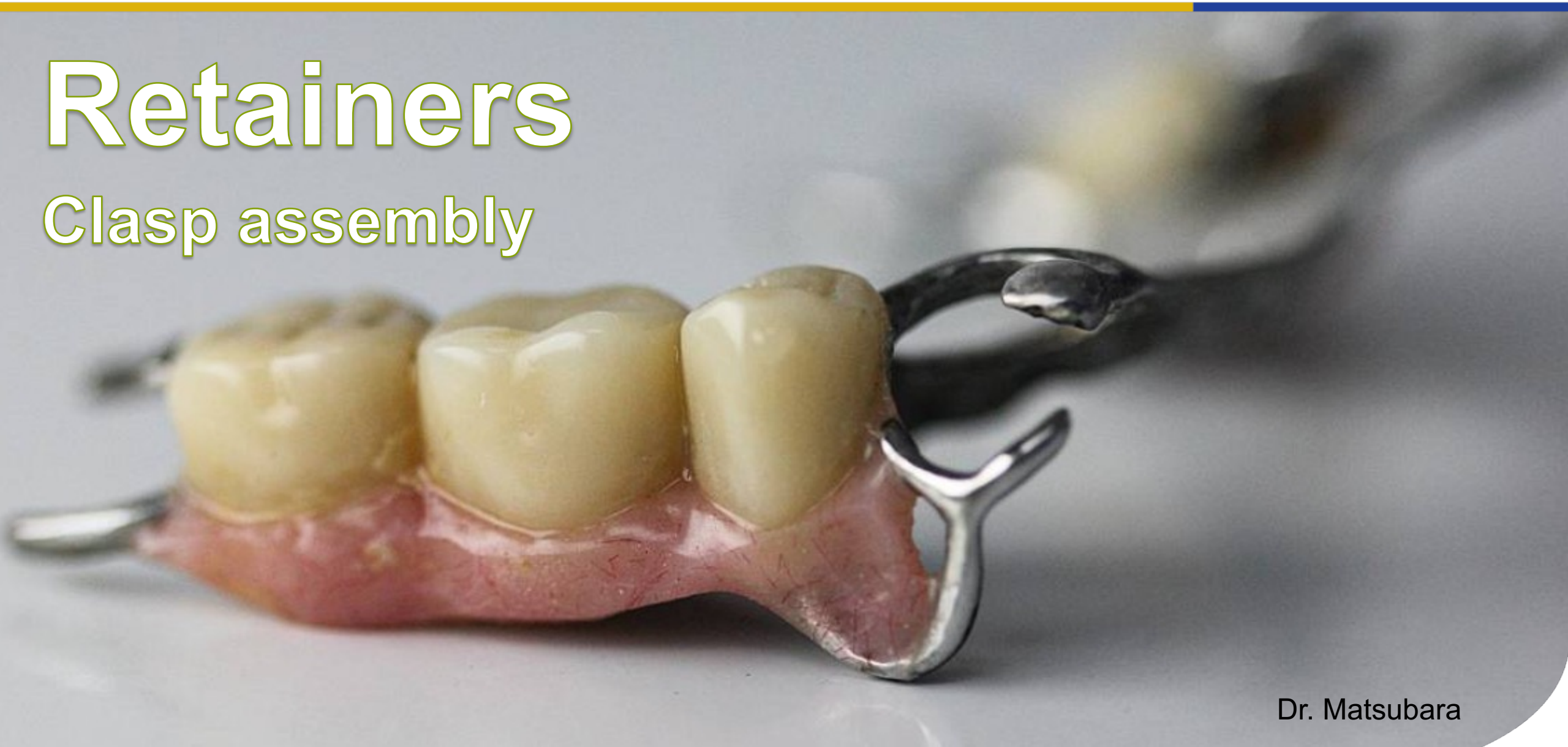
THE UNIVERSITY OF WESTERN AUSTRALIA | Oral Health Centre of Western Australia

# Retainers

## Clasp assembly



Dr. Matsubara

# Retainers – Retentive unit

Components of a RPD that engage abutments and resist dislodging forces

Provide resistance to displacement by deformation of the retentive arm

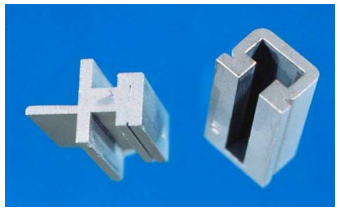
**Retainers**

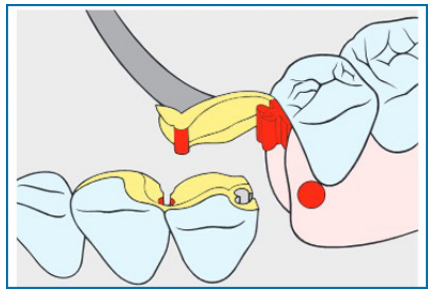
# Forces

Displacement can occur through gravity, sticky foods or functional jaw movements

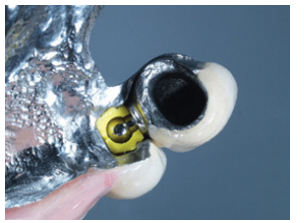
# Retainers

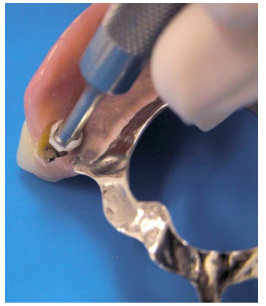
- Intracoronal
  - Precision Attachments

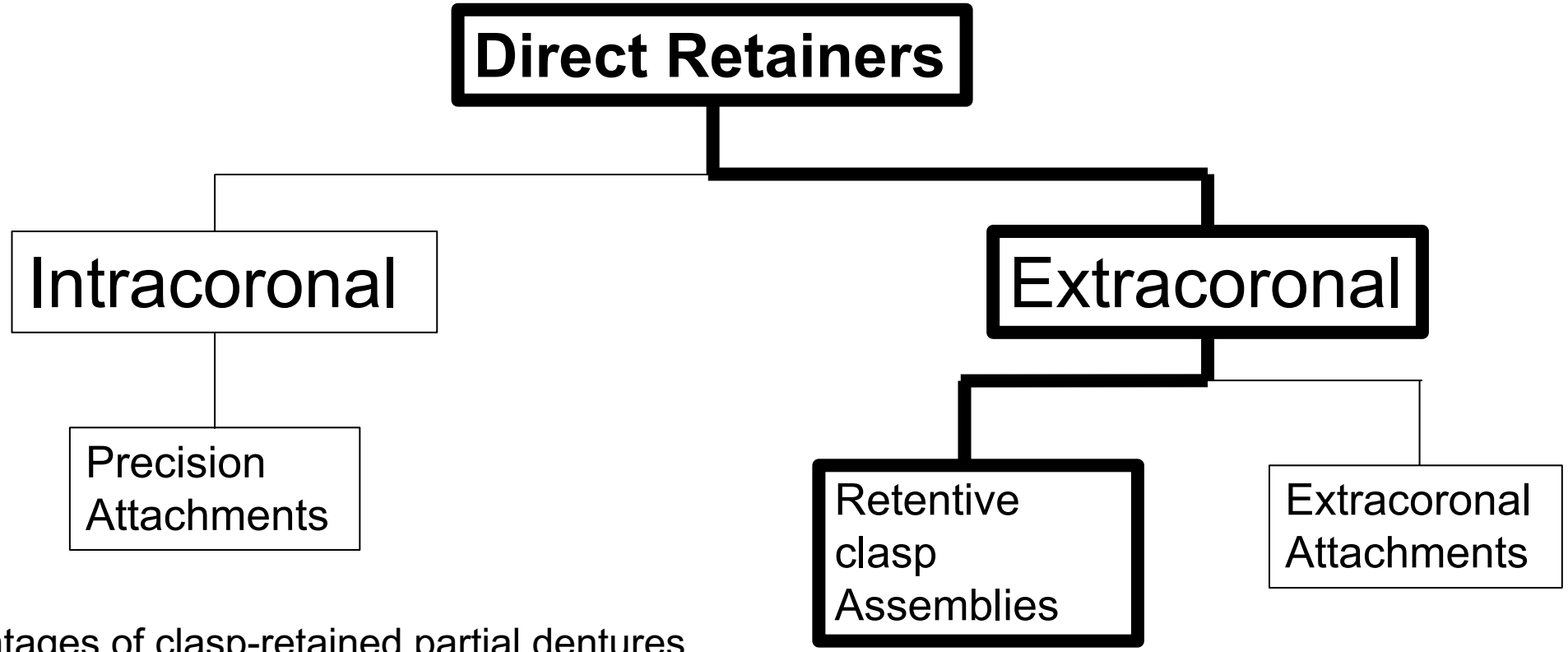




- Extracoronal
  - Retentive clasp Assemblies
    - Suprabulge
    - Infrabulge
  - Extracoronal Attachments
    - Semiprecision Attachments








## Disadvantages of clasp-retained partial dentures

1. Strain on the abutment teeth often is caused by improper tooth preparation or clasp design
2. Clasps can be unaesthetic, particularly when they are placed on visible tooth surfaces
3. Caries may develop beneath clasp components, especially if the patient fails to keep the prosthesis and the abutments clean.

# Clasp Assemblies

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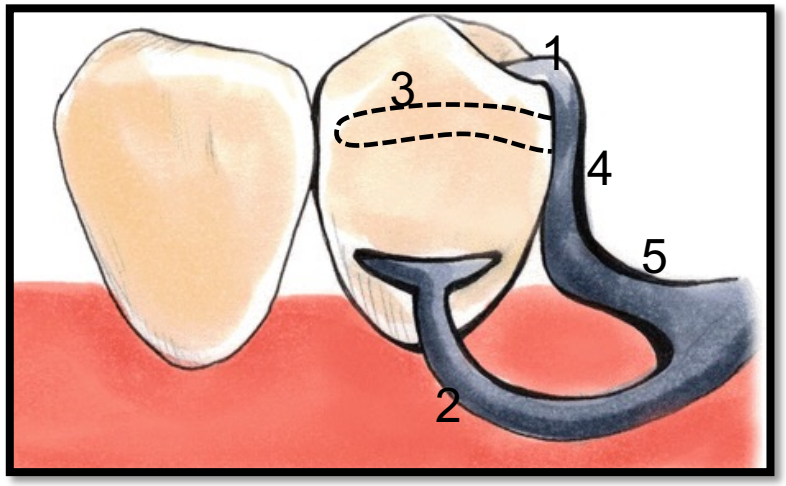
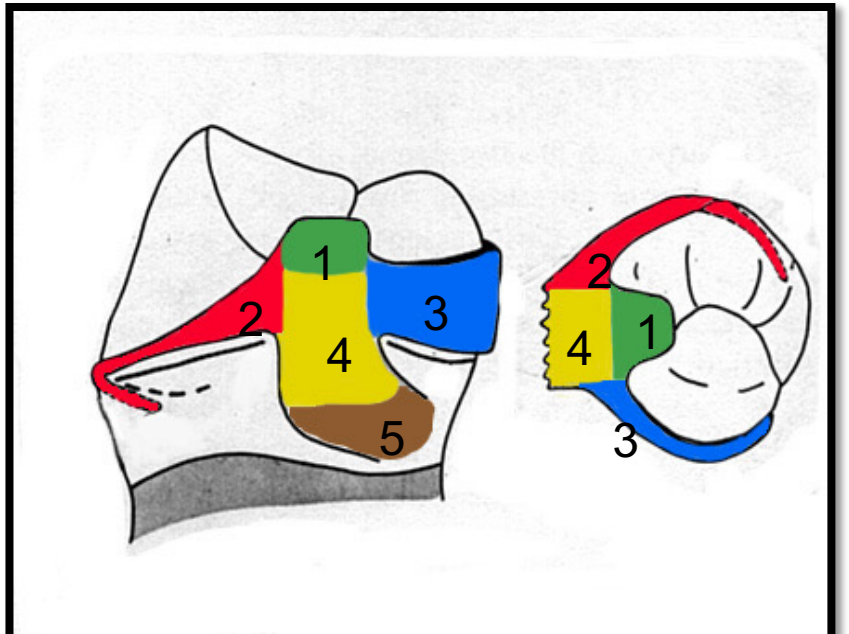
## Components of Clap Assembly

1) Rest
2) Retentive arm
3) Reciprocating arm
4) Clasp body: proximal plate

5) Minor connector



# Clasp Assemblies

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## Suprabulge

- Retentive arm approach the undercut region of the abutment from the Occlusal direction

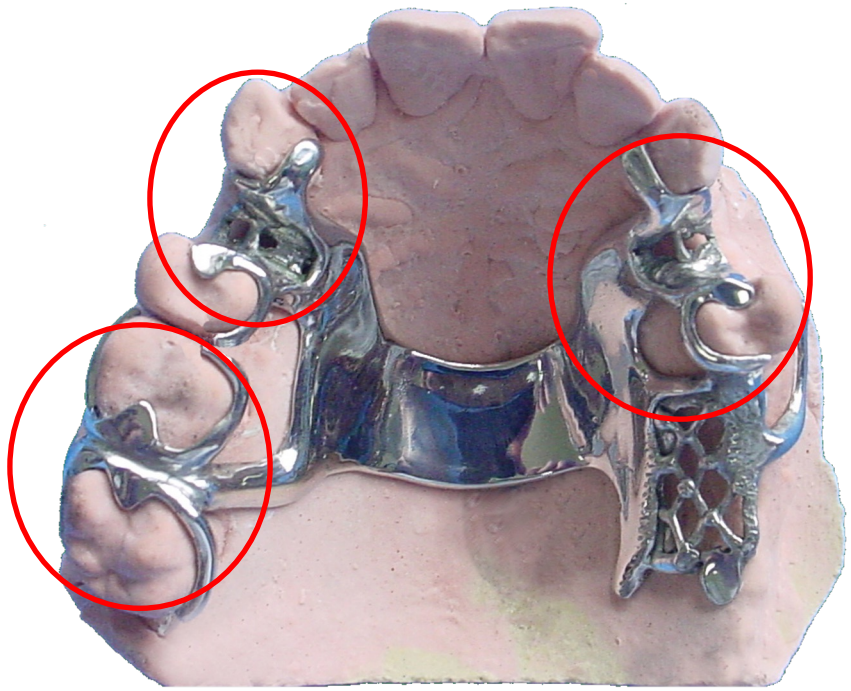
## Infrabulge

- Retentive arm approach the undercut region of the abutment from the apical direction

# Classification

## According to the retention

- Direct retainer: adjacent to the edentulous area
- Indirect retainer: away from the edentulous area, makes indirect retention



# Classification

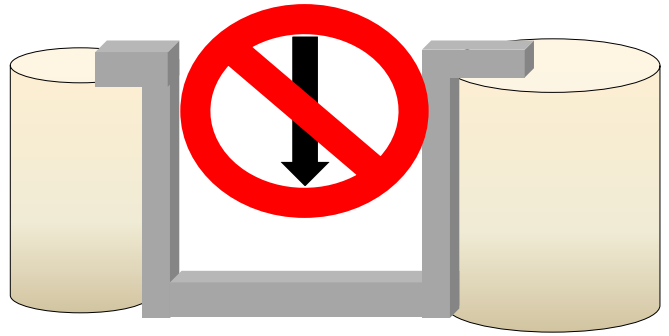
## According to the retention

- Direct retainer: adjacent to the edentulous area
- Indirect retainer: away from the edentulous area, makes indirect retention

## According to the construction

- Adapted, wrought wire
- Cast

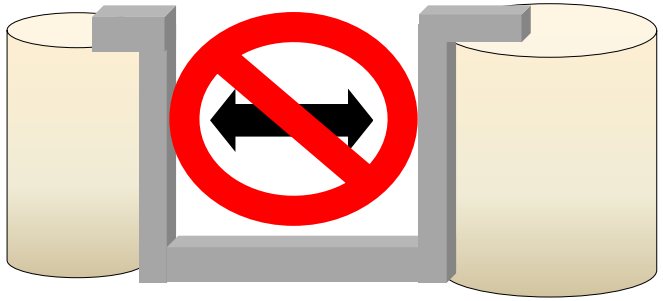
# Requirements for the retentive unit

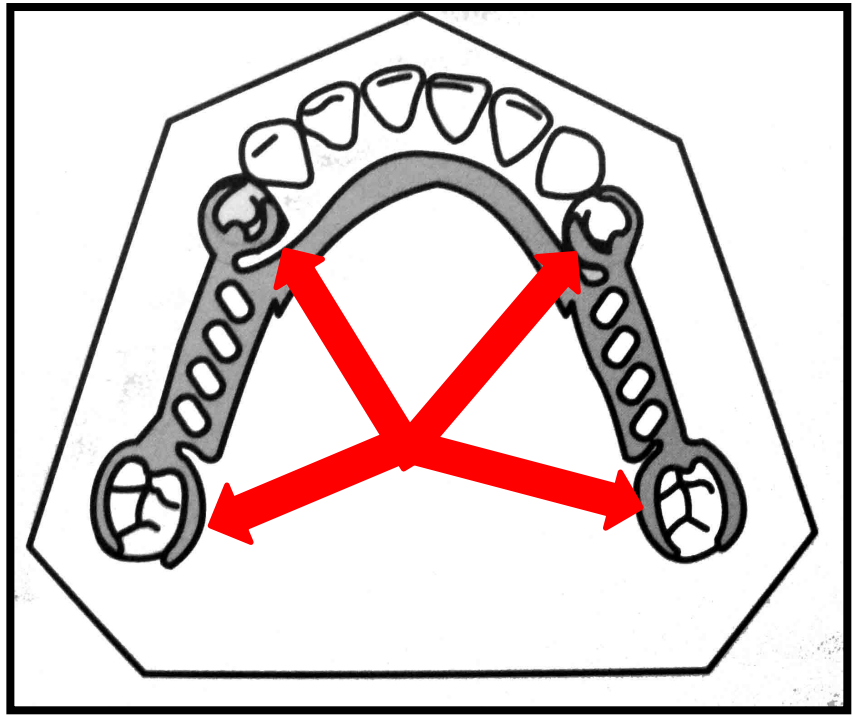


*1.Support*: mainly provided by the rest. It distributes loading through the abutment - teeth protects the soft tissues & periodontium

# Requirements for the retentive unit

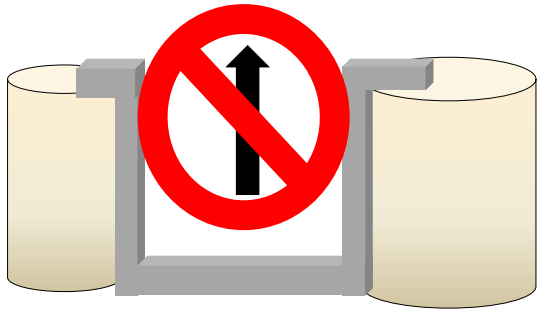
*2. Stabilization:* bracing effect resists horizontal forces evenly through all abutment teeth





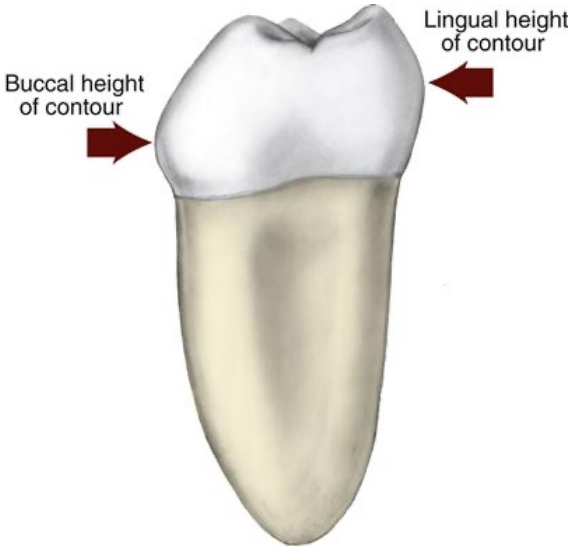
- Reciprocating arm
- Proximal plate (minor connector)
- Initial third of the retentive arm

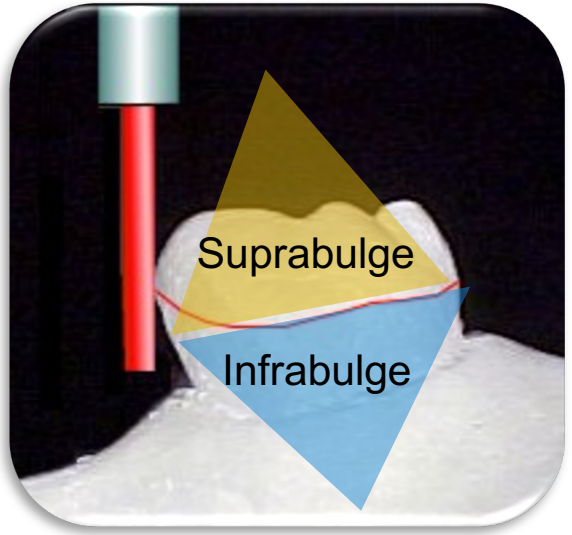
# Requirements for the retentive unit



*3. Retention:* resists occlusal displacement and is provided by the terminal third of the retentive arm.

- Retention should be distributed throughout the arch.
- Depth of undercut is determined by the flexibility of the alloy used.



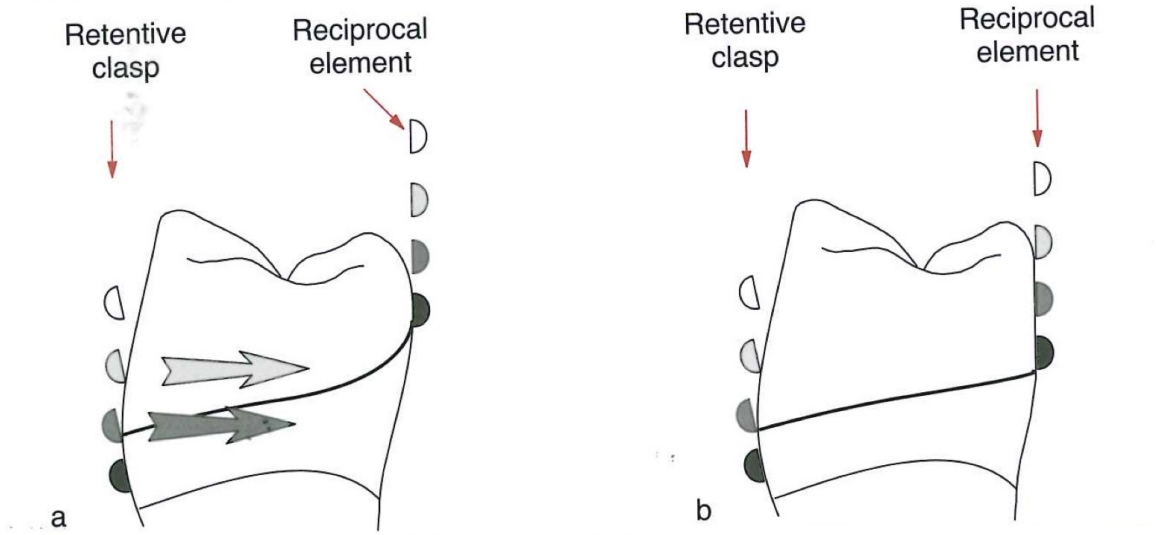




# Requirements for the retentive unit

*4. Reciprocity:* Insertion force of the retention arm must be opposed by reciprocating arms and/or other components of the RPD.

Optimally the reciprocating arm should contact the tooth when the retentive arm engages.

It contributes to bracing of the RPD

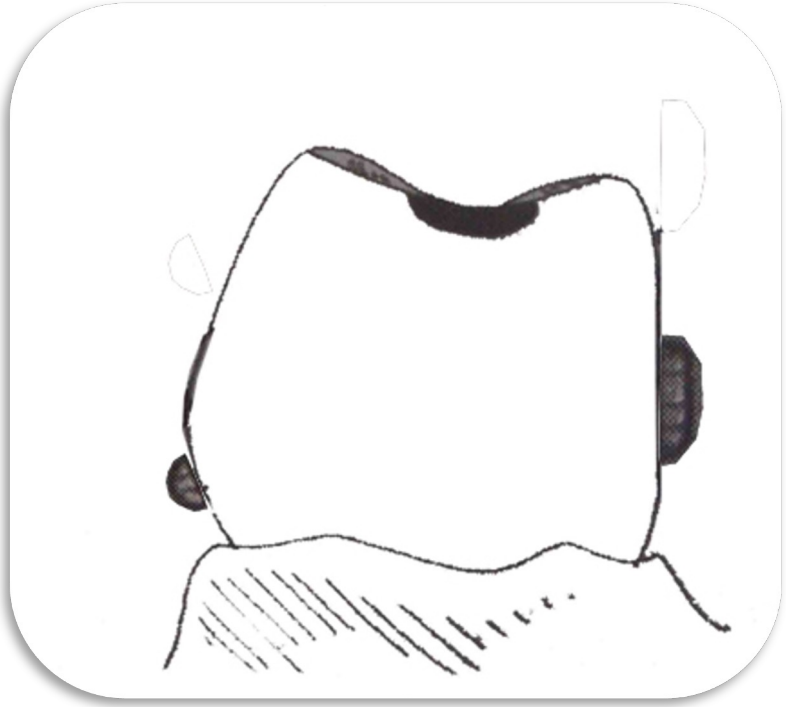


# Requirements for the retentive unit

*5. Engagement:* Components must encircle more than 180° of the tooth to prevent movement of the abutment out of the assembly

# Requirements for the retentive unit

*6. Passivity:* when fully seated the clasp assembly exerts no force on the tooth

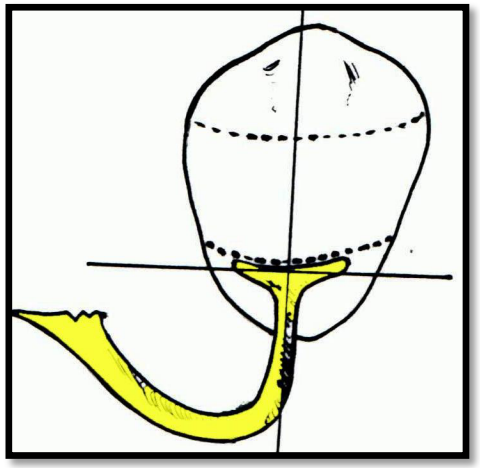


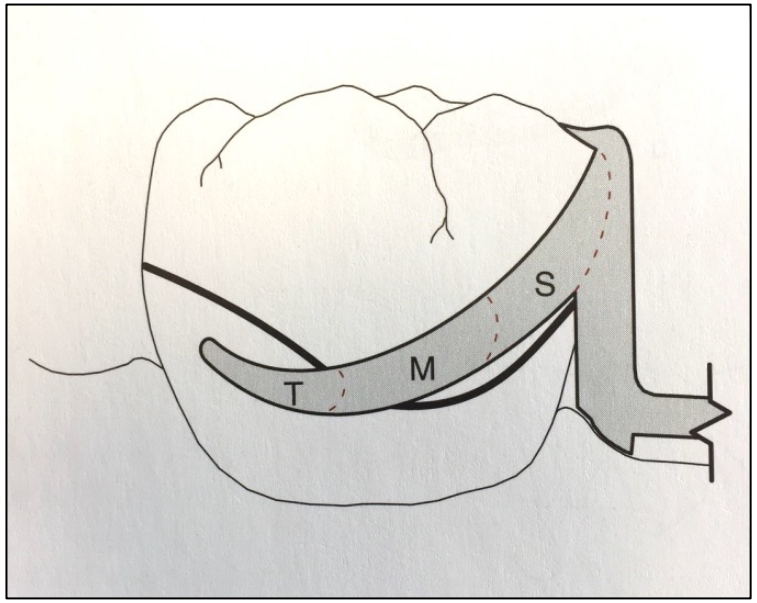
# Retention Arm

Correct location:

- Middle and/or gingival third
- 3 sections: (S) Shoulder, (M) Midsection

(T) Terminal third: Flexible clasp terminus





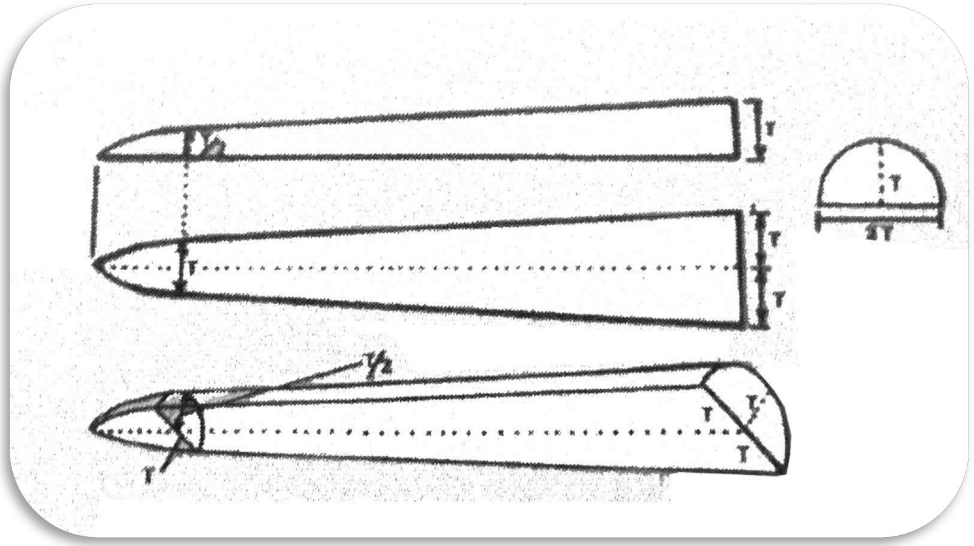

(T): Bellow the height of contour – Retentive area

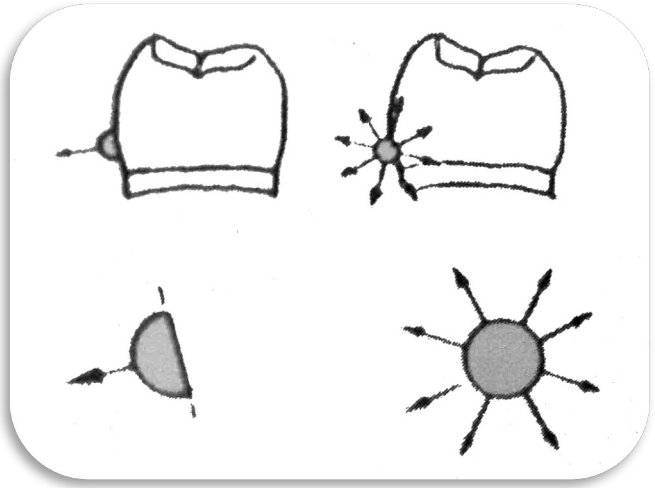
# Clasp Assemblies

## Retention Arm

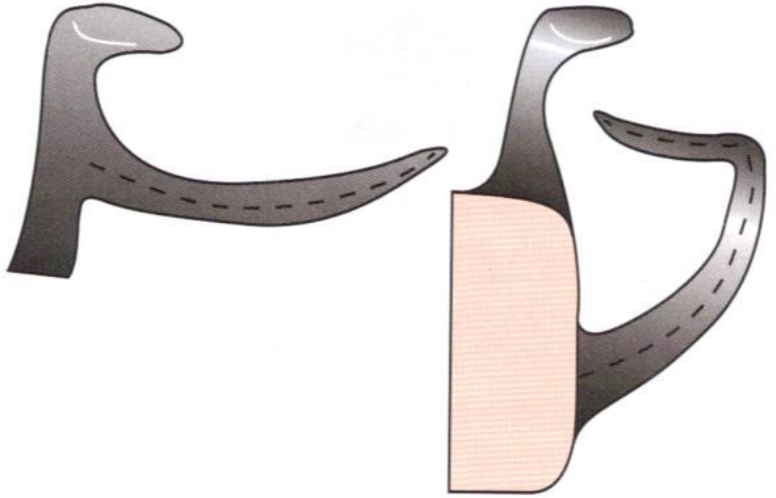
Shape

- Tapered uniformly
- Cross-sectional form: half-round form





## Retention Arm



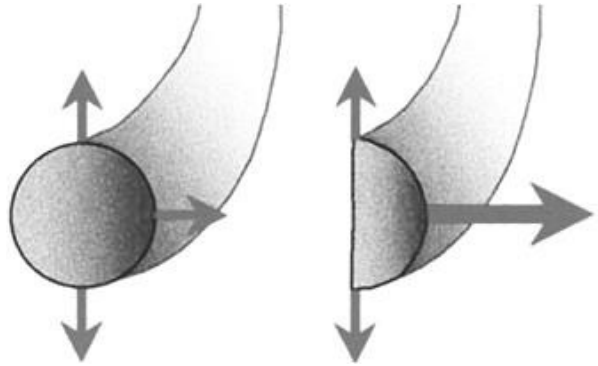
Flexibility (capacity to suffer elastic deformation)

- Length of the arm: longer = more flexible

- Circumferential: point of origin in the clasp body

- Bar clasp: from metal base or resin base

- Degree of taper: lengthwise and widthwise
- Cross-section form
- Diameter: greater = less flexible
- Type of material:



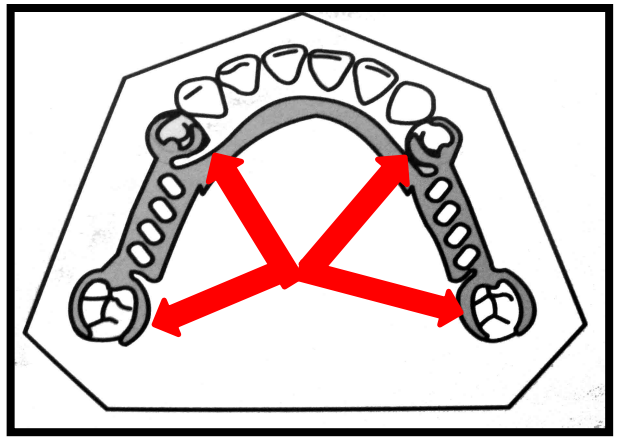
## Retention Arm

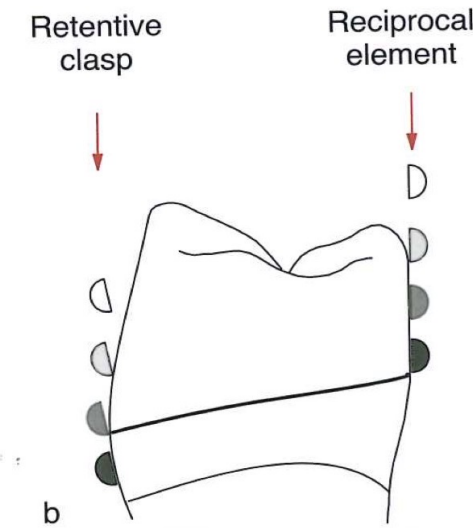
Flexibility

- All cast alloys show some degree of flexibility
- Cast gold alloys have greater resiliency than Cr-Co alloys
- Cast alloys flexibility is inversely proportional to bulk
- Wrought wire clasp has higher tensile strength than cast clasps. It can be used in smaller diameter to provide greater flexibility without fatigue and fracture.

# Reciprocal Arm

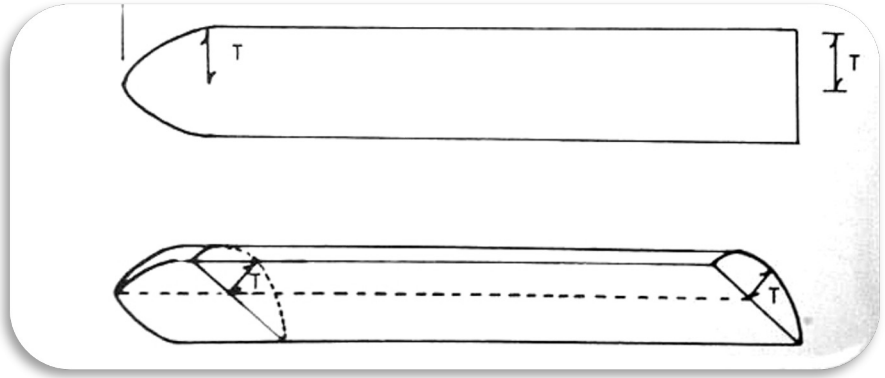
- To resist tooth movement in response to deformation of the retentive arm
- Must be in contact during the entire period of retentive clasp deformation
- Stabilize the framework against horizontal movements during deformation of the retentive arm

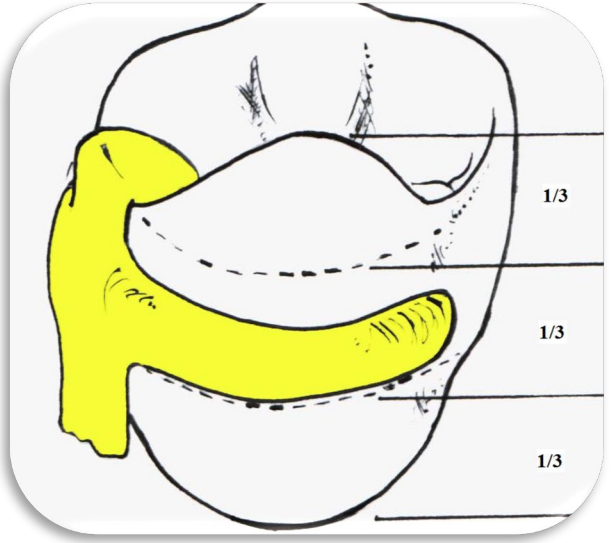




# Reciprocal Arm

- Rigid
- Half-round form
- Average diameter (AD) > AD opposing retentive arm
- No taper or Taper in one dimension (lengthwise)
- Above the height of contour.



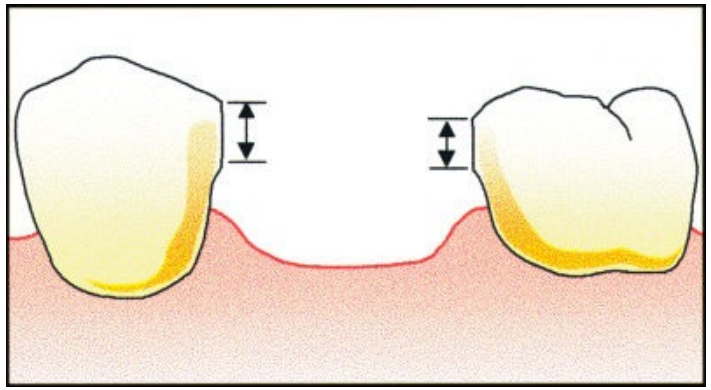



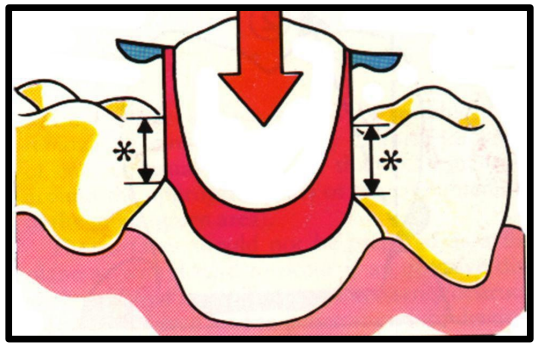
# Clasp body

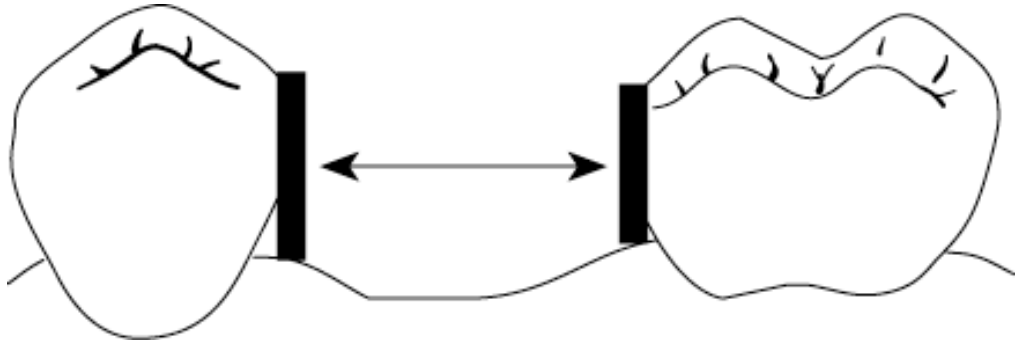
- Union of arms and rest to the framework
- Above the height of contour
- Rigid
- It will be in contact with guiding planes (frictional retention)

# Guiding planes

- Flat parallel surfaces prepared on abutment teeth (occlusal one/two thirds)
- Guide planes provide a *single path of Insertion (POI)* .
- GP are used to control and limit the directions of movement of RPD during insertion, removal or function.
- Components of the denture start to contact the abutments in the guiding planes area



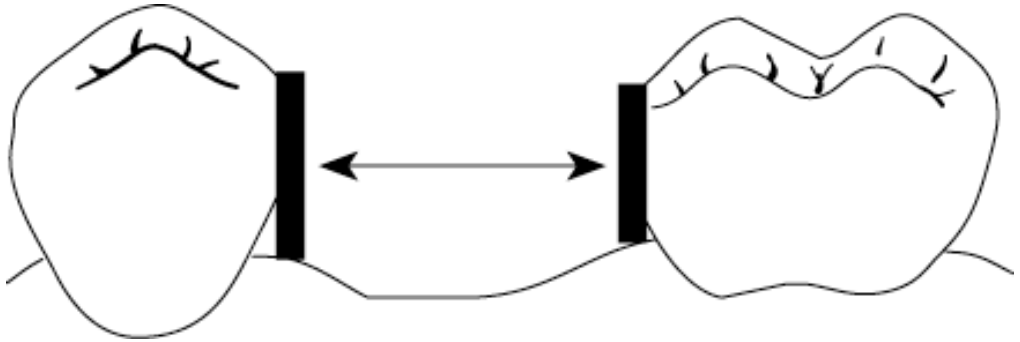


# Guiding planes

Most effective:

- Parallel
- Include more than one common axial surface (e.g. proximal and lingual surfaces)
- Placed on several teeth
- Cover a large surface area (long and/or broad)



# Clasp Assemblies



## Types:

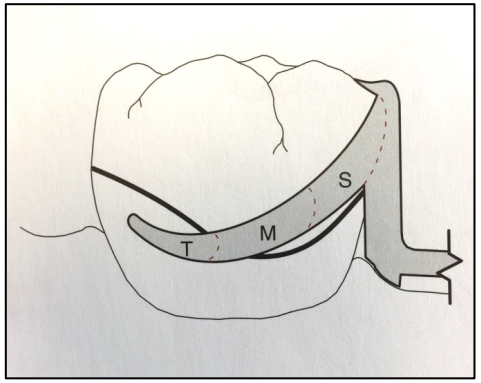
Based on the position of the retentive arm

- Suprabulge
- Infrabulge

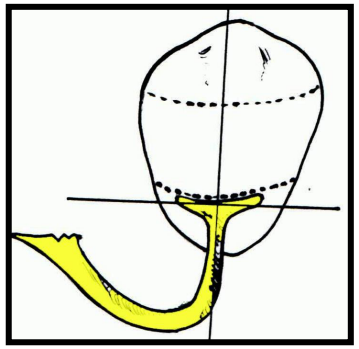
# Clasp Assemblies

Types:

Suprabulge
CIRCUNFERENCIAL CLASPS




Inflabulge
BAR CLASPS



- Continuous contact with the crown
- From occlusal to gingival
- Retention arm needs to be pull over the height of contour

- Short contact of retentive arm with the crown
- From gingival to occlusal
- Retention arm needs to be push over the height of contour

Suprabulge vs Inflabulge

# Clasp Assemblies

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## Circumferential clasps

### 1) Simple circumferential design

- The most simple and versatile clasp
- Clasp assembly has one retentive arm opposed by a reciprocal arm originating from the rest

**Indication:**

- Molars e premolars
- Intercalated edentulous area
- Canines with no aesthetic restriction

**Limitation**

Abutment is tilted toward the edentulous space

# Clasp Assemblies

## Circumferential clasps

### 2) Reverse circumferential design

- Rest and body opposite to the edentulous area and the arms run towards the edentulous space
- Need a proximal plate

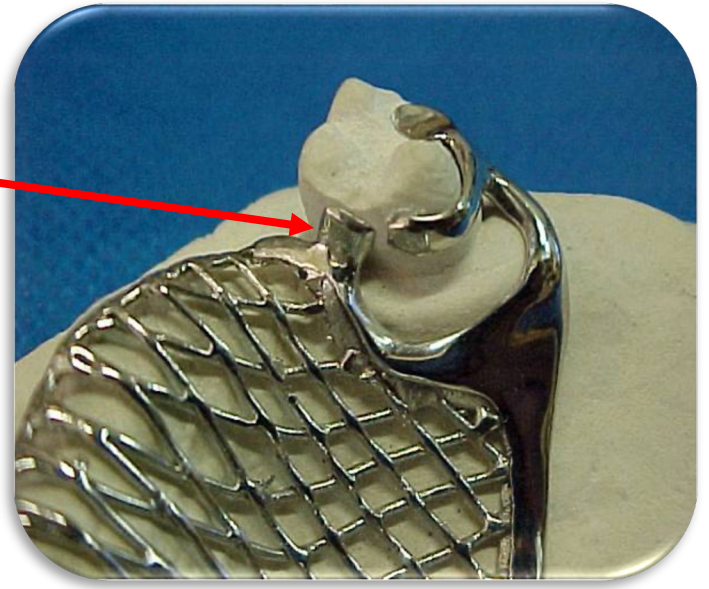
**Indication:**

- Abutment is tilted to the edentulous space

**Limitation**

- Short clinical crown
- No space for the connector

Proximal plate



# Clasp Assemblies

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## Circumferential clasps

### 3) Ring clasp design

- Mesial and distal rests
- Encircle nearly all tooth

**Indication:**

- Intercalated edentulous area
- Molars tipped in a mesiolingual directio

**Limitation**

- Free end saddle

# Clasp Assemblies

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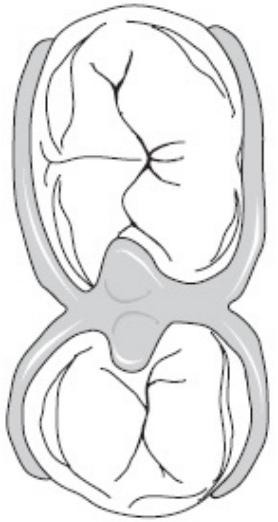
## Circumferential clasps

### 4) Embrasure clasp design

- Essentially two simple circumferentials joined at bodies
- There should be enough occlusal clearance through the embrasure form
- Occlusal rest seats should not create wedging forces between the teeth



**Indication:**

- Indirect retention
- Molars and premolars

**Limitation**

- Extensive preparation of marginal ridges, involving facial inclines

# Clasp Assemblies

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## Bar clasps

### 1) T-clasp design

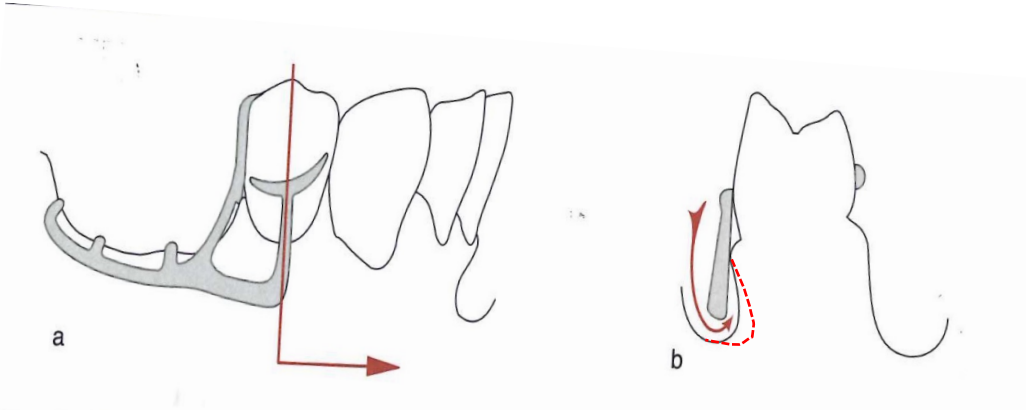
- Approach arm originates from components in the edentulous area
- Retention arm cross gingival margin at 90°
- Two horizontal projections

**Indication:**

- Intercalated or free end edentulous area

**Limitation**

- Interference with frenulum
- Severe soft tissue undercut (Risk of food entrapment and soft tissue irritation)
- Height of contour near the occlusal surface



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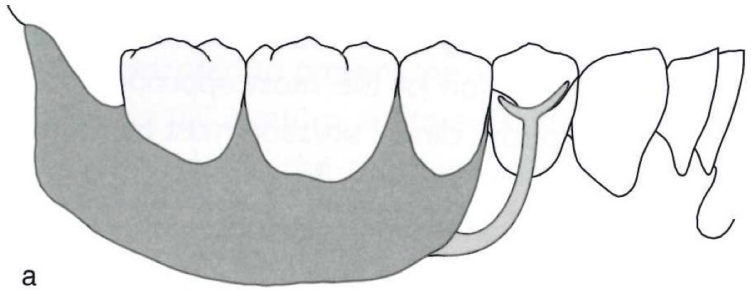


**Limitation**

- Interference with frenulum
- Severe soft tissue undercut (Risk of food entrapment and soft tissue irritation)
- Height of contour near the occlusal surface

# Direct Retainer

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## Bar clasps

### 2) Modified T-clasp design

- Only one horizontal projection
- Design to avoid significant soft tissues undercuts

**Indication:**

- Intercalated or free end edentulous area

**Limitation**

- Interference with frenulum
- Severe soft tissue undercut (Risk of food entrapment and Soft tissue irritation)
- Height of contour near the occlusal surface

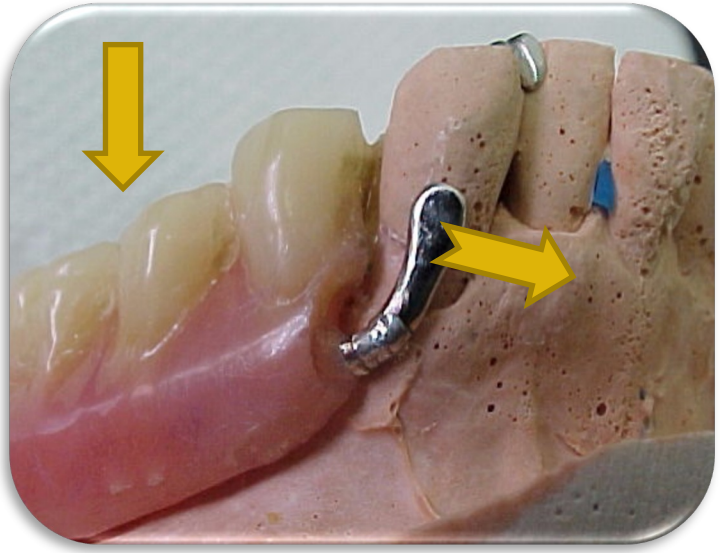
# Direct Retainer



## Bar clasps

### 3) I-clasp design

- Cross perpendicular the gingival margin
- Should be placed mesially to the midfacial prominence of the abutment



**Indication:**

- Intercalated or free end edentulous area

**Limitation**

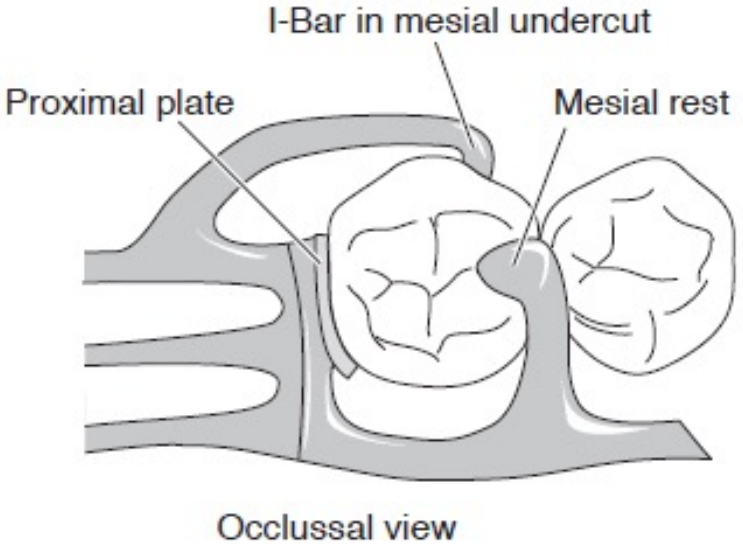
- Interference with frenulum
- Severe soft tissue undercut (Risk of food entrapment and Soft tissue irritation)
- Height of contour near the occlusal surface

# Direct Retainer

## Bar clasps

### 4) RPI clasp design

- Comprises of rest (R), proximal plate (P) and I bar (I).
- The I bar is located in the mesio-buccal undercut
- Need preparation of guiding planes



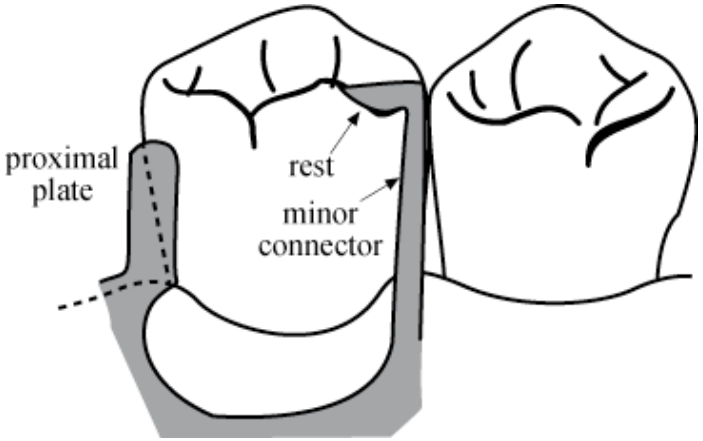
Occlussal view

**Indication:**

- Kennedy Class I and II

**Limitation**

- Need to reduce tooth structure
- Tipped teeth require severe axial reduction



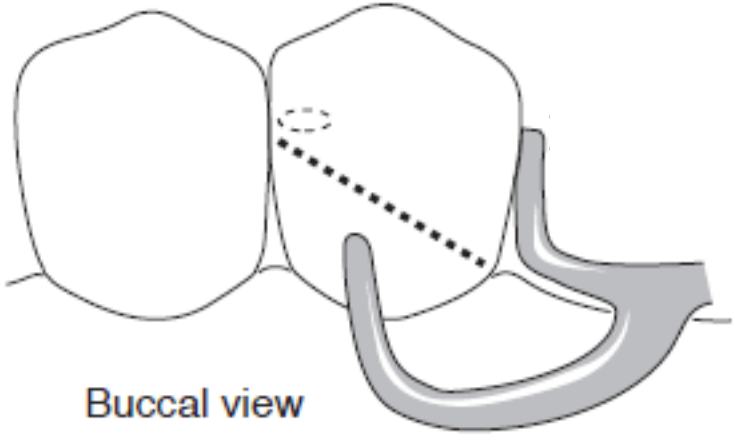
# Direct Retainer

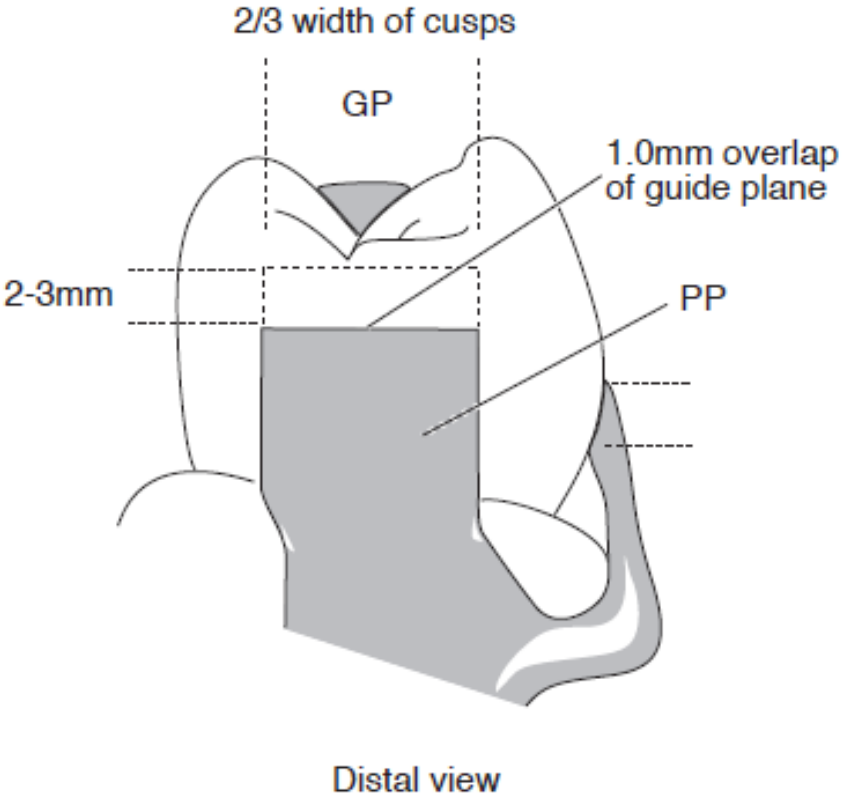
## Bar clasps

4) RPI clasp design

### Proximal plate:

- Wide minor connector touching the distal guiding plane
- Junction of the occlusal and middle third of the guiding plane
- 1 mm thick
- Joins the framework at a right angle.




Distal view

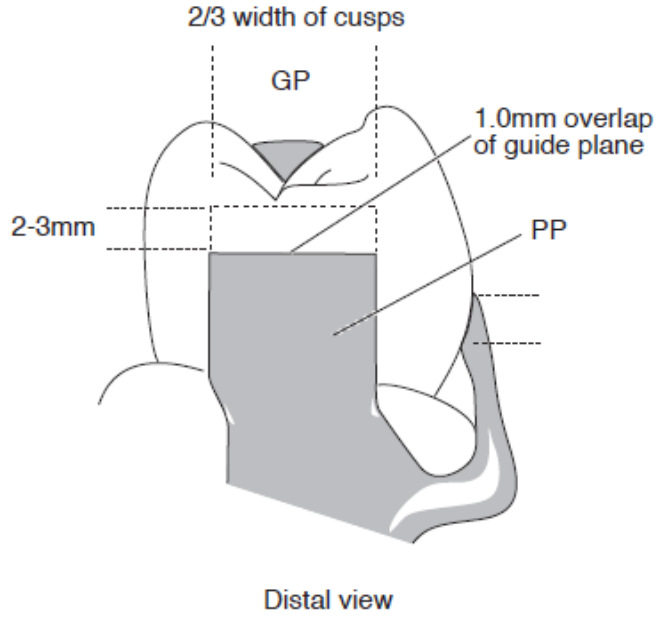
# Direct Retainer

## Bar clasps

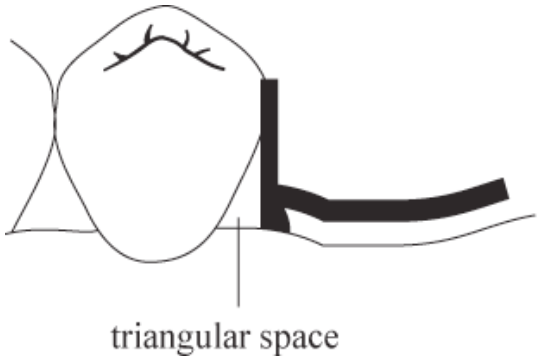
4) RPI clasp design

## Proximal plate:

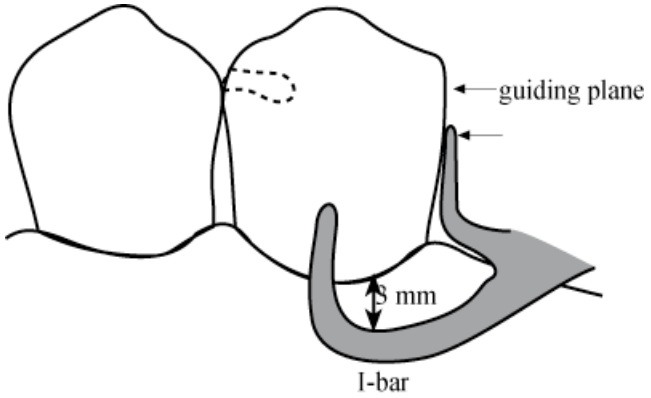
- Improves stabilization of the prosthesis
- Improves retentiveness by limiting the path of insertion and removal
- Provides reciprocation
- Reduce food impaction (when guide plane are properly done)




Distal view




No guiding plane preparation




I-bar

# Direct Retainer

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## Telescopic Crown retained removable partial dentures

Retention Principles:

- Parallel-sided inner and outer crowns
- Rigidly connected to the abutment teeth

- High treatment costs
- Increased risk for tooth fracture
- Treatment and laboratory procedures are highly complex

Wostmann et al. 2007 Long-term analysis of telescopic crown retained removable partial dentures: Survival and need for maintenance

# Direct Retainer

## Aesthetic clasps: Flexible removable partial dentures

**Thermoplastic materials**: Nylon, Acetal resin (Polyoxymethylene), PMMA, Polypropylene

Hill et al 2013 Flexible Removable partial dentures: an overview

# Direct Retainer

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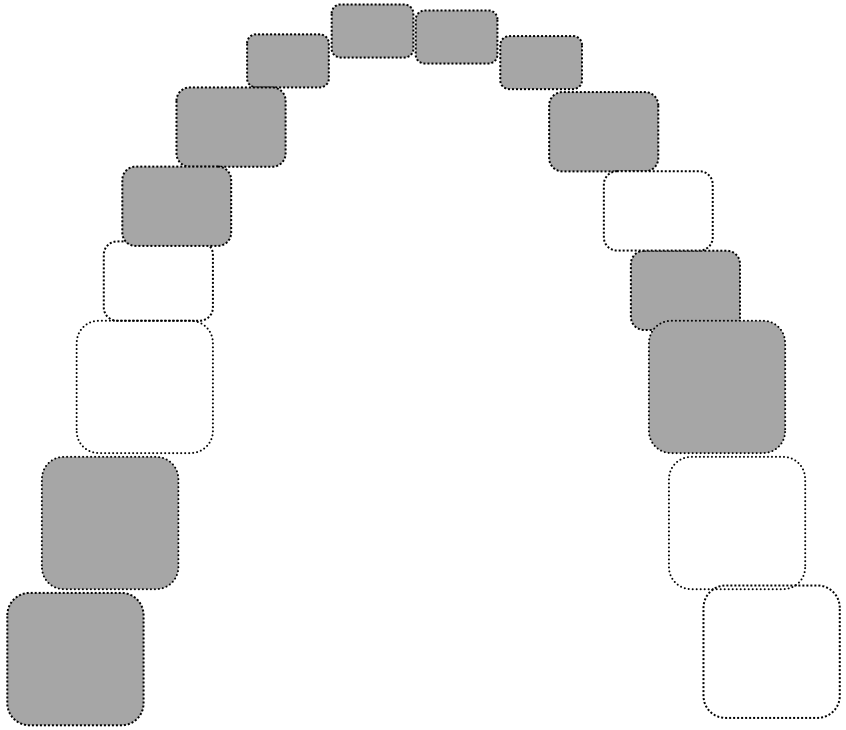
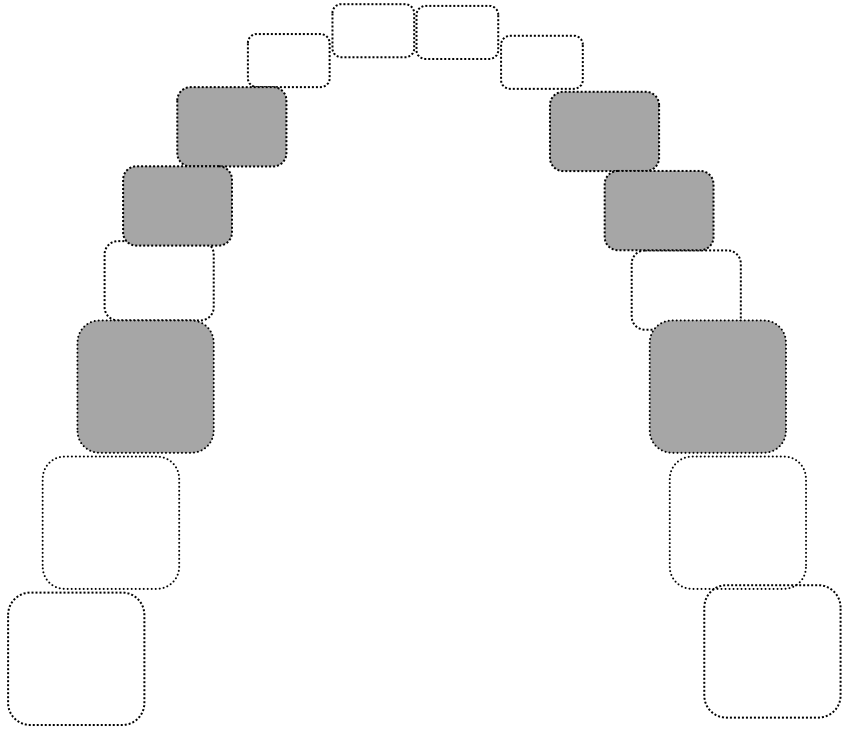
## Aesthetic clasps: PEEK (polyether ether ketone) (CAD-CAM partial dentures)

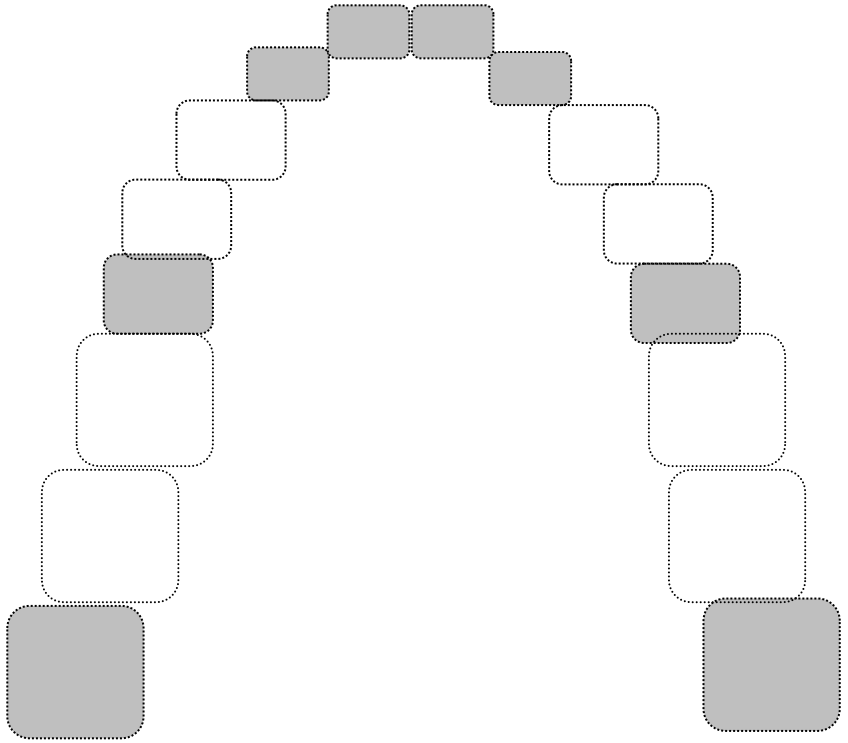
PRESENT / FUTURE ?

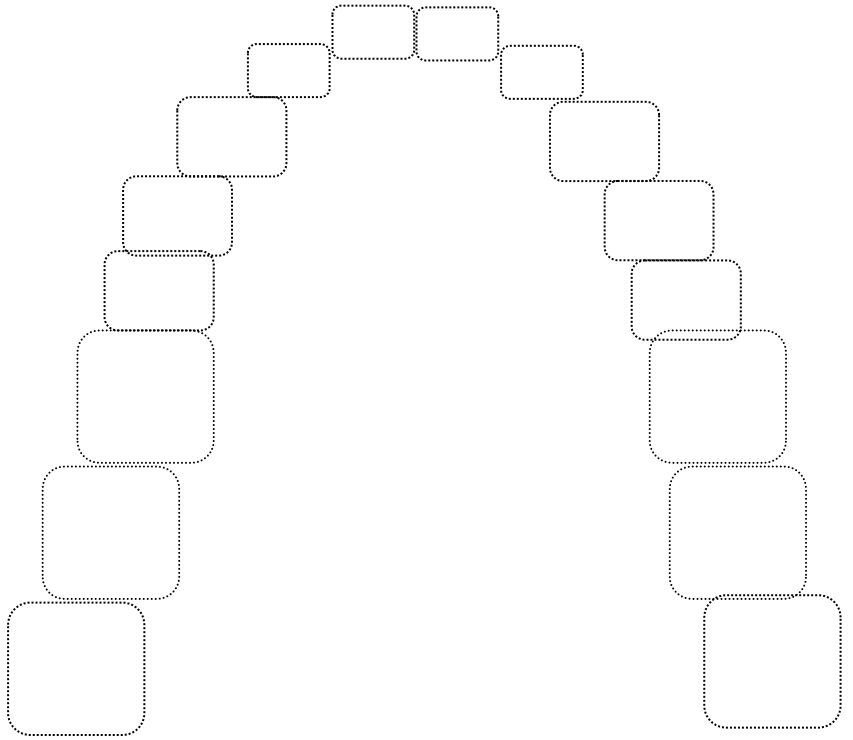
- Good mechanical and biological properties
- Denture clasps made of PEEK have lower retentive forces compared to cobalt–chromium(Co–Cr) clasps

Najeeb et al 2016 Applications of polyetheretherketone (PEEK) in oral implantology and prosthodontics









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# Thank you