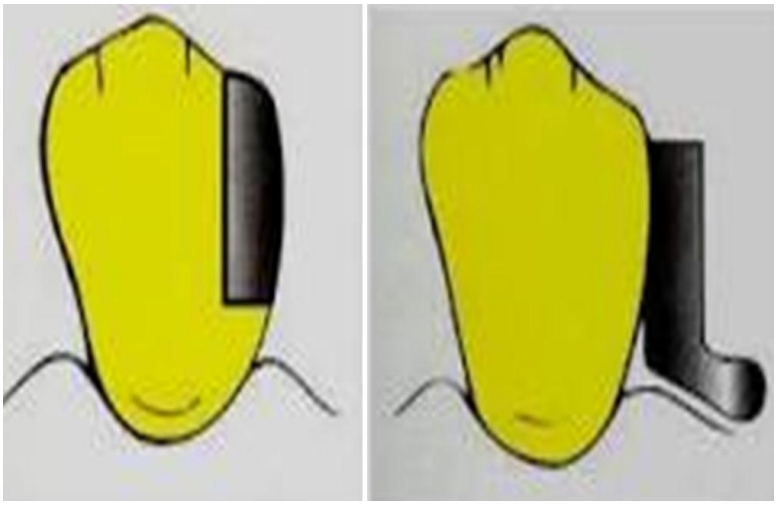

Figure 1. (a) Intracoronal attachment (b) Extracoronal attachment

The female element of intraradicular stud type attachments fits within the root form contour. Examples: Swiss Logic, Zest, and the ZAAG. Some stud type attachments, such as the Uni- Anchor and the Direct O-Ring are directly cemented into the prepared root without requiring a cast coping. Stud type titanium implant attachments are also available to screw directly into implants or tissue extensions. Bar Type: Bar type attachments span an edentulous area and connect abutment teeth, roots, or implant. The removable bridge, partial denture, or overdenture fit over the bar and are connected to it with one or more retention sleeves, riders/ clips, or retentive plungers.

Based on function or movement: Solid/rigid: When metal-to-metal contact of the patrix matrix restricts the relative movement between the abutment and prosthesis during the functional loading (of the removable partial denture), the attachment is said to be rigid [Figure 2].

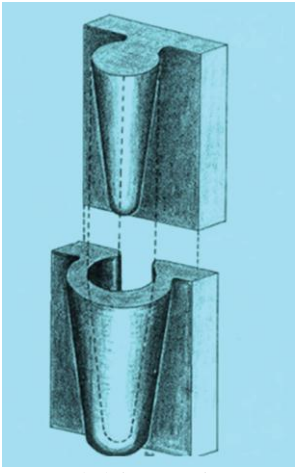

Figure 2. Rigid attachment

Rigid attachments are those that theoretically allow no movement of their component parts during function. However, even under the best of condition, minute movement of the prostheses will occur when occlusal forces are applied. The amount of movement will increase with wear of component. These attachments are usually used in bounded saddle situations where the abutment teeth fully support the restoration and attachment, and soft tissue does not give any support.

Subclassified into a two types: Non-lockable and lockable: Resilient: Abutment/tooth and tissue-supported restorations are considered resilient. Many attachments are designed to permit movement of the denture base, and during functional loading, these attachments are considered to be resilient attachments. Functional movement of the prosthesis may be restricted to defined vertical, horizontal, and/or rotational path, or omnidirectional displacement of the prosthesis may be permitted [Figure 3].

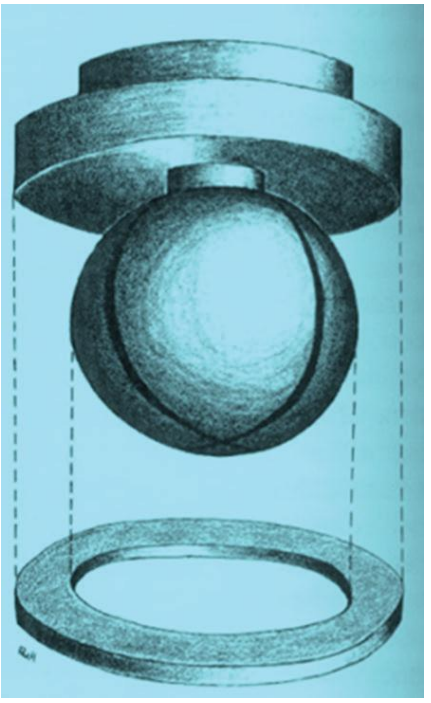

Figure 3. Resilient attachment

Provide a defined amount and direction of movement of their components permitting movement of the denture base toward the tissue under function while theoretically minimizing the amount of force being transferred to the abutment teeth.

- Hinged motion - Allowing movement along one plane.
- Rotary motion - Allowing movement along many planes

Based on modes of retention:

- Frictional: Frictional retention is resistance to the relative motion of two or more surfaces in intimate contact with each other.
- Mechanical: Mechanical retention is resistance to the relative motion of two or more surfaces due to a physical undercut.
- Frictional and Mechanical: Frictional and mechanical retention combines both features of frictional and mechanical retention.
- Magnetic: Magnetic retention is the resistance to movement caused by a magnetic body that attracts certain materials by virtue of a surrounding field of force produced by the motion of its atomic electrons and the alignment of its atoms. Magnets do not provide lateral stability and are contraindicated for flat ridges. It is used in limited applications, heat curing will weaken magnets, and they are liable to corrode.
- Suction types: Suction is a force created by a vacuum that causes a solid object to adhere to a surface. An example would be a well-fitting denture.

Depending on the geometric configuration and design of the attachment system:

- Key and keyway.
- Ball and socket.
- Bar and clip or bar and sleeve.
- Telescope.
- Hinge.
- Push button.
- Latch.
- Screw units.
- Interlock.

Attachment selection

In 1971, 126 attachments were listed and classified by Dr. Merrill Mensor; this is called as E. M. attachment selector.[14]

It has 5 charts giving specification as to type, vertical dimension (Minimal and Maximal), whether it is for anterior and posterior teeth, whether the assembly is simple or complex, whether the function is rigid or resilient, type of resilience, size of movement and type of retention. It shows if the attachment is interchangeable or replaceable and finally what type of alloy and material it is made of. E.M. attachment selector system utilizes a colour coded millimeter attachment gauge to define the vertical clearance available in the edentulous regions of occluded casts for attachment selection. The gauge is made of plastic and measuring 75 mm in length. It is graduated from 3 to 8 mm in 1 mm increments with a corresponding colour code. Red designates 3 to 4 mm, yellow designates 5 to 6 mm and black designates 7 to 8 mm. The gauge is placed between the occluded casts adjacent to a tooth that will carry an attachment. The measurement is thus read numerically and according to colour. The vertical limits measured by the EM gauge are the common area of concern for all connector systems. The available space will govern the type of attachment system that can be used. A closed vertical space will narrow the selection of available or recommended attachments. Where vertical intermaxillary space is abundant, the choice of attachment systems is less restricting.

In selecting an attachment system;

- The first decision that must be made is whether to use an intracoronal or extracoronal
- attachment
- The second decision to be made is whether to use a resilient or a nonresilient type
- The third consideration is that the largest attachment can be used within the given space
- Should be chosen to gain maximum stability, retention and strength for the prosthesis.

Conclusion

Precision attachment retained overdenture provide a better treatment modality in preventive prosthodontics for edentulous patient if the patient is properly motivated regarding the maintenance of oral hygiene. The choice of attachment should be based on the pattern of stress distribution from these attachments through the abutments and other structures and not the retention and stability. The patient's physiological dimension is maintained through the preservation of teeth and bone.

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