Operative

Complicated Cavities for Amalgam

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.

Complex posterior amalgam restorations should be considered when large amounts of tooth structure are missing, when one or more cusps need capping, and when increased resistance and retention forms are needed.

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 improves 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.

Advantages

1- **Conserves Tooth Structure.** The preparation for a complex amalgam restoration is usually more conservative than the preparation for an indirect restoration or a crown.
2- **Appointment Time.** The complex restoration can be completed in one appointment. The cast restoration requires at least two appointments.
3- **Resistance and Retention Forms.** Resistance and retention forms may be significantly increased by the use of pins, slots, and bonding.
4- **Economics.** Compared to an indirect restoration, the amalgam restoration is a relatively inexpensive restorative procedure.

DISADVANTAGES

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

1- **Dentinal Microfractures.** Preparing pinholes and placing pins may create craze lines or fractures, as well as internal stresses in the dentin.
2- **Microleakage.** In amalgam restorations using cavity varnish, microleakage around all types of pins has been demonstrated.

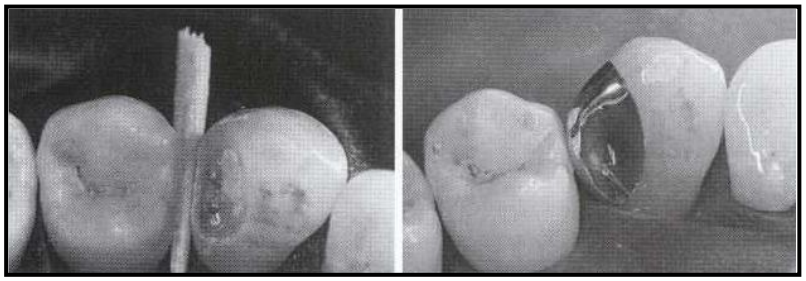
3- **Decreased Strength of Amalgam.** The tensile strength and horizontal strength of pin-retained amalgam restorations are significantly decreased.
4- **Resistance Form.** Resistance form is more difficult to develop than when preparing a tooth for a cusp capping onlay or a full crown. The complex amalgam restoration does not protect the tooth from fracture as well as an extracoronal restoration. However, amalgam restorations with cusp coverage significantly increase the fracture resistance of weakened teeth as compared to amalgam restorations without cusp coverage.
5- **Penetration and Perforation.** Pin retention increases the risk of penetrating into the pulp or perforating the external tooth surface.
6- **Tooth Anatomy.** Proper contours and occlusal contacts, and/or anatomy, are sometimes difficult to achieve with large complex restorations.

CLINICAL TECHNIQUE

Before the preparation for a complex amalgam restoration begins the treatment options should be discussed with the patient.

Pin-Retained Amalgam Restorations.

A pin retained restoration may be defined as any restoration requiring the placement of one or more pins in the dentin to provide adequate resistance and retention forms. Pins are used whenever adequate resistance and retention forms cannot be established with slots, locks, or undercuts only. Amalgam restorations including pins have significantly greater retention than those using boxes only or those relying solely on bonding systems.

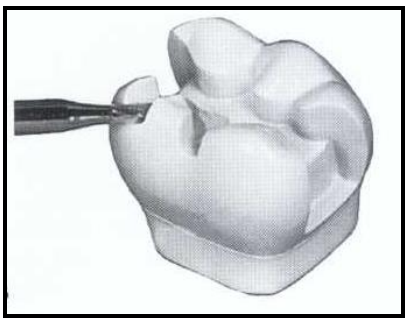


The use of pins may be considered for a large Class IV preparation on the distal surface of a canine that involves a significant amount of the disto-incisal corner, when this area is being restored with amalgam. Pins placed in the gingival portion may provide the needed retention for the restoration. However, use of a lingual dovetail is an alternative to pin retention, if enough lingual tooth structure is available for preparation of the dovetail.

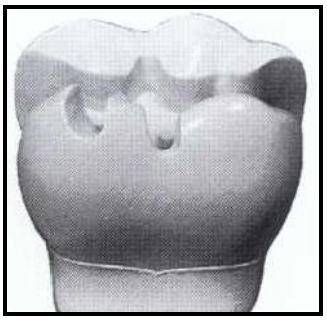
Tooth Preparation for Pin-Retained Amalgam Restorations

Initial Tooth Preparation. When caries is extensive, reduction of one or more of the cusps for capping may be indicated.

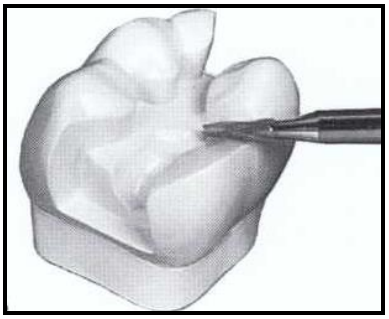
Reduction should be accomplished during initial tooth preparation because it improves access and visibility for subsequent steps. If the cusp(s) to be capped is located at the correct occlusal height before preparation, depth cuts should be made on the remaining occlusal surface of each cusp to be capped,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



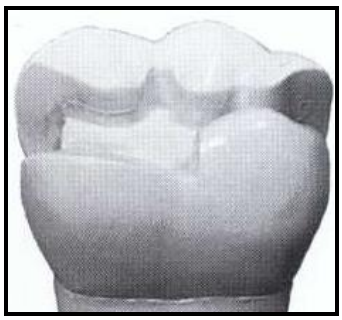
The depth cuts should be 2 mm deep minimum for functional cusps and 1.5 mm deep minimum for nonfunctional cusps." However, to correct an occlusal relationship, if the unreduced cusp(s) height is located less than the correct occlusal height, the depth cuts may be less. Likewise, if the unreduced cusp(s) 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.



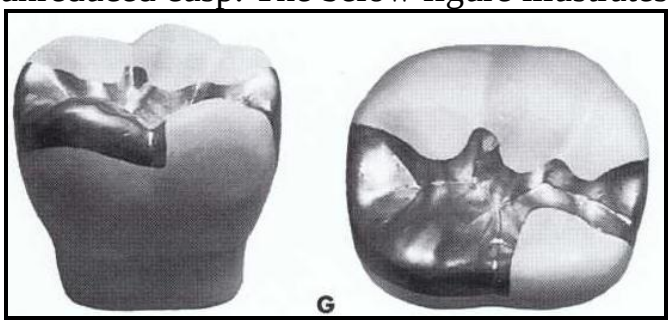
Using the depth cuts as a guide, the reduction is completed to provide for a uniform reduction of tooth structure.



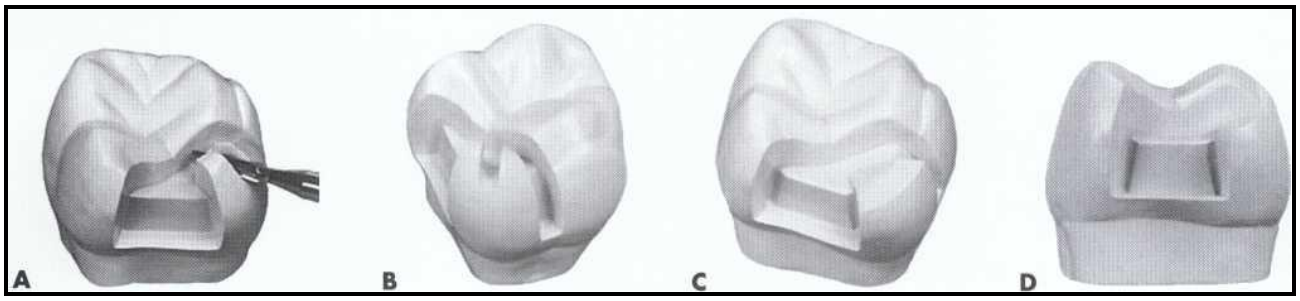
The occlusal contour of the reduced cusp should be similar to the normal contour of the unreduced cusp. Any sharp internal corners of the tooth preparation at the junction of prepared surfaces should be rounded to reduce stress concentration in the amalgam because this improves the resistance to fracture from occlusal forces.



When reducing only one of two facial or lingual cusps, the cusp reduction should be extended just past the facial or lingual groove, creating a vertical wall against the adjacent unreduced cusp. The below figure illustrates a final restoration.



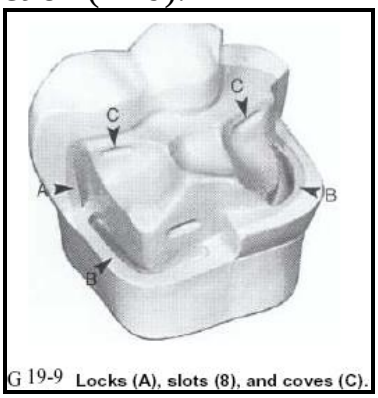
While the procedure for capping the distolingual cusp of a maxillary first molar is done by extending the facial or lingual wall of a proximal box to include the entire cusp is indicated only when necessary to include carious or unsupported tooth structure or existing restorative material. When possible, opposing vertical walls should be converging occlusally, to enhance primary retention form. Also, a facial or lingual groove may be extended to increase retention form. The pulpal and gingival walls should be relatively flat and perpendicular to the long axis of the tooth.



Final Tooth Preparation. After initial tooth preparation of a severely involved tooth, remove any remaining infected carious dentin or remaining old restorative material. A liner can be applied, if needed, and, if used, should not extend closer than 1 mm to a slot or a pin.

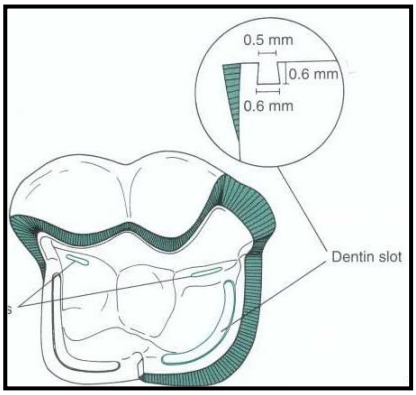
Pins placed into prepared pinholes, coves and retention locks should be prepared, when possible. Coves are prepared in a horizontal plane and locks are prepared in a vertical plane. These locks and coves should be prepared before preparing pinholes and inserting pins. When additional retention is indicated, pins

may be used to increase retention. Slots may be prepared along the gingival floor, axial to the dentinoenamel junction (DEJ).



G 19-9 Locks (A), slots (8), and coves (C).

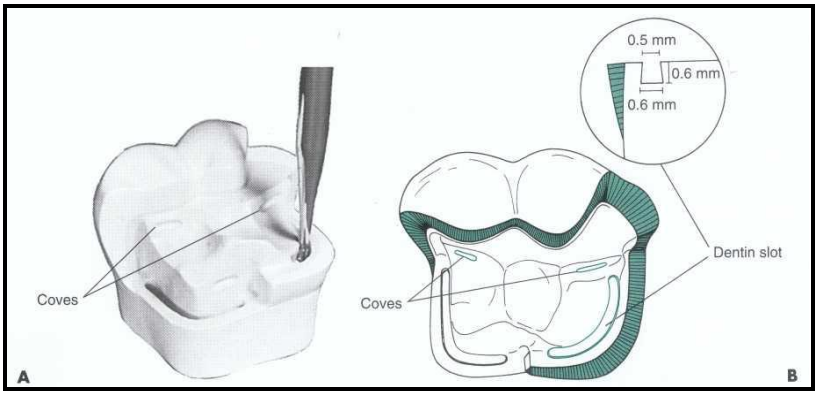
Slot-Retained Amalgam Restorations.



A slot is a retention groove in dentin whose length is in a horizontal plane. Slot retention may be used in conjunction with pin retention, or as an alternative to it. 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.

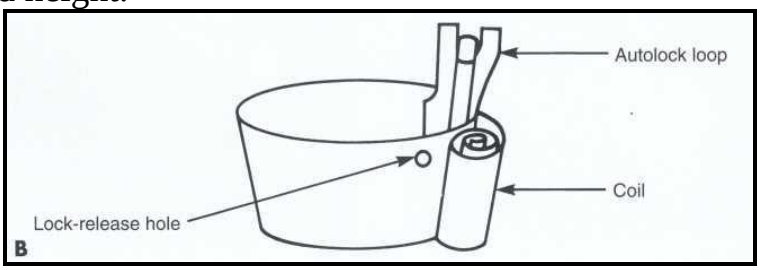
Slot length depends on the extent of the tooth preparation. Slots are usually placed on the facial, lingual, mesial, and distal aspects of the preparation. The slot may be continuous or segmented, depending on the amount of missing tooth structure and whether pins were used. Shorter slots provide more resistance to horizontal force than longer slots.



Matrix Placement. One of the most difficult steps in restoring a severely involved posterior tooth is placement matrix.

Universal Matrix. The placement of retainer and band can be used successfully for the majority of posterior amalgam restorations, but it requires sufficient tooth structure to retain the band after it is applied.

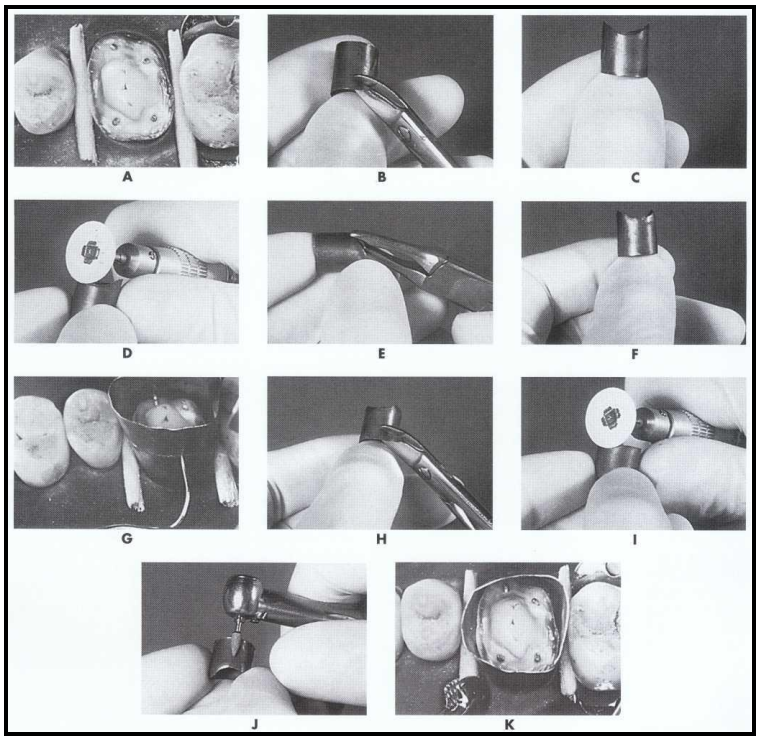
Automatrix. is a retainerless matrix system designed for any tooth regardless of its circumference and height.



Advantages of this system include:
(1) Convenience.
(2) Improved visibility because of absence of a retainer
(3) Ability to place the autolock loop on the facial or lingual surface of the tooth.
(4) Decreased time for application as compared to the copper band matrix.

Disadvantages of this system are that:
(1) The band is flat and difficult to burnish and is sometimes unstable even when wedges are in place
(2) Development of proper proximal contours and contacts can be difficult.

Compound-Supported Copper Band Matrix. Also may be used when the universal matrix cannot be used successfully. Fabrication of the copper band matrix can be time consuming.



Select the smallest copper band that will fit over the circumference of the tooth. Before trying a band on the tooth, cut the gingival end with curved crown and bridge scissors to correspond to the level of the gingiva. Then, smooth any rough edges with a sandpaper disc or mounted rubber wheel, (see Fig. 19-46, B through F). The band should be 1 mm below the gingival margins and 1 to 2 mm above the marginal ridges of adjacent teeth and should provide adequate occlusal height on the facial and lingual surfaces to allow for restoration of reduced cusps.

Regardless of the type of matrix system used, the matrix must be stable. Because If not stable during condensation, a homogeneous restoration may not be developed. The restoration may be improperly condensed, weak. In addition to providing stability, the matrix should extend beyond the gingival margins of the preparation enough to provide support for the matrix and to permit appropriate wedge stabilization.
If the matrix is not secure during condensation, it may slip out of position causing loss of the restoration.

Inserting the Amalgam. A high-copper alloy is strongly recommended for the complex amalgam restoration because of excellent clinical performance and high early compressive strengths . Spherical alloys have a higher early strength than the admixed alloys, and spherical alloys can be condensed quicker with less pressure to ensure good adaptation around the pins.

Matrix removal is critical when placing complex amalgam restorations. If the matrix is removed prematurely, there is risk of amalgam fracture causing loss of the restoration. After condensation of the amalgam and initial carving of the occlusal aspect of the restoration.
Universal retained matrices are removed first by loosening and removing the retainer, and then removing the matrix band with laterally oriented, do not attempt to remove any matrix vertically because this will apply dislodging forces on the recently placed restoration.
Automatrix bands are removed by using the system's instruments.
To remove a **copper band** (after 24 hrs), carefully cut a groove occlusogingivally on the facial and lingual surfaces of the band. Tear the band apart along these grooves with an explorer, and remove the two sections in an oblique direction occlusolingually or occlusofacially. Complete the carving of the restoration.

Contouring and Finishing the Amalgam. Finish and polish the amalgam restoration.

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