Repair Following Periodontal Flap Surgery with the Retention of Gingival Fibers

by

H. LESLIE LEVINE, D.D.S.
S. SIGMUND STAHL, D.D.S.

The level of gingival repair following the performance of periodontal surgery is of primary concern to the periodontal therapist. Obviously, the ideal postsurgical repair would be the establishment of a new soft tissue attachment in the most coronal position possible. Insertion of collagen fibers into cementum at a level more coronal to that which existed prior to surgical intervention has been repeatedly demonstrated. The technique and conditions that produce such a response on a predictable basis, however, are currently unknown. On the other hand, it has been our clinical impression that when gingival fibers were left attached to the root of the tooth, rapid repair would occur without loss of attachment level. Speculations similar to ours have been made regarding the interdigitation of newly formed fibers from the soft tissue wound with incised collagen fibers whose ends remain attached to the cementum. While the exact mechanism of this type of repair is not known, it has been described in both tendon and skin wounds. At these sites, union occurred from one to two weeks after surgery. It should be noted that similar sequences have also been related to the continuing repair activities seen in periodontal lesions. This information suggested a histologic study of the repair of gingival wounds in patients where attached supracrestal fibers were allowed to remain on the root surface during surgery.

Materials and Methods

Periodontal flap surgery was performed on eight periodontally involved teeth in two Caucasian females aged 45 and 52 years respectively. These teeth were to be extracted for the fabrication of a prosthesis. The surgery was conducted retaining gingival fibers as described in a previous paper. The operative procedure was executed on the facial aspects of the eight involved teeth as follows. The flaps on four of the teeth were resutured at a level similar to that noted prior to surgery; however, care was taken not to remove the attached gingival fibers. Two teeth had all of the supracrestal gingival fibers removed with a curette, and the root surfaces of the teeth were deliberately planed to the crest of the alveolar process. The flap was then replaced to a level similar to that noted prior to surgery. One tooth was extracted prior to flap replacement. This was done to examine
histologically the portions of gingival fibers that remained on the root after the flap was reflected and the detached gingiva excised. One tooth was left unoperated as an experimental control. A dressing was placed over the operated area and left in place for ten days. Erythromycin at 1000 mg. per day was given to the patient the day before surgery and continued for five days post-surgery. Routine postoperative care was employed following surgery. In view of repair sequences reported at other sites, the six operated teeth and the one unoperated control tooth were removed by block resection three weeks after surgery. The blocks were prepared for histologic section, cut in a labial-lingual direction, and stained with hematoxylin-eosin stain, Mallory's stain, and silver impregnation. Step serial sections were utilized in the histologic analysis. Figures 1 to 13.

**Observations**

The clinical conditions are demonstrated in Figures 1 to 3. The specimen removed immediately prior to flap replacement showed inserted collagen fibers (Fig. 4). Biopsy specimens from the control (Fig. 13), non-root-planed teeth (Fig. 8), and root-planed teeth (Fig. 5) excised three weeks after surgery showed similar typical marginal inflammatory responses. The teeth that were root-planed during flap surgery demonstrated marked apical migration of the epithelium, with a long adherent epithelial cuff. The apical position of the attached cuff had reached an area close to the level of the alveolar process. Cementum had essentially been removed, and little evidence of resorption of tooth structures was seen (Fig. 5 to 7). By contrast, the teeth on which gingival fibers were retained, but which did not receive root-planing during surgery, demonstrated limited epithelial apical migration and attached and functionally oriented gingival fibers immediately apical to the cuff. Cementum was observed to be of a uniform thickness coronal to the crest of the alveolar bone and did not show evidence of resorption or subsequent repair (Fig. 8 and 9). Connective tissue stains demonstrated the presence of a functionally oriented and attached gingival complex three weeks after surgery. Detailed examination of the gingival region showed collagen bundles in “apparent continuity” with argyrophilic fibers (Fig. 10 to 12).
Figure 6. A higher magnification of area A. Magnification X75.

Figure 7. A higher magnification of area shown in Figure 6 demonstrating apical migration of the epithelium onto the remaining cementum and the parallel orientation of collagen bundles adjacent to the tooth immediately below the apical end of the cuff. Magnification X125.

Figure 8. A survey magnification of a section from the left maxillary central incisor. The supracrestal fibers were retained on this tooth. Note the relatively short attached epithelial cuff (0.5 mm). The fibers apical to the cuff appear to be attached to a well-defined cemental layer and are functionally oriented. Hematoxylin and eosin.

Figure 9. A higher magnification of Area B demonstrating the fibers below the attached cuff. Magnification X350.
COMMENT

In our introduction, we suggested that a remodeling process occurred between the cut connective tissue surfaces of a wound whereby new collagen fibers forming within the wound become united with pre-existing collagen fibers. The details of this process, however, have not been finally elucidated. Biochemically, it has been postulated that pre-existing collagen may be depolymerized to molecular units, or subunits, which reaggregate to contribute to newly forming connective tissue. Although our material does not answer the above-outlined problem, it does support the repair sequence of incised fibers observed in skin and tendon healing. The time sequence also appears similar to most sequences described at other wound sites.

Of particular periodontal interest was the variant in healing response when cementum had or had not been planed. The planed roots exhibited a long, adhering, epithelial cuff in association with lack of root resorption. In a previous discussion, conditions which might determine different modes of gingival repair were evaluated. It was suggested that cemental repair associated
with newly attached fiber formation was most frequently seen at sites of previous cemental or dental resorption and such a resorptive phenomenon might be a significant precursor for renewed cementogenesis. In the present material, root resorption did not take place, but rather, the epithelium migrated apically resulting in a long epithelial adherence to the root surface. Why this response took place rather than, for example, formation of parallel-oriented collagen fibers often seen following flap procedures, is not known. One might consider, however, that the degree of trauma to the root surface sustained by instrumentation and the intensity of the inflammatory response may play a significant role in determining the mode of postsurgery soft tissue to tooth interfaces.

**Summary and Conclusion**

A technique of periodontal flap surgery aimed at maintaining attached gingival fiber units has been evaluated by limited histologic material from patients. Our data suggested that maintenance of attached gingival fibers aided in predicting postsurgical attachment levels. We concluded from the histologic material that severed gingival fibers allowed to remain attached to the root joined in some manner with newly forming fibers from the soft tissue wound border. In only three weeks, this led to a functionally oriented gingival fiber complex.

**References**


**Announcement**

As part of the meeting four continuing education programs will also be conducted. The specific material to be covered will be (1) Clinical Laboratory Aspects, (2) Diagnostic and Unusual Problems in Oral Disease, (3) Cryotherapy, and (4) Dental and Oral Manifestations of Genetic Disease.

The meeting is open to all interested individuals. Those desiring additional information should write to Dr. George C. Blount, Secretary-Treasurer, College of Dentistry, Ohio State University, Columbus, Ohio 43210.