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Types and Materials of Precision Attachments

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Declaration

I certify that this project entitled "Types And Materials Of Precision Attachments" was prepared by Anfal Asim Salman under my supervision at the College of Dentistry / University of Baghdad in partial fulfillment of the graduation requirements for B.D.S degree.

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Dedication

I dedicate this work to my the owner of a fragrant biography and enlightened thought, for he had the first credit in attaining highereducation (my beloved father), may God prolong his life. To those who set me on the path of life, made me calm, and took care of me until I became old (my mother).

TO those who lit up my dark paths , supported me since the beginning of my trip until I almost reached, and were my source of inspiration gave me strength when I thought of giving up (my sister Dr.Aya conservative dentistry)and (my brother in low Dr.mohammed Prosthodontics).

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Anfal Asim Salman

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RPD	***Removable partial denture***
FPD	***Fixed partial denture***
RV	***Reduced Vertical***
ERA	***Extra coronal Resilient Attachment***
et al.	***et alia ; and others***
EM gauge	***named for the track gauge of a nominal Eighteen Millimetres.***

Introduction

An attachment is defined as "A mechanical device for the fixation, retention, and stabilization of prosthesis"**(Ambayiram, Chidembaranathan and Balasubramanium, 2020).** From precision first introduction to the dental profession, precision attachments have been surrounded by an aura of mystery, implying that greater skill is required in their use. This has served as a contributing factor in discouraging their general use. From a patient's view point, no other appliance offers more comfort, security and esthetics than the precision attachment offers **(Gowda and Shashidhar, 2020).**

Many edentulous patients specially with free end extention with class I and II partial denture experience problems with their removable dentures, especially the lack of stability and retention together with a decrease in chewing ability, to overcome this problem and the desire to balance between functional stability and cosmetic appeal give rise to the development of Precision attachments **(Al-Jallad, 2020).**

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 attachments are two precocious metal 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 **(Shetty, 2014).**

The attachments allow for micro-movement between segments and provide stress relief to the connected abutment teeth. Development of intracoronal and

extracoronal attachments has been traced from antiquity to modern times. Prior to manufacturing of intracoronal attachment, early attachments were being bent, cut and soldered into shape by their inventors such as Evans, Peeso, Roach, Morgan and Chayes. Materials employed were Gold, Platinum and Iridoplatinum. Some of these early attachments were named the split bar attachment, tube and split cast attachment, solid post attachment, winged lug attachment and tube attachment **(Białoskórska and Szczyrek, 2018).**

Without doubt, the most important personality in the development of precision attachment dentistry was Dr. Herman. E. S. Chayes. He is called the father of precision intracoronal retainer. In Europe, particularly Switzerland, known as the "country of watch makers and fine mechanics", development in the field of attachments picked momentum before, during and after the Second World War **(B.Angadi et al., 2012).**

Aim of the review:

The aim of this review was

1- Evaluating historical background about the development of precision attachment.
2- Over Viewing resin development in the technique of precision attachment.
3- Viewing resin development in the material use in construction of precision attachment.
4- Presenting new advances and development in precision attachment for prosthodontic application.

1.1 History of clinical development:

The use of attachments as connectors was popularized in the twentieth century by Dr Herman E.S. Chayes. He fabricated dental bridgework in segments that were connected by a key and keyway attachment***(Roy, Idzior-Haufa and Hedzelek, 2016).***

Over the years, attachments were fabricated to accommodate a wider range of controlled micro-movements and are now selected on a case-by-case basis, according to how the final prosthesis is planned to function on the remaining supporting elements ***(Szarek and Gronkiewicz, 2019).***

Various types of attachments have been developed (The precision attachmentsthe semi-precision attachments and the non precision attachments). The *precision attachments* are very precise, and are milled out of alloy. The male and female parts fit together with tolerances of about 10 microns. They are purchased as a finished product and are soldered or cast to the final prosthesis ***(Preiskel and Preiskel, 2009).***

The semi-precision attachments are much less precise in their fit and usually have much more resiliency than their precision attachment counterparts. These attachments are cast from refractory patterns, and the male or female parts may be made of nylon, polymer, or metal ***(Farret et al., 2013).***

The choice of which attachment to use depends on the patient and all the data that is gathered during the treatment planning process. This allows the dentist to make decisions that will build longevity into the prosthesis and satisfy the needs of the patient ***(Jeyavalan et al., 2012).***

Many authors devised a unilateral PRD employing anterior and posterior telescopic abutment restoration.1908 – 1910 they 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 (McCollum unit) ***(Thomas, Williams and Addy, 2014).***

Figure (1.1): McCollum **(Thomas, Williams and Addy, 2014).**

1.2 Material Option:

A) Precision attachments: are milled from high noble metals and must be cast to high noble metal frameworks. They are obtained as finished products ready for the laboratory to use. Their tolerances are so precise that errors in the casting process may prevent the final prosthesis from fitting well ***(Williams, Thomas and Addy, 2014)*** as in figure (1.2).

B) Semi-precision attachments: can be cast in semi-precious or base metal. Because they are cast, their tolerances are not as precise as those of their precision counterparts. One element is generally made of plastic and cast along with the framework. The other element can be made of metal or has a metal housing with a nylon or polymer insert. ***(ELsyad, Errabti and Mustafa, 2015).***

Treatment planning consists of cast mounted models, radiographs, periodontal charting, mobility assessments, thorough evaluation of the remaining teeth and condition of the residual ridges, arch form, esthetics, and patient desires. These are all used to determine the prosthetic design and the use of specific attachments. Cases are planned on an individual basis and determinations are made as to whether the prosthesis will be implant or root supported and retained, implant or root and tissue supported and retained, or soft tissue supported and implant or root retained. ***(Kochanek-Leśniewska and Sobczyk, 2015)*** as in figure (1.3).

The treatment planning process often places both dentists and patients in a dilemma between function and esthetics. Removable cast partial dentures are fabricated with clasps, rests, and reciprocating elements that can create visibly unpleasant esthetics as well as wear and torque on the abutment teeth ***(ELsyad, Omran and Fouad, 2015)***

Various types of attachments have been developed. The precision attachments are very precise, and are milled out of alloy. The male and female parts fit together with tolerances of about 10 microns. They are purchased as a finished product and are soldered or cast to the final prosthesis ***(Chiu et al., 2016).***

Figure (1.2): Sterngold precision attachment ***(Chiu et al., 2016).***

The semi-precision attachments are much less precise in their fit and usually have much more resiliency than their precision attachment counterparts. In removable partial denture cases, they are cast with the crown or splint and are placed outside the contours of the teeth **(Eraiah Gowda et al., 2020).**

Figure (1.3): Sterngold ERA semi-precision attachment **(*Chiu et al.,2016).***

Another classification of attachment are Intracoronal and Extracoronal Attachment:

1. Decision to use an intracoronal or extracoronal attachment depends on size and shape of the abutment teeth.

2. Intracoronal attachment requires more teeth preparation and tooth reduction than extracoronal attachment.

3. If intracoronal attachments are used where there is insufficient space, the abutment retainer will be over contoured on the proximal surface resulting in restoration that can create periodontal problems. In case the space is adequate, intracoronal attachment is preferred as they direct the forces along the long axis of abutment teeth. As in Figure (1.4).

4. Although extracoronal attachments are employed in areas of inadequate space, they can create areas which may be difficult to clean leading to maintenance problems. The lever arm associated with extracoronal attachment may not direct all force along the long axis of teeth ***(Zoidis, 2018).***

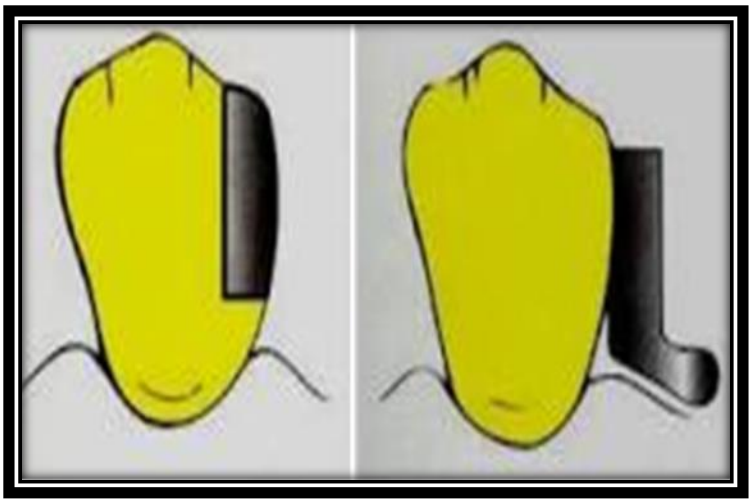


Figure (1.4): (Left) Intracoronal attachment **(Right)**Extracoronal attachment ***(Zoidis, 2018).***

1.3 Criteria for attachment selection:

There are a few criteria that help to decide the appropriate attachment based on the individual need of the case. ***(HEDZELEK, RZATOWSKI and CZARNECKA, 2010).***

Table (1.1): According to MC mensor ***(HEDZELEK, RZATOWSKI and CZARNECKA, 2010).***

Coronal	**Radicular**	**Accessory**
Intracoronal	Telescope	Auxiliary
Extracoronal	Pressure buttons	Screw units
	Bar attachment	Bar connector
	Bar joints and	Stabilizers
	bar units Bolts	Balances
		Interlocks

1. Based on Location: Intracoronal attachments, extracoronal attachments, and radicular/intraradicular stud type attachments, bar type.

2. Based on function: It is important to differentiate between a solid and resilient‐type restoration.

3. Based on modes of Retention: They are frictional, mechanical, frictional and mechanical, magnetic and suction types.

4**. Space:** The space available vertically, buccolingually, and mesiodistally plays a key role in attachment selection.

5. Cost: Cost is directly related to the type and material of attachment selected ***(Patel et al., 2017).***

The vertical space is measured from the tissue to the marginal ridge or from the margin of the abutment to the marginal ridge of the opposing dentition. Use the full length of the attachment, whenever possible, and place it as low as possible without impinging on the tissue ***(Patel et al., 2017).***

Buccolingual or labiolingual space is very critical, especially with removable partial dentures. It should be measured accurately to avoid over contouring the restoration in this dimension. An additional 1 mm should be added to the buccolingual measurement for metal precision attachments to allow for the casting alloy. It is best to set the teeth before the selection of an attachment. This will aid in the size determination and exact position of the attachment. ***(Gill, 2018).***

Mesial-Distal measurements are critical for intracoronal attachments since a box preparation is required. To avail maximum use, select the largest attachment possible for the space available. ***(Dable et al., 2013).***

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 ***(Dable et al., 2013).***

1.4 INDICATIONS:

Precision attachment indicated in cases that required the following***(Mishra, Gulati and Kumar, 2021):***

1. Movable joints in fixed-movable Bridgework.
2. As stress breakers in free-end saddles and bridges.
3. Intracoronal attachments are effective retainers for removable partial dentures.
4. As connectors for sectional dentures.
5. Sections of a fixed prosthesis may be connected with intra coronal attachments.
6. To lock a connector joining a saddle on the opposite side of the arch.
7. As contingency devices for the extension or conversion of existing fixed appliances
8. Periodontal involvement that contraindicates fixed partial dentures.
9. Labial clasp arms that would otherwise be displayed in the anterior part of the mouth and would be esthetically not acceptable.
10. To retain hybrid dentures.
11. Esthetics zone.
12. Redistribution of forces required.
13. Minimize trauma to soft tissue.
14. Control of loading and rotational forces.
15. Nonparallel abutments present.
16. Segmenting of the long-span bridges.
17. Future salvages efforts.
18. Improved retention.

1.5 CONTRA-INDICATIONS:

1. 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).

2. Patient with sever Periodontitis.

3. Abnormally high caries rate Such as patients take Medications that cause dry mouth are always a serious concern because patients lack salivary flow raising the caries index.

4. Inadequate space to employ them (teeth that are very narrow facio-lingually).

5. Poor neuromuscular coordination and in neuromuscular disorders.

6. Along one precise path of insertion, the patient must possess an average degree of manual skill. ***(Mishra, Gulati and Kumar, 2021).***

1.6 ADVANTAGES:

1. The labial or buccal clasp arms can be eliminated altogether. This makes spectacular improvement in the esthetic excellence of a denture especially in the maxillary arch.

2. Precision attachments are less stressful to the abutment teeth than conventional.

3. Improved esthetics and elevated psychological acceptance.

4. Compared to conventional clasp retained partial denture they give better retention and stability, less liable to fracture than clasp, less bulky.

5. Lateral forces in the abutment during the insertion and removal are eliminated and more axial force during functions are achieved.

6. Cross arch load transfer/force transmission and prosthesis stabilization may also be improved with attachments particularly when rigid precision attachments are used.

7. In case of distal extension base, RPD 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.

8. Precision attachments provide better vertical support and better stimulation to the underlying tissue through intermittent vertical massage.

9. Frictional wall precision attachment partial dentures direct the forces on the abutment with the long axis of the tooth this improves the longevity of the abutment teeth. ***(elcharkawy, Fawzy and dohiem, 2021).***

1.7 DISADVANTAGES:

1. The tooth may have to be extensively prepared to provide required space to accommodate intracoronal attachment.

2. 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.

3. 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.

4. 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.

5. Requires high technical expertise for successful fabrication experience and knowledge on the part of dentist and laboratory technician.

6. They are essential Expensive so increased overall cost of the treatment. ***(elcharkawy, Fawzy and dohiem, 2021).***

1.8 CLASSIFICATION:

1. Based on their method of fabrication and the tolerance of fit between the components:

I. Precision attachment (prefabricated types): A precision attachment is fabricated from milled alloys, their advantages include consistent quality, controlled wear, and easier repair. 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 ***(Melisa and Laura Susanti Himawan, 2021).***

Figure (1.5): Gold precision attachment

(Melisa and Laura Susanti Himawan, 2021).

Figure (1.6): Platinum precision attachment

(Melisa and Laura Susanti Himawan, 2021).

II. Semi precision attachment (laboratory-made or custom-made types): components usually originate as prefabricated or manufactured patterns (made of plastic, nylon, or wax) ***(Sands, 2012).***

A Semi-Precision attachment is fabricated by the direct casting of plastic, wax, or refractory patterns. They are considered "semi-precision" Since in their fabrication they are subject to inconsistent water/powder ratios, burn out temperatures and other variables. The resulting components therefore, vary to a small degree. They are less costly, easy to fabricate and may be cast in alloy**,** they are generally extra coronal and resilient ***(Sands, 2012)*** As in Figure (1.7)**..**

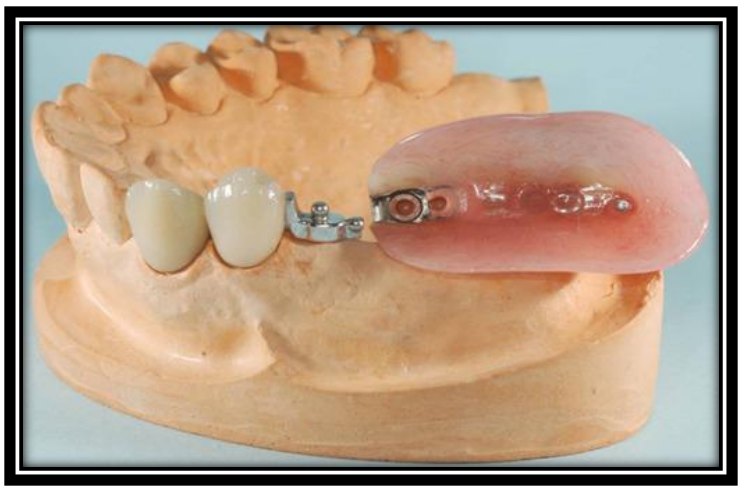


Figure (1.7): Semi Precision Attachments ***(Sands, 2012)***

1.8 .2 According to their relationship to the abutment teeth:

I. Intracoronal / internal attachment: If the attachment resides within the normal contours of the abutment teeth. The advantage is that the occlusal forces exerted upon the abutment tooth are applied close to the long axis of the tooth. ***(SUVARNA, 2014).***

It usually requires a box preparation to allow the attachment to fit within the crown contour. If it is not possible to create a box preparation that will totally incorporate the female element, then an extracoronal attachment should be considered. Since all intracoronal attachments are non- resilient, double abutting is recommended. ***(SUVARNA, 2014).***

II. Extracoronal/external attachment: If the attachment resides outside the normal clinical contours of the abutment crown/teeth. Advantages of this type are that the normal tooth contour can be maintained, minimal tooth reduction is necessary and the possibility of devitalizing the tooth is reduced. Also, the path of insertion is easier for patients with dexterity problems ***(SUVARNA, 2014).***

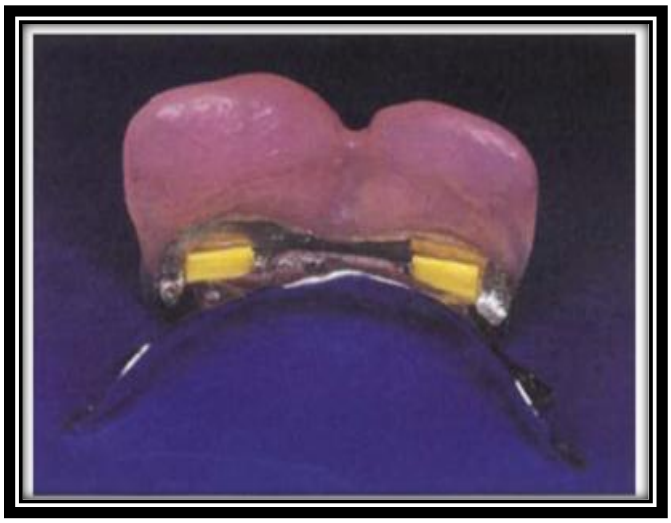
Most extracoronal attachments have some type of resiliency (stress redirectors). Even with resilient attachments, double abutting is recommended whenever possible. Patients are instructed on the use of dental floss and hygiene accessories as it is more difficult to maintain hygiene ***(Weckmann et al., 2019).***

III. 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. The female element of intraradicular stud type attachments fit within the root form contour. The SwissLogic, Zest and the ZAAG are examples of this type of attachment. 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 directlyinto implants or tissue extensions **(Prasad et al., 2016).**

IV. 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 ***(ELsyad, Elhaddad and Khirallah, 2016).***

Bar attachments is sub classified into : Dolder bar Hader barAndrews bar, Ceka bar, Octalink, C.M. bar,M.P. Channels, Ackerman bar, Customized bars ***(ELsyad, Elhaddad and Khirallah, 2016).***

Figure(1.8): Dodler bar ***(ELsyad, Elhaddad and Khirallah, 2016).***



Figure(1.9): The hader bar attachment **(*ELsyad, Elhaddad and Khirallah,2016).***

1.8.3 Based on function or movement:

I. 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, those theoretically allow no movement of their component parts during function and used in bounded saddle situations where the abutment teeth fully support the restoration and attachment, and soft tissue does not give any support **(Petropoulos and Mante, 2011).**

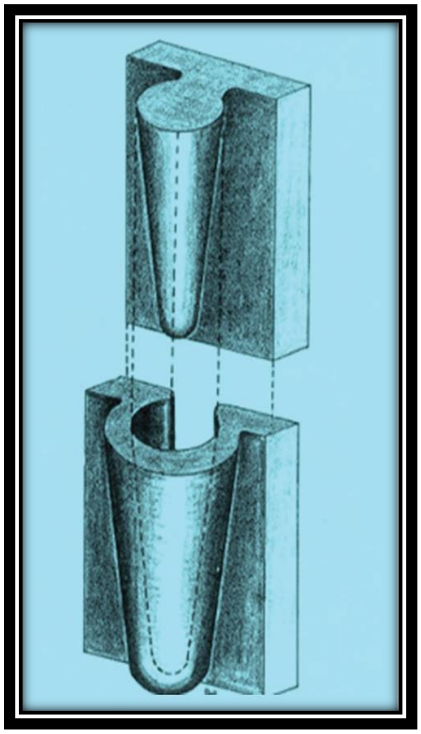


Figure (1.10): Rigid attachment ***(Petropoulos and Mante, 2011).***

II. Resilient: Abutment/tooth and tissue-supported restorations are considered resilient are designed to permit movement of the denture base, and during functional loading 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 ***(Petropoulos and Mante, 2011).***

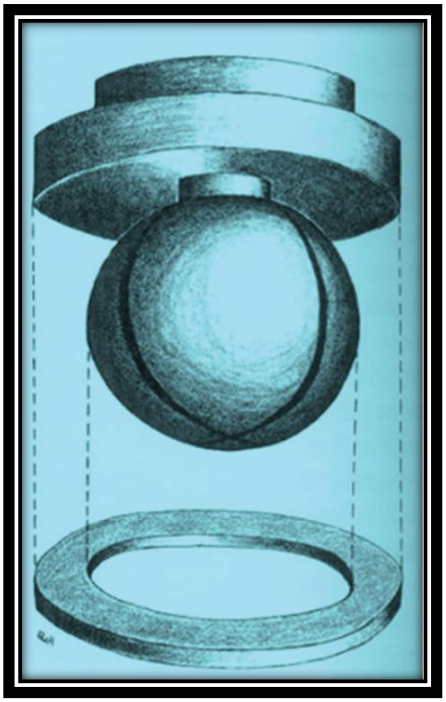


Figure (1.11) Resilient attachment ***(Petropoulos and Mante, 2011).***

1.8.4 Based on modes of retention:

I. Frictional: Frictional retention is resistance to the relative motion of two or more surfaces in intimate contact with each other.

II. Mechanical: Mechanical retention is resistance to the relative motion of two or more surfaces due to a physical undercut.

III. Frictional and Mechanical: Frictional and mechanical retention combines both features of frictional and mechanical retention.

IV. 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, Magnets do not provide lateral stability and are contraindicated for flat ridges ***(B.Angadi et al., 2012).***

Figure (1.12): Magnetic precision attachment ***(B.Angadi et al., 2012).***

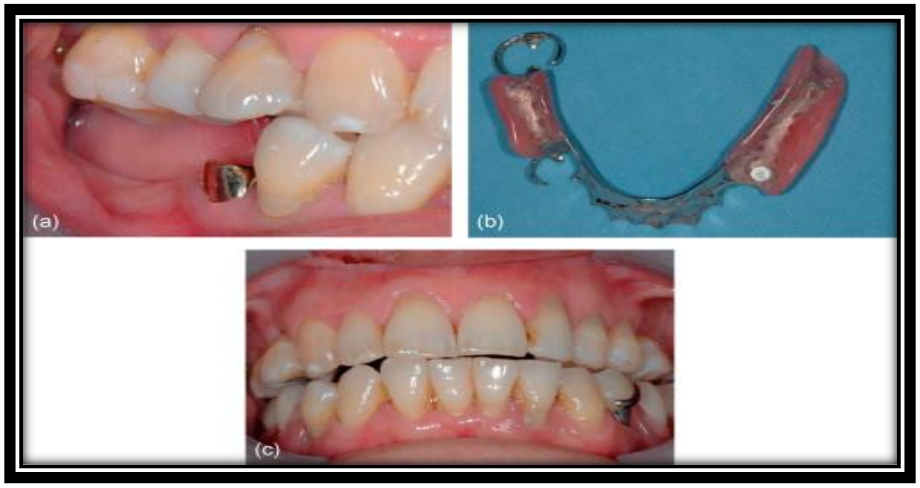


Figure (1.13): Frictional precision attachment ***(B.Angadi et al., 2012).***

V. Suction types: Suction is a force created by a vacuum that causes a solid object to adhere to a surface. **(Arti et al.,2017)**

1.8.5 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 ***(Dable et al., 2013).***

Figure (1.14): ball and socket attachment ***(Kochanek-Leśniewska and Sobczyk, 2015).***

Figure (1.15): Telescopic attachment ***(Kochanek-Leśniewska and Sobczyk, 2015).***

One type of the attachment based on geometric configuration and design is Telescopic attachment which have been used for several years in oral rehabilitation of patients with advanced periodontal disease. Patients with periodontal disease undergoing prosthetic reconstruction often present with teeth with minimal supportive tissue and increased tooth mobility. Therefore, it is extremely important for the prosthesis not to cause periodontal destruction or worsen an existing periodontal condition **(Petropoulos and Mante, 2011).**

1.8.6 Another Classification of precision attachment:

Attachments are classified according to how they work in

Prosthetic designs into:

- Class 1A—solid, rigid, non-resilient
- Class 1B—solid, rigid, lockable
- Class 2—vertical resilient
- Class 3—hinge resilient
- Class 4—vertical and hinge resilient
- Class 5—rotational and vertical resilient
- Class 6—universal, omni-planer . **(Szarek and Gronkiewicz, 2019)**

1.9 Resilient Versus Non-resilient Attachment:

Major differences of philosophy regarding the use of resilient or non-resilient attachment system occur when dealing with distal extension edentulous situation.

Theoretically, resilient attachment allows the functional forces to be directed to the tissues and alveolar ridge, and the non-resilient attachment primarily directs the vertical functional forces to the abutment teeth. Realistically, there is some sharing of function at loads in both systems ***(Williams, Thomas and Addy, 2014).***

1.10 Stress-Breaker, Dovetail, Rod And Tube Attachments For Unparallel Bridge Abutments:

Use when the abutments either prepped teeth or implant abutments are not parallel and require an attachment for independent seating of the crown and/or bridge. ***(Shetty, 2014).***

Figure (1. 16): Actual fabricated case By ***(Shetty, 2014).***

1.11 Mechanism of Action:

Retainers must hold the prosthesis securely in place during chewing, swallowing, speaking, and other oral functions. Therefore, male and female portions must fit preciously. Resistance to separation within the attachment is done by following mechanisms:

- **Friction:** Occurs when parallel walls of closely fitting bodies pass over one another. Friction occurs between contacting parallel walled bodies. The frictional force is directly related to the area of the opposing surfaces as well as to the length of axial walls.
- **Binding:** Occurs when a parallel walled body tips within its receptor site.
- **Wedging of conical bodies:** Friction comes into play only in the terminal position and is lost as soon as the bodies begin to separate.
- **Internal spring loading:** The friction within retainers is often increased by loading with internal spring clips. Slots in the male portion allow the pressure to be adjusted.
- **Active Retention:** That is when one body must be temporarily deformed to be withdrawn from its fully seated position. Active retention means a physical obstruction to separation of other parts. One part must undergo elastic deformation before separation can occur (***Patel et al., 2017).***

1.12 Attachment Gauge:

Matsuo in 1970 developed a color-coded millimeter gauge to define the vertical clearance available in the edentulous region of occluded casts for attachment selection. The gauge is made up of plastic and measures 75 mm in length. It is graduated from 3 to 8 mm in 1 mm increments with a corresponding color.

1. Red → 3–4 mm.

2. Yellow → 5–6 mm.

3. Black → 7–8 mm. ***(Mishra, Gulati and Kumar, 2021).***

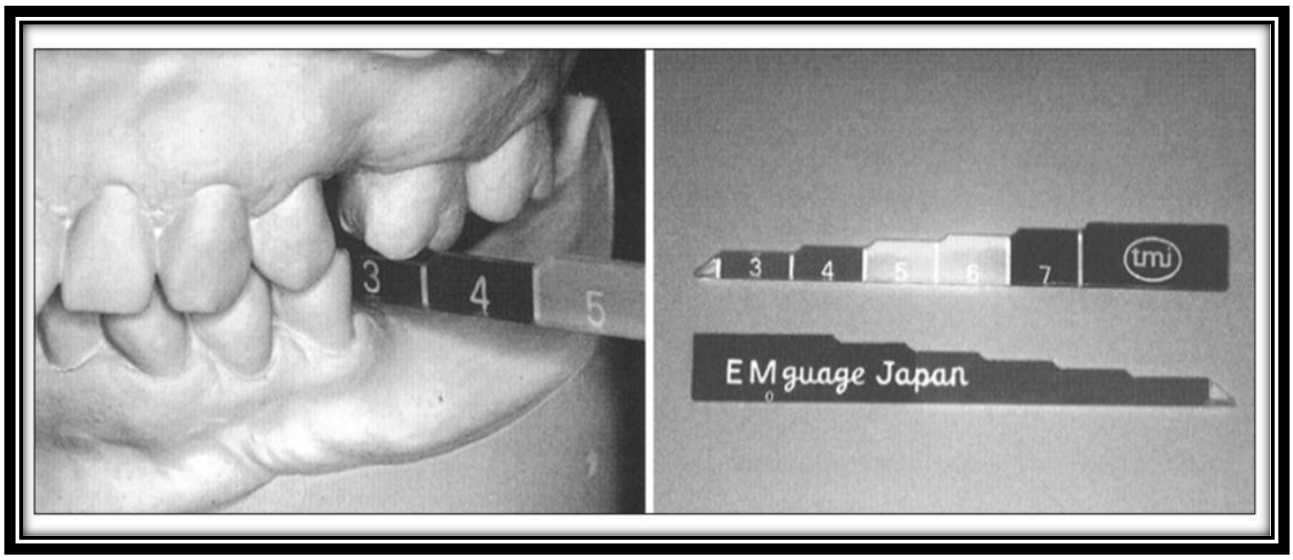


Figure (1.17): Attachment gauge for selection of Precision attachment ***(Mishra, Gulati and Kumar, 2021).***

EM gauge is placed between the occluded casts adjacent to the tooth that will carry an attachment. The measurement is then read both numerically and according to the color. It also gives information about where the particular attachment can be used (in terms of anterior or posterior regions and in different classes of partially edentulous arches). All these information are given in chart form which is different for intracoronal and extracoronal attachments ***(Al-Jallad, 2020).***

1.13 Precision attachments in fixed prosthodontics:

Precision Attachments are also used in fixed prosthodontics. They are employed to reduce the size of a splint for ease of parallelism and for ease of cementation. Rationales for employment are as follows:

- Precision attachments facilitate parallelism of small sections rather than requiring attempts to parallel up to 14 teeth.
- Usually the lower anterior teeth are flared; thus it is impossible to obtain a path of insertion between the lower anterior teeth and the second molar for a one piece splint that will have a common path of insertion, unless a number of teeth are devitalized.
- When using porcelain fused to metal, the more units the dentist places on the splint, the more contraction occurs when the technician bakes the porcelain, and the poorer the fit.
- When the cementing medium washes out, it is usually the second molar that washes out first. The dentist can then replace a small section instead of remaking a complete dental arch. The rest seat is placed in the strongest section, which usually is the anterior section, with the rest in the posterior. The rest and rest seat should be at the desired occlusal height, and no porcelain should be placed occlusally over the attachment. If porcelain is placed occlusally over the attachment, it will fracture. **(B.Angadi et al., 2012).**

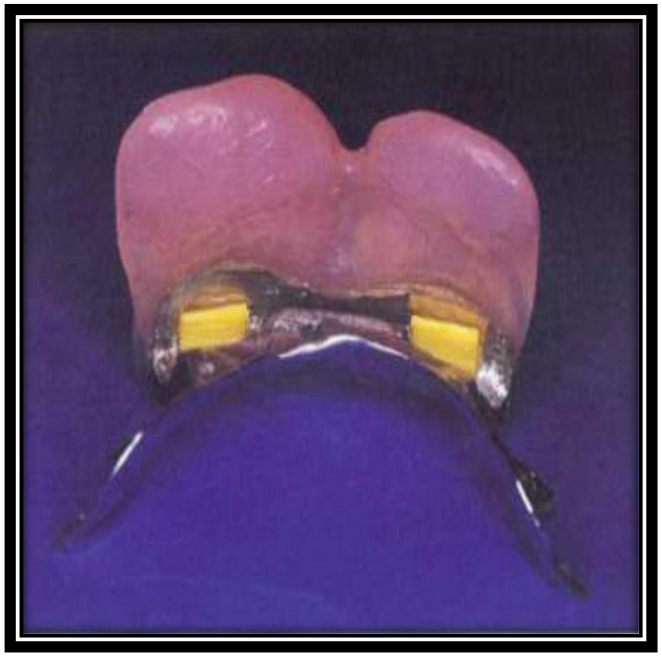


Figure (1.18): the Hader bar **(Białoskórska and Szczyrek, 2018).**

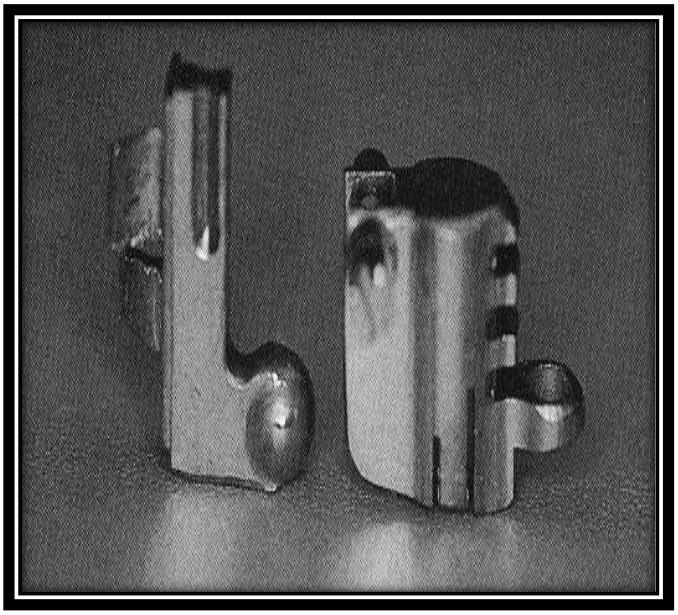


Figure (1.19): Dalla bona attachment **(Białoskórska and Szczyrek, 2018).**

1.14 In Selecting an Attachment System for a Removable Partial Denture:

- 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 non-resilient 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 ***(elcharkawy, Fawzy and dohiem, 2021).***

1.15 When to Wear the Partial Denture

It is better to leave the removable partial denture out of the mouth during sleeping hours to allow the adjacent tissues a chance to rest and recuperate. When the prosthesis is out of the mouth it should be immersed in water to prevent dehydration of the acrylin resin. When the removable partial denture is not being worn, the patient should refrain from eating, since food can become impacted within the female receptacle ***(elcharkawy, Fawzy and dohiem, 2021).***

1.16 Precision attachment-retained overdentures:

The attachment-fixation overdenture is far superior to other types of overdentures or other forms of overlay prostheses. It can more closely approximate the results obtained with fixed bridgework and precision partial denture prosthetics than is possible with conventional complete dentures. The patient is more secure in its use. Thus, he enjoys increased comfort, function, and a more natural appearance. ***(ELsyad, Errabti and Mustafa, 2015).***

Whether an extra-coronal or intra-coronal attachment is to be utilized, the dentist must make his selection based upon his knowledge of such factors as crown-root ratio, type of copings, vertical space available, number of teeth present, amount of bone support, location of abutments, and whether the overdenture is to be a tooth-supported or tooth-tissue-supported. These attachments can also be used with implants ***(Eraiah Gowda et al., 2020).***

Figure (1.20): Precision attachment-retained overdentur ***(Eraiah Gowda et al., 2020).***

1.17 A maxillofacial prosthetic using precision attachments:

The prosthodontic rehabilitation of patients with acquired defects of the maxilla after surgical resection is one of the responsibilities of a maxillofacial prosthodontist.

Indication:

- To recreate an artificial barrier between the cavities and thus restore the functional capabilities of speech, mastication and swallowing.
- Maxillofacial defects are caused by trauma, tumor or congenital deformations.
- separation of oral and nasal cavities to allow adequate deglutition and articulation, possible support of the orbital contents to prevent enophthalmos and diplopia, support of the soft tissue to restore the midfacial contour and an acceptable aesthetic results.
- One of the main impacts of patients submitted to maxillectomy is the impairment of speech intelligibility and lack of good retention and stability of the prosthesis planned after the surgery. ***(Nagpal et al., 2019).***
- These defects caused by hemi or full maxillectomy can be repaired surgically using free microvascularized flaps or pedicled flaps. When there are very large resections of the maxilla and covered with flaps, success is questionable. Such defects need to be obturated with a dental or maxillofacial prosthesis ***(Kumar, 2014).***

Figure (1.21): Acrylic hollow bulb with female attachment ***(Kumar, 2014)***

Bar or magnetic abutments are commonly employed retentive measures for implant supported craniofacial prostheses. Bar attachments offer more support and stability when compared to magnetic attachments, but hygiene is a constraint. ***(Hsu, 2015).***

- **Orbital Prosthesis**: For orbital region, magnet retention has emerged as retentive aid has as magnets are less stressful in comparison to bar-clip. For an orbital defect, the superior, lateral, and inferior orbital rims are possible sites for 3 or 4 mm implants ideally three or four implants are needed. The long axes of the implants should be directed toward the center of the **orbit** ***(Prasad, 2017).***
- **Nasal Prosthesis:** The implant is but the implants are not evenly distributed and are located in one part of the defect, the abutments are connected by a bar. The bar can be extended superiorly 10 to 15 mm from the abutments Retentive clips or magnets can be used ***(Moselhy and Aly, 2016).***

Figure (1.22): Anterior part of maxilla or lateral rounded eminence serve as preferred sites for implant placement. ***(Yadav et al., 2017).***

- **Auricular Prosthesis:** The abutments are joined by a bar constructed in a C shaped design to improve the stability and retention of the prosthesis. Three retentive clips or magnets and a bar do not appear to compromise the contours of the prosthesis. The presurgical waxed prosthesis will determine whether magnets or retentive clips should be used. An acrylic resin section is constructed within the prosthesis to house the retentive elements ***(Akhtar, Almastadi and Liao, 2021).***

Figure (1.23): Implants with abutments joined through bar in C-shape ***(Akhtar, Almastadi and Liao, 2021).***

2. CONCLUSION

- Precision attachments serve the function of retention, stress distribution, and aesthetics successfully provided the case is planned based on sound biological and technical grounds, and proper care is rendered by the dentist and the patient during the maintenance phase.
- The use of attachments requires a thorough knowledge of basic prosthodontic principles, appropriate training, experience with the particular attachment used, technical skills and clinical ability, and judgment.

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