Prosthodontics

Types of clasp assemblies:

They are of two types:-

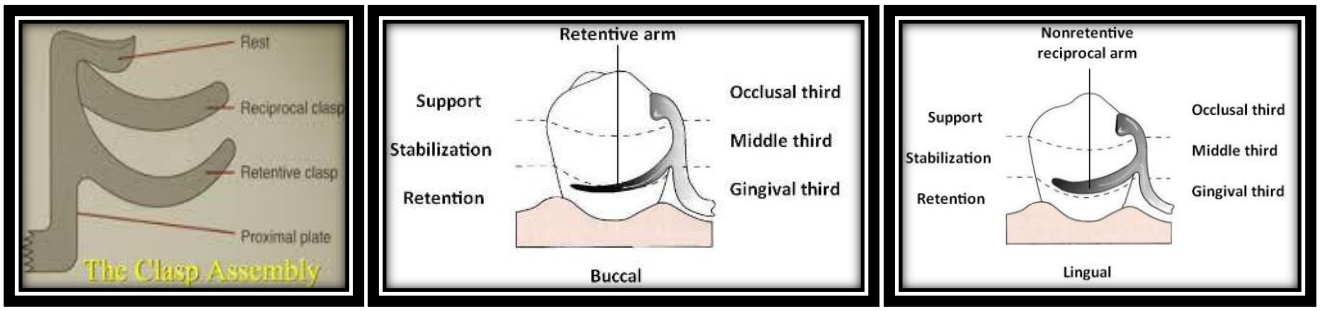
1. **Clasps designed without movement accommodation.**
2. **Clasps designed to accommodate distal extension functional movement.**

Clasps designed without movement accommodation: It is also named suprabulge clasp or occlusally approach clasp since the clasp approaches the retentive undercut from the occlusal direction.

Clasps for tooth-borne partial dentures (Class III and IV) have one function to prevent dislodgment of the prosthesis without damage to the abutment teeth. Since there is little or no rotation caused by tissue ward movement of the edentulous area (as happens in distal extension cases) stress releasing properties are usually not required. These clasps can also be used in modification spaces for tooth and tissue supported removable partial dentures (Class I and II).

Circumferential (Circle or Akers) clasp:

- The circumferential clasp will be considered first as an all-cast clasp and it is the simplest one.
- The basic form of the circumferential clasp is a buccal and lingual arm originating from a common body (principle occlusal rest and minor connector).
- The circumferential clasp has only one retentive clasp arm, opposed by a nonretentive reciprocal arm on the opposite side.
- It approaches the undercut area from an occlusal direction so it is called (occlusally approaching clasp) since it is coming to the undercut area from above the bulge area so-called (suprabulge clasp) and since it is pulling the tooth during action also called pull clasp and also called Aker clasp.
- The retentive arm begins above the height of contour, and curves and tapers to its terminal tip, in the gingival 1/3 of the tooth, well away from the gingival.
- The bracing (nonretentive reciprocal) arm is in the middle 1/3 of the tooth, and is broader occlusal – gingivally, does not taper and is either entirely above the height of contour or completely on a prepared guiding plane – it should never be designed into an undercut, as it is a rigid element.
- Support is provided by occlusal rest; stabilization is provided by occlusal rest, proximal minor connector, lingual clasp arm and rigid portion of buccal retentive clasp arm occlusal to the height of contour; retention is realized by the retentive terminal of buccal clasp arm; reciprocation is provided by nonflexible lingual clasp arm. Clasp Assembly engages more than 180 degrees of abutment tooth's circumferences.



Indications:

- It is a most logical clasp to use with all tooth-supported partial dentures because of its retentive and stabilizing ability.
- On free end extension when minimal undercut is utilized.

Contraindication:

- When the retentive undercut may be approached better with a bar clasp arm.
- When esthetics will be enhanced by using bar clasp arm.

Advantages:

- Excellent bracing qualities.
- Easy to design and construct.
- Less potential for food accumulation below the clasp compared to bar clasps.

Disadvantages:

- More tooth surface is covered than with a bar clasp arm because of its occlusal origin.
- On some tooth surfaces, particularly the buccal surface of mandibular teeth and the lingual surfaces of maxillary teeth, its occlusal approach may increase the width of the occlusal surface of the tooth.
- In the mandibular arch, more metal may be displayed than with the bar clasp arm.
- Its half-round form prevents adjustment to increase or decrease retention. True adjustment is impossible with most cast clasps.

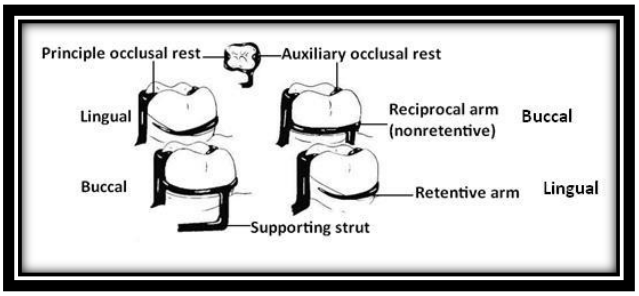
The circumferential type of clasp may be used in several forms:

1. Ring-type clasp:

- Ring clasp, which encircles nearly all of a tooth from its point of origin.
- Usually used with mesially and lingually tilted mandibular molars or the undercut is on the same side as the rest seat (i.e. adjacent to edentulous span).
- The clasp should never be used as an unsupported ring because if it is free to open and close as a ring, it cannot provide either reciprocation or stabilization. Instead, the ring-type clasp should always be used with a supporting strut on the nonretentive side, with or without an auxiliary occlusal rest on the opposite marginal ridge. The advantage of an auxiliary rest is that further movement of a mesially inclined tooth is

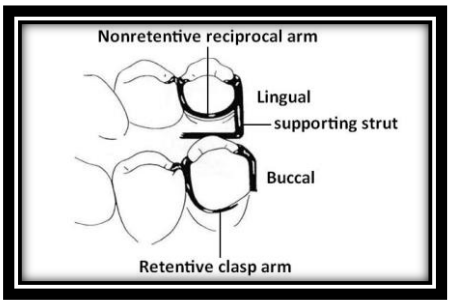
prevented by the presence of a distal rest. In any event, the supporting strut should be regarded as being a minor connector from which the flexible retentive arm originates.

- Reciprocation comes from the rigid portion of the clasp lying between the supporting strut and the principal occlusal rest.
- The ring-type clasp should be used on protected abutments whenever possible because it covers such a large area of the tooth surface.



Indications:

- It is used when a proximal undercut cannot be approached by other means. For example, when a mesiolingual undercut on a lower molar abutment (isolated lower molar such as in Class II modification one) cannot be approached directly because of its proximity to the occlusal rest area and cannot be approached with a bar clasp arm because of lingual inclination of the tooth.
- It may be used in reverse on an abutment located anterior to a tooth-bounded edentulous space when a distobuccal or distolingual undercut cannot be approached directly from the occlusal rest area and/or tissue undercuts prevent its approach from a gingival direction with a bar clasp arm.

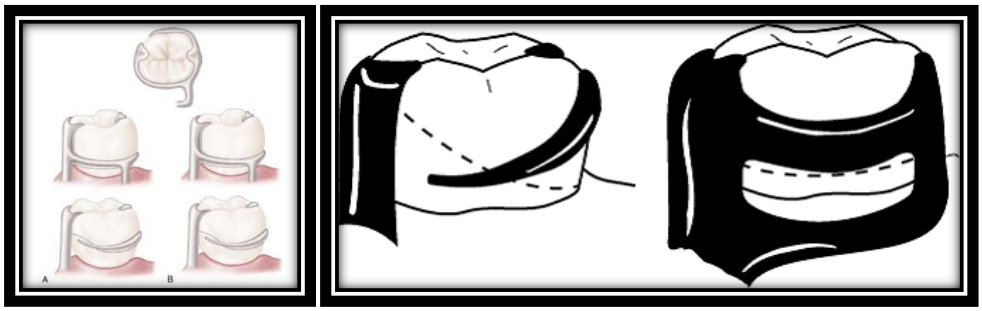


Contraindication:

- Excessive tissue undercuts prevent the use of a supporting strut.

Advantages:

a. Excellent bracing (with supporting strut).
b. Allow the use of an available undercut adjacent to the edentulous area.



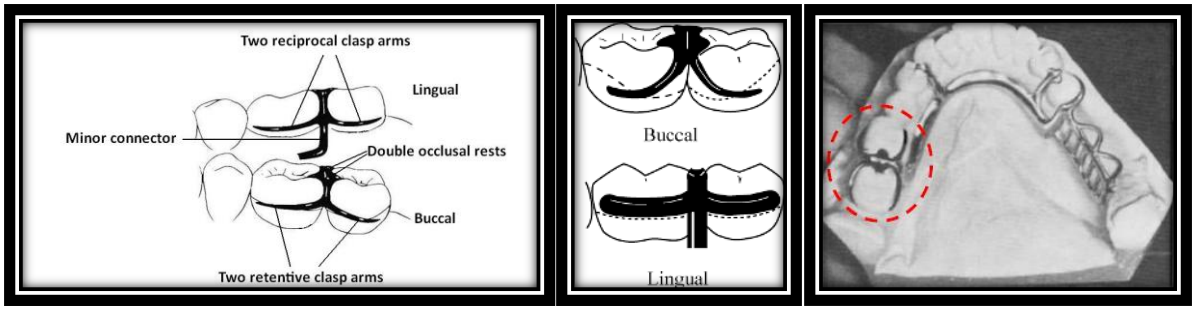
Ring clasp (s) encircling nearly the entire tooth from its point of origin. A Clasp originates on the mesiobuccal surface and encircles the tooth to engage the mesiolingual undercut. B, Clasp originates on the mesiolingual surface and encircles the tooth to engage the mesiobuccal undercut.

Disadvantages:

- Covers a large area of the tooth surface, therefore requiring meticulous hygiene.
- Very difficult to adjust due to the extreme rigidity of the reciprocal arms.
- The lower bracing arm should be at least 1mm from the free gingival margin and relieved to prevent impingement of the gingival tissues.

2. Embrasure (double Akers) clasp:

- The embrasure clasp always should be used with double occlusal rests, even when definite proximal shoulders can be established. This is done to avoid interproximal wedging by the prosthesis, which could cause separation of the abutment teeth and result in food impaction and clasp displacement.
- In addition to providing support, occlusal rests also serve to shunt food away from contact areas.
- Embrasure clasps should have two retentive clasp arms and two reciprocal clasp arms, either bilaterally or diagonally opposed.



Example of use of embrasure clasp for a Class II partially edentulous arch: Embrasure clasp on two left molar abutments were used in the absence of posterior modification space.

Indications:

Used in a quadrant where no edentulous area exists, In an unmodified Class II or Class III partial denture, where there are no edentulous spaces on the opposite side of the arch to aid in clasping.



Occlusal and proximal surfaces of adjacent molar and premolar prepared for embrasure clasp. Note that rest seat preparations are extended both buccally and lingually to accommodate retentive and reciprocal clasp arms.

Disadvantages:

- Extensive interproximal reduction is usually required.
- Covers large area of tooth surface – hygiene considerations.

Other less commonly used modifications of the cast circumferential clasp are:

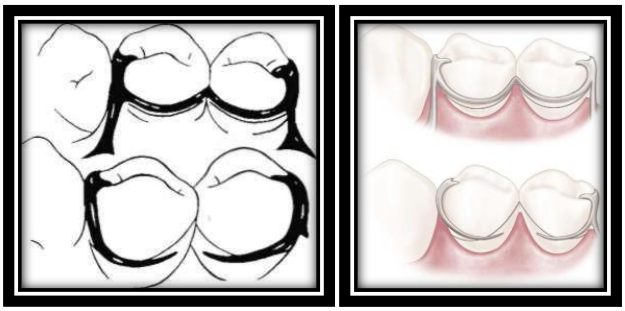
1. Back action clasp:

- The back-action clasp is a modification of the ring clasp.
- It is used on premolar abutment anterior to edentulous space.
- The undercut can usually be approached just as well using a conventional circumferential clasp, with less tooth coverage and less display of metal.
- Its use is difficult to justify.



2. Multiple clasps:

The multiple clasps are simply two opposing circumferential clasps joined at the terminal end of the two reciprocal arms.



Indications:

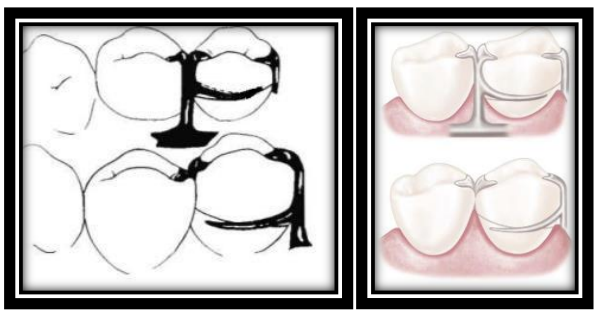
- It is used when additional retention and stabilization are needed, usually on tooth-supported partial dentures.
- It may be used for multiple clasping in instances in which the partial denture replaces an entire half of the dental arch.
- It may be used rather than an embrasure clasp when the only available retentive areas are adjacent to each other.

Disadvantage:

- Its disadvantage is that two embrasure approaches are necessary rather than a single common embrasure for both clasps.

3. Half-and-half Clasp:

- It is consists of a circumferential retentive arm arising from one direction and a reciprocal arm arising from another.
- The second arm must arise from a second minor connector, and this arm is used with or without an auxiliary occlusal rest.
- Its design was originally intended to provide dual retention, a principle that should be applied only to unilateral partial denture design.
- Reciprocation arising from a second minor connector usually can be accomplished with a short bar or with an auxiliary occlusal rest, thereby avoiding so much tooth coverage.
- There is little justification for the use of the half-and-half clasp in bilateral extension base partial dentures.

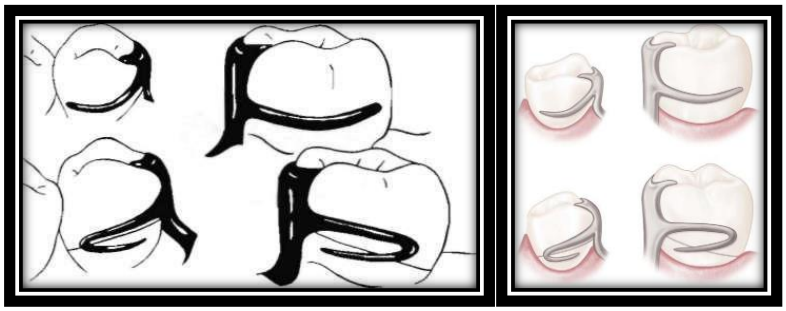


4. Reverse-action clasp (Hairpin):

- Ring clasp or bar clasp originating on the opposite side of the tooth can be used with the same result getting from reverse- action clasp.
- The upper part of the arm of this clasp should be considered a minor connector, giving rise to the tapered lower part of the arm. Therefore only the lower part of the arm should be flexible. With the retentive portion beginning beyond the turn, only the lower part of the arm should flex over the height of the contour to engage a retentive undercut.
- The bend that connects the upper and lower parts of the arm should be rounded to prevent stress accumulation and fracture of the arm at the bend.

Advantage:

- Clasp arm is designed to permit engaging a proximal undercut (undercut adjacent to edentulous space) from an occlusal approach.



Disadvantages:

- Esthetically objectionable when using an anterior abutment.
- The clasp covers a considerable tooth surface and may trap debris.
- Almost impossible to adjust.
- Difficult to fabricate.
- Insufficient flexibility on short crowns due to insufficient clasp arm length.

Indications:

- When a proximal undercut must be used on a posterior abutment and when tissue undercuts, tilted teeth or high tissue attachments prevent the use of a bar clasp arm.
- When lingual undercuts may prevent the placement of a supporting strut (of ring clasp) without tongue interference.
- May be used on abutments of tooth-supported dentures when proximal undercut lies below the point of origin of the clasp.

Disadvantages of circumferential clasps in summary:

- A large amount of tooth surface is covered by clasp assembly.
- It alters the gross morphology of the clinical crown.

Clasps designed to accommodate distal extension functional movement:

Two strategies are adapted to either:

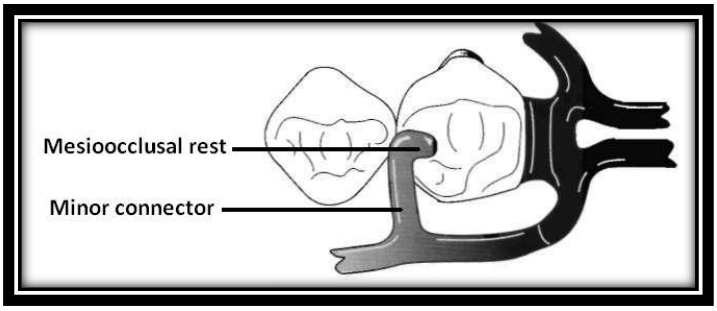
- Change the fulcrum location and subsequently the "resistance arm" engaging effect (mesial rest concept clasp assemblies).
- Minimize the effect of the lever by use of a flexible arm (wrought-wire retentive arm).

Change the fulcrum location and subsequently the "resistance arm" engaging effect: Mesial rest concept clasps assemblies (RPI, RPA, and Bar clasp): These are proposed to accomplish movement accommodation by changing the fulcrum location to prevent harmful tipping or torquing of the abutment tooth and prevent more denture base movement. This is concept includes RPI and RPA clasps.

RPI clasp:

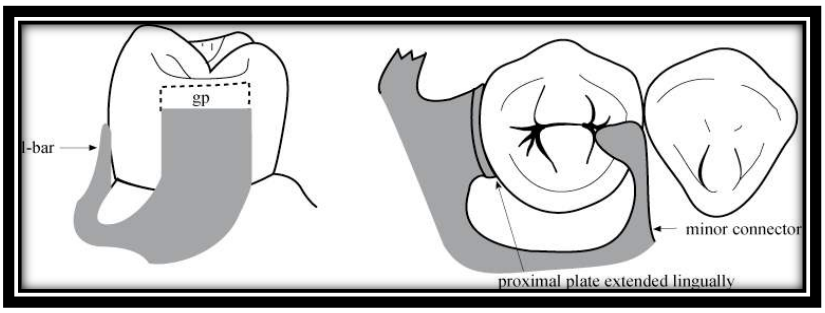
RPI clasps are referring to the: R = Rest always mesial, P = Proximal plate, and I = I-bar. These are component parts of the clasp assembly. Basically, this clasp assembly consists of:

- A mesioocclusal rest of a premolar or mesiolingual surface of a canine with the minor connector placed into the mesiolingual embrasure, but not contacting the adjacent tooth (prevents wedging).

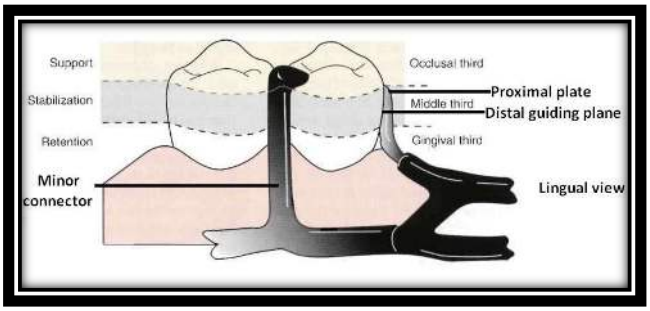


Occlusal view

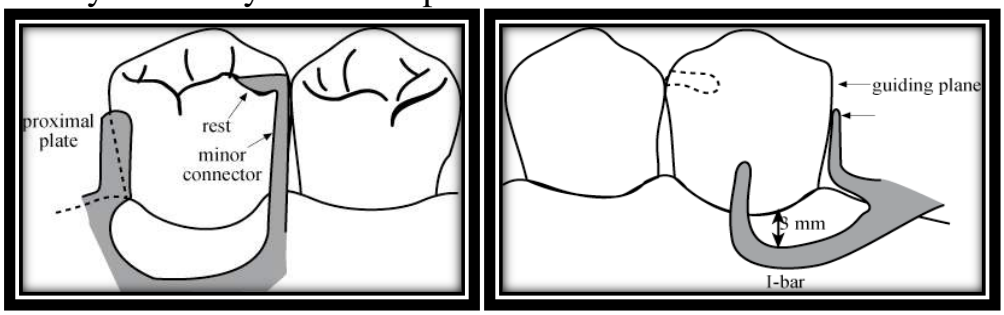
- A distal guiding plane, extending from the marginal ridge to the junction of the middle and gingival thirds of the abutment tooth, is prepared to receive a proximal plate. The buccolingual width of the guiding plane is determined by the proximal contour of the tooth.



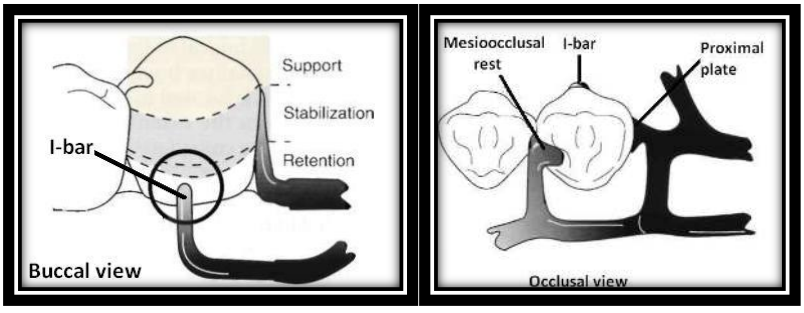
- The proximal plate (essentially a wide minor connector) is located on a guide plane on the distal surface of the tooth. The plate is approximately 1 mm thick and joins the framework at a right angle.
- The I-bar in conjunction with the minor connector supporting the rest provides the stabilizing and reciprocal aspects of the clasp assembly.



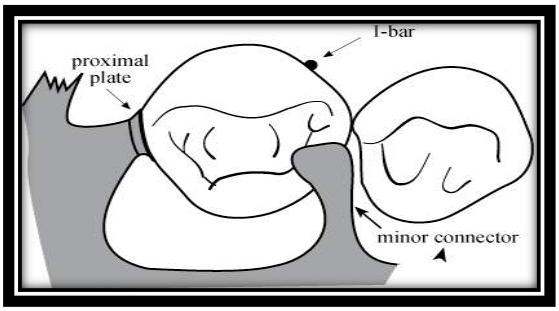
- I-bar should be located in the gingival third of the buccal or labial surface of the abutment in a 0.01-inch (0.25mm) undercut. The whole arm of the I-bar should be tapered to its terminus, with no more than 2 mm of its tip contacting the abutment. The retentive tip contacts the tooth from the undercut to the height of the contour. This area of contact along with the rest and proximal plate contact provides stabilization through the encirclement. The bend in the I-bar should be located at least 3 mm. from the gingival margin. This distance will prevent food entrapment and provide the length for the necessary flexibility in the clasp arm.



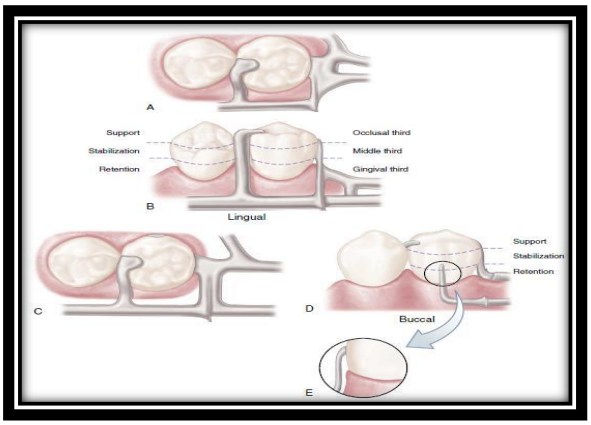
- The clasp is usually cast and is placed just below the height of the contour line.



- On the canine, the I-bar is located in the mesiobuccal undercut and is reciprocated directly by the proximal plate.

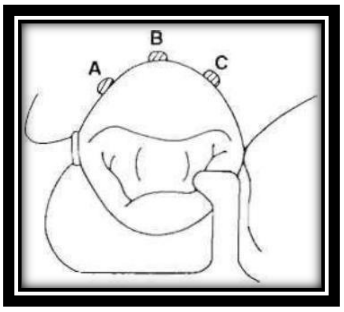


The horizontal portion of the approach arm must be located at least 4 mm from the gingival margin and even farther if possible.



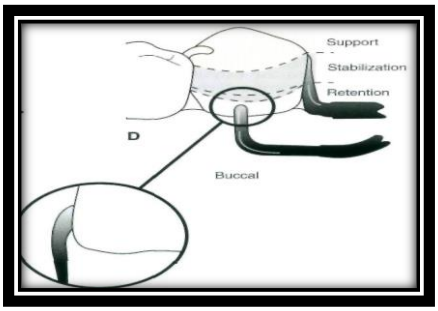
Bar-type clasp assembly:

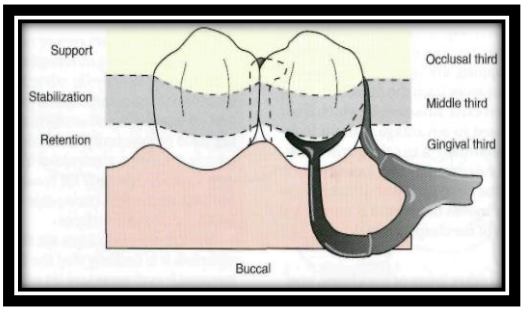
A: Occlusal view. Component parts :(proximal plate minor connector, rest with minor connector, and retentive arm) tripod the abutment to prevent its migration. B: The proximal plate minor connector extends just far enough lingually so that it combines with the mesial minor connector to prevent the lingual migration of the abutment. C: On narrow or tapered abutments (mandibular first premolars), the proximal plate should be designed to be as narrow as possible but still sufficiently wide to prevent lingual migration. D: I-bar retainer located at the greatest prominence of the tooth in the gingival third. E: Mesial view of I-bar illustrating the retentive tip relationship to the undercut and a region superior to the height of contour, which serves stabilization function in the encirclement.



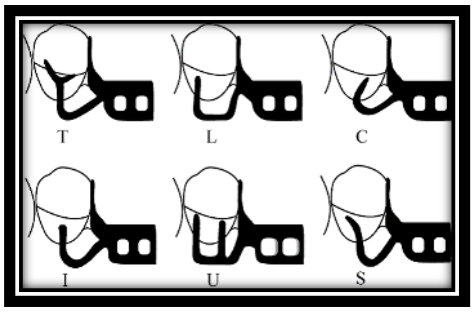
Occlusal view of RPI bar clasp assembly. Placement of l-bar which is depending on the position of proximal plate in relation to guiding plan on proximal tooth surface: (A) On the distobuccal surface. (B) At greatest mesiodistal prominence. (C) On the mesiobuccal surface.

The bar clasp arm arises from the denture framework or a metal base and approaches the retentive undercut from a gingival direction.





The bar clasp arm has been classified by the shape of the retentive terminal. Thus it has been identified as T, Y, L, I, U and S. I shape bar is preferred than other shapes because this shape being biologically and mechanically sound.



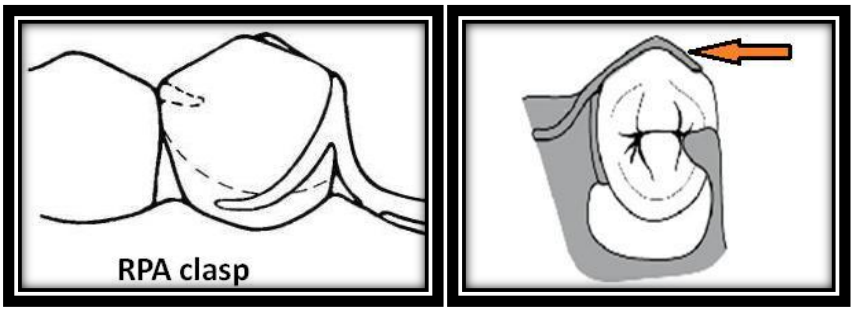
If the abutment teeth demonstrate contraindications for a bar-type clasp a modification should be considered for the RPI system (the RPA clasp; Akers clasp).

Contraindications:

- Deep cervical undercuts - food trap or impingements result.
- Severe soft tissue or bony undercuts - food trap or impingements result.
- Insufficient vestibular depth for approach arm, because this reduces the advantageous length of the arm and made the clasp too close to the gingival margin it (requires 4 - 3 mm from the free gingival margin, 1 mm for the thickness of the approach arm).
- Pronounced frenal attachments area – impingement.
- The excessive buccal or lingual tilt of the abutment tooth.

RPA clasp; Akers clasp:

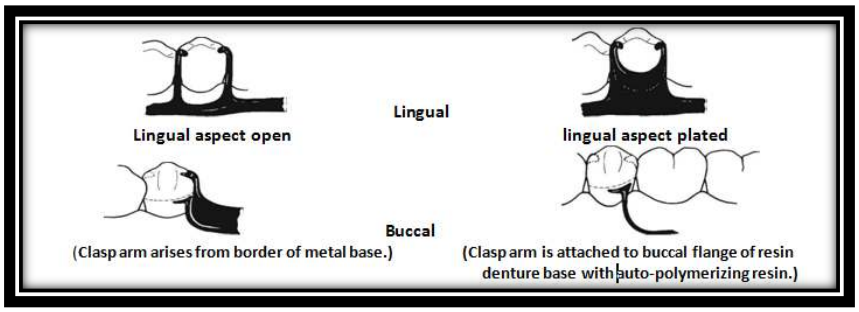
This clasp assembly is similar to the RPI design (consists of a mesial occlusal rest, proximal plate, except a wrought wire circumferential clasp (Akers) is used instead of the I-bar. This clasp arises from the proximal plate and terminates in the mesiobuccal undercut. It is used when there is insufficient vestibule depth or when a severe tissue undercut exists.



There are several other types of bar clasps; for example:

Infrabulge clasp:

It is designed so that the bar arm arises from the border of the denture base, either as an extension of a cast base or attached to the border of a resin base. It is made more flexible than the usual bar clasp arm.

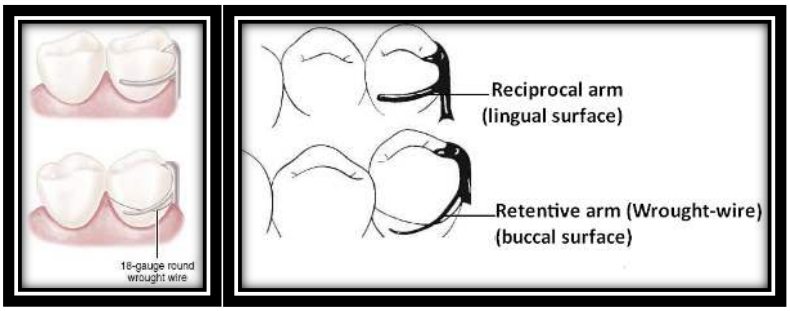


Advantages:

- Its interproximal location, which may be used to esthetic advantage. And Increased retention without tipping action on the abutment.
- Less chance of accidental distortion resulting from its proximity to the denture border.
- Minimize the effect of the lever by use of a flexible arm (wrought- wire retentive arm).

Combination clasp:

- Another strategy to reduce the effect of the Class I lever in distal extension situations is to use a flexible component in the "resistance arm," which is the strategy employed in the combination clasp. The combination clasp consists of a wrought-wire retentive clasp arm (round, uniformly tapered 18-gauge platinum-gold-palladium alloy or chrome- cobalt alloy wrought- wire) and a cast reciprocal clasp arm.
- The retentive arm (wrought-wire) is almost always circumferential, but it also may be used in the manner of a bar, originating gingivally from the denture base.
- The cast reciprocal arm may be in the form of a bar clasp arm, it is usually a circumferential arm.



Advantages:

- The flexibility.
- The adjustability.
- The esthetic appearance of the wrought-wire retentive arm over other retentive circumferential clasp arms).
- Minimum of tooth surface covered because of its line contact with the tooth, rather than having the surface contact of a cast clasp arm.
- A less likely occurrence of fatigue failures.

Disadvantages:

- It involves extra steps in fabrication, particularly when high-fusing chromium alloys are used.
- It may be distorted by careless handling on the part of the patient.
- Because it is bent by hand, it may be less accurately adapted to the tooth and therefore provide less stabilization in the suprabulge portion.
- It may distort with function and not engage the tooth.

Indications:

- When maximum flexibility is desirable, such as on an abutment tooth adjacent to a distal extension base where only a mesial undercut exists on the abutment or a weak abutment or where a large tissue undercut, contraindicates a bar- type direct retainer.
- It may be used for its adjustability when precise retentive requirements are unpredictable and later adjustment to increase or decrease retention may be necessary.
- When esthetic required overcast clasps, because wrought -wire is round, light is reflected in such a manner that the display of metal is less noticeable than with the broader surfaces of a cast clasp.

The various types of cast circumferential clasps may be used in combination with bar clasp arms. Circumferential and bar clasp arms may be made either flexible (retentive) or rigid (reciprocal) in any combination as long as each retentive clasp arm is opposed by a rigid reciprocal component.