

## Flap Surgery

Periodontal flap surgery is one of the most frequently employed procedures, particularly for moderate & deep pockets in the posterior areas. Periodontal flap surgery provides access for root instrumentation & pocket reduction via gingival resection, osseous resection, & periodontal regeneration. So periodontal flaps are used in surgical periodontal therapy to accomplish the following:

1. Access for root instrumentation
2. Gingival resection.
3. Osseous resection
4. Periodontal regeneration

To fulfill these purposes, five different flap techniques are used:

(1) The Modified Widman Flap, (2) The Undisplaced Flap, (3) The Apically Displaced flap, (4) The Papilla Preservation flap, (5) & The Distal Terminal Molar flap.

*The modified Widman flap* facilitates root instrumentation. It does not attempt to reduce the pocket depth, but it does eliminate the pocket lining. The objectives of the *undisplaced & apically displaced flaps* include root surface access & the reduction of probing depth. The choice of which procedure to use depends on two important anatomic landmarks: the transgingival probing depth & the location of the mucogingival junction. These landmarks establish the presence & width of the attached gingiva, which are the basis for the decision. *Papilla preservation techniques* are useful in regenerative therapy, as well as minimizing recession & loss of interdental papilla in the aesthetic area. While *the distal terminal molar flap* is used for treating pockets & osseous defects on the distal surface of the terminal maxillary & mandibular molars.

## Modified Widman Flap

The original Widman flap used two vertical releasing incisions connected by a submarginal scalloped internal bevel incision to demarcate the area of surgery. A full-thickness flap was reflected & the marginal collar of tissue was removed to provide access for root instrumentation & osseous recontouring. In 1974, Ramfjord & Nissle published the “modified Widman flap”, which used only horizontal incisions. This technique offers the healthy collagenous connective tissue to tooth surfaces, & it provides access for adequate instrumentation of the root surfaces & immediate closure of the area.

***The step-by-step technique is as follows:***

***Step 1:*** The first incision parallel to the long-axis of the tooth is a scalloped internal bevel incision to the alveolar crest starting 0.5 to 1 mm away from the gingival margin. The papillae are dissected & thinned to have a thickness similar to that of the remaining flaps.



***Step 2:*** Full-thickness flaps are reflected 2 to 3 mm away from the alveolar crest.

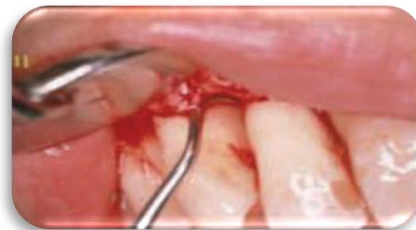


***Step 3:*** The second, crevicular incision is made in the gingival crevice to detach the attachment apparatus from the root.

***Step 4:*** The interdental tissue & the gingival collar are detached from the bone with a third incision



***Step 5:*** The gingival collar & granulation tissue are removed with curettes. The root surfaces are scaled & planed. Residual periodontal fibers attached to the tooth surface should not be disturbed.



***Step 6:*** Bone architecture is not corrected unless it prevents intimate flap adaptation. Every effort is made to adapt the facial & lingual interdental tissue in such a way that no interdental bone remains exposed at the time of suturing. The flaps may be thinned to allow for close adaptation of the gingiva around the entire circumference of the tooth.

***Step 7:*** The flaps are stabilized with sutures & covered with a surgical dressing.



Ramfjord performed an extensive study that compared the modified Widman procedure with the curettage technique & the pocket elimination (gingivectomy & osseous surgery) methods. Results were analyzed yearly for up to 7 years after therapy. The researchers reported similar results for each of the three methods tested. Pocket depth was initially similar for all methods, but it was maintained at shallower levels with the modified Widman flap; the attachment level remained higher with the modified Widman flap.

## Undisplaced Flap

Currently, the undisplaced flap may be the most frequently performed type of periodontal surgery. For the undisplaced flap, the submarginal scalloped internal bevel incision is initiated at a distance from the tooth that is roughly one-half to two-thirds the interdental transgingival probing depth.

This incision can be accomplished only if sufficient attached gingiva remains apical to the incision. Therefore, the two anatomic landmarks, the transgingival interdental probing depth & the mucogingival junction, must be considered to evaluate the amount of attached gingiva that will remain after surgery.

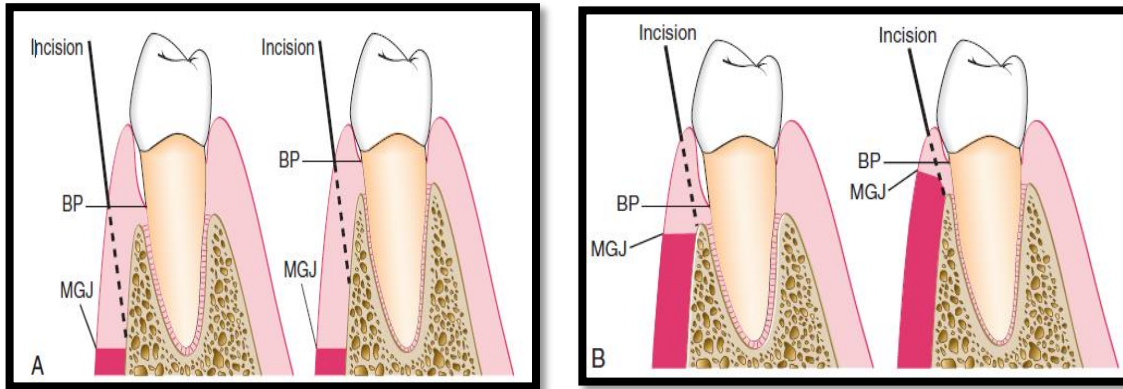
The internal bevel incision should be scalloped to create surgical papillae, which are essential to covering the interdental bone. If the tissue is too thick, the flap margin should be thinned with the initial incision. Proper placement of the flap margin at the alveolar crest during closure is important to prevent either recurrence of the pocket or exposure of bone.

***The step-by-step technique for the undisplaced flap is as follows:***

***Step 1:*** The periodontal probe is inserted into the gingival crevice & penetrates the junctional epithelium & connective tissue down to bone.

***Step 2:*** The mucogingival junction is assessed to determine the amount of keratinized tissue.

***Step 3:*** The initial placement of the submarginal scalloped internal bevel incision is based on the transgingival interdental probing depth & the mucogingival junction (*fig. 1*). The incision is made parallel to the long axis of the tooth & directed down to the alveolar bone. The angulation of the incision may be altered depending on the thickness of the gingiva, as well as the initial placement of the submarginal scalloped incision, to produce a thin flap margin. The thicker the tissue, the more apically the incision will end (*fig. 1*). A short mesial vertical incision may be employed to allow flap release on the palate or to avoid extension of the horizontal incision into the aesthetic area.



*Fig. 1 (A) & (B) The location of two different areas where the internal bevel incision is made in an undisplaced flap. The incision is made at the level of the pocket to discard the tissue coronal to the pocket if remaining attached gingiva is sufficient. BP, Bottom of pocket; MGJ, mucogingival junction.*

**Step 4:** Full-thickness flaps are reflected 1 mm apical to the mucogingival junction.

**Step 5:** The crevicular is made in the gingival crevice to detach the attachment apparatus from the root.

**Step 6:** The gingival collar & granulation tissue are removed with curettes. The root surfaces are scaled & planed.

**Step 7:** Osseous recontouring is performed to eliminate defects & reestablish positive architecture.

**Step 8:** The flaps are coapted on the alveolar crest with the flap margin well adapted to the roots. The flaps may be trimmed & rescalloped if necessary.

**Step 9:** The flaps are stabilized with sutures & covered with a surgical dressing.

## Apically Displaced Flap

The apically displaced flap is selected for cases that present with a minimal amount (<3 mm) of attached gingiva. For this reason, the internal bevel incision should be made as close to the tooth as possible (i.e., 0.5 to 1.0 mm). No need exists to determine where the bottom of the pocket is in relation to the incision for the apically displaced flap as one would for the undisplaced flap. The flap is placed at the tooth–bone junction by apically displacing the flap. Its final position is not determined by the placement of the first incision. With some variants, the apically displaced flap can be used for pocket eradication, widening the zone of attached gingiva, or both.

Depending on the purpose, the apically displaced flap can be a full-thickness flap or a split-thickness flap. The split-thickness flap requires more precision & finesse, as well as a gingiva

that is thick enough to split. The split-thickness flap can be more precisely positioned & sutured in an apical position with the use of a periosteal suturing technique.

***The step-by-step technique for the apically displaced flap is as follows:***

**Step 1:** A marginal scalloped internal bevel incision parallel to the long axis of the tooth is made down to the crest of bone (fig.2).

**Step 2:** If used, vertical incisions are made extending beyond the mucogingival junction. It is important that the vertical incisions - & therefore the flap elevation- reach past the mucogingival junction to provide adequate mobility to the flap for its apical displacement.

**Step 3:** The flap is reflected in full thickness or partial thickness, depending on the thickness of the gingiva & the objective of the surgery.

**Step 4:** Crevicular & interdental incisions are made, & the marginal collar of tissue is removed.

**Step 5:** After degranulation, scaling & root planing, & osseous surgery if needed, the flap is displaced apically.

**Step 6:** If a full-thickness flap was reflected, an independent sling suture positions the flap margin at the alveolar crest, & a surgical dressing can prevent its coronal movement. If a partial-thickness flap was reflected, it can be apically displaced with an independent sling suture, & further stabilized with periosteal sutures. A periodontal dressing can prevent its coronal movement.

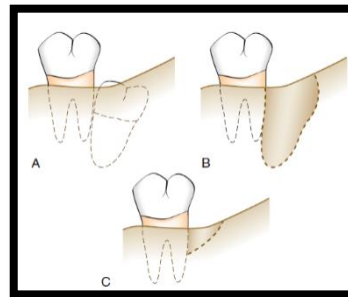
After 1 week, dressings & sutures are removed. The area is usually repacked for another week, after which the patient is to brush gently along the gingival margin with a soft brush & interdentially with interdental brushes.



**Fig.2** An apically displaced flap. (A) & (B) Facial & lingual preoperative views. (C) & (D) The facial & lingual flaps have been elevated. (E) & (F) After debridement of the areas. (G) & (H) The sutures are in place. (I) & (J) Healing after 1 week. (K) Healing after 2 months. Note the preservation of attached gingiva displaced to a more apical position.

## Distal Wedge (Terminal Molar) Flap

The treatment of periodontal pockets on the distal surface of terminal molars is often complicated by *the presence of bulbous fibrous tissue over the maxillary tuberosity or prominent retromolar pads in the mandible*. Some of these osseous lesions may result from incomplete repair after the extraction of impacted third molars.



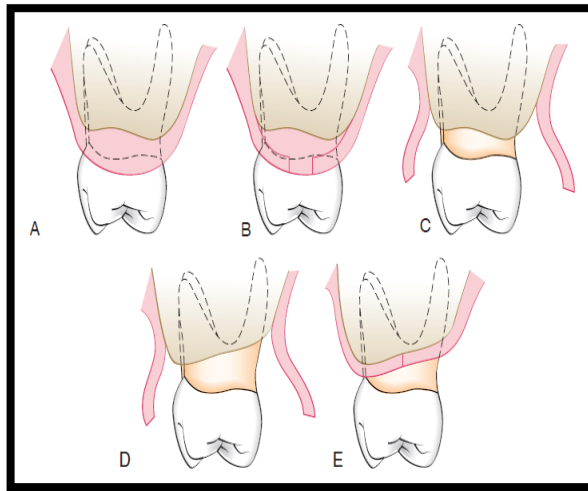
Although the “distal wedge” procedure is popular & widely practiced, it is perhaps one of the most difficult procedures to execute well due to the location of the surgical site, as well as the challenges presented by the anatomy of the mandibular retromolar pad & the maxillary tuberosity. The distal wedge procedure is not simply removing a “wedge of tissue” distal to the terminal molar to reduce or eliminate a pocket. Well-executed distal terminal molar flap surgery requires the flaps to approximate intimately to allow for primary closure & in an apical position to achieve pocket reduction.

Access to these distal areas may be obtained by a single horizontal incision, two converging horizontal incisions, or two parallel incisions extending distally from the distal surface of the terminal molar to the mucogingival junction distal to the tuberosity or the retromolar pad. The distal horizontal incision is connected with the crevicular incision on the distal surface of the terminal molar, which merges mesially with the buccal & lingual or palatal scalloped incisions.

If the *secondary objective* of surgery is *regenerative* or the buccolingual width of the distal keratinized tissue is limited, a *single* horizontal incision in keratinized tissue is used. If the *secondary objective* of surgery is *resective* & adequate keratinized tissue is present buccolingually, *two distal* horizontal incisions are placed in keratinized tissue. The two horizontal incisions technique were described by Robinson & Braden & modified by several other investigators. These techniques are called the distal wedge & the modified distal wedge.

**The distal wedge technique** employs two horizontal incisions that begin at the distal surface of the terminal molar & converge distally at the mucogingival junction distal to the tuberosity or the retromolar pad. **The modified distal wedge technique** employs two parallel horizontal incisions that extend distally from the distal surface of the terminal molar & are connected by a transverse incision distal to the mucogingival junction distal to the tuberosity or retromolar pad.

The buccolingual distance between the two horizontal incisions in both techniques depends on the transgingival probing depth & the amount of fibrous tissue involved. When the flaps are thinned & the tissue between the two incisions is removed, the two flap edges must approximate each other at a new apical position without overlapping (*fig.3*).



**Fig.3** (A) Coronal view from behind a maxillary second molar with an osseous defect. (B) Distal terminal flap surgery employing two horizontal incisions; both buccal & lingual flaps are thinned. (C) Buccal & lingual flaps are elevated, & the “wedge” of tissue is removed. (D) The bone is sloped to the palatal side to eliminate the osseous defect. (E) The flaps are coapted on the bone in the apical position.

Generally, the distance between the two parallel incisions is roughly one-half to two-thirds the distal transgingival probing depth & should never be farther apart than the distance between the buccal & lingual line angles of the tooth.

To ensure primary closure of the distal flaps, especially in the tuberosity, it is advantageous to use one horizontal incision or two horizontal incisions that are closer together rather than farther apart.

### Papilla Preservation Flap

In current regenerative therapy, bone grafts, membranes, or a combination of these are used with or without other biologics. The flap design should maximize the amount of gingival tissue & papilla retained to cover the material placed in the osseous defect. In the esthetic area, when surgery is necessary, flap design must minimize recession & loss of interdental papillae. As such, the crevicular incision is the incision of choice for the anterior aesthetic area & regenerative therapy.

The interdental papilla is retained with the papilla preservation technique when the interdental space is adequate for reflection of the intact papilla; otherwise, it is split beneath the contact point of the two approximating teeth. The flap is elevated in full thickness without thinning of the flap or the papilla.

***The step-by-step technique for the papilla preservation flap (Fig.60.24) is as follows:***

**Step 1:** A crevicular incision is made around each tooth, with no incisions across the interdental papilla.

**Step 2:** The preserved papilla can be incorporated into the facial-buccal flap (original papilla preservation technique) or lingual-palatal flap (modified papilla preservation technique). If the preserved papilla is reflected with the facial-buccal flap, the semilunar incision at the base of the

papilla is on the lingual-palatal side of the interdental space. If the preserved papilla is reflected with the lingual-palatal flap, the semilunar incision at the base of the papilla is on the facial-buccal side of the interdental space. This semilunar incision dips apically from the line angles of the tooth so that the incision is at least 5 mm from the crest of the papilla.

**Step 3:** The papilla is then elevated with an Orban knife or curettes & is reflected intact with the flap.

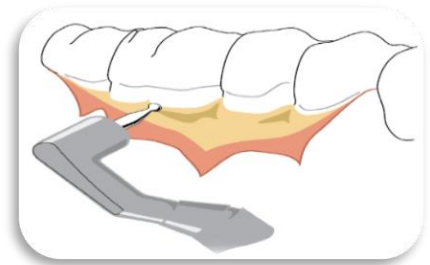
**Step 4:** The flap is reflected without thinning the tissue.



**Fig.4** Papilla preservation flap. (A) Facial view after sulcular incisions have been made. (B) Straight-line incision in the palatal area about 3 mm from the gingival margins. This incision is then connected to the margins with vertical incisions at the midpart of each tooth. (C) Papillae are reflected with the facial flap. (D) Lingual view after the reflection of the flap. (E) Lingual view after the flap is brought back to its original position. It is then sutured with independent sutures. (F) Facial view after healing. (G) Palatal view after healing.

## Osteoplasty

The term *osteoplasty* was introduced by Friedman in 1955. The purpose of osteoplasty is to reshape the alveolar bone *without* removing any “supporting” bone. Examples of osteoplasty are the thinning of thick osseous ledges & the establishment of a scalloped contour of the buccal (lingual & palatal) bone crest (*fig.8*).



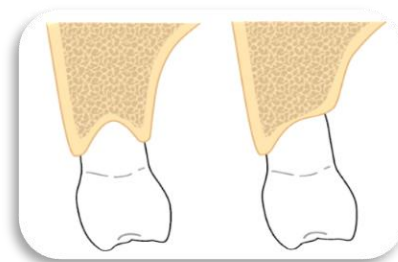
**Fig.8** Thick osseous ledges in a mandibular molar region area are eliminated with the use of a round bur to facilitate optimal flap adaptation.

In flap surgery without bone recontouring, interdental morphology may sometimes preclude optimal mucosal coverage of the bone postsurgically, even if pronounced scalloping of soft tissue flaps is performed. In such a situation, removal of non-supporting bone by vertical grooving to reduce the faciolingual dimension of the bone in the interdental areas may facilitate flap adaptation, thereby reducing the risk of bone denudation as well of ischemic necrosis of unsupported mucosal flaps due to flap margin deficiencies.



Removal of non-supporting bone may sometimes also be required to gain access for intrabony root surface debridement.

The leveling of interproximal craters & the elimination (or reduction) of bony walls of circumferential osseous defects are also referred to as “osteoplasty” since usually no resection of supporting bone is required (*fig.9*).



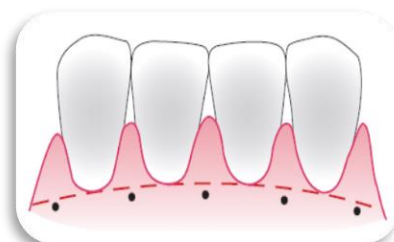
*Fig.9* Leveling of an interproximal bone crater through the removal of the palatal bone wall. For esthetic reasons, the buccal bone wall is maintained to support the height of the soft tissue.

## Suturing Techniques

The needle is held with the needle holder, & it should enter the tissues at right angles & be no less than 2 to 3 mm from the incision. The needle is then carried through the tissue, where it follows the needle’s curvature. The knot should not be placed over the incision.

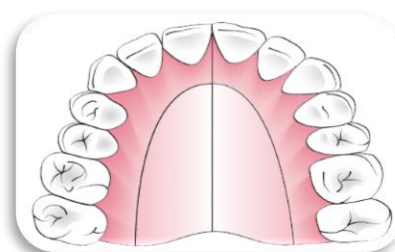
The periodontal flap is closed either with *independent* sutures or with *continuous, independent sling* sutures. The latter method eliminates the pulling of the buccal & lingual or palatal flaps together & instead uses the teeth as an anchor for the flaps. The flaps are less likely to buckle, & the forces on the flaps are better distributed.

Sutures of any type that are placed in the interdental papillae should enter & exit the tissue at a point located below the imaginary line that forms the base of the triangle of the interdental papilla (*fig.5*). The location of sutures for the closure of a palatal flap depends on the extent of flap elevation that has been performed. The flap is divided into four quadrants, as depicted in (*fig.6*).



*Fig.5* Placement of sutures in the interdental space below the base of an imaginary triangle in the papilla

If the elevation of the flap is slight or moderate, the sutures can be placed in the quadrant closest to the teeth. If the flap elevation is substantial, the sutures should be placed in the central quadrants of the palate. The clinician may or may not use periodontal dressings.



*Fig.6* Placement of sutures to close a palatal flap. For slightly or moderately elevated flaps, the sutures are placed in the shaded areas. For the more substantial elevation of the flap, the sutures are placed in the central (unshaded) areas of the palate.

When the flaps are not apically displaced, it is not necessary to use dressings other than those needed for patients’ comfort.