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Systematic Clinical Evaluation and Correction Procedures for Support of Removable Partial Dentures

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Abstract

Support, retention, and bracing are the three main functions of a direct retainer in removable partial dentures (RPDs). RPDs must have sufficient supporting ability for proper occlusal rehabilitation. Support ability depends on the fit, size, shape, and location of the occlusal rest. Support cannot be adjusted chairside in most cases. The purpose of this article is to present systematic evaluation criteria for support in an RPD and to describe methods for adjusting cast clasps with improper support. Appropriate design of RPDs and preparation of abutments are also described.

Support, retention, and bracing are the three main functions of a direct retainer in a removable partial denture (RPD). RPDs must have sufficient supporting ability for proper occlusal rehabilitation. Ill fit,[1] inadequate size and shape of the occlusal rest,[2] and improper location of the rest seat[3] may result in poor support. A systematic clinical method for adjusting the retention of a cast clasp has been suggested previously;[4–6] however, no clinical procedure has been reported for evaluation of the support ability of a direct retainer, because it cannot be evaluated quantitatively.

There are four factors that determine support and retention of the occlusal rest: (1) fit,[1] (2) size,[7–14] (3) shape,[7–9,11–16] and (4) location of the occlusal rest seat.[3] In this article, we will discuss methods to clinically evaluate each of these four factors and suggest procedures to correct the support function of RPDs.

Evaluation of fit of the occlusal rest

The fit of an occlusal rest can be evaluated by observing the gap between the rest and the rest seat of the abutment (Fig 1). If the fit is poor, occlusal forces cannot be transferred properly to the abutment (Fig 2). The causes and evaluation of misfit of rests, and probable solutions are listed below.

Projections on the inner surface of the cast clasps

Evaluation: Inspection with a stereomicroscope (Fig 3).

Solution: Removal of the projections.

The projections observed on the inner surface are caused by breakage of the working cast or air voids trapped in investment materials. These may also occur as a result of sharp edges of the abutment (Fig 4). To effectively prevent the formation of projections, the sharp edges of the abutment should be rounded before the impression is taken.

Interference of denture base resin near the clasp body

Evaluation: Inspection of the mark after insertion and removal by placing a piece of articulation paper between the clasp and the abutment (Fig 5) (chairside).

Solution: Removal of the interference.

Denture base resin near the clasp body sometimes exists at the proximal undercut and interferes with the insertion.

Deformation of the clasp or rest

Evaluation: Checking the fit with a silicone disclosing medium or marking liquid (Fig 6) (AutoBrush with Accufilm IV cartridge, Parkell, Farmingdale, NY) (chairside).

Figure 1 Gap between rest and abutment.

Figure 3 Projections on inner surface of cast clasp. Arrows indicate projections to be removed.

Solution: Removal of the interference if it is slight; refabrication if it is marked. If the deformation is corrected by bending, the risk of fracture or redeformation will increase. The best approach is to remake.

Displacement of the clasp

Evaluation: Checking the fit with a silicone disclosing medium (chairside).

Solution: Removal of the interference if it is slight; removal of the clasp from the denture base and checking the fit of the clasp alone; remaking if it does not fit.

If the clasp is displaced while investing into a flask or resin packing (Fig 7), remove the clasp from the denture base and check the fit. If the fit is sufficient, reattach the clasp to the resin base in the mouth. Before reattachment, check the space between the denture base and the clasp. Otherwise, the clasp will displace again.

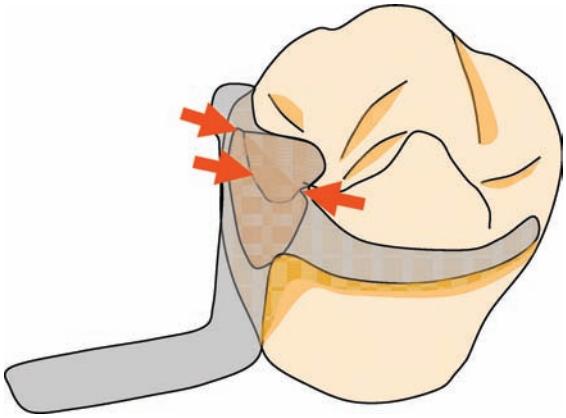

Figure 4 Sharp edges in the abutment. These are causes of cracks or pits.

Evaluation of the occlusal rest size

Most occlusal forces are distributed to the abutment via the occlusal rests and the rest seats in tooth-supported RPDs. To prevent fracture[2] of an occlusal rest, specific sizes have been recommended (Fig 8).

Buccolingual width

Evaluation: A minimum buccolingual width of 2.0 to 2.5 mm[7,10,14] and maximum buccolingual width of one-third of the crown[12] or half the distance between the cusp tips[9,11,13] have been suggested (preparatory stage).

Solution: If the rest seat is too narrow, widen the rest seat and remake an impression.

Mesiodistal length

Evaluation: The recommended mesiodistal length is one-third to one-half of the crown[11–13] (preparatory stage).

Solution: If the rest seat is too short, lengthen the rest seat and remake an impression.

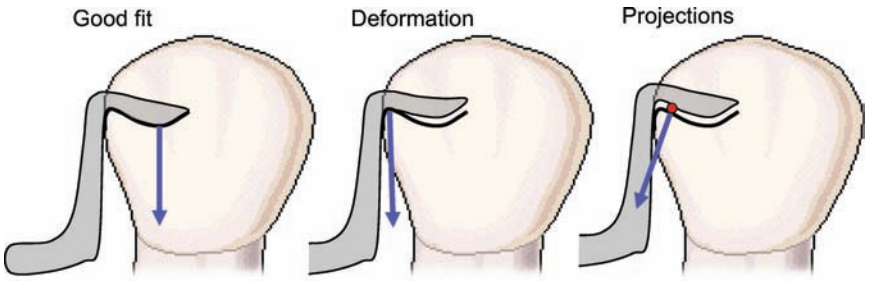

Figure 2 Force transfer to the abutment. Good fit generates vertical and axial force. Deformation and projections cause oblique and/or peripheral force.

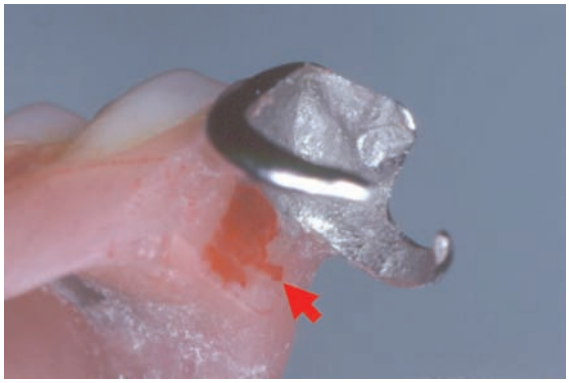

Figure 5 Denture base resin near clasp body after insertion and removal of articulating paper between clasp and abutment. Arrow indicates red-colored mark.

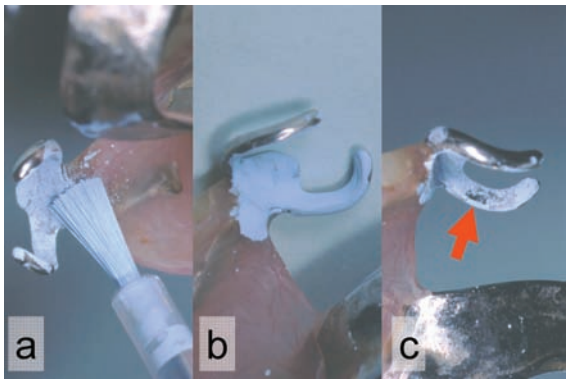

Figure 6 Check fit of clasp with marking liquid: (A) applying marking liquid on inner surface of clasp; (B) drying liquid; (C) after insertion and removal. Marking liquid is rubbed off at strong contact.

Thickness

Evaluation: The recommended thickness is 1.0 mm[12] to 1.5 mm[7,8,14] (preparatory stage).

Solution: If the rest seat is too shallow, deepen the rest seat and remake an impression.

Chairside solutions are impossible. Checking the space on the diagnostic cast (Fig 9) and in the mouth (Fig 10) is important.

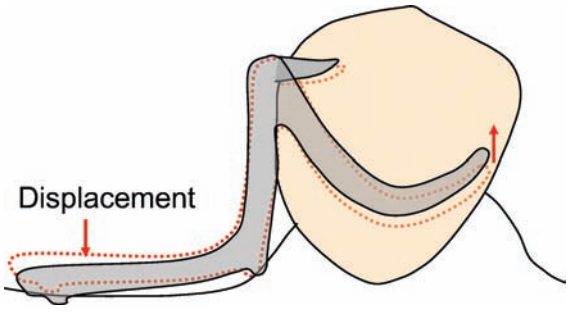

Figure 7 Displacement of the clasp.

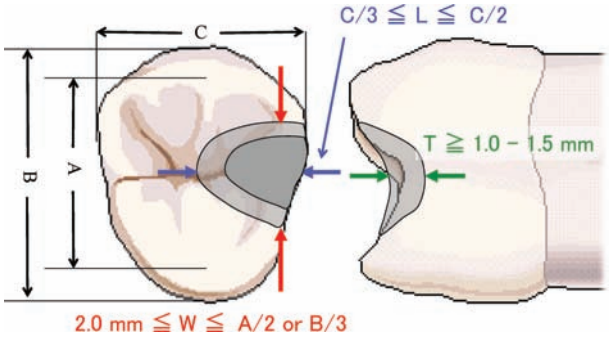

Figure 8 Recommended size of rest. (A) distance between the cusp tips; (B) buccolingual width of the crown; (C) mesiodistal width of the crown; (W) buccolingual width of rest; (L) mesiodistal length of rest; (T) thickness of rest.

Evaluation of the occlusal rest shape

To maximize the support function of a rest, specific shapes have been recommended (Fig 11).

Bottom shape of the rest

Evaluation: Occlusal rest seats are expected to be saucer-[12,13] or spoon-shaped[7–9,11,14,15] depressions (preparatory stage).

Solution: Reshape the rest seat and remake an impression.

Saucer- or spoon-shape prevents horizontal dislodging of the rest from its seat.

Inclination of the horizontal axis of the occlusal rest

Evaluation: The recommended inclination of the horizontal axis of the occlusal rest is $<90^{\circ}$[11,14] (preparatory stage).

Solution: Reshape the rest seat and remake an impression.

A horizontal inclination of $<90^{\circ}$ prevents horizontal dislodging of the rest from the rest seat with occlusal force.

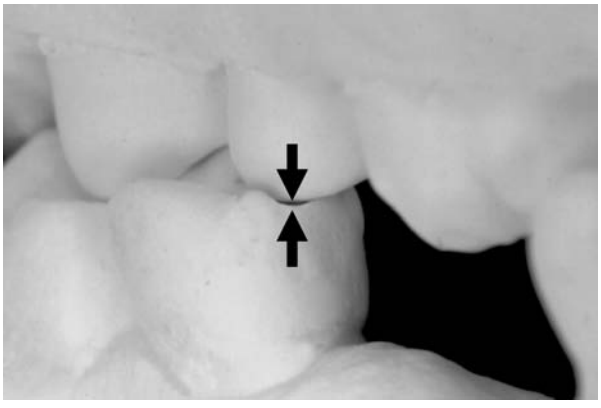

Figure 9 Checking space between abutment and antagonist on the diagnostic cast. Arrows indicate space.

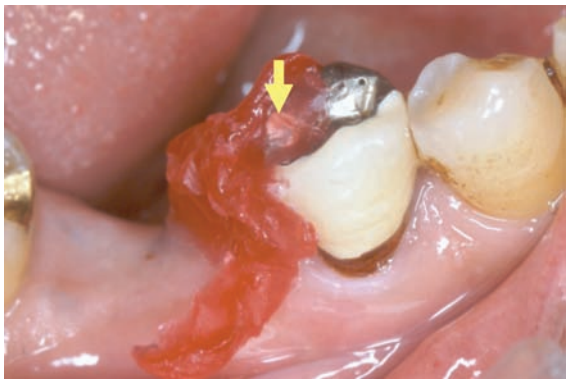

Figure 10 Checking the space between abutment and antagonist with soft wax in the mouth. Arrow indicates the space in the rest seat.

Inner connection between the occlusal rest and the minor connector

Evaluation: The inner connection between the occlusal rest and the minor connector should be rounded[16] (preparatory stage).

Solution: If the edge is too sharp, round the edge of the rest seat and remake an impression.

Sharp edges increase the risk of fracture by stress concentration.

Evaluation of location of the occlusal rest seat

Location of the rests affects the movement of RPDs.

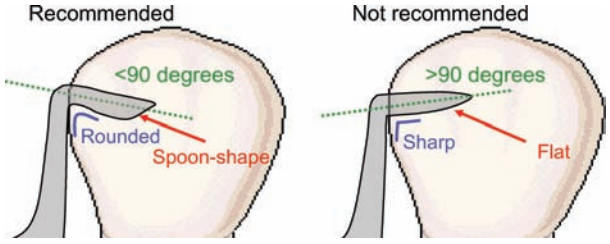

Figure 11 Recommended shape of rest.

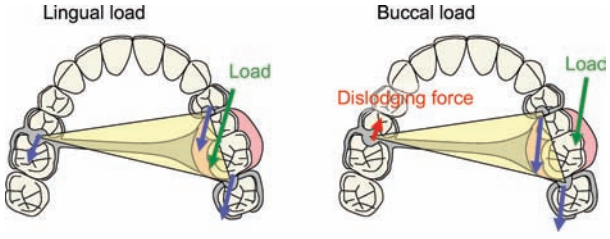

Figure 12 Loads and dislodging of RPDs for intermediary missing teeth.

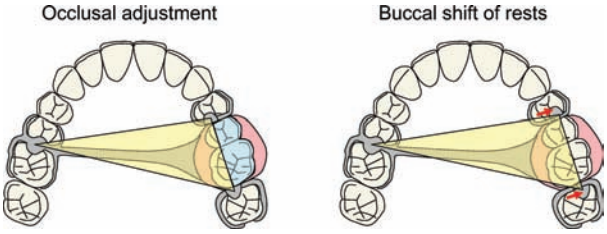

Figure 13 Solutions for bad buccolingual location for intermediary missing teeth. Left: eliminate occlusal contacts outside the connecting line of rests, and make a spillway. Right: buccal shift of rests.

Buccolingual location for intermediary missing teeth

Evaluation: Check the dislodging of the indirect retainer by pressing the buccal cusp of the artificial teeth (Fig 12) (chairside).

Solution: Eliminate occlusal contacts outside the connecting line of rests, and make a spillway (Fig 13).

Lingually shifted rests cause lack of support,[3] whereas buccal shift of rests increases the support (Fig 13).

Mesiodistal location for distal extension missing teeth

Evaluation: Check the sinking of the base or dislodging of indirect retainer by pressing the most distal artificial tooth (Fig 14) (chairside).

Solution: Eliminate the occlusal contacts of the most distal artificial tooth, make a spillway, create a mesial rest seat, widen the base (Fig 15), make a pressure impression, and/or use an altered cast technique.

Summary

Evaluation criteria and methods for adjusting improper support of cast clasps are presented in a systematic manner. For retention, chairside adjustment can be performed in a majority of situations; however, support cannot be adjusted chairside in

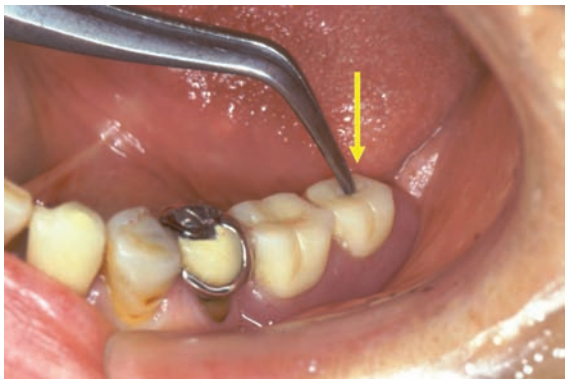

Figure 14 Check the sinking of the base or dislodging of indirect retainer by pressing the most distal artificial tooth.

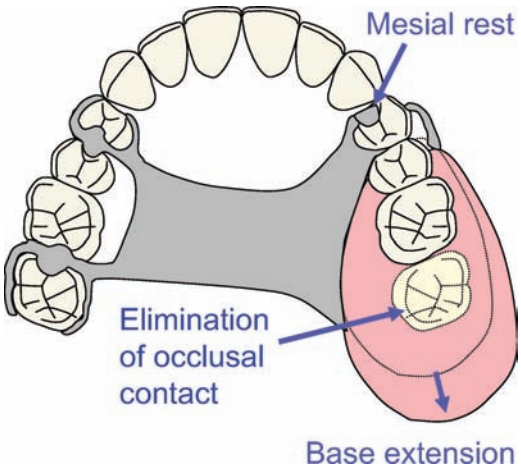

Figure 15 Solution for distal extension missing teeth. Eliminate the occlusal contacts of most distal artificial tooth, make a spillway, create a mesial rest seat, and widen the base.

most cases. Appropriate design of RPDs and preparation of abutments are essential for proper support. Evaluation of the cause for the lack of support will contribute to the proper solution and establish a clinical procedure that will allow clasps to be constructed for proper long-term support.

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