DIRECT RETAINERS

Mechanical retention of a removable partial denture is provided by the direct retainers or clasps, and the denture base. The direct retainers provide the partial denture with the ability to resist movement away from the basal seating tissues. The denture base can provide some retention by adhesion, cohesion, atmospheric pressure, polished surface contours, and gravity.

There are basically two types of direct retainers:

1. Precision or semi-precision attachments. These are usually premanufactured and either machined or cast in the laboratory. They can be either placed intracoronal or extracoronal in conjunction with the fabrication of a single crown or fixed bridge. 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 extracoronal 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.

![Diagram of clasps](image)

**Clasps must meet the requirements of:**

- a-Support
- b-Retention
- c-Cross-tooth reciprocation
- d-Encirclement (encompass more than 180° of the abutment tooth)
- e-Be passive when the removable partial denture is seated
Most clasps consist of one or more of the following components:

Rest
Retentive arm
Reciprocal arm
Minor connector

Most clasps contain a single retentive arm. The action of the retentive clasp when flexing over the height of contour is counteracted by the reciprocating clasp. The reciprocal clasp or plate, contacts the portion of the abutment tooth parallel to the path of placement and removal, either before or at the same time the retentive clasp contacts the tooth, and remains in contact as the retentive clasp arm flexes over the height of contour. The reciprocal component is located 180° around the tooth from the direction of force of the retentive clasp arm. The reciprocal component can also provide for bracing and occasionally indirect retention.

All clasps contain one or more minor connectors. This element joins the clasp arms and the rest (occlusal, cingulum, etc.) to the major connector.

**Types of clasps:**
There are two types of retentive clasps based on the direction from which they approach the undercut on the tooth:

1. Circumferential (suprabulge or pull clasp) - These clasps arise from a minor connector or lingual plate and crosses cervically over the height of contour of the tooth into the retentive undercut area.

2. Bar (infrabulge or push clasp) these clasps originate from the denture base retention minor connector and cross the soft tissue of the facial of the alveolar ridge before contacting the tooth in the desired undercut area. The portion of the bar clasp that extends from the denture base is termed the arm. The retentive portion of the clasp arm approached the undercut on the tooth from the cervical direction. Due to the friction of the " tripping " or "pushing" action of the bar clasps, they generally will provide more retention with the same amount of undercut and cervical convergence than a circumferential clasp.

*There are multiple factors that are involved in determining the amount of retention that will be provided by a clasp and are:*

a-The angle of cervical convergence.
b-How far into the angle of cervical convergence the retentive tip of the clasp is placed.
c-The type of material from which the clasp is made (different materials have varying degrees of flexibility.
d-The shape and contour of the retentive clasp.

The retentive clasp arms should be tapering. The terminal one-third of the retentive clasp is the portion that flexes, and the rest is rigid. The reciprocal clasp should possess little if any taper. The larger the diameter of a retentive clasp arm the less flexible it will be. Most cast clasps are half-round and flex away from the tooth, in one direction, with edgewise flexing minimal or non-existent. Wrought wire is also used for retentive clasps and are flexible, that is, able to flex in all directions. This is thought to be a very desirable property in not placing too much stress on the abutment tooth, and is desirable in stress distribution during function. This type of clasp is also more easily adjusted during function.

**Basic rules of clasp design:**
a-All clasp assemblies must encompass more than 180° of the tooth.
At least three areas of tooth contact must be embracing more than one-half of the tooth circumference for this rule to be satisfied.
b-Generally, the retention on all clasped abutments should be nearly as equal as possible.
c-The rest must prevent cervical movement of the clasp arm.
d-Retention should be minimum to resist reasonable dislodging forces.
e-Generally, retentive clasps should be bilaterally opposed. For example, buccal retention on one side of the arch should be opposed by buccal retention on the other side, or lingual opposed by lingual, etc.
f-Reciprocating arms should be located at the junction of the gingival and middle thirds of the tooth. The retentive arm tip should be placed in the middle of the gingival third, no closer than 1 mm to the marginal gingiva.
g-The simplest clasp for the given survey line should be used. If the survey line can be modified to simplify the clasp design, then it should be considered.

**Description of surveying lines:**
Survey lines can be classified as either type I, II or III.

**Type I:**
A type I survey line is "S" shaped with the portion adjacent to the edentulous space being low on the tooth (cervical). The portion away from the edentulous space is higher on the tooth (occlusal). The
deepest undercut is located on the portion of the tooth away from the edentulous space.

**Type II:**
A type II survey line is "S" shaped with the portion adjacent to the edentulous space being high on the tooth (occlusal). The portion away from the edentulous space is lower on the tooth (cervical). The deepest undercut is located on the portion of the tooth adjacent to the edentulous space.

**Type III:**
The type III survey line is straight or "U" shaped. It is usually higher on the mesial and distal of the tooth, with the bottom of the "U" being more cervical placed. The deepest undercut can be anywhere along the survey line. This survey line will usually provide minimal retention.

**Circumferential clasp:**
Survey Line: Type I
Amount of Undercut: Cr/Co or Ni/Cr alloys - premolar .010", molar .010" -.020"
Indications:
1. Type I survey line
2. Tooth supported RPD
3. Tooth supported modification space

Contraindications:
1. Type II or III survey line
2. Tooth-tissue supported RPD
3. When facial clasp arm is unesthetic
Advantages:
1. Simplest design.
2. Maximum support, bracing, retention, encirclement, and reciprocation
3. Strong and not easily deformed.
Disadvantages:
1. Maximum metal-tooth contact  
2. Difficult to properly adjust, usually only in a horizontal plane  
3. Can be difficult to repair, as are all cast clasps

**Ring clasp:**
Survey Line: Type II
Amount of Undercut: Cr/Co or Ni/Cr alloys - premolar .010", molar .010" - .020"
Indications:
1. Type II survey line  
2. Tipped or tilted primary abutment tooth (usually mandibular molars)  
3. Tooth supported RPD  
4. Tooth supported modification space
Contraindications:
1. Type I or III survey line  
2. Tooth-tissue supported RPD  
3. Soft tissue undercut in the area of the support arm  
4. Muscle/frenum attachments in the area of the support arm  
5. When a more simple clasp will be acceptable.
Advantages:
1. Can use the Type II survey line without a bar clasp  
2. Maximal support, bracing, retention, encirclement, and reciprocation
Disadvantages:
1. Complex design  
2. On larger molars will require support arm for reciprocating clasp to prevent clasp from being distorted and over flexing, also for increased ease of casting  
3. Support arm will be a food trap and may impinge on soft tissue  
4. Maximal metal-tooth contact  
5. Difficult to adjust, usually on in a horizontal plane  
6. Very difficult to repair
Cast ring clasp with buccal support arm and mesial-lingual retention with a type II survey line. Support arm may be necessary to add strength to clasp arm to prevent overflexing and distortion.

**Reverse action or hairpin clasp:**
Survey Line: Type II
Amount of Undercut: Cr/Co or Ni/Cr alloys- premolar .010", molar .010" - .020"
Indications:
1. Type II survey line
2. Soft or hard tissue undercuts and/or high muscle and frenum attachments
3. Tooth supported RPD
4. Tooth supported modification space
Contraindications:
1. Type I or III survey line
2. Small teeth where clasp would be too short or too rigid
3. Survey line too occlusally located - the clasp would be too high and interfere with occlusion
Advantages:
1. Can use Type II survey line without using a bar clasp
2. Not easily distorted due to short length
3. Maximum support, bracing, retention, encirclement and reciprocation
Disadvantages:
1. Maximum metal-tooth contact
2. Complicated design
3. Clasp arm is usually minimally flexible
4. Not easily adjustable
5. May be difficult to place the occlusal portion of the clasp low enough on the tooth to insure that it won't interfere with occlusal function.

Embrasure clasp:
Survey Line: Type I
Amount of Undercut: Cr/Co or Ni/Cr alloys - premolar .010", molar .010" - .020"
Indications:
1. Type I survey line
2. Tooth supported RPD
3. Desire to distribute occlusal support, bracing, and retention in unilateral distal-extension RPD's
4. Prevention of extrusion of a tooth not contacted by an opposing tooth
Contraindication:
1. When a simpler clasp can be used
2. When adequate occlusal clearance cannot be provided
3. When survey lines will not permit this design
Advantages:
1. May distribute support, retention, and bracing to two teeth
2. Not easily distorted
3. Relatively simple design
Disadvantages:
1. Considerable occlusal clearance must be provided
2. Wedging apart of the abutment teeth may occur if the occlusal rests do not possess positive seats
3. More enamel reduction is required than with a single tooth clasp
4. Maximum metal-tooth contact
5. Difficult to adjust, usually only on a horizontal plane
6. Difficult to repair

Multiple clasp:
The multiple clasp simply consists of two opposing circumferential clasps joined at the terminal end of the two reciprocal arms.

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

Disadvantages:
is that two embrasure approaches are necessary rather than a single common embrasure for both clasps.

Half-and-half clasp:
The half-and-half clasp 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. 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. Its design was originally intended to provide dual retention, a principle that should be applied only to unilateral partial denture design.

Half-and-half clasp consists of one circumferential retentive arm arising from the distal aspect and a second circumferential arm arising from the mesial aspect on the opposite side, with or without a secondary occlusal rest.

**Combination clasp:**
Survey Line: Type I (usually)
Amount of Undercut: Stellite alloy, premolar .010" -.020", molar .020" -.030". Slightly less retentive undercut is necessary when 18 gauge is used than when using 19 gauge. Generally 19 gauge is used for smaller teeth such as premolars and anteriors, and 18 gauge is used for larger teeth when more retention is desired.

Indications:
1. Type I survey line
2. Distal extension RPD - because of possible stress-releasing properties of the wire on the abutment
3. Wrought wire can be placed into a greater undercut than a cast clasp and may be more esthetic
4. When soft or hard tissue undercuts preclude the use of a bar clasp

Contraindications:
1. Type II survey line
2. When maximum retention is necessary
3. When there is not adequate room to solder the wire far enough distal to the retentive tip, thus changing the physical properties of the wire (see physical properties of wrought wire in the chapter on metals)

Advantages:
1. Wrought wire is thought to be stress releasing
2. Wire has a line contact on the tooth, therefore, there is less of the clasp in contact with the tooth, compared to the cast clasps (this is better for hygiene, with less food retention under the clasp)
3. May be more esthetic than a cast clasp due to more cervical placement
4. Can be added after fabrication of the framework, which may make fitting of the framework easier
5. Much easier to adjust than cast clasps
6. Easier to repair than cast clasps

Disadvantages:
1. Easily comes out of adjustment if the patient removes the RPD by the wrought wire clasp and not as instructed.
2. An added laboratory step is necessary for the fabrication of a combination clasp, which increases the laboratory fees to you (this is not a good reason not to use a wrought wire clasp)

Combination clasp (facial wrought wire retentive arm, soldered to base retentive minor connector and cast lingual reciprocating arm with cast occlusal rest.

I Bar or RPI clasp:

RPI clasp {mesial rest (R), distal proximal plate (P), facial I bar (I)}-
Survey Line: Type I or III
Amount of Undercut: Stellite alloy, premolar and molars .010"
Indications:
1. Type I or III survey line on facial (sometimes lingual) of abutment tooth
2. Distal extension RPD - thought to be stress releasing on the abutment tooth
3. Esthetic requirements of the patient
Contraindications:
1. When it is not possible to rest on the mesial of the tooth, due to fulcrum lines the clasp is unable to release from the undercut with a distal rest (theoretically)
2. Type II survey line
3. High muscle or frenum attachments
4. Significant hard or soft tissue undercuts
Advantages:
1. Good esthetics
2. Minimal change in natural tooth contour
3. Not easily distorted
4. Increased retention over circumferential clasps with the same amount of undercut due to "tripping" action
5. Easier to adjust than circumferential clasps
6. Very simple design

Disadvantages:
1. Approach arm may create food trap
2. Bracing and reciprocation is minimal
3. Approach arm can interfere with the placement of prosthetic teeth if not properly placed in the embrasure of the proposed prosthetic teeth
4. Approach arm may interfere with soft or hard tissues in function such as an active frenum
5. Encirclement may not be satisfied with improper placement of retentive tip of the clasp,

**T – Bar clasp**
Survey Line: Type II (usually)
Amount of Undercut: Stellite alloy, premolar and molar .010"
Indications:
1. Type II survey line on facial of abutment tooth.
2. Distal extension RPD (non-retentive portion of T-bar needed for encirclement)
Contraindications:
1. Type I survey line
2. Excessive hard or soft tissue undercuts
3. High muscle or frenum attachments

Advantages:
1. Esthetics
2. Minimal change in natural tooth contour
3. Not easily distorted
4. Increased retention over circumferential clasp with the same amount of undercut

Disadvantages:
1. More complicated design than I-bar
2. Approach arm may create food trap
3. Approach arm may interfere with placement of prosthetic teeth if not placed in interparochial area of proposed placement of teeth
4. Approach arm may interfere with soft or hard tissue in function
5. Bracing better than -I bar, but not as good as a cast circumferential clasp

**Modified T – Bar clasp -**

Survey Line: Type II
Amount of Undercut: Stellite alloy, premolar and molar .010"

Indications:
1. Type II survey line on facial of abutment tooth
2. Distal extension RPD
3. Non-retentive portion of T-bar not needed to provide encirclement

Contraindications:
1. Same as 1 - 3 for T-bar clasp

Advantages:
1. less tooth-metal contact than T-bar clasp
2. Same as 1 - 4 for T-bar clasp

Disadvantages:
1. Same as 1 – 5 for T-bar clasp
**Clasp selection:**
Successful clasp selection depends upon many factors. The practitioner should select a direct retainer that will control tipping and torquing forces on the abutment teeth, provide adequate retention against normal dislodging forces, and be compatible with the tooth and tissue contours, and satisfy the patients esthetic and functional requirements. The most important factor is the location of the retentive areas and placement of the survey line. The clasp selection will depend upon where the retentive undercut is located and how much undercut is available. If the existing undercut area is undesirable, then the contour of the abutment tooth must be changed. The alteration in the height of contour is accomplished through the use of fixed restorations or enamel recontouring. These procedures will allow the clinician to ideally place the survey line in a more desirable and functional position.

Accurate diagnostic casts are a requirement if an accurate diagnosis is to be made in regard to clasp selection. The amount of soft tissue undercut can be determined, if present, to evaluate the possibility of using a bar clasp. The height of contour must be accurately marked to evaluate the type of survey line and amount of retentive undercut available. This accumulation of information will guide the practitioner in an intelligent and informed selection of the proper clasp design.