

Clinical Applications of Precision Attachments: A Review

Shraddha Rani¹, Sanjeev Kumar¹, Pratibha², Vivek Kumar³

ABSTRACT

Today's practitioners are faced with challenging tasks due to a better understanding of the oral environment. This makes it very important for the practitioner to reconcile what is actually feasible considering the patient's own expectations. Precision attachments evolved as a connecting link between the fixed and removable type of partial dentures. They retain and attach a removable bridge or partial denture on natural teeth, vital and non-vital. Some serve as retainers for complete dentures (overdentures) where few abutments remain. The main purpose of each precision attachment, besides retention, is its concealment within or under a restoration as an esthetically better alternative to a visible clasp retainer. This article reviews other such clinical applications of precision attachments.

Keywords: attachment-retained overdenture, bar attachment, stud attachment

INTRODUCTION

Modern day technological advancements like the internet have provided patients with the power of knowledge of the oral environment together with the fact that their restorations be esthetically pleasing, functional and comfortable. The desire to balance between functional stability and cosmetic appeal in partial dentures gave rise to the development of precision attachments.

From their 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 offers¹.

HISTORY

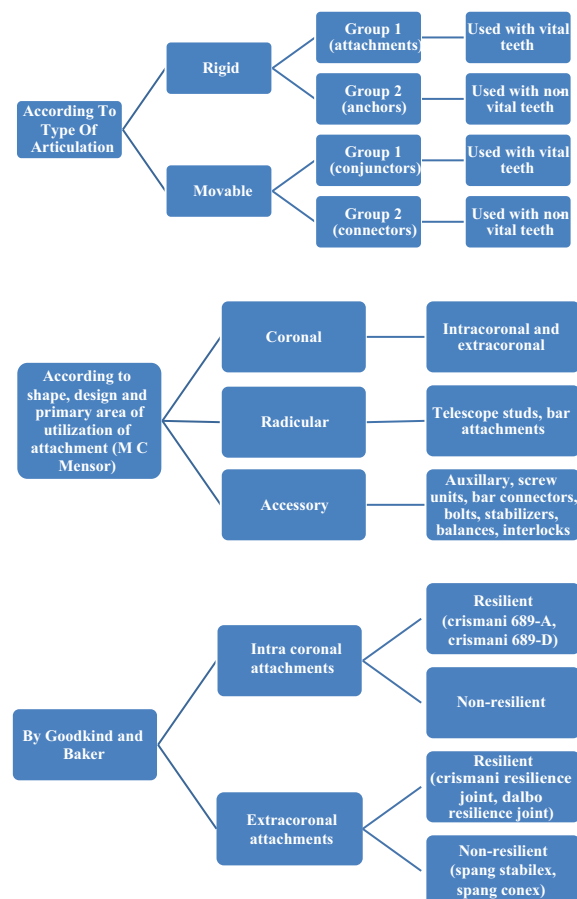
Development of intracoronal and extracoronal attachments has been traced from antiquity to modern times. Prior to manufacturing of intracoronal attachment, early attachments were being bent, cut and soldered into shape by their inventors such as Evans, Peeso, Roach, Morgan and Chayes. Materials employed 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.

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.

CLASSIFICATIONS²⁻⁴



INDICATIONS⁵

1. Movable joints in fixed-movable bridge work
2. As stress breakers in free-end saddles and bridges
3. Intracoronal attachments are effective retainers for removable partial dentures

¹Senior Lecturer, Department of Prosthodontics and Crown and Bridge, ²Senior Lecturer, Department Of Oral Medicine and Radiology, ³Reader, Department of Oral and Maxillofacial Surgery, Dr. B R Ambedkar Institute of Dental Sciences and Hospital, Patna, India

Corresponding author: Dr Shraddha Rani, Senior Lecturer, Department of Prosthodontics and Crown and Bridge. Dr.B.R.Ambedkar Institute Of Dental Sciences, Patna, Bihar , India.

How to cite this article: Shraddha Rani, Sanjeev Kumar, Pratibha, Vivek Kumar. Clinical applications of precision attachments: a review. International Journal of Contemporary Medical Research 2016;3 (2):342-346.

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 which would otherwise be displayed in the anterior part of the mouth and would be esthetically not acceptable
10. To retain hybrid dentures

CONTRA-INDICATIONS⁵

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. Periodontosis
3. Abnormally high caries rate
4. Inadequate space to employ them (teeth that are very narrow facio-lingually).
5. Poor neuromuscular coordination and in neuromuscular disorders

ADVANTAGES⁵

Frictional wall precision attachment partial dentures direct the forces on the abutment with the long axis of the tooth. The fulcra are reduced in height, closer to the crestal bone level.

This improves the longevity of the abutment teeth and increases patient satisfaction.

DISADVANTAGES⁵

1. Abutment teeth have to be restored
2. Economics

MECHANISM OF ACTION⁶

Retainers must hold the prosthesis securely in place during chewing, swallowing, speaking and other oral functions. Therefore, male and female portions must fit together precisely.

Resistance to separation within the attachment is by following mechanisms.

- 1) 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.
- 2) Binding – Occurs when a parallel walled body tips within its receptor site.
- 3) Wedging of conical bodies- Friction comes into play only in the terminal position and is lost as soon as the bodies begin to separate.

- 4) 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.
- 5) 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.

ATTACHMENT SELECTION⁷

In 1971, 126 attachments were listed and classified by Dr. Merrill Mensor, this is called as E. M. attachment selector. (fig 1)

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.

In selecting an attachment system;

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

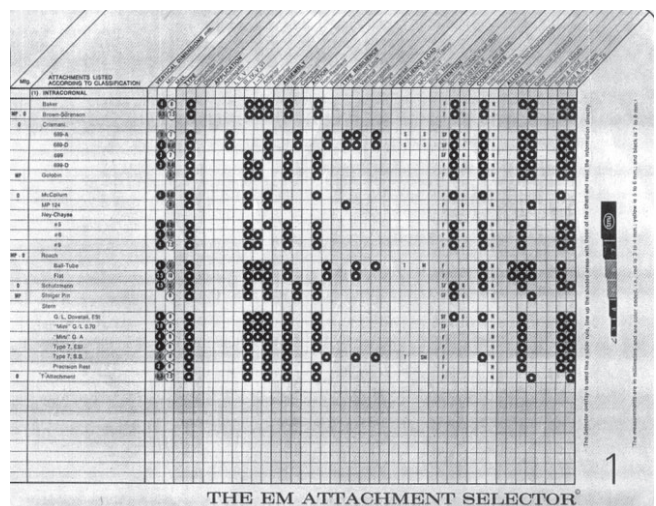


Figure-1: EM attachment selector

CLINICAL APPLICATIONS OF PRECISION ATTACHMENTS

Precision attachments can be used in various situations for rehabilitation. Some of these are outlined below.

1. Precision attachment-retained overdentures

The attachment-fixation overdenture is far superior to other types of overdentures or other forms of overlay prostheses⁸. 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.

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.

Examples of precision attachments for overdentures are:

A. Bar attachments

- Dolder bar
- Hader bar (fig 2)
- Andrews bar
- Ceka bar
- Octalink
- C.M. bar
- M. P. Channels
- Ackerman bar
- Customized bars

B. Stud attachments

- Dalla Bona
- Gerber
- Ceka
- Rothermann
- Gmur
- Huser
- Schubiger
- Ancrofix

C. Auxiliary attachments

- Schubiger screw system
- VK screw system
- Ipsoclip
- Pressomatic
- IC attachment

2. Precision attachments for removable partial dentures

A. Extracoronal attachments⁹⁻²⁰

- Spang stabilex and conex
- Crismani resilience joint
- Dalla bona resilience joint (fig 3)
- Steiger axial rotation joint

- Scott External precision attachment
- Hinges

B. Intracoronal attachments²¹⁻²⁴

- Ceka attachment
- Telescope Studs (Push Button Attachments)
- Gerber retention cylinder
- Dalla bona cylindrical anchor
- Schneider anchor
- Baer fah anchor
- Rothermann eccentric

3. Precision attachments in fixed prosthodontics²⁵⁻²⁸

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:

1. Precision attachments facilitate parallelism of small sections rather than requiring attempts to parallel up to 14 teeth.
2. 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.
3. 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.
4. When the cementing medium washes out, it is usually the second molar that washes out first. The dentist can

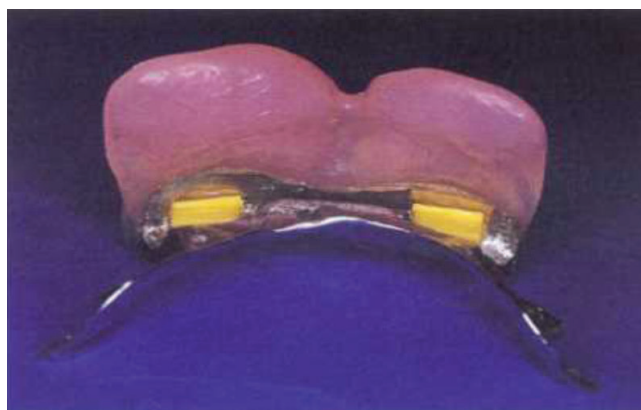


Figure-2: the Hader bar

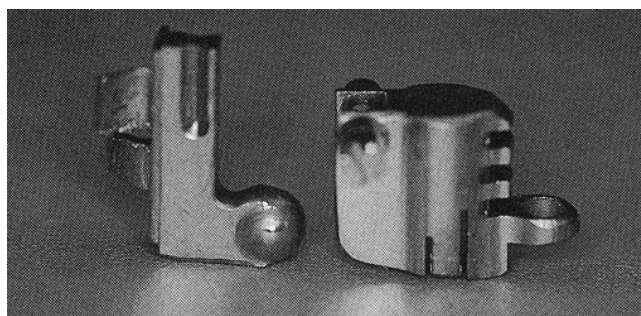


Figure-3: Dalla bona attachment

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.

INSTRUCTIONS TO PATIENT AND RECALL²⁹

Instructions to the patient

Before the patient is dismissed, the difficulties that may be encountered and the care that must be given to the prosthesis and the abutment teeth must be reviewed.

Return For Post insertion Adjustments

The patient should be scheduled for the first post insertion appointment 24 hours following insertion of the denture. The patient is instructed to wear the denture continuously between the first two appointments except for cleaning. After 24 hours, the patient will have some opinions regarding how the denture feels and how they function. Scheduled appointments for postinsertion adjustments will indicate to patients that there is concern for their well being and that minor adjustments will be necessary to improve the fit and comfort of the denture.

Sore spots

The patient should be informed that sore spots may develop and that appointments are being scheduled to detect and eliminate them at the earliest opportunity. The patient should be informed that after the initial period of adjustment additional sore spots may develop from time to time, and those that persist for several days should be examined and adjusted.

Insertion and removal

The patient should be visually introduced to the removal and placement of removable partial denture. The patient is brought in front of a mirror and asked to insert and remove the partial denture in the correct fashion several times before being dismissed.

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 acrylic 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.

Cleaning The Denture

Patients who wear removable partial denture prostheses should be encouraged to maintain meticulous oral hygiene. The teeth adjacent to the removable partial denture are especially susceptible to decay, since they no longer receive

the same kind of thorough cleansing action from the cheeks, tongue and saliva. Food that accumulates between the prosthesis and the teeth must be removed after meals to prevent the potential for carious involvement. The removable partial denture should be rinsed under cool water after each meal and brushed at bedtime with a natural bristle brush along with the regular tooth brushing routine. Special partial denture brushes for cleaning inside portions of clasps and adjacent to attachments can be purchased at most pharmacies. Smokers tars that build up on the framework can be removed by immersing the denture overnight in white vinegar. More persistent stains and calculus buildup should be removed at the patient's routine recall appointment. An ultrasonic cleaner with the proper solution for stains and calculus will remove stubborn unsightly deposits.

Speech

The patient may experience some difficulty in speaking clearly at first, particularly if the maxillary removable partial denture covers all or part of the palate or anterior teeth are being replaced. The tongue may be somewhat restricted and needs time to adjust to the new environment. The condition is usually temporary and will improve rapidly, almost without conscious effort on the part of the patient. The patient who has greater difficulty can speed up the speaking process by reading aloud and repeating those sounds that are most troublesome.

Saliva

The patient may notice an excess of saliva in the first few days of wearing the partial denture. As the removable partial denture becomes a permanent part of the oral environment, the flow of saliva should decrease.

Tooth soreness or sensitivity

Teeth that have become abutments for the removable partial denture have often been out of function prior to placement of the prosthesis. Teeth that are put back into function may become sore as a result of loading and the minor orthodontic effects of the removable partial denture. The patient should be advised of this possibility. A premature occlusal contact may also be the cause. Remount procedures and occlusal adjustment are recommended at the time of insertion and subsequently with or without the symptoms of tooth soreness.

CONCLUSION

A dental surgeon must combine his skills of prosthodontics, periodontics and conservative dentistry if he has to restore a dentition effectively after it has been damaged by disease, trauma or wear. He must be capable of making an accurate diagnosis, taking into account all pertinent information. This will include condition of remaining teeth, their supporting structures, the surrounding soft and hard tissues, the occlusal relationship of teeth and articulation of jaws. This information must be considered against emotional and social circumstances of the patient before satisfactory treatment plan is evolved. All these factors play a very important role in

replacement of missing teeth by prosthesis that include precision attachments.

Unfortunately, most often precision attachments are chosen from descriptions in commercial catalogues. A dentist must base his techniques on both sound biological principles and mechanical considerations.

Then precision attachments becomes what it should be, a beautiful example of bio-engineering that will be compatible with the continuing health of masticatory apparatus.

REFERENCES

1. Alexander Leff. Precision attachment dentures. JPD, 1952: 84-91
2. Baker, J. L. And Goodkind, R. J.: Theory and practice of precision attachment removable partial dentures, St Louis, 1981, the C. V. Mosby Co.
3. Prieskel: Precision attachments in dentistry, ed 3, London, 1979, Henry Kimpton, Publishers
4. Nally. The use of prefabricated precision attachments. Int Dent J 1961; 11: 192.
5. Kenneth Rudd, Robert Morrow, John Rhoads. Dental lab procedures. Volume 3
6. Prieskel: Precision attachments in dentistry, ed 3, London, 1979, Henry Kimpton, Publishers
7. Merrill Mensor. Classification and selection of attachments. JPD, 1973; 29: 494-497
8. Leroy Knowles. A Dowel attachment removable partial denture. JPD. 13, 679-687
9. Isaacson. Telescope crown retainers for removable partial dentures. JPD 1969; 22: 436.
10. Goodman Jerome J and Goodman Herman W. Balance of force in precision free end restorations JPD 1963; 13: 302-308.
11. Rantanen, T, Makila, E, Yli-Urpo, A. Investigations of the therapeutic success with dentures retained by precision attachments. II. Partial dentures. Suom Hammaslaak toim 1972: 68: 73.
12. Hecknebey. Distribution of load with the lower free-end partial denture. Acta Odont Scand 1969; 27; 140.
13. Kabcenell. The resilient partial denture. N Y State Dent J 1970; 36: 492.
14. Rushford. A technique for precision removable partial denture construction. JPD 1974; 31;377-383.
15. Scott and Bates. The relining of partial dentures involving precision attachments. JPD 1972; 28: 325.
16. Steiger. Abutment preparation for removable crown and bridgework with a new system of attachment. Dent Mag 1951; 68: 183.
17. Miller. Intra-coronal attachments for removable partial dentures. DCNA 1963; 779.
18. Preiskel. The use of internal attachments. Brit Dent J 1966; 121: 564.
19. Morison. Internal precision attachment retainers for partial dentures. JADA 1962; 64: 209.
20. Terrel. Specialised frictional attachments and their role in partial denture construction. JPD 1951; 3: 339.
21. Davodi Aria. An implant-supported fixed-removable prosthesis with a milled tissue bar and hader clip retention of a restorative option for the edentulous maxilla. JPD 1997; 78: 212-217
22. Kurer. A pressure stud denture retainer. Brit Dent J 1979; 146:119-122.
23. Merill Mensor. Attachments for the overdenture. In overdentures, by Brewer And Morrow. C V Mosby, St Louis, Mo, 1975
24. Prieskel. Prefabricated attachments for complete overlay dentures. Brit Dent J 1967; 123: 161.
25. Lorenchi Stanley F. Planning precision attachment restorations JPD 1969; 21: 506-508.
26. Markley MR. Broken stress principle and design in fixed bridge prosthesis. JPD 1951; 1: 416-213.
27. Rudd Kenneth D. An esthetic and hygienic approach to the use of intra coronal attachments as interlocks in fixed prosthodontics. JPD 1998; 79: 347-349.
28. Shillinburg Herbet T, Fisher Donald W. Non rigid connectors for fixed partial dentures. JADA 1973; 87: 1195-1199
29. Stewart BL, Edwards RO. Retention and wear of precision type attachments. JPD 1983; 49: 28-34.

Source of Support: Nil; **Conflict of Interest:** None

Submitted: 11-12-2015; **Published online:** 01-01-2016