Prosthodontics

Retention and Removable Partial Denture Retainers

In general, a removable partial denture should have these requirements :

Support: The support derived from the abutment teeth through the use of rests and from the residual ridge through the use of well-fitting bases .

Stability: Removable partial denture must be stable against horizontal movement through the use of rigid components like the reciprocal arm of the circumferential clasp and minor connector. The removable partial denture must also be stable against rotational movements through the use of rigid connectors and indirect retainers.

Retention: Retention is the quality of the removable partial denture that resists forces acting to dislodge components away from the supporting tissues. Sufficient retention is provided by two means. Primary retention for removable partial denture is accomplished mechanically by placing retaining elements (direct retainers) on the abutment teeth. Secondary retention is provided by the intimate relationship of the minor connector contact with the guiding planes, denture bases, and major connectors (maxillary) with the underlying tissue. The latter (secondary retention) is similar to the retention of complete denture. It is proportionate to the accuracy of the impression registration, the accuracy of the fit of the denture bases, and the total involved area of contact.

Retainers can be divided into:

I. Direct retainers .

II. Indirect retainers.

Direct retainers

A direct retainer: is any unit of a removable dental prosthesis that engages an abutment tooth to resist displacement of the prosthesis away from basal seat tissue.

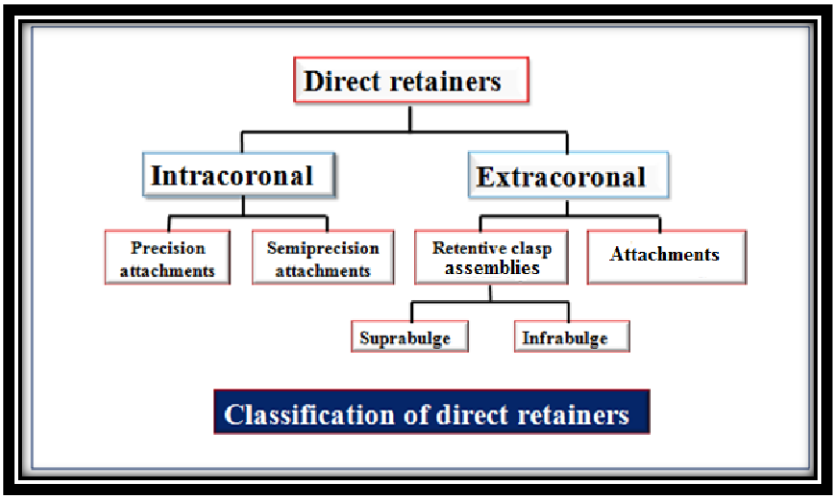
The direct retainer's ability to resist this movement is greatly influenced by the stability and support of the prosthesis provided by major and minor connectors, rests, and tissue bases.

There are basically two types of direct retainers:

1. Intracoronal in conjunction with the fabrication of a single crown or fixed bridge. Precision or semi-precision attachments are usually pre manufactured and either machined or cast in the laboratory.

There is a male-female union between the abutment tooth and the RPD framework. The primary advantage of using attachments as direct retainers is esthetics as the retentive clasp arm is eliminated from the design. A disadvantage of using these attachments is they can be costly, they are difficult to use, and they require more maintenance than a conventional clasp design.

2. Conventional extra coronal cast clasp, where the retention is usually provided by a flexible arm that flexes over the area of greatest contour into an area of lesser contour. This is usually called a clasp.



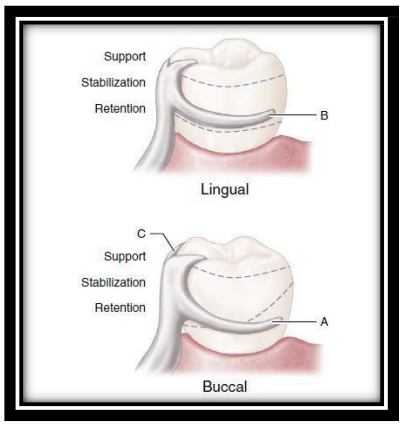
The extra coronal retainer (Clasp type): Most mechanical retention is derived from the use of direct retainers (clasp assemblies) utilizing tooth undercuts.

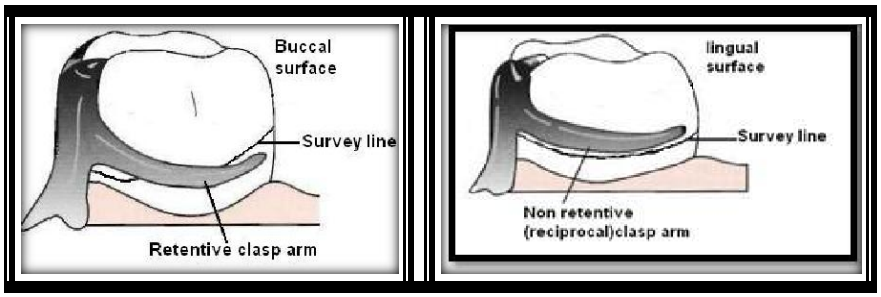
The extra coronal retainer is the most commonly used retainer for removable partial dentures, which uses mechanical resistance to displacement through components placed on

the external surfaces of an abutment tooth in an area cervical to survey line or in a depression created for this purpose. Usually, a flexible arm is forced to deform, so there will be resistance to removal.

Component parts, Function, and position of clasp assembly parts

Component Part	Function	Location
Rest	**Support**	Occlusal, lingual and incisal rests.
Minor connector	**Stabilization**	Proximal surfaces extending from a prepared marginal ridge to the junction of the middle and gingival one-third of abutment crown.
Clasp arms	**Stabilization (Reciprocation)**	Middle one-third of the crown.
	Retention	Gingival one-third of the crown in the measured undercut.





Extracoronal circumferential direct retainer Assembly consists of: (A) the buccal retentive arm; (B) the rigid lingual stabilizing (reciprocal) arm; and (C) the supporting occlusal rest. The terminal portion of the retentive arm is flexible and engages measured undercut. Assembly remains passive until activated by placement or removal of the restoration, or when subjected to masticatory forces that tend to dislodge the denture base.

No single component of a clasp assembly is solely responsible for prosthesis retention. Rather, it is the effective design and accurate construction that make the removable partial denture retentive. Each part contributes to some critical features. For example :

1. The retentive arm must be designed so that only the clasp terminus engages the prescribed undercut .
2. The accompanying rest must provide support so the clasp terminus is maintained in an optimal location .
3. The minor connector must be sufficiently rigid to ensure proper stability and function of parts of the clasp assembly.
4. The reciprocal element must contact the abutment slightly before the retentive element contacts the tooth to protect the abutment from destructive lateral forces.
5. Components must provide sufficient encirclement; otherwise, retention will be lost.
6. Indirect retainers must resist forces acting to dislodge the prosthesis from its fully seated position.

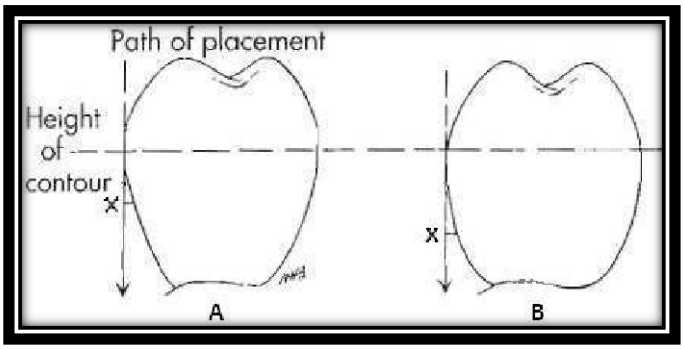
Factors affecting the magnitude of retention: Clasp retention is based on resistance to the deformation of the metal. For a clasp to be retentive, it must be placed in an undercut area of the tooth, it is forced to deform upon application of a vertical dislodging force. The amount of retention depends on various factors.

I. Size of and distance into the angle of cervical (gingival) convergence and how far into the angle of convergence the clasp terminal is placed: To be retentive, a tooth must have an angle of convergence cervical to the height of contour. When it is surveyed, any single tooth will have a height of contour or an area of greatest convexity. Any areas cervical to the height of contour may be used for the placement of retentive clasp components, whereas areas occlusal to the height of contour may be used for the placement of nonretentive, stabilizing, or reciprocating components. So, only flexible components may be placed gingivally to the height of contour because rigid elements would not flex over the height of contour or contact the tooth in the undercut area.

The location and depth of a tooth undercut available for retention are therefore only relative to the path of placement and removal of the partial denture. The most suitable path of placement is generally considered to be the path of placement that will require the least

amount of mouth preparation necessary to place the components of the partial denture in their ideal position.

When the angle of convergence between two abutments differs, uniformity of retention can be obtained by placing the clasp arms into the same degree of undercut (i.e. both 0.01"). A guiding principle of partial denture design is that retention should be uniform in magnitude and bilaterally opposed amongst abutments.

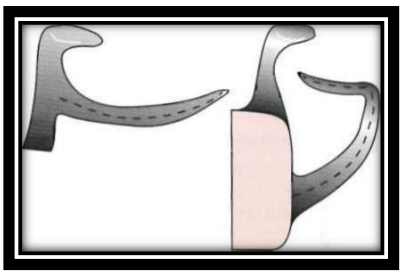


The greater angle of cervical convergence on the tooth (A) necessitates placement of clasp terminus, (X), nearer the height of contour than when a lesser angle exists, as in (B).

II. The flexibility of the clasp arm: This is influenced by the following factors:

1. **Length of clasp arm:**

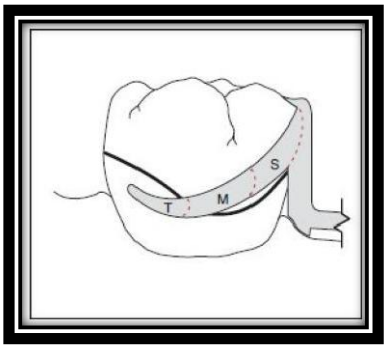
- Increase the length of the clasp arm increase the flexibility of it, all other factors being equal, (increasing clasp curvature increases length).



- The length of the clasp arm is measured from the point where the taper begins.
- The length of the clasp arm may be increased by using curving rather than straight retentive arms.

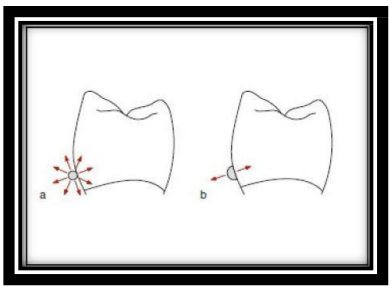
2. **The diameter of clasp:**

- The greater the average diameter of a clasp arm the less flexible it will be .
- If it's taper is absolutely uniform, the average diameter will be at a point midway between its origin and its terminal end. If its taper is not uniform, a point of flexure and therefore a point of weakness will exist .
- The clasp should always taper from the body to the tip, being thicker where the body is attached to the denture base metal or acrylic and thinnest at the end of the arm.



The rigid clasp shoulder (S) originates from the minor connector and projects across the axial surface of the abutment. The relatively flexible midsection of the clasp arm (M) continues along the abutment surface and approaches the height of the contour. The flexible clasp terminus (T) crosses apical to the height of contour, contacting the abutment on a surface undercut relative to the path of prosthesis insertion and removal.

3. Cross-sectional form of the clasp arm: Flexibility may exist in any form, but it is limited to only one direction in the case of the half-round form (bidirectional flexure). The only universally flexible form (omnidirectional flexure) is the round form, which is practically impossible to obtain by casting and polishing.



When viewed in cross-section, a round clasp (a) can flex in all directions, while a half-round clasp (b) is restricted to bidirectional flexure.

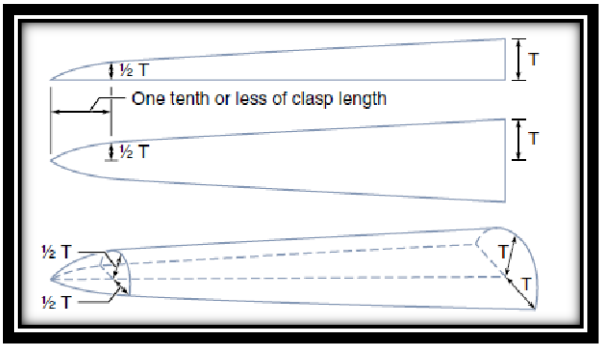
4. Clasp material:

- Whereas all cast alloys used in partial denture construction possess flexibility; their flexibility is proportionate to their bulk.
- Greater rigidity with less bulk is possible through the use of chromium-cobalt alloys.
- Gold clasps are not as flexible or adjustable as wrought wire.
- Cast gold alloys may have greater resiliency than doing cast chromium- cobalt alloys.
- Wrought wire clasp has greater tensile strength than cast clasps and hence can be used in a smaller diameter to provide greater flexibility without fatigue fracture.

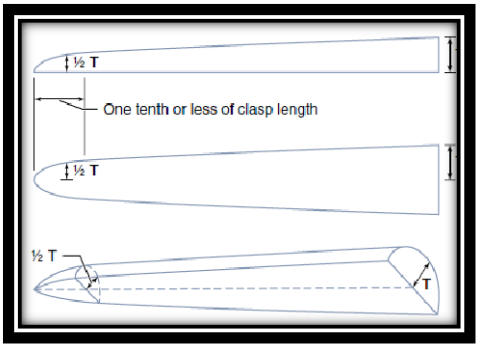
5. The relative uniformity of retention: Having reviewed the factors inherent to a determination of the amount of retention from individual clasps, it is important to consider coordination of relative retention between various clasps in a single prosthesis.

6. Stabilizing-reciprocal cast clasp arm:

- When the direct retainer becomes active, the framework must be stabilized against horizontal movement. This stabilization is derived from either cross-arch framework contacts or a stabilizing or reciprocal clasp in the same clasp assembly.
- To provide true reciprocation, the reciprocal clasp must be in contact during the entire period of retentive clasp deformation. This is best provided with lingual- palatal, guide-plane surfaces.
- Its average diameter must be greater than the average diameter of the opposing retentive arm to increase desired rigidity.



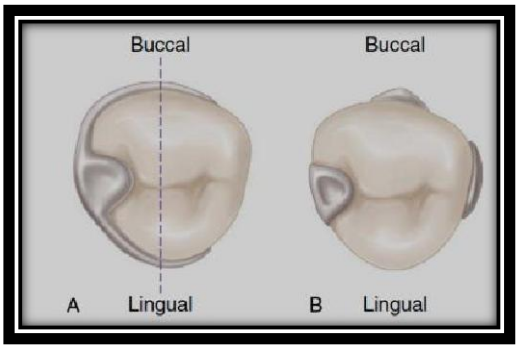
(Cast retentive arm)

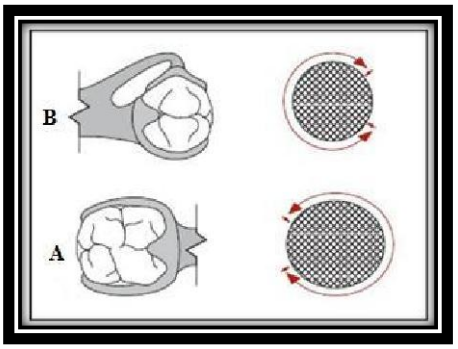


(Cast reciprocal arm)

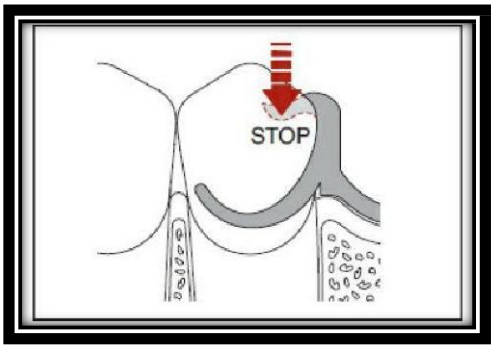
The basic principles of clasp design:

1. **Encirclement:** The principle of encirclement means that more than 180 degrees in the greatest circumference of the tooth must be engaged by the clasp assembly. The engagement can be in the form of continuous contacts, such as in a circumferential clasp (A), or discontinuous contact, such as in the use of a bar clasp (B). Both provide tooth contact in at least three areas encircling the tooth: the occlusal rest area, the retentive clasp terminal area, and the reciprocal clasp terminal area.



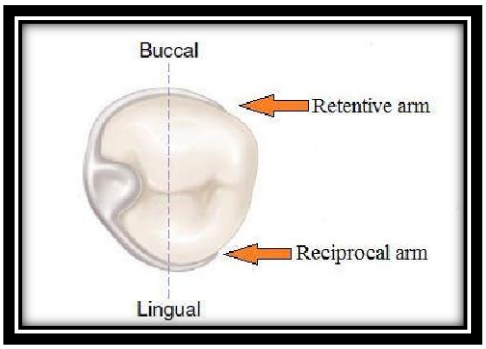


2. **Support:** The occlusal rest must be designed to prevent the movement of the clasp arms toward the cervical.

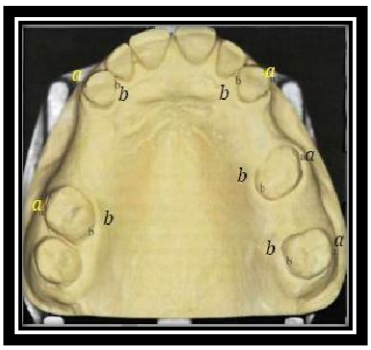


A rest must prevent the apical displacement of the prosthesis. If this is not accomplished, the underlying hard and soft tissues may be damaged.

3. **Reciprocation:** Each retentive terminal should be opposed by a reciprocal component capable of resisting any transient pressures exerted by the retentive arm during placement and removal.



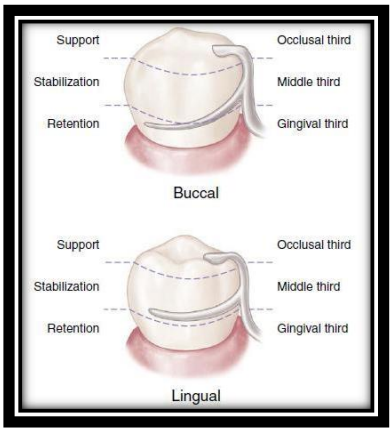
4. **Clasp retainers:** on abutment teeth adjacent to distal extension bases should be designed so that they will prevent direct transmission of tipping and rotational forces to the abutment. In effect, they must act as stress breakers either by their design or by their construction.
5. **Retentive clasps:** Unless guiding planes will positively control the path of removal and will stabilize abutments against rotational movement, retentive clasps should be bilaterally opposed, i.e., buccal retention on one side of the arch should be opposed by buccal retention on the other, or lingual on one side opposed by lingual on the other.

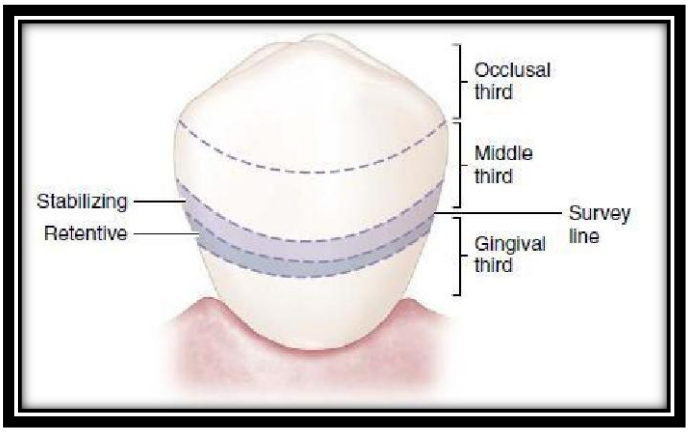


Retentive clasps should be bilaterally opposed. This means using bilateral buccal or bilateral lingual undercuts as shown on this Class III, mod. 2 arches where the retention may be either (a) bilaterally buccal or (b) bilaterally lingual.

6. The amount of retention should always be the minimum necessary to resist reasonable dislodging forces.
7. Reciprocal elements of the clasp assembly should be located at the junction of the gingival and middle thirds of the crowns of abutment teeth. The terminal end of the retentive arm is optimally placed in the gingival third of the crown. These locations

permit better resistance to horizontal and torquing forces because of a reduction in the effort arm.





8. **Passivity:** When the clasp is in its place on the tooth surface, it should be at rest, the retentive tip of the clasp arm must be passive and remain in contact with the tooth ready to resist vertical dislodging force, so when a dislodging force is applied the clasp arm should immediately become active to engage tooth surface to resist vertical displacement.