

Operative Dentistry

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Complex amalgam restorations

Complex posterior restorations are used to replace missing tooth structure of teeth that have fractured or are severely involved with caries or existing restorative material. These restorations usually involve the replacement of one or more missing cusps.

INDICATIONS

Complex posterior amalgam restorations should be considered When:

- (1) Large amounts of tooth structure are missing.
- (2) When one or more cusps need capping.
- (3) When increased resistance and retention forms are needed.

When determining the appropriateness of a complex amalgam restoration, the following factor must be considered:

(1) Resistance and Retention Forms

In a tooth severely involved with caries or existing restorative material, any undermined enamel or weak tooth structure subject to

fracture must be removed and restored. Usually, a weakened tooth is best restored with a properly designed indirect (usually cast) restoration that will prevent tooth fracture caused by mastication forces. However, in selected cases, preparations may be designed for amalgam that improve the resistance form of a tooth.

When conventional retention features are not adequate because of insufficient remaining tooth structure, pins, slots, and amalgam bonding techniques may be used to enhance retention form. The retention features needed depend on the amount of tooth structure remaining and the tooth being restored. As more tooth structure is lost, more auxiliary retention is required. Pins, slots, and bonding also provide additional resistance form to the restoration.

(2) Status and Prognosis of the Tooth

Complex restoration may be used as

(1) control restoration in teeth which are severe Caries. that may require endodontic therapy .

A control restoration helps:

(1) protect the pulp from the oral cavity (i.e., fluids, thermal stresses, pH changes, bacteria).

- (2) provide an anatomic contour against which the gingival tissue may be healthier,
- (3) facilitate control of caries and plaque.
- (4) provide some resistance against tooth fracture (or propagation of an existing fracture).

The status and prognosis of the tooth will determine the size, number, and placement of retention features. Larger restorations generally require more retention. However, the size, number, and location of retention features demand greater care in smaller teeth, in teeth that have been significantly excavated, and in symptomatic teeth. Carelessness can risk pulpal irritation or exposure.

(3) Role of the Tooth in the Overall Treatment Plan

Abutment teeth for fixed prostheses may utilize a complex restoration as a foundation. Extensive caries or previous restorations on abutment teeth for removable prostheses generally indicate a cast restoration for resistance and retention forms and for development of external surface contours for retention of the prosthesis. A tooth may be treated with a complex restoration if adequate resistance and retention forms can be provided.

(4) Occlusion, Esthetics, and Economics

- (1) Complex amalgam restorations are sometimes indicated as

interim restorations for teeth that require elaborate occlusal alterations ranging from vertical dimension changes to correcting occlusal plane discrepancies.

(2) When esthetics is a primary consideration, a complex amalgam restoration may not be the treatment of choice because of the display of metal. However, a more esthetic result may be obtained by inserting a composite veneer within the amalgam to mask some of the metallic appearance of the restoration.

(3) When cost of indirect restorations is a major factor for the patient, the complex direct amalgam restoration may be an appropriate treatment option, provided that adequate resistance and retention forms are included.

(5)Age and Health of the Patient

For some geriatric and debilitated patients, the complex amalgam restoration may be the treatment of choice over the more expensive and time-consuming cast restoration.

CONTRAINDICATIONS

The complex amalgam restoration may be contraindicated if the patient has significant occlusal problems, or if the tooth cannot be properly restored with a direct restoration because of anatomic

and/or functional considerations. The complex amalgam restoration also may be contraindicated if the area to be restored is esthetically important for the patient.

ADVANTAGES

Conserves Tooth Structure

The preparation for a complex amalgam restoration is usually more conservative than the preparation for an indirect restoration or a crown.

Appointment Time

The complex restoration can be completed in one appointment. The cast restoration requires at least two appointments.

Resistance and Retention Forms

Resistance and retention forms may be significantly increased by the use of pins, slots, and bonding.

DISADVANTAGES

Most of the disadvantages related to complex amalgam restorations refer to the use of pins used to provide retention for these restorations. However, some disadvantages apply to complex amalgam restorations in general.

Dentinal Microfractures

Preparing pinholes and placing pins may create craze lines or fractures, as well as internal stresses in the dentin. Such craze lines and internal stress may have little or no clinical significance, but they may be important when minimal dentin is present.

Microleakage

In amalgam restorations using cavity varnish, microleakage around all types of pins has been demonstrated .

Decreased Strength of Amalgam

The tensile strength and horizontal strength of pin-retained amalgam restorations are significantly decreased .

Resistance Form

Resistance form is more difficult to develop than when preparing a tooth for a cusp capping. The complex amalgam restoration does not protect the tooth from fracture as well as an extra coronal restoration. However, amalgam restorations with cusp coverage significantly increase the fracture resistance of weakened teeth as compared to amalgam restorations without cusp coverage.

Penetration and Perforation

Pin retention increases the risk of penetrating into the pulp or perforating the external tooth surface.

Cusp capping

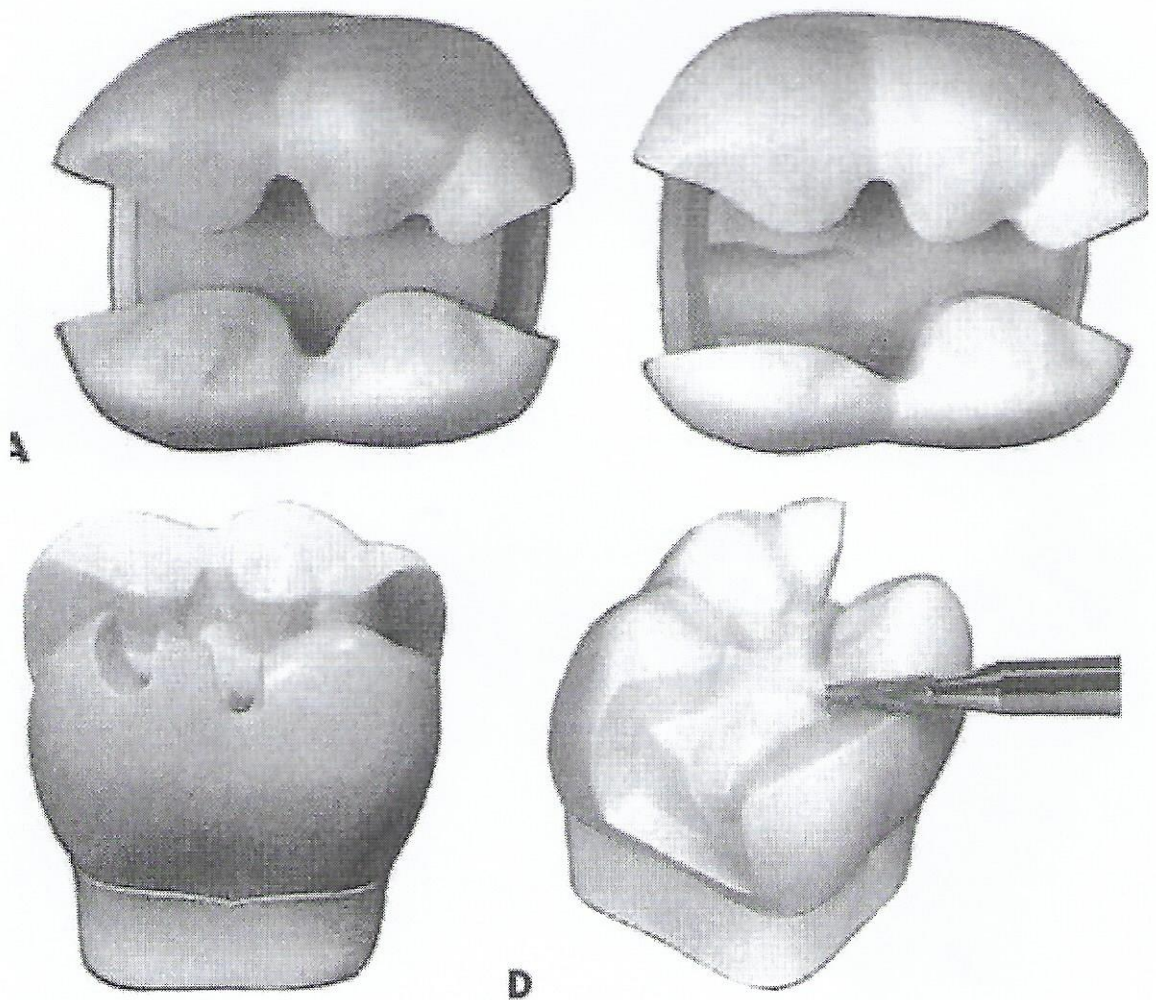
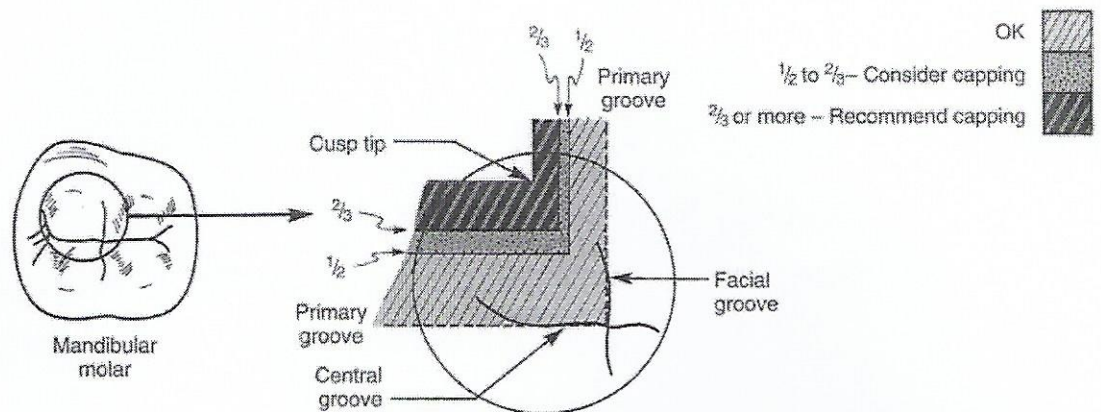
When caries is extensive, reduction of one or more of the cusps for capping may be indicated. When the facial or lingual extension exceeds two thirds the distance from a primary groove toward the cusp tip (or when the facial-lingual extension of the occlusal preparation exceeds two thirds the distance between the facial and lingual cusp tips), reduction of the cusp(s) for amalgam is usually required for the development of adequate resistance form.

Reduction should be accomplished during initial tooth preparation because it improves access and visibility for subsequent steps. If the cusp(s) to be capped is located at the correct occlusal height before preparation, depth cuts should be made on the remaining occlusal surface of each cusp to be capped, using the side of a carbide fissure bur or a suitable diamond instrument. The depth cuts should be 2 mm deep minimum for functional cusps and 1.5 mm deep minimum for nonfunctional cusps." on the remaining occlusal surface of each cusp to be capped, using the side of a carbide fissure bur or a suitable

diamond instrument However, to correct an occlusal relationship, if the unreduced cusp(s) height is located less than the correct occlusal height, the depth cuts may be less. Likewise, if the unreduced cusp(s) height is located at more than the correct occlusal height, the depth cuts may be deeper. The goal is to ensure that the final restoration has restored cusps with a minimal thickness of 2 mm of amalgam for functional cusps and 1.5 mm of amalgam for nonfunctional cusps The occlusal contour of the reduced cusp should be similar to the normal contour of the unreduced cusp. Any sharp internal corners of the tooth preparation formed at the junction of prepared surfaces should be rounded to reduce stress concentration in the amalgam and thus improve its resistance to fracture from occlusal forces extending the facial or lingual wall of a proximal box to include the entire cusp is indicated only when necessary to include carious or unsupported tooth structure or existing restorative material.

Retention form

Cusp reduction significantly diminishes retention form by decreasing the height of the vertical walls When additional retention is indicated, Slots may be prepared along the gingival floor, axial to the dentinoenamel junction in addition to pins may be inserted in carefully positioned pinholes increasing retention.



Slot and Locks Retained Amalgam Restorations

For a complex restoration, a slot is a retention groove in dentin whose length is in a horizontal plane locks are prepared in a vertical plane.

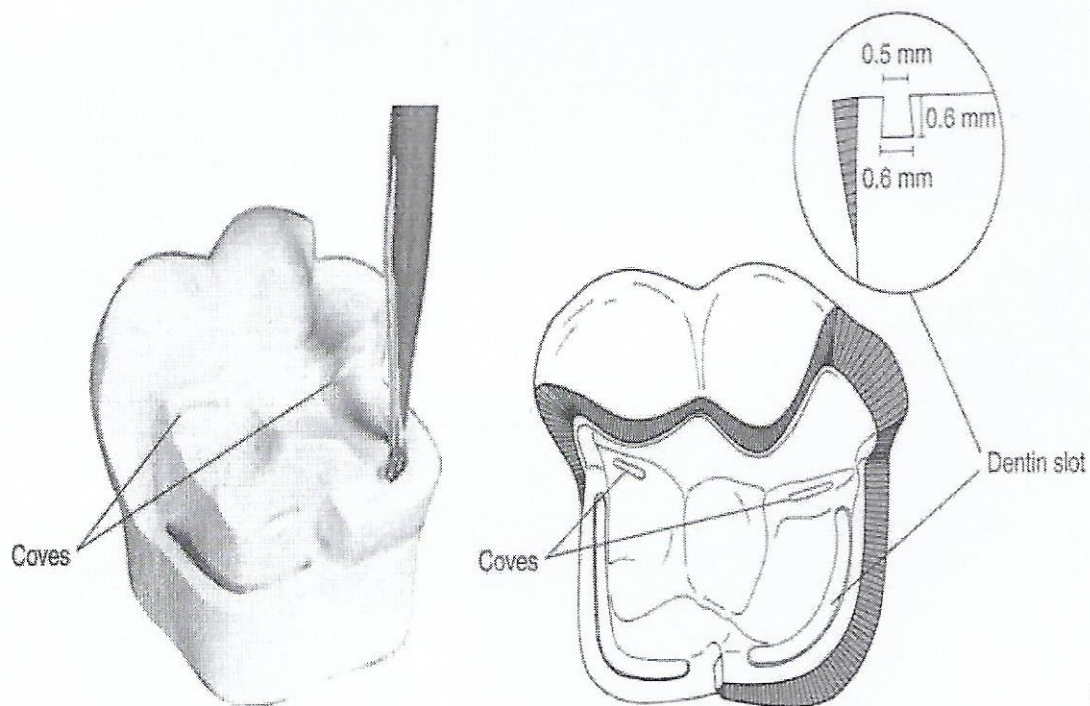
Slot and locks retention may be used in conjunction with pin retention, or as an alternative to it. Some operators use slot retention and pin retention interchangeably. However, others more frequently use slot retention in preparations with vertical walls that allow retention locks to oppose one another. Pin retention is used more frequently in preparations with few or no vertical walls. Slots are particularly indicated in short clinical crowns and in cusps that have been reduced 2 to 3 mm for amalgam. Compared with pin placement, more tooth structure is removed preparing slots. However, slots are less likely to create microfractures in the dentin and to perforate the tooth or penetrate into the pulp.

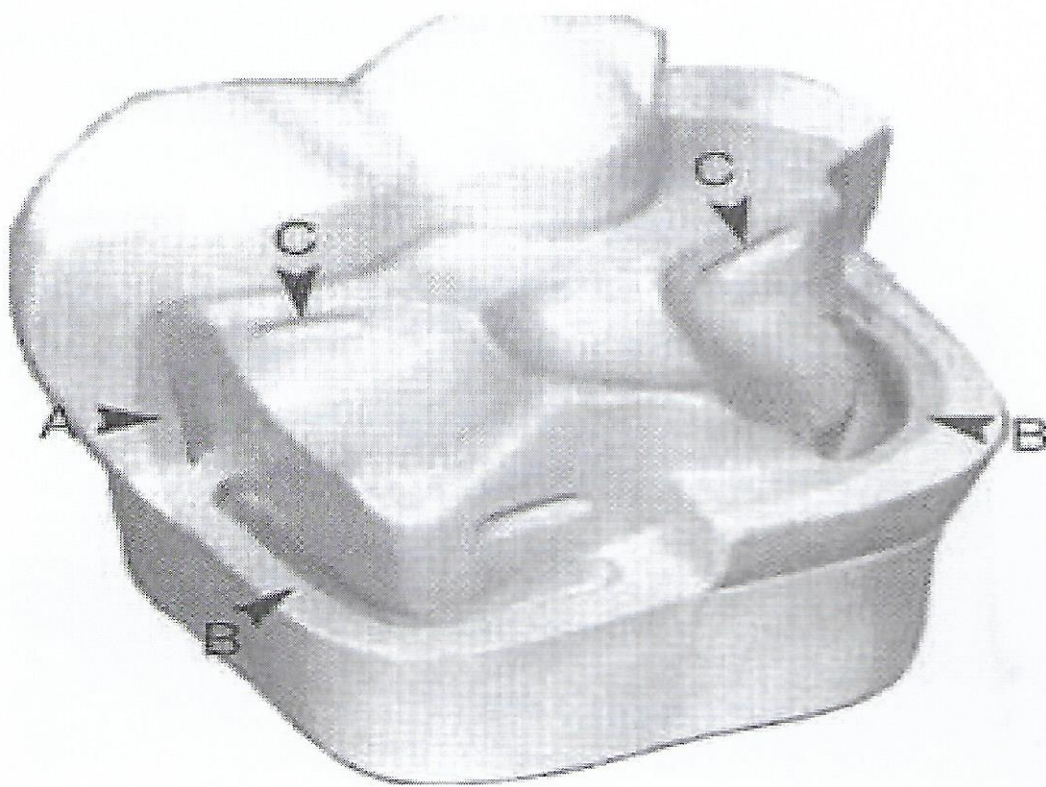
Tooth Preparation for Slot-Retained Amalgam Restorations

Slot length depends on the extent of the tooth preparation. Slots are usually placed on the facial, lingual, mesial, and distal aspects of the preparation. The slot may be continuous or segmented, depending on the amount of missing tooth structure and whether pins were used. It have shown that shorter slots provide as much resistance to horizontal force as do longer slots

bur is used to place a slot in the gingival floor 0.5 mm axial of the DEJ. The slot is at least 0.5 mm in depth and 1 mm or more in length, depending on the distance between the vertical walls.

Retention locks are placed in remaining vertical walls 1 mm in depth and the width length is usually 2 to 4 mm, depending on the distance between the remaining vertical walls.





Locks (A), slots (B), and coves (C).