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The Semilunar Flap Technique for Root Coverage

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The semilunar flap procedure was introduced to the dental profession by Tarnow[5] as a suture-free root coverage technique. To date, no long-term controlled studies have provided outcomes assessment data with regard to predictability and percentage of recession resolution using this technique. Nevertheless, the semilunar flap may be considered as a valid option in the treatment of single- or multiple-site marginal tissue recession[3] when the following prerequisites exist:

1. Adequate zone of keratinized tissue.
2. Intact interdental papillae.
3. Absence of severe facial ridge curvatures coronoapically.
4. Relatively thick periodontium (ie, type I or II)[4].

When compared with the coronally repositioned flap,[2] the advantages of the semilunar flap technique were listed by the original authors as follows:

1. No disturbance of the adjacent papillae.
2. No shortening of the vestibule.
3. No tension on the flap.
4. No sutures needed.

The following cases will demonstrate the surgical technique for treatment of various recession conditions using the semilunar flap.

The patient in color Figure 1*A* presents with a 4-mm root denudation on the maxillary right cuspid as a result of toothbrush trauma at the marginal gingiva over the prominent root surface. Careful root planing must be performed using a Gracey curette or a Kirkland back-action chisel for exposure of fresh root surface collagen that would allow formation of a new attachment. This may be further enhanced by application of tetracycline to the exposed root surface. In the authors' experience, one of the critical factors for success of this procedure is placement of the apical crest of curvature of the semilunar incision within the mucosal tissues. For this reason it is important to accurately determine the location of the mucogingival

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Figure 1. *A*, Marginal tissue recession on tooth number 6. *B*, Identifying the level of the mucogingival junction. *C*, Initial split-thickness sulcular incision. *D*, Semilunar incision extending beyond the mucogingival junction. *E*, Connecting both incisions. *F*, Coronal repositioning of the flap. *G*, Healing at 10 days. *H*, Complete root coverage maintained at 1 year.

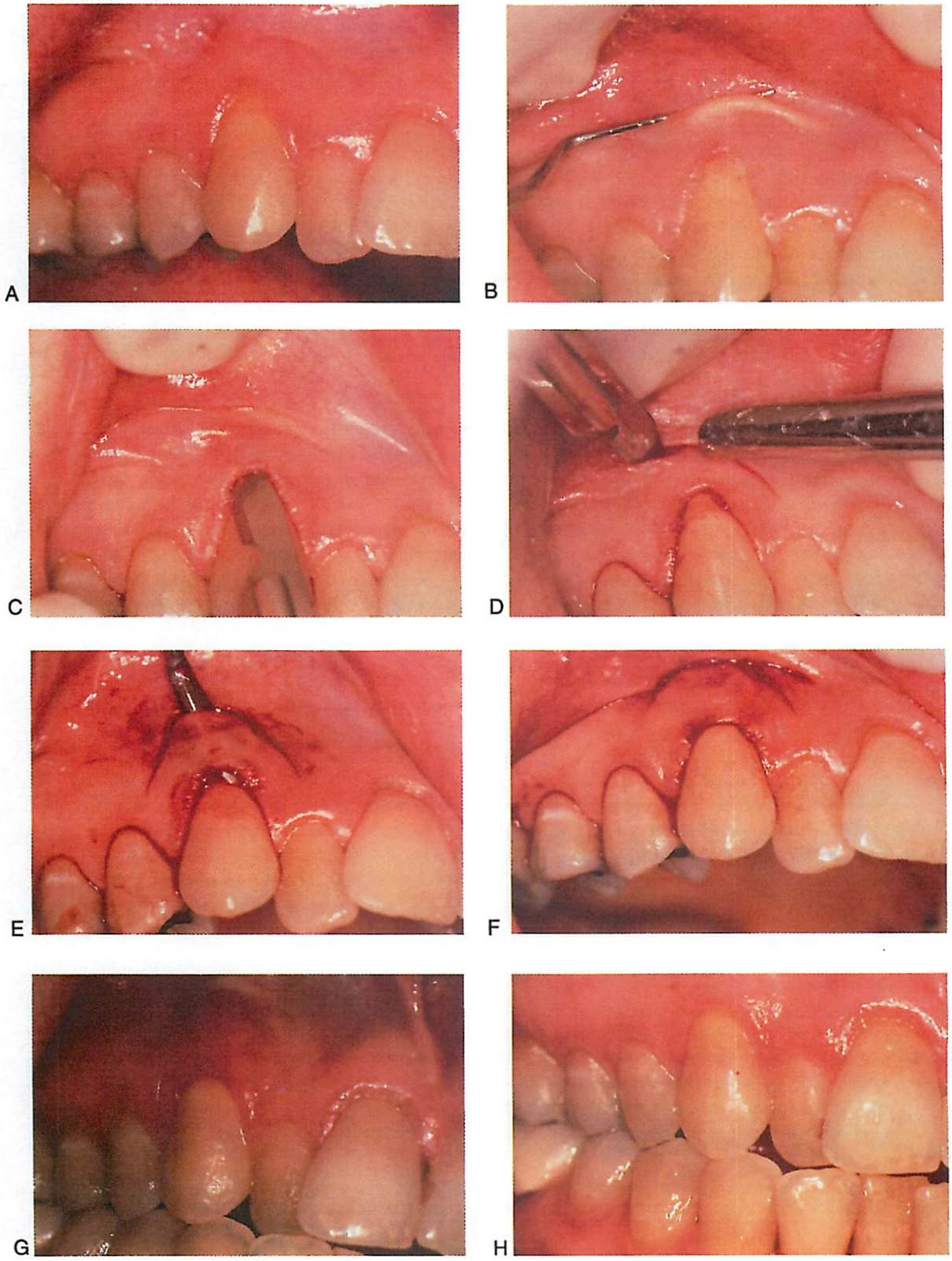

Figure 1.

junction by rolling the alveolar mucosa in a coronal direction with a periodontal probe to verify the level at which the attached gingival tissues terminate (Fig. 1*B*). This technique is preferred over using mere color change to distinguish between fixed and movable soft tissues due to increased reliability, especially when inadequate contrast exists at the transitional zone.

A number 15c blade is used to establish a sulcular partial-thickness incision directed apically toward the alveolar mucosa and following a semilunar pattern mesiodistally (Fig. 1*C*). As the sharp dissection proceeds apically, the blade must be curved to follow the osseous contour, with caution at the mucogingival junction to avoid tissue perforation. It should be emphasized that a monoplane dissection must be maintained while carefully advancing toward the critical interproximal areas. In the meantime, a plane of incision that is too superficial must be avoided to prevent sloughing of the flap.

A semilunar incision is performed starting approximately 3 mm from the adjacent free gingival margins at the base of the papilla, following the contour of the marginal gingiva from one interproximal area apically, well into the alveolar mucosa, then continuously curving coronally to the other interproximal area (Fig. 1*D*). This incision should extend only as deep as the level of the previously created pouch. A minimum of 2 to 3 mm of intact tissue must be maintained at both mesial and distal aspects of the flap to ensure adequate blood supply and prevent tissue laceration at these vulnerable junctions at coronal repositioning time. The authors prefer to use this approach as a modification of the original protocol, in which the semilunar incision initiates the procedure, due to added safety with split-thickness dissection. Increased predictability has been experienced with this approach because better blood supply is maintained in the superficial layer (flap) while pouching coronoapically. A periodontal knife is then used to free any attached tissue tags, through the apical semilunar incision (Fig. 1*E*) as well as through the sulcular incision, assuring continuity in both the mesiodistal and apicocoronal directions. Once complete flap freedom has been achieved, the flap is easily advanced as far coronally as possible without tension (Fig. 1*F*). Overcorrection is recommended to compensate for possible posthealing tissue shrinkage.

A moist gauze pad is placed with light pressure perpendicular to the flap at its new level for 5 to 10 minutes to avoid formation of a dead space between the flap and the underlying tissues. Use of a periodontal dressing is optional and is advised only when adequate stabilization of the pack can be ensured; otherwise, superficial friction from dressing movement may jeopardize the results. In our opinion, strict adherence to a soft diet for 7 to 10 days and avoiding tooth brushing at the surgical site for 2 weeks postoperatively are vital to success without need for packing. Figure 1G shows healing after 10 days where no periodontal dressing has been applied, with maintenance of 100% root coverage at 1 year following surgery (Fig. 1*H*).

One of the common applications of the semilunar flap is correction of free gingival margin levels following traumatic restorative procedures in the esthetic zone. The patient in Figure 2*A* had undergone esthetic crown lengthening surgery for optimization of marginal tissue levels and clinical crown dimensions prior to ceramic veneer preparation to mask internal tetracycline tooth staining.

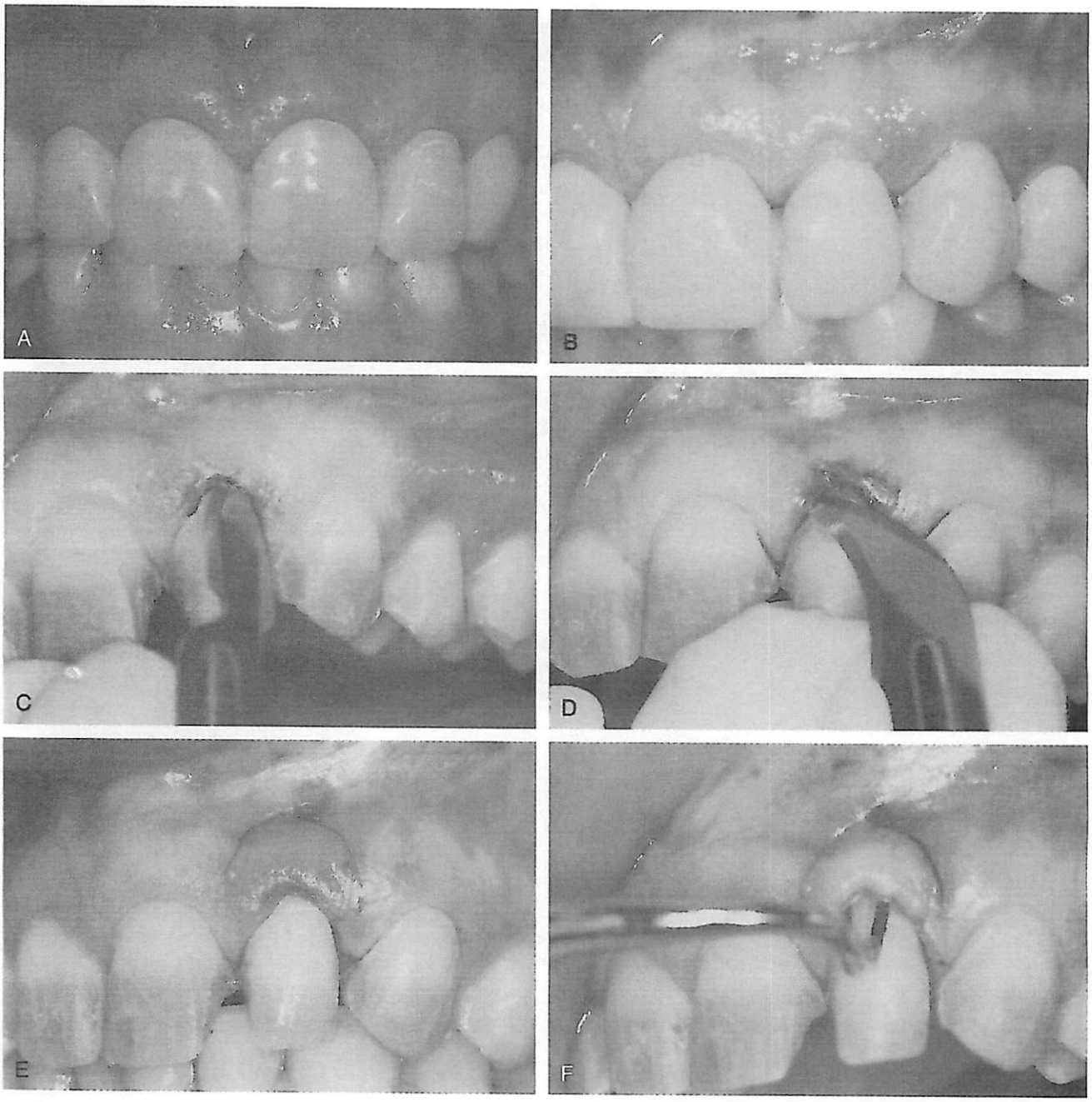

Figure 2. *A,* Provisional restorations before impression procedures. *B,* Recession at number 10 caused by traumatic impression technique. *C,* Midfacial split-thickness incision. *D,* Interproximal releasing incision. *E,* Semilunar incision. *F,* Connecting both incisions.

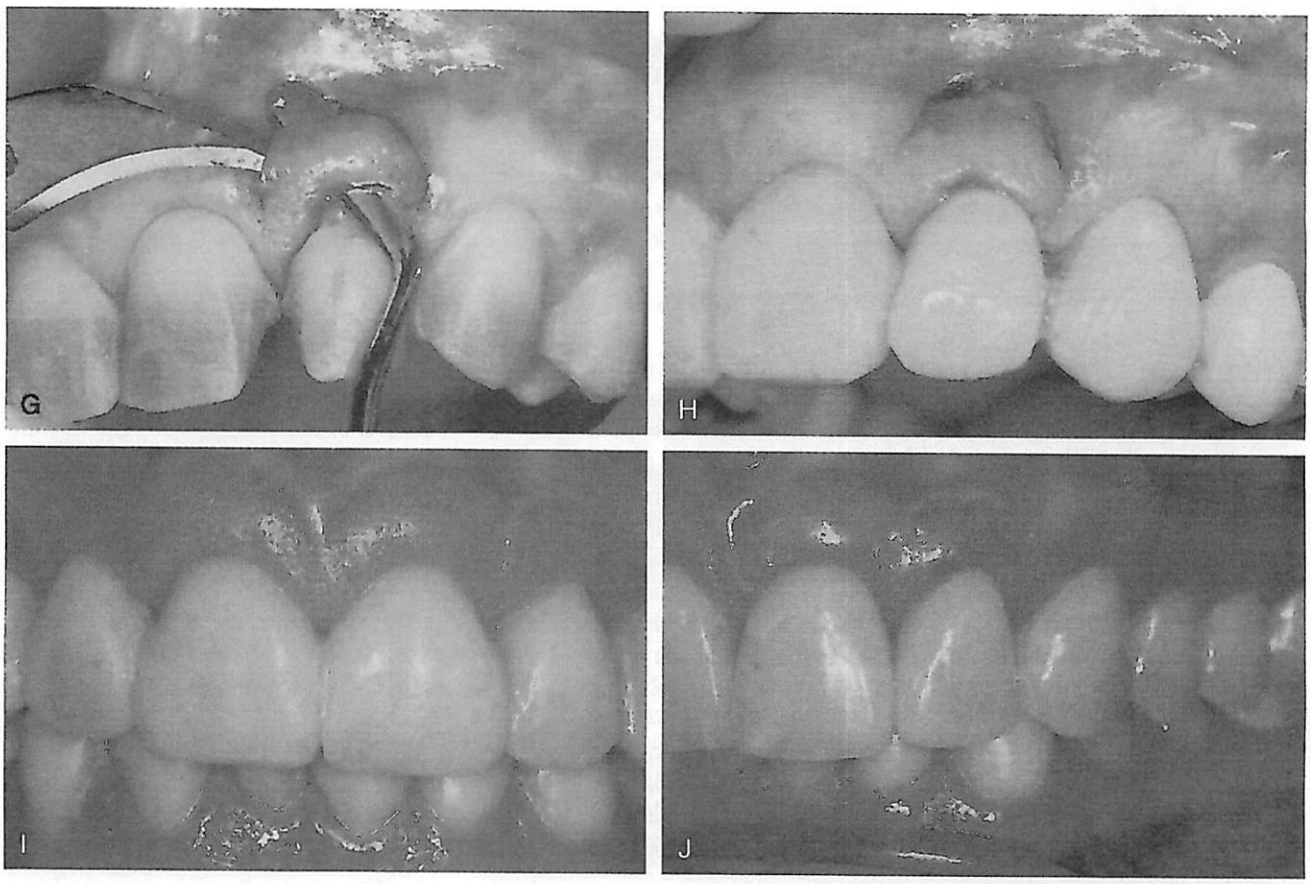

Figure 2 (*Continued*). *G,* Freeing residual attachment sites. *H,* Coronal advancing of the semilunar flap. *I,* One-month result. *J,* Ten-month result with final veneer restorations.

At this stage, temporary resin veneer restorations were placed after tooth preparation by the prosthodontist. Due to traumatic tissue retraction cord packing at the time of final impressions, the patient presented with marginal tissue sloughing after 3 days with subsequent recession at tooth number 10 after 2 weeks (Fig. 2*B*).

In order to correct the existing problem and reestablish symmetrical crown proportions, a semilunar flap offers a minimally invasive solution. The provisional restoration is removed for surgical convenience, and a split-thickness sulcular incision is initiated and directed apically beyond the mucogingival junction, as previously described (Fig. 2*C*). Due to restricted accessibility at the mesial and distal marginal areas, a number 12b blade is preferred over the 15c blade to undermine the tissues apical to the papilla (Fig. 2*D*).

After root preparation as above, a semilunar incision is performed following the curvature of the receded free gingival margin (Fig. 2*E*), then monoplane communication between both incisions is verified using an Orban periodontal knife (Fig. 2*F*). If minor tissue tags persist at either end of the flap preventing tension-free mobilization, these can be released easily using the tip of the number 12b blade through the semilunar incision while supporting the superficial tissues (Fig. 2*G*). The flap can then be coronally repositioned to the desired original level (Fig. 2*H*) and maintained in the new position without packing, as shown in Figure 2*I* 1 month post operatively.

Figure 2*J* presents the final restorative outcome with ceramic veneers in place and stable marginal tissue levels 10 months after performing this procedure.

Under limited conditions, the semilunar flap may be used to idealize the free gingival margin levels on the facial aspect of implant abutments when only a minor correction is required. In such cases, an unpredictable result is to be anticipated because the natural root dentine is not present to offer a biological surface for new attachment formation. A recent experimental study has demonstrated, however, the formation of a mucosal attachment at commercially pure titanium and ceramic abutments, which included one epithelial and one connective tissue portion that were about 2 and 1 to 1.5 mm high, respectively.[1] Because no long-term clinical studies are available, patients must be informed that attempting this technique is experimental at the present time, but may be worth consideration due to its minimally invasive nature.

The patient in Figure 3*A* presents with intact papillae but exhibits a receding facial marginal tissue level following implant abutment placement at the number 7 position. Asymmetry between right and left sides dictated the need for crown lengthening of teeth numbers 6 and 8 (refer to article in this issue on crown lengthening); however, the planned future clinical crown lengths would not provide for ideal esthetic proportions without an additional procedure to resolve the horizontal discrepancy between marginal levels of teeth numbers 7 and 10.

Figure 3. *A,* Unesthetic length of the implant abutment. *B,* Careful interproximal dissection to avoid disturbing the intact papilla. *C,* Semilunar incision extending into alveolar mucosa. *D,* Coronal repositioning of the marginal tissue level. *E,* Healed tissues before crown lengthening.

Because the final outcome may be unpredictable, the semilunar flap approach is attempted at the number 7 implant abutment prior to crown lengthening the adjacent natural teeth. After performing the sulcular incision as previously described, a number 12b blade is used to carefully dissect beneath the papilla (Fig. 3*B*). Then, the classic semilunar incision is made following the same guidelines for natural dentition (Fig. 3*C*).

In case of implant abutments, significant overcorrection must be planned (Fig. 3*D*) to compensate for postoperative tissue retraction. An adequate healing period (approximately 4–6 weeks) must be allowed for tissue stabilization (Fig. 3*E*) before any further surgical or restorative procedures are performed in order to avoid premature misjudgment of final gingival margin levels.

SUMMARY

The semilunar flap technique may be considered as a simple, minimally invasive option for coronally repositioning the receded free gingival margin on the facial aspects of natural teeth and implants. Judicious case selection and careful application of the described procedure may enhance the final esthetic outcome using this approach. Work is currently in progress by the authors to provide long-term evidence-based results using this technique, with future considerations including the application of recent advances in microsurgical instrumentation to facilitate surgical tissue management.

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