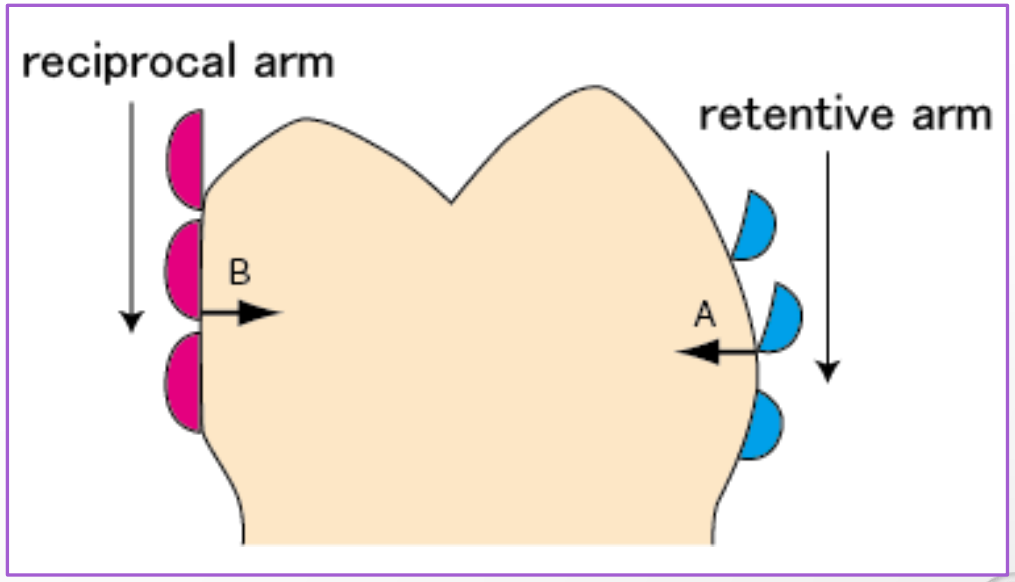
Topics of Denture



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C. Mandibular impression procedures
D. Difficult case of complete denture
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Design of direct retainers

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1. Types of direct retainer

Direct retainers include clasps and attachments. In the past, many direct retainers, such as attachments and RPI clasps, were developed to replace Akers clasps. However, none of these direct retainers could surpass the functionality of the Akers clasp, and it is now recognized as the most superior direct retainer.

Nevertheless, an Akers clasp can only be designed if an effective undercut area exists in the far zone of the abutment tooth (on the opposite side of the defect). In such cases, a direct retainer, such as a roach clasp as shown in the photo in the upper right, would be selected. Other clasps are known to be used for occlusal stability, covering the occlusal surface, as shown in the lower right photo.

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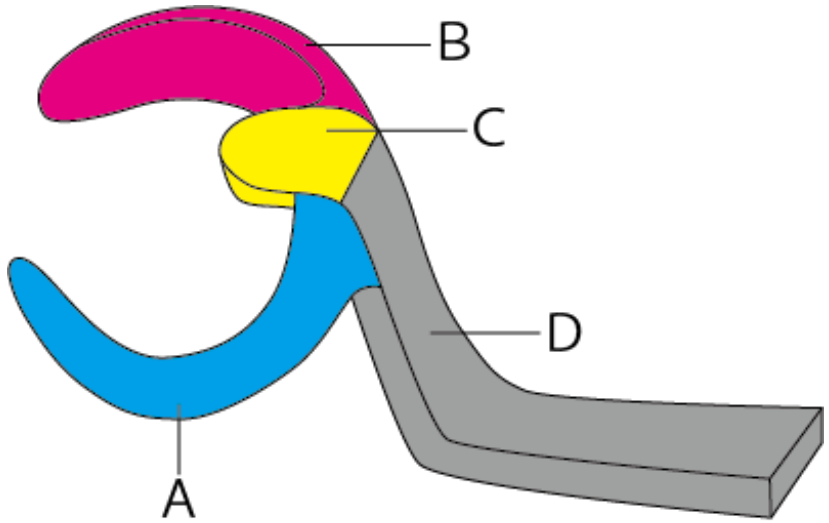
2. Akers clasp

Around 1970, Kratochvil and Krol et al. discussed concerns regarding the placement of a rest adjacent to a distal extension. However, in 1982, Boucher provided scientific rationale that if the Akers clasp is properly designed, it will not add stress that would interfere with the hooked tooth. Today, the Akers clasp is commonly designed as an abutment tooth adjacent to a distal extension.

As shown in the lower figure on the right, an Akers clasp can be divided into its component parts: a retentive arm (A), a reciprocal arm (B), a rest (C), and a minor connector (D). Each of these component parts has its own role and should be designed according to those roles.



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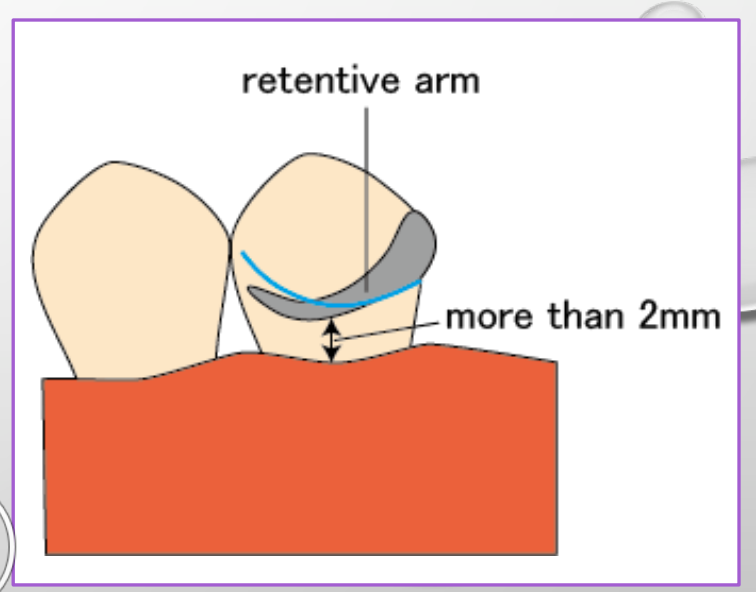
3. Retentive arm of akers clasp

The retentive arm of the Akers clasp is designed to exert a resisting force, preventing the partial denture from dislodging from the alveolar ridge. This component frequently undergoes deformation as it enters the undercut area during attachment or detachment. Therefore, it should be tapered uniformly from its point of attachment at the clasp body to its tip. Consequently, as shown in the figure on the right, the arm curves into a convex form toward the gingival side, and it intersects the survey line near the center. The apical portion of the arm enters the undercut area, and the gingivally lateral edge of the arm's apical portion matches the undercut depth of 0.25 mm. The distance between the gingivally lateral undercut edge of the arm and the gingival margin should be at least 2 mm apart.



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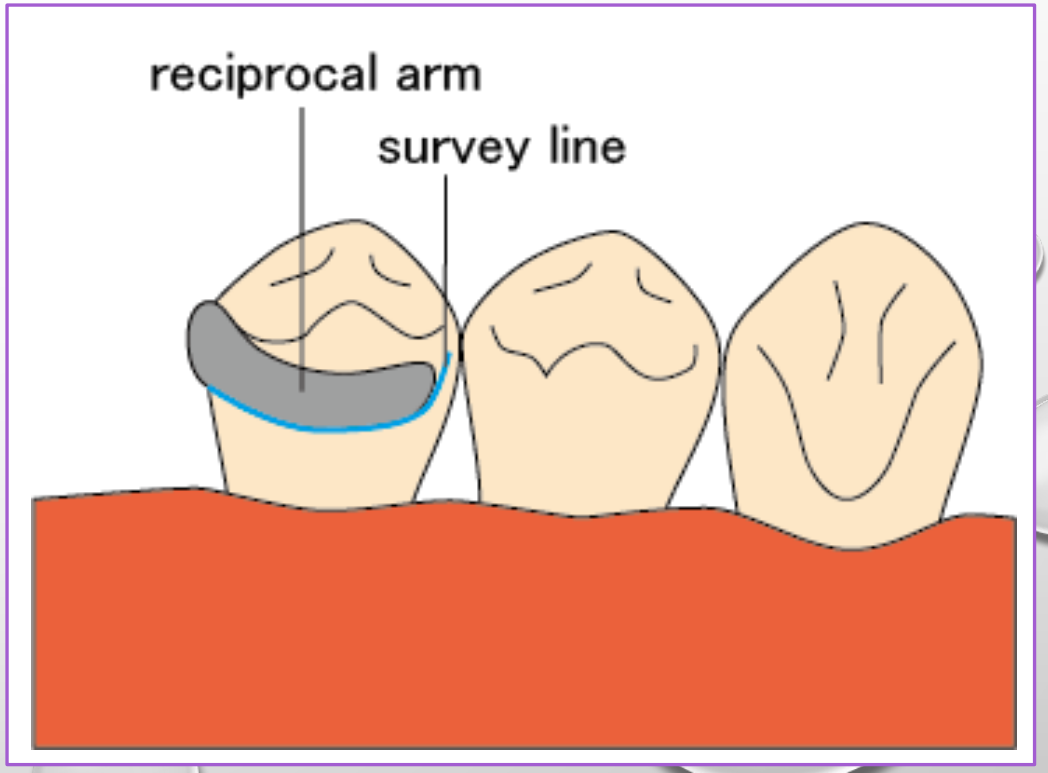
4. Reciprocal arm of akers clasp

As shown in the figure on the right, the gingival margins of the Akers clasp reciprocal arms are aligned with the survey line, and the arms do not intrude into the undercut area. The arms should be designed to be rigid throughout, with a wide band of the same width in contact with the tooth surface.



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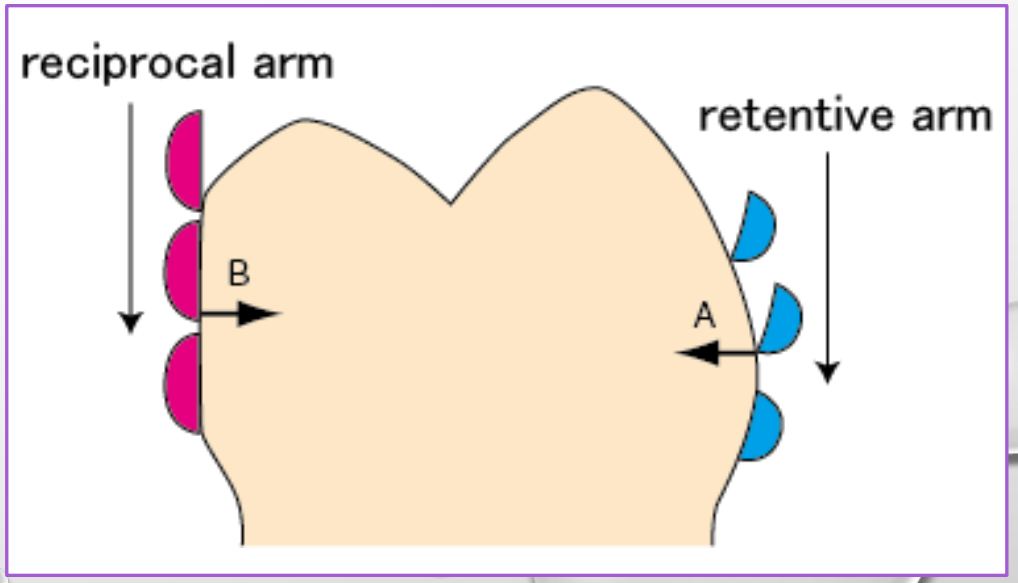
5. Function of the reciprocal arm

The reciprocal arm controls the direction of attachment and removal of the partial denture and also serves to provide self-reciprocating function of the clasp.

When the tip of the retentive arm crosses the survey line and enters the undercut area, the abutment tooth receives lateral pressure (A in the figure) from the retentive arm. If a rigid reciprocal arm is set on the opposite side of the retentive arm, the lateral pressure from the retentive arm is counteracted by the reciprocal arm (B in the figure), and the lateral pressure is not transmitted to the periodontal ligament of the abutment tooth. This action is called self-reciprocating function.



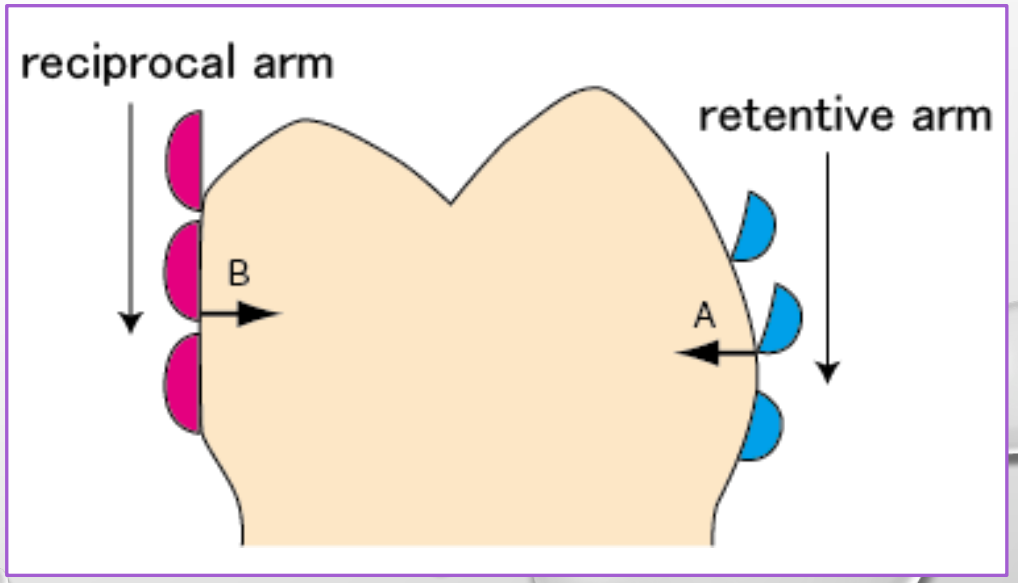
Design of direct retainers

5. Function of the reciprocal arm

In order for the clasp to function in a self-reciprocating manner, as shown in the figure on the right, the reciprocal arm must maintain continuous contact with the denture during attachment and removal to support the abutment tooth. Therefore, the reciprocal arm is designed as a wide, rigid arm.

Simultaneously, the abutment tooth must have a surface along the direction of attachment and removal, which is necessary for the clasp arm to stay in contact with the tooth. As a result, a direct retainer device in which the retentive arm and the reciprocal arm work in opposition to each other in a single direct retainer is called a self-reciprocating clasp.

A partial denture with a self-reciprocating clasp is considered excellent because it does not adversely affect the abutment teeth, even after repeated removal and replacement. Furthermore, it provides adequate maintenance force.



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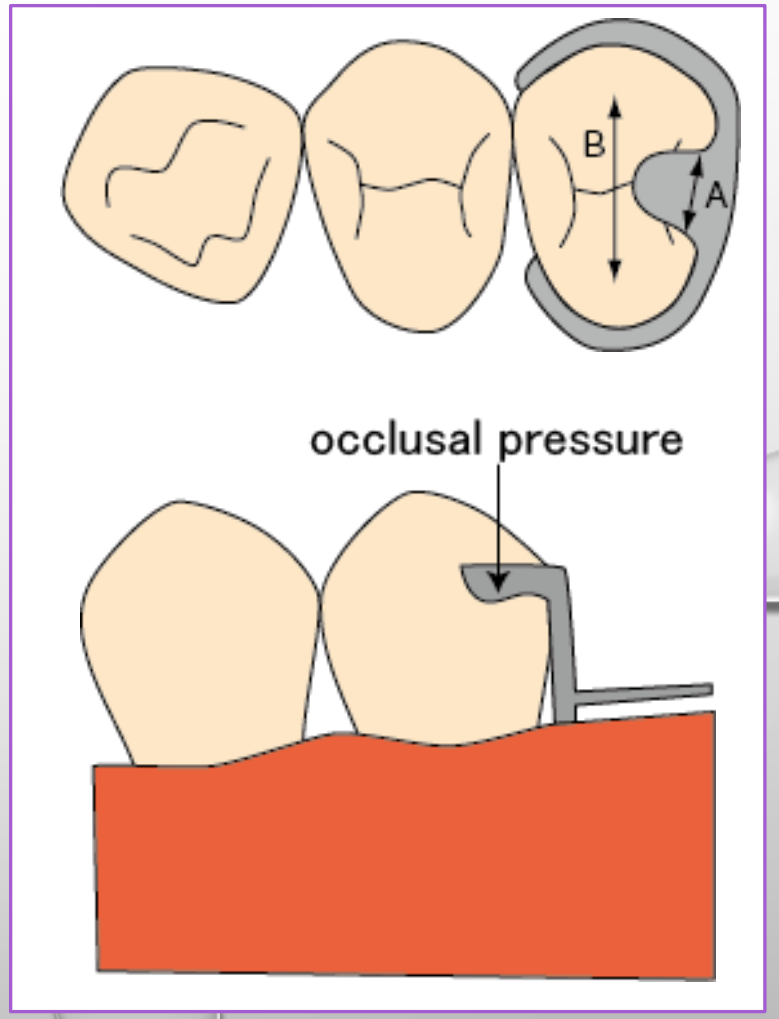
6. Rest of akers clasp

Akers clasp rests are designed as occlusal surface rests. As shown in the upper right figure, when viewed from the occlusal plane direction, the occlusal surface rest has a convex form drawn with a smooth curve that protrudes towards the center of the occlusal surface. Additionally, the transition from the rest to the arm features a smooth curve.
In the lower right figure, when the cross-section of the occlusal rest is viewed from the buccal side, the bottom of the rest is deeper towards the center of the occlusal surface, and the transition to the minor connector is drawn with a smooth curve.
The rests designed in this manner function to transmit occlusal pressure in the direction of the tooth axis. The reason for the smooth curve of the transition to the rest, arm, and minor connector is to prevent direct fractures of the maintenance device due to stress concentrated in the transition area.



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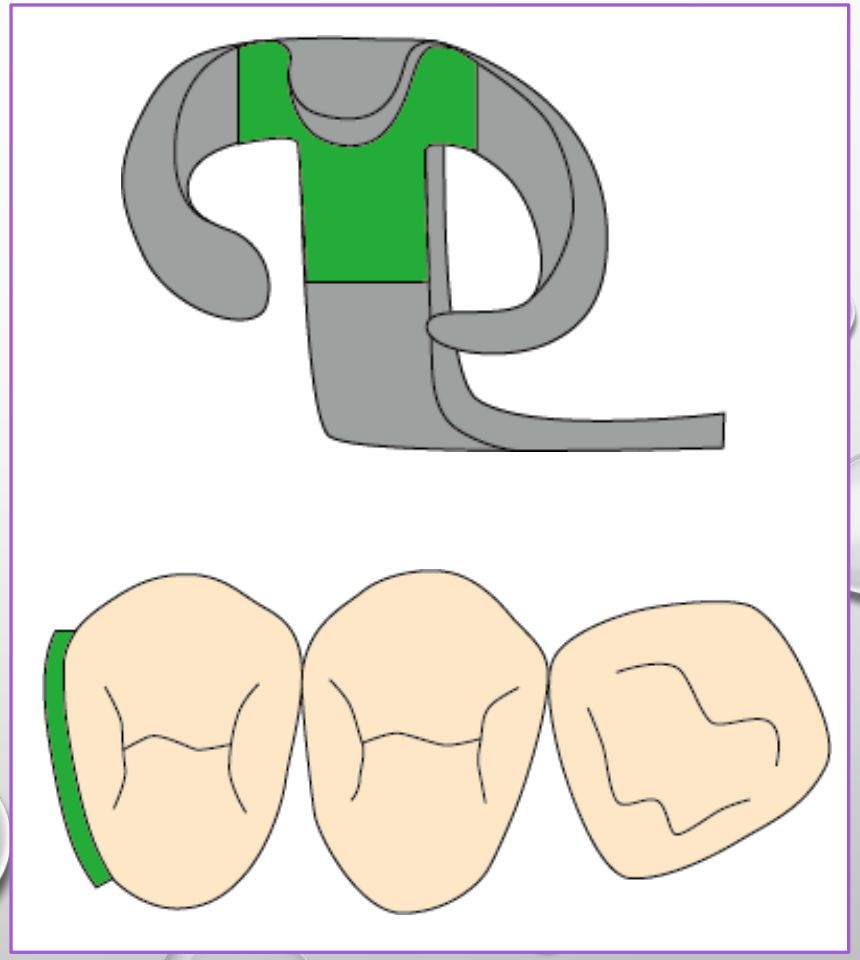
7. Minor connector of akers clasp

The minor connector of the Akers clasp serves the function of directly connecting the direct retainer and the major connector, thereby transmitting the force applied to the artificial tooth directly to the direct retainer. Therefore, the minor connector is designed to possess sufficient strength and rigidity. Furthermore, it is designed to control the direction of attachment and removal of the partial denture.

The green part of the Akers clasp, responsible for controlling the direction of attachment and removal, is referred to as the 'guiding plane' and comes into contact with the guiding plane of the clasp. When the partial denture is attached or detached, the guiding plane of the clasp slides over the guiding plane of the abutment tooth, appropriately controlling the direction of attachment and removal of the partial denture.



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8. Hairpin clasp

The hairpin clasp is selected when the undercut area of the abutment tooth is in the near zone, and there is no suitable undercut area in the far zone. This clasp cannot be designed without a large crown diameter of the abutment tooth and is primarily intended for bicuspids.

The retentive arm begins near the occlusal surface on the crown-deficient side and curves downward past the center of the crown to enter the undercut of the near zone. The apical gingival margin of the arm is aligned with the 0.25 mm undercut. This retentive arm is said to be aesthetically inferior because it covers a large area of the crown surface. However, this direct retainer is functionally superior because the retentive arm can be designed to be long.

The design of the reciprocal arm, rest, and minor connector is similar to that of the Akers clasp.

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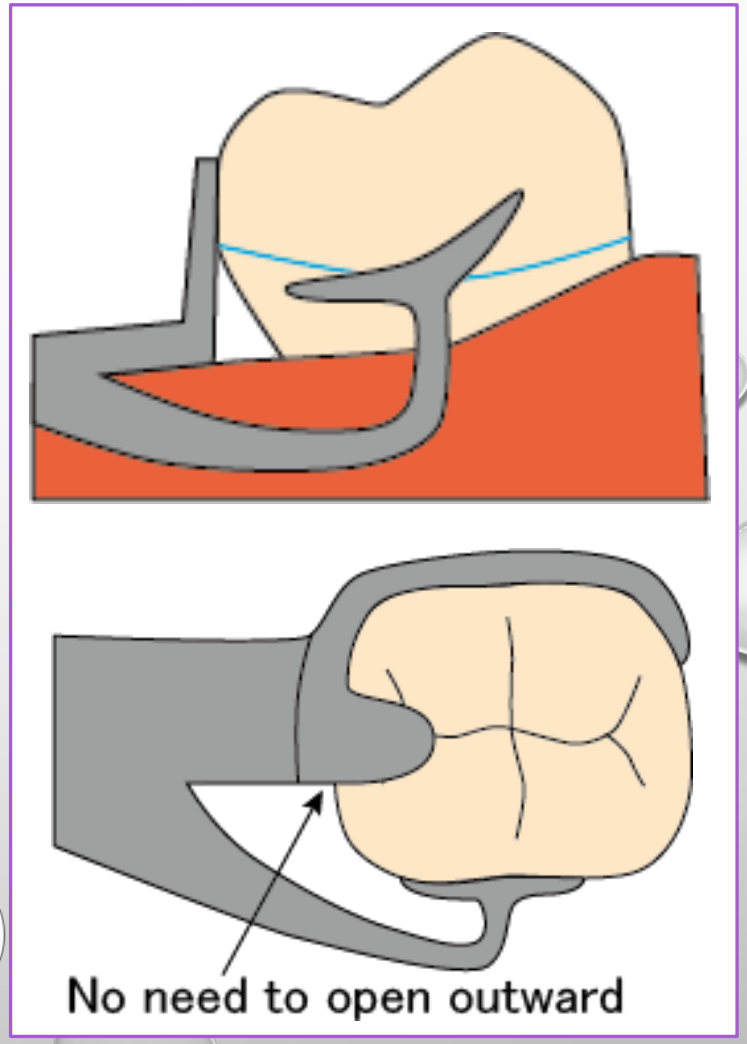
9. Roach clasp

The roach clasp is selected when the undercut area of the abutment tooth is in the near zone, and there is no suitable undercut area in the far zone. This clasp can be designed even if the crown length diameter of the abutment tooth is small, and it is primarily designed for isolated molars that are tilted proximally. However, this clasp cannot be designed for cases with narrow gingival widths because the retention arm approaches the abutment tooth from the gingival direction.

The retentive arm of the roach clasp begins in the denture base and rises gingivally toward the crown of the abutment tooth. The tip of the arm has a T-shaped bar attached to it, with half of the bar entering the undercut area. The gingivolateral edge of the T-shaped bar that enters the undercut area is matched at the 0.25 mm undercut amount.

The reciprocal arm is designed in the same way as the acer clasp.

The rest is designed as an occlusal surface rest. However, since the arm does not attach in the buccal direction from the rest, the buccal transition part of the rest (arrowed part) does not need to be opened outward.



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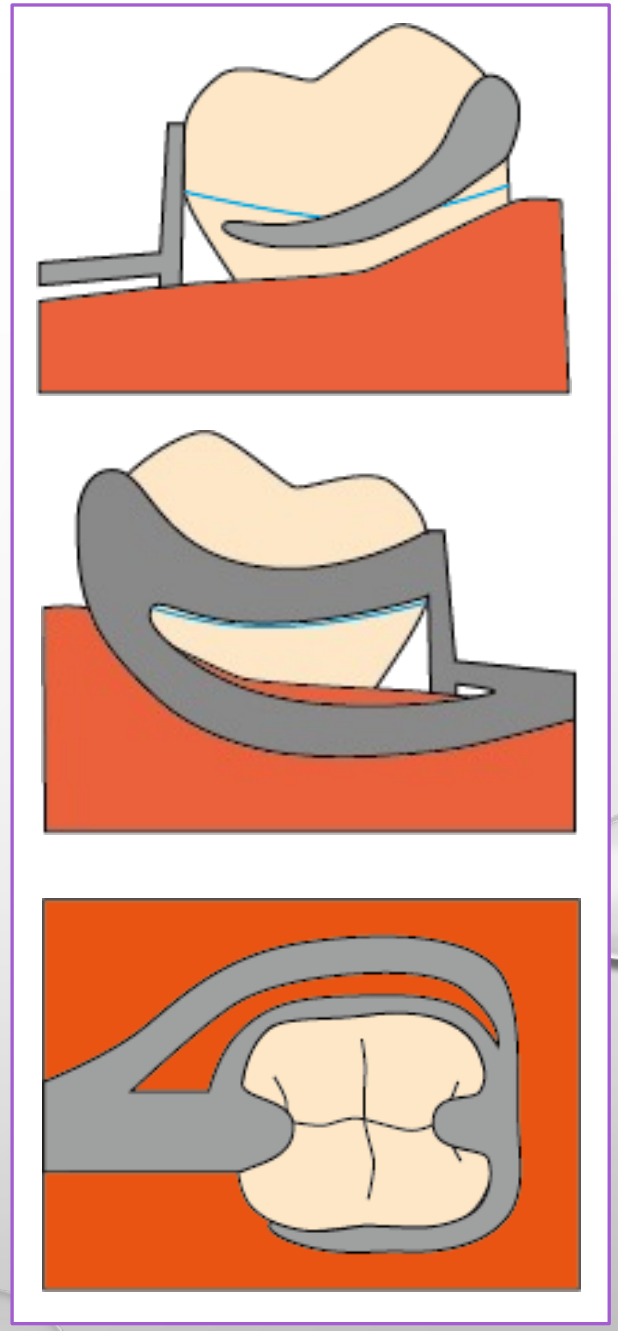
10. Ring clasp

As shown in the illustration on the right, ring clasps have several disadvantages, including a complex structure, a strong foreign body sensation, and a tendency for food residue to stagnate. For this reason, they are rarely employed in partial denture design. However, they are used when an appropriate undercut is not recognized in the far zone of the defect, and moreover, when the width of the buccal gingiva is too narrow to design a roach clasp.

The arm of the ring clasp starts from the missing minor connector and crosses the lingual, centric, and buccal surfaces, with one arm encircling all three surfaces and the tip of the arm entering the undercut on the proximal buccal surface. The long arm is easily deformed, so to prevent deformation, a reinforcing arm is placed on the lingual side, and two rests are placed on the proximal and distal sides.



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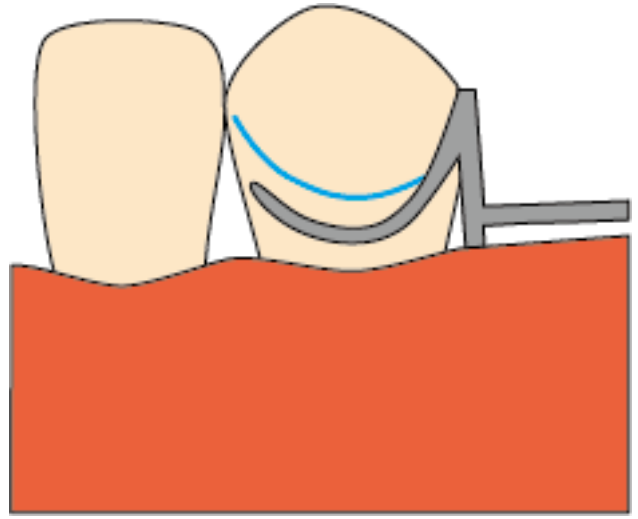
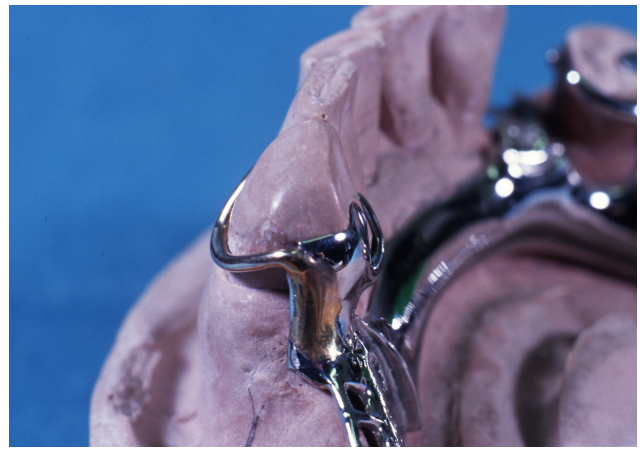
11. Combination clasp

Combination clasps are selected when the abutment tooth is a premolar or first bicuspid, where aesthetics must be considered, or when a high survey line is drawn on the tooth surface of the abutment tooth.

The retentive arm is fabricated by bending flexible platinum-plated gold wire or cobalt chrome wire. Two-thirds of the arm can be placed in an undercut, allowing the arm to be designed in close gingival proximity where it is less likely to touch the exterior.

The tip of the arm should be matched at the 0.5 mm undercut amount. A ledge is set on the abutment tooth as a reciprocal arm. If a ledge cannot be formed on the abutment tooth, a reciprocal arm similar to that of an Akers clasp should be designed.





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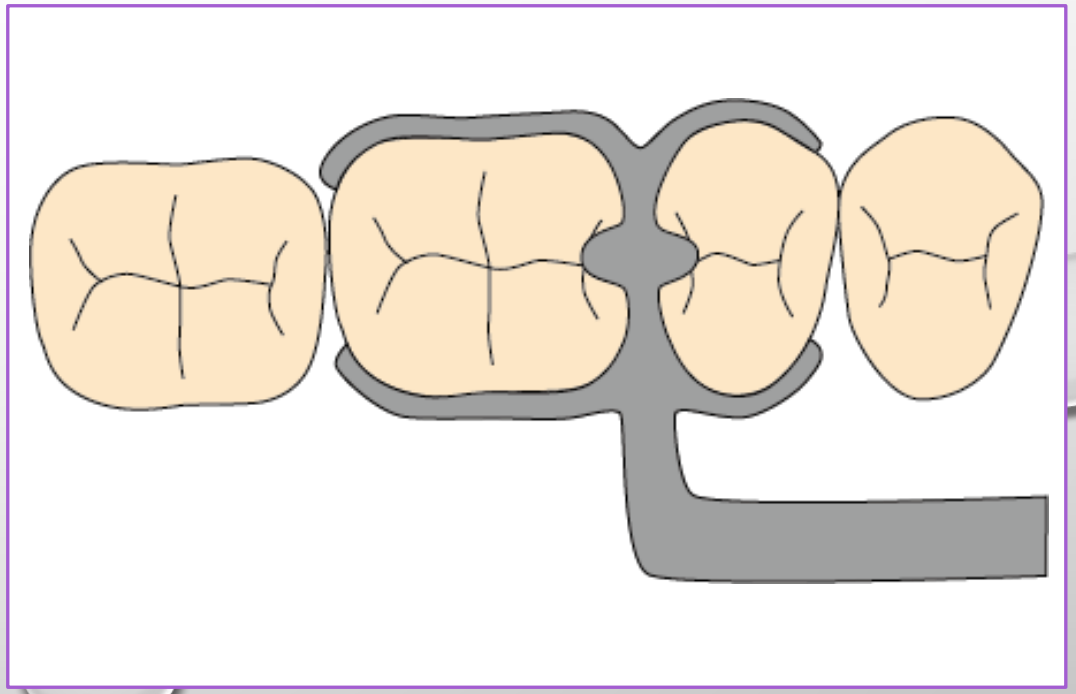
12. Double akers clasp

The double akers clasp is chosen in only a very limited number of cases. The double akers clasp is placed on two consecutive abutment teeth, as shown in the figure on the right. Double akers clasps are rarely designed because of their complex structure, susceptibility to deformation, and the difficulty of setting the guiding surface on the minor connector. However, it may be selected when the mandibular second molar is tilted lingually, and the major connector cannot be extended to the second molar.



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13. Wire clasp

A wire clasp is a clasp with all arms made of bent wire. The disadvantage of this type of clasp is the lack of control over the direction of attachment and removal. Therefore, inappropriate lateral forces may be applied to the clasp when it is detached. Today, wire clasps are rarely designed.

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If you have any questions or doubts, please leave them in the public comment section below.

The next topic will be the seventh, " Design of indirect retainer ".