REMOVABLE PARTIAL DENTURES

INFLUENCE OF OCCLUSAL REST POSITION AND CLASP DESIGN ON MOVEMENT OF ABUTMENT TEETH

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ONE OF THE DENTIST'S most interesting and thought-provoking situations occurs when treatment requires a rigid prosthetic replacement which must be compatible with two different kinds of support. This situation exists in treatment with distal extension partial dentures.

To weigh the merits of various designs, several methods of treatment must be studied and their effects on both hard and soft structures evaluated.

Since the greatest difficulty occurs in the transition area where tooth support ends and mucosa support begins, i.e., in the tooth-tissue region adjacent to the edentulous space, this discussion will be confined to the distal extension situation. Three basic aspects will be considered: (1) the effect of the rotation or occlusal rest position on the soft and hard tissues, (2) the effect of clasp design and placement on hard and soft tissues, and (3) considerations at the junction of the tooth and edentulous mucosa.

EFFECT OF THE ROTATION OR OCCLUSAL REST POSITION

The relative merits of the mesial and the distal rotation point, or rest, on the most posterior abutment tooth have been discussed.[1,2] A training aid can be used to demonstrate clearly the effect of the rest placement (Fig. 1). This training aid has a changeable rotation pin, and the movement of a partial denture base can be diagrammatically shown. Fig. 1 demonstrates the direction of movement of a denture base with a distal rest.

The gingival part of the denture base adjacent to the posterior abutment moves in an arc almost parallel to the mucosa. This results in little or no support from the mucosa near the tooth. Also, the soft tissue adjacent to the tooth may be pinched, with resultant tissue strangulation.

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As the denture base is followed posteriorly, the arc of movement becomes more nearly perpendicular to the surface of the mucosa.

By movement of the rotation point (the occlusal rest) to the mesial surface

Fig. 1.

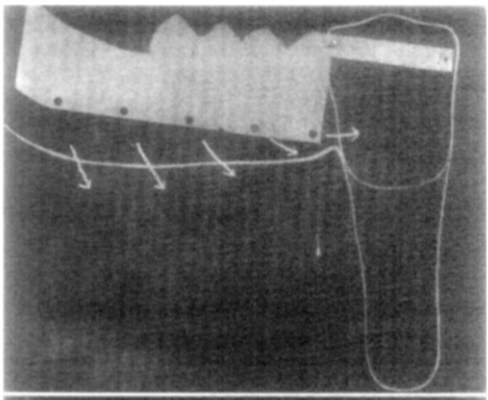


Fig. 2.

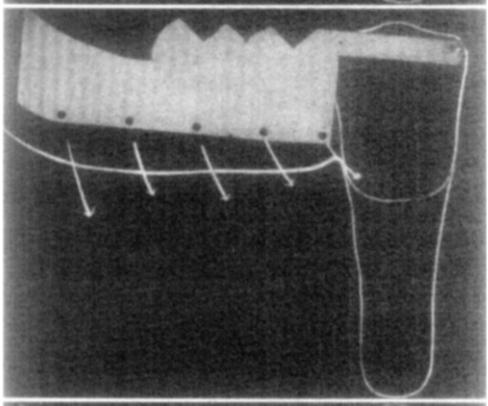


Fig. 3.

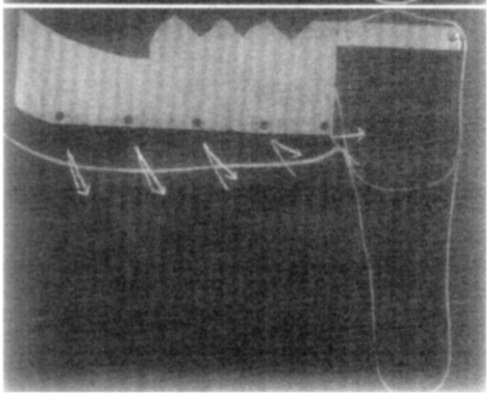


Fig. 1.—A training aid demonstrating the direction of forces against the edentulous area and the posterior tooth when a posterior rotation point is used.

Fig. 2.—The direction of forces is more nearly vertical when an anterior rotation point is used.

Fig. 3.—The differences in the direction of forces. The lines with arrows show the direction of the forces when a posterior rest is used. The lines without arrows result from the use of an anterior rest.

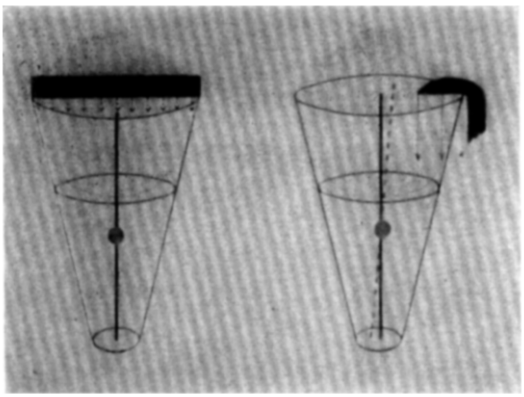


Fig. 4.—An abutment tooth will be moved toward the side on which the rest is located.

of the most posterior tooth (Fig. 2), the arc of movement of the denture base is changed. The direction of movement and force application is more nearly perpendicular to the surface of the mucosa in each region under the base (Fig. 3). The mesial fulcrum will increase the support provided by the soft tissues. Also, the direction of movement at the gingival region adjacent to the tooth is less likely to cause pinching or strangulation of the gingival tissues.

The placement of an occlusal rest distally to the central axis of the posterior abutment tooth will tend to tip the teeth posteriorly (Fig. 4). If the rest is placed on the mesio-occlusal surface, it will tend to tip the tooth mesially[3] so it will receive support and bracing assistance from the teeth anterior to it (Fig. 7).

The effect of the distal rest is shown (Fig. 5). When movement of the edentulous base occurs, the force exerted on the tooth can be compared to that of a precision-constructed and fitted "wrench" (Fig. 6) which tends to tip or pull the tooth backward. This can result in tooth mobility, bone loss, and tooth and denture movement bodily, with resulting occlusal disharmony.

As a result of transferring the rest to the mesial surface (Fig. 7), the denture movement will force the tooth anteriorly and reverse the wrench effect (Fig. 8). All remaining teeth will combine to help withstand this forward force.

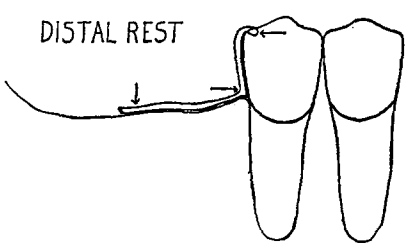


Fig. 5.

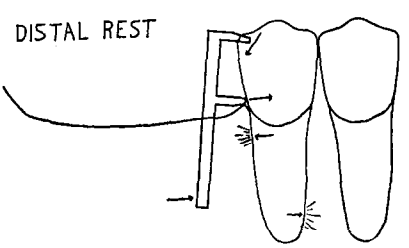
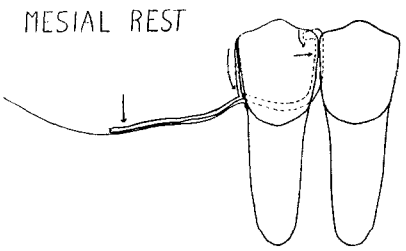


Fig. 6.

Fig. 5.—An abutment tooth with a metal casting having the occlusal rest on the side adjacent to the edentulous region. The arrows indicate the direction of forces when the denture moves downward.

Fig. 6.—The "wrench" effect exerted on an abutment tooth by a metal framework with a disto-occlusal rest.

Fig. 7.



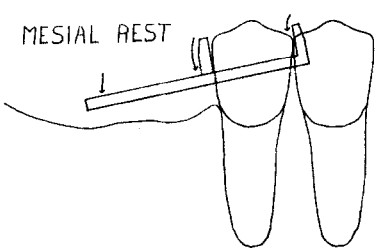


Fig. 8.

Fig. 7.—A mesio-occlusal rest on the metal casting on an abutment tooth. The arrows show the direction of movement when the base moves.

Fig. 8.—The wrench effect on an abutment tooth by a metal framework with a mesio-occlusal rest is minimized.

EFFECT OF CLASP DESIGN AND PLACEMENT

Much importance is placed on the contour of fixed partial dentures, individual crowns, and alloy restorations. Natural tooth anatomy and contour are carefully studied because accurate reproduction of anatomic structures is essential for proper cleansing and stimulation of the gingival tissues.

When a circumferential clasp is placed on a tooth, the natural contour of the tooth in cross section is altered (Fig. 9). Interference with the natural flow of food over the tooth and onto the gingivae results in loss of the tissue stimulation so necessary for healthy gingivae.[4] This distortion of tooth form provides a space for food debris to accumulate between the clasp and the gingivae. A much more natural situation exists when an infrabulge I bar clasp is used[5] (Fig. 10). This type of clasp causes the least possible distortion of natural tooth contour and allows for natural food flow, gingival stimulation, and minimal contact of the clasp with the tooth.

The forces brought into play by different types of clasps on the distal abutment tooth can be illustrated by a training aid. A commonly used T bar clasp is shown in Fig. 11. As the metal framework rotates around a mesio-occlusal rest, the mesial part of the clasp moves forward and slightly upward (Fig. 12). It

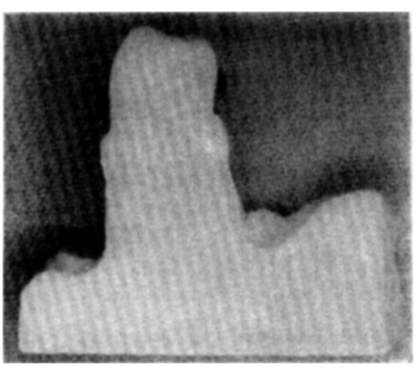


Fig. 9.—The contour of an abutment tooth is distorted by the circumferential type of clasp arms.

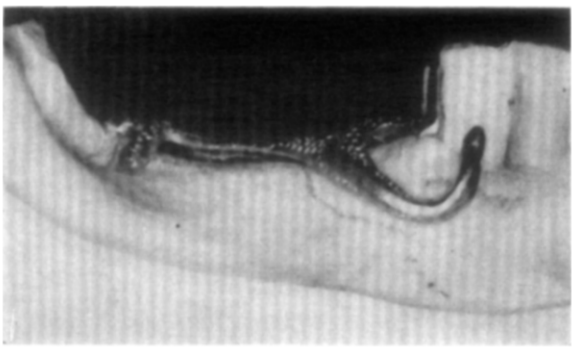


Fig. 10.—The infrabulge I bar clasp produces minimal alteration of tooth contour and requires minimal contact with the tooth. The cuspid demonstrates the least possible alteration of natural tooth contour and minimal tooth contact.

loses contact with the tooth and causes no adverse forces. The distal part of the clasp moves forward and downward. This seems to be acceptable until an occlusal view of the region is observed (Fig. 13). The distal part of the T bar wraps around the natural curvature of the tooth. Then, when the distal part of the clasp moves forward (Fig. 12), it engages the distal curvature of the tooth and exerts a torquing effect which is most detrimental to the periodontal membrane. A solution to this problem is the use of an infrabulge I bar clasp (Fig. 14) with the retentive tip placed at the point of greatest curvature of the buccal surface of the tooth. As movement of the denture base occurs, the clasp moves forward and downward away from the tooth (Fig. 15), completely losing contact with it and removing any possibility of torquing action. If the clasp tip is placed distally to the greatest curvature, it will engage the tooth in its forward movement and produce torque.

If the fulcrum is moved to the distal surface of the tooth with the same

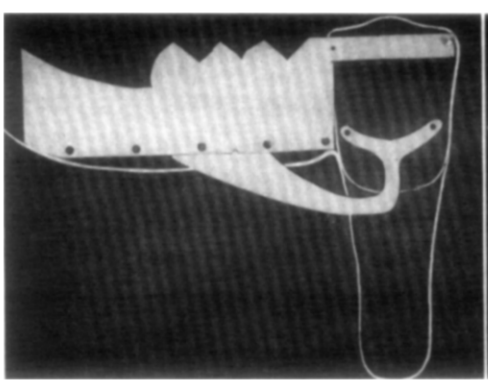


Fig. 11.

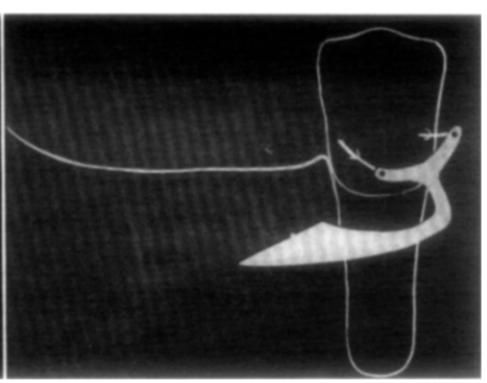


Fig. 12.

Fig. 11.—A partial denture with a mesial rest and a T bar clasp.
Fig. 12.—The arrows indicate the direction of clasp movement when used with a mesial rest.

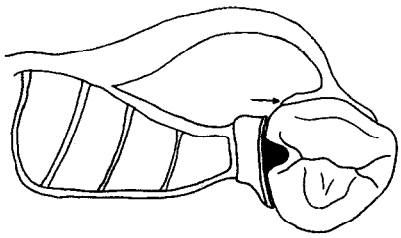


Fig. 13.—An occlusal view of a T bar clasp. The forward movement of the distal part of the clasp produces a torquing effect by engaging the distal curvature of the tooth.

clasping situation (Fig. 16), the movement of the clasp tip will be upward and forward. This will involve immediate engagement of the undercut area on the tooth and cause a torquing effect on the abutment tooth.

When a mesial rest is used, a lingual reciprocating clasp arm or lingual plate covering the lingual surface of the tooth is not desirable. The lingual clasp (Fig. 17) distorts the natural contour of the tooth. If the clasp is placed above the survey line, the tooth will be pushed or twisted toward the cheek as downward movement of the denture occurs and as the clasp moves downward over the greatest convexity of the tooth. This action is exactly the same as on the facial surface (Fig. 12).

The lingual plate (Fig. 18) will exert the same forces on the abutment tooth as those of the lingual clasp arm. Also, the lingual curvature of the teeth will not usually permit complete gingival-metal contacts. The space below the survey line will not allow for adequate tissue contact and stimulation, and hypertrophy of tissue into the void or gingival recession will result.

The lingual surfaces of these abutment teeth can be best treated by designing the rest arm to extend straight downward from the rest onto the mucosa well below and away from the gingival crest where it connects with the lingual bar. A metal arm is then brought upward to contact the tooth on its distolingual surface (Fig. 19). A lingual design of this type will remove the possibility of torque which might result from a lingual clasp or plate, will preserve the natural lingual contour of the tooth, thus allowing for more natural gingival stimulation, and will provide the necessary reciprocation against the buccal retention clasp arm through the mesial rest and the distolingual metal contact.

CONSIDERATIONS AT THE JUNCTION OF TOOTH AND MUCOSA

Many distal extension partial dentures cause difficulties at the distogingival region of the most posterior abutment tooth. The pathosis found involves (1) recession of mucosa and gingival irritation, (2) a large open space between the tooth and the denture so that debris collects, affecting the tooth and gingiva, (3) decay, (4) loss of bone followed by mobility of the tooth, or (5) movement of abutment teeth which allows the denture to shift to a different position, resulting in deflective occlusal contacts and further tissue destruction.

Since metal is clean and compatible with hard and soft tissues, all tooth struc-

ture on the distal surface of the tooth should be contacted with a thin metal plate that extends 1 to 2 mm. onto the soft tissues (Fig. 20).

The metal plate will eliminate any contact of acrylic resin with the tooth. Acrylic resin is more difficult to keep clean than metal. The metal will not wear

Fig. 14.

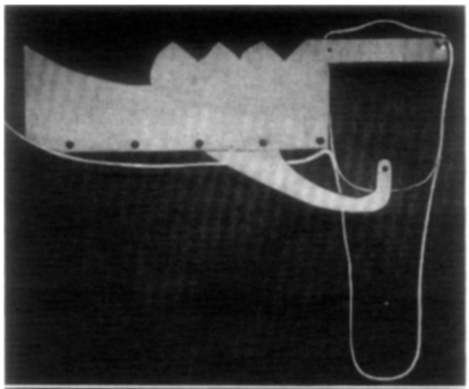


Fig. 15.

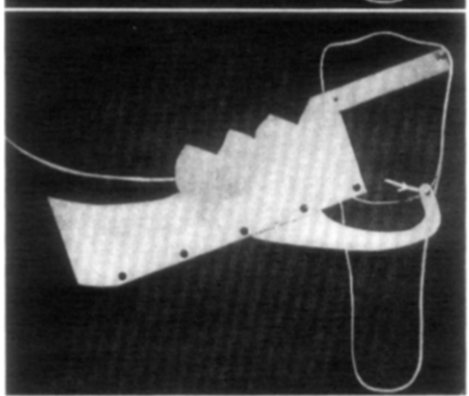


Fig. 16.

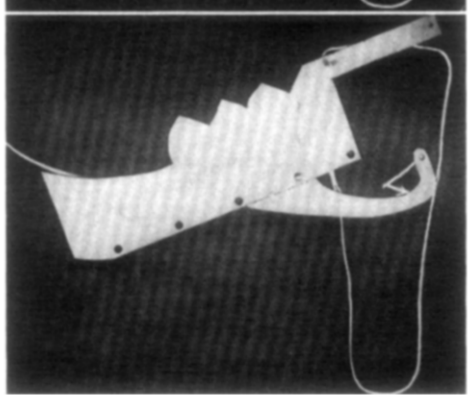


Fig. 14.—The tip of the infrabulge I bar clasp is placed at the point of greatest contour of the surface of the tooth.

Fig. 15.—Movement of the I bar downward and forward is away from the tooth when a mesial rest is used.

Fig. 16.—A clasp with a distal rest moves upward and forward as it engages an undercut and creates torque. With a mesial rest, the movement would be as indicated by the arrow.

or chip when it is finished or cleaned, no space is created where food debris can collect, and there is no void into which gingival tissues can hypertrophy.

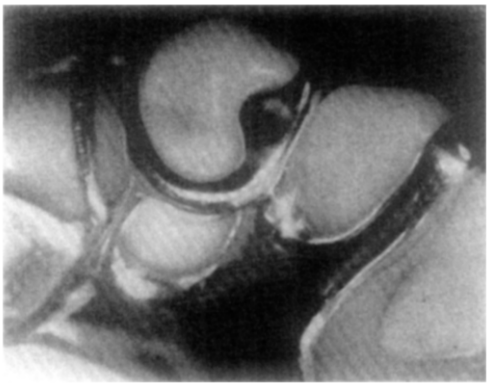


Fig. 17.

Fig. 18.

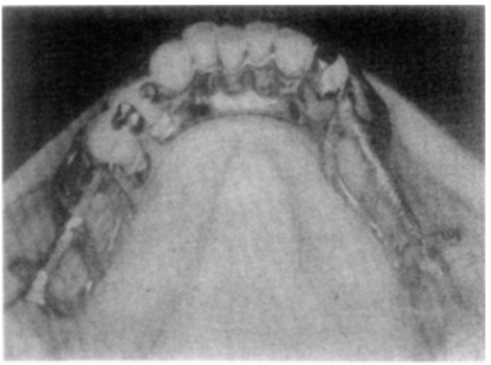


Fig. 19.

Fig. 17.—A lingual reciprocating clasp with a mesial rest distorts the tooth contour and twists the tooth as the clasp moves downward.

Fig. 18.—A lingual plate distal to the fulcrum point. The downward arc of movement in function will twist the tooth toward its buccal surface.

Fig. 19.—The suggested design of the lingual side of the metal framework. The lingual surface of the tooth and the tissue is kept clear. A distolingual clasp arm is extended upward against the tooth for reciprocation.

MOUTH PREPARATION

Proper mouth preparation and tooth alteration are usually necessary in the region of the lingual plate on the posterior abutment tooth to create a parallel surface.[6]

Fig. 20.

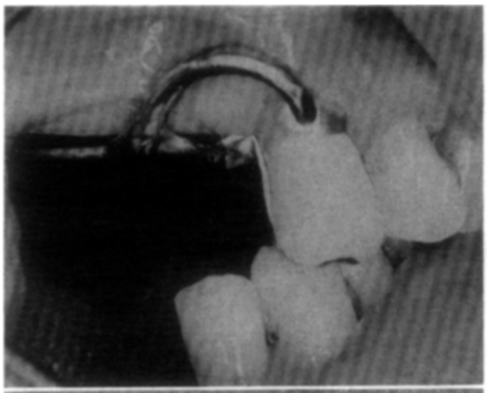


Fig. 21.

Fig. 22.

Fig. 20.—All tooth contacts are metal plus 2 mm. of mucosa adjacent to the abutment tooth.

Fig. 21.—Gold rouge and chloroform are used to detect contacts at the tooth-metal contact areas.

Fig. 22.—The areas of pressure against the tooth are revealed by shiny spots where the gold rouge has been wiped away.

The movement of the denture at the distogingival surface of the posterior abutment tooth, as shown in Fig. 2, is downward and forward. This movement must be considered when using distal plate coverage. This can be accomplished intraorally in the same manner and by using the same principles which apply when adjusting the tissue surface of a complete denture to the tissue using a pressure-indicating paste. Gold rouge and chloroform are excellent indicating materials for metal. The gold rouge, wetted with chloroform, is painted on the metal (Fig. 21). When the rouge has dried, partial denture movement is produced with finger pressure in the patient's mouth. The areas of contact are revealed as shiny spots where the gold rouge is worn off (Fig. 22). These areas are carefully relieved and retested until the pressure points have disappeared. Particular attention must be directed to the rest arm which lies between the proximal surfaces of the abutment teeth and moves with rotation of the denture. Pressure points disclosed by the gold rouge in this region must be relieved to prevent a wedging action between these teeth when movement of the denture occurs.

SUMMARY

1. When treatment with a removable partial denture is necessary, the transition region from tooth to mucosa support must receive most careful consideration.

2. An occlusal rest placed on the mesial or anterior part of the most distal abutment tooth provides mucosa or soft tissue support more perpendicular to the residual alveolar ridge than does one on the distal side of that tooth.

3. The gingival mucosa adjacent to the most posterior tooth is less likely to be pinched when the occlusal rest is placed on the mesial side of the tooth.

4. The occlusal rest providing a mesial rotation point will tend to tip the abutment tooth anteriorly where it will be reinforced and assisted by other teeth.

5. All extracoronal retainers alter the natural tooth contour and interfere with proper stimulation of the gingivae and natural cleaning action. The infrabulge I bar design alters natural tooth contour the least and allows for more natural gingival stimulation than any other type of extracoronal retainer. The area of contact of the clasp with the tooth is minimal.

6. The I bar retentive clasp, when placed at the point of greatest circumference of the tooth and used in conjunction with a mesio-occlusal rest or anterior rotation point, will exert no adverse or torquing force on the abutment tooth.

7. The region of the junction between the tooth and the edentulous area exhibits pathosis most frequently. The tooth contact should be made with a thin metal plate which extends onto the soft tissue for at least 1 mm. This will increase cleanliness and prevent mutilation of the denture base which results in a space at the tooth-mucosa junction.

8. The metal-tooth contact at the distal gingival region must be physiologically adjusted in the patient's mouth to prevent tooth and tissue impingement.

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