Article 3

Continuing Education

Covering Denuded Maxillary Root Surfaces With the Subepithelial Connective Tissue Graft

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The subepithelial connective tissue graft is an esthetic gingival grafting procedure used to cover denuded single and multiple surfaces primarily of maxillary anterior and bicuspid teeth. A clinical study of 10 private practice periodontal patients is presented with results of 97.04% root coverage achieved on average in 21 sites treated, which had an average recession of 3.86 mm. The technique and the rationale for its use are presented with documented case report results.

Introduction

A current goal in dentistry in general and periodontics in particular is to maximize our esthetic results. Miller[1,2] and Holbrook and Ochsenbein[3] reported on various surgical techniques to attain the cosmetic result of root coverage, using the free soft-tissue autograft technique with and without the use of citric acid root conditioning, respectively. Levine[4,5] reported achieving similar results using surgical techniques described by Miller and Holbrook and Ochsenbein. The results have been extremely predictable, gaining 100% root coverage on most teeth (indicated to be) treated in the anterior mandibular region of the mouth. However, the technique has not been very predictable when trying to cover very wide and deep areas of recession (greater than 3 mm in height and width) that are often present in the maxillary jaw where the mesiodistal and apicocoronal distances to cover are significantly greater than those in the lower anterior region. In addition, the free soft-tissue autograft technique for root coverage has its limitations in the treatment of multiple areas of recession. Holbrook and Ochsenbein[3] reported that 50 teeth with recessions less than 3 mm had close to 96% total root coverage. Recessions of 3 to 5 mm had coverage of approximately 81%. The success rate decreased to about 77% with recession greater than 5 mm. Miller[2] documented 100% root coverage attained in 87% (58 of 66) of areas of deep and wide recession and in 100% (13 of 13) of areas of shallow and wide recession in 100 cases (91 mandibular and 9 maxillary). Based on this research, it is possible to predict that in maxillary cases of deep-wide marginal recession, using free soft-tissue autografts will achieve 100% coverage in 77% to 87% of cases.

Langer and Langer[6] developed a subepithelial connective tissue graft technique to address the problem of predictability in covering isolated and/or multiple sites as generally seen

Figure 1—Patient presented with esthetic chief complaint of gingival recession on teeth Nos. 12 and 13. Facial attachment loss (visible and hidden recession) recorded 3 mm on tooth No. 12 and 3 mm on tooth No. 13. Probing depths were within 3 mm throughout this sextant. No proximal bone loss was noted radiographically.

Figure 2—Buccal partial thickness pedicle flap raised with vertical releasing incisions extending up into the mucobuccal fold in area of distobuccal line angle of tooth No. 11 and mesiobuccal lingual angle of tooth No. 14. A butt joint incision was made at level just above the CEJ into the adjacent papillary areas. Root surfaces are thoroughly root planed to reduce the convexity of the root to the level of attachment loss previously recorded.

in the maxillary jaw. The technique is an adaptation of the subepithelial connective tissue graft used to correct edentulous ridges.[7,8] It combines the positive features of both the pedicle flap and free soft-tissue autograft techniques.

Indications

According to Langer and Langer[6] the indications for the procedure include:

1. inadequate donor site for a horizontal sliding flap
2. isolated wide gingival recession
3. multiple root exposures
4. multiple root exposures in combination with minimal attached gingiva
5. recession adjacent to an edentulous area that also requires ridge augmentation.

Surgical Technique

Recipient Site

Presurgical analgesic and anti-inflammatory premedication with Motrin®[a] (ibuprofen) 800 mg t.i.d. commencing 2 days before surgery is recommended to the patient. Peridex®[b] (0.12% chlorhexidine) is used as a presurgical disinfectant, also beginning 2 days before surgery. Medrol Dosepack®[a] (methylprednisolone) is prescribed to reduce swelling and, thus, postoperative discomfort when there is no contraindication to steroid usage, and is commenced the morning of the procedure. A partial thickness flap is raised using vertical releasing incisions anteriorly and posteriorly of the tooth (or teeth) to be treated. The flap extends up into the mucobuccal fold area a significant distance and at least one-half to one tooth to achieve adequate release and flexibility of the gingival flap, which will be coronally positioned later (Figures 1 and 2). The coronal margin of the flap is prepared to create a butt joint as described by Miller just coronal to the cementoenamel junction (CEJ). Sulcular incisions connect the butt joints while keeping the papillary areas intact.

[a] Upjohn Company, Kalamazoo, MI 49001
[b] Procter & Gamble Cincinnati, OH 45202

Figure 3—Lifting of palatal partial thickness flap to gain access to connective tissue wedge of adequate length and thickness (1 to 2 mm).

Figure 4—Primary wound closure of the palate with 4-0 silk after placement of hemostatic agent (Gelfoam®). Suturing the lateral borders to prevent hemorrhage and formation of hematoma is also recommended.

Figure 5—Connective tissue graft sutured up to the butt joint coronally and to the vertical releasing incisors laterally with 5-0 resorbable gut sutures.

Figure 6—Partial thickness flap is coronally positioned to gain coverage over connective tissue graft and sutured with 4-0 silk. Adequate releasing incisions into the mucobuccal fold areas are necessary to avoid excessive pulling on the flap, which would compromise its blood supply.

Thorough root planing as described by Levine[5] to the level of the clinical hidden recession (attachment loss as measured from CEJ to base of sulcus) is used to detoxify the root surface and reduce the root convexity locally, thereby decreasing the surface area needed to be covered.

Donor Site

The palate is used as the donor site. The first incision starts approximately 5 to 6 mm from the gingival margins of the maxillary teeth and extends a few millimeters past the desired length on either side to allow easy removal and access. It is continued as an inverse bevel incision apically towards the alveolar bone.

A second parallel incision is made approximately 2 mm coronal to the first incision and is carried apically until it meets the base of the original incision. The surgeon scores the palatal bone to permit easy removal of the connective tissue wedge. Vertical incisions on either side of the horizontal incision provide access for removal of a connective tissue graft of the correct size, which promotes ideal wound closure (Figure 3). Because the wedge of connective tissue is removed, the palate is not denuded as it would be with a free soft-tissue autograft; thus, the course of palatal healing is significantly improved with greater comfort via primary wound closure (Figure 4). A hemostatic gauze material (Gelfoam®[a]) that fills the dead space and prevents hemorrhage by aiding the clotting process can be placed after removal of the wedge.

When the graft is extraoral, all adipose tissue is removed by dissection. Langer and Langer believe that leaving the 2-mm band of epithelium (the coronal aspect of the graft) provides a smoother junction with the existing epithelium when it is placed marginally on the denuded root surfaces. The present author has found no difference in healing when the epithelial portion is omitted as described above.

Figure 7—Six-week postoperative visit. Note 100% root coverage with displacement of nonkeratinized tissue coronally from the pedicle flap.

Figure 8—At 6-week postoperative visit, a gingivoplasty of outer mucosal surface down into the connective tissue portion (donor tissue) is completed.

Figure 9—Three-month postoperative visit reveals 100% coverage of teeth Nos. 12 and 13 with less than 1 mm midbuccal probing depth and no bleeding upon probing.

Recipient Site

After the adipose tissue has been removed, the graft is placed over the prepared denuded root surface(s) to be covered and is sutured with 5-0 plain gut with a P-2 atraumatic needle (Figure 5). This small needle provides pinpoint placement of the graft. The dissolvable sutures enable the clinician to avoid disturbing the graft at the first postoperative visit. After the graft has been sutured coronally and laterally, the partial thickness recipient flap is coronally positioned and sutured to cover as much of the graft as possible. Vertical releasing incisions into the vestibular area create enough slack via the inherent elasticity of the mucosal tissue[2] to attain total coverage of the graft in most cases. When adequate vestibular releasing incisions are made, the author has not seen the problem noted by Langer and Langer of creating an excessive pull on the vestibular fold area with this technique. The partial thickness coronally positioned flap is sutured with 4-0 silk and an FS-2 atraumatic needle to stabilize the flap and thus indirectly stabilize the graft underneath it (Figure 6). The silk sutures are removed approximately 7 to 10 days later. The patient is instructed to rinse b.i.d. with 0.12% chlorhexidine for 4 to 6 weeks postsurgery. A periodontal dressing is placed buccally and usually palatally unless a stent is fabricated chairside before the procedure, as described by Levine.[5]

During the postoperative healing phase the patient is instructed to use a two-row soft toothbrush for 2 to 3 weeks. Normal plaque control is

Table 1—Clinical Study of 10 Patients

Patient No.	Tooth No.	Attachment Loss in mm (tooth No.)	Months Post-operative	Plasty at 6 Weeks (Y/N)	% Root Coverage Gained (tooth No.)
1	11	3 (11)	3	Y	100 (11)
2	12, 13	3 (12), 3 (13)	3	Y	100 (12), 100 (13)
3	12	5 (12)	3	Y	100 (12)
4	5, 6	6 (5), 3 (6)	30	Y	83 (5), 100 (6)
5	5, 6	3 (5), 4 (6)	6	Y	100 (5), 100 (6)
6*	12, 13, 14	4 (12), 3 (13), 4 (14)	8	Y	100 (12), 100 (13), 75 (14)
7*	4, 5	3 (4), 5 (5)	9	Y	100 (4), 100 (5)
8	8, 9	3 (8), 2 (9)	15	Y	100 (8), 100 (9)
9	11, 12	5 (11), 5 (12)	3	Y	100 (11), 100 (12)
10	12, 13	5 (12), 3 (13)	4	Y	100 (12), 100 (13)
11	5, 6	5 (5), 4 (6)	12	Y	80 (5), 100 (6)

Average recession 3.86 mm
Average % root coverage gained 97.04%

*Same patient
Note: All patients were nonsmokers.

Figure 10—Patient No. 1. Pretreatment tooth No. 11 with 3 mm of facial attachment loss.

Figure 11—Patient No. 1. Posttreatment 3-month recall visit revealed 100% root coverage on tooth No. 11.

Figure 12—Patient No. 4. Pretreatment facial attachment loss of 6 mm and 3 mm on teeth Nos. 5 and 6, respectively.

Figure 13—Patient No. 4. Posttreatment 30-month recall visit with 83% (tooth No. 5) and 100% (tooth No. 6) root coverage evident. Note metal margin of mesial abutment still evident on tooth No. 5.

Figure 14—Patient No. 5. Pretreatment facial attachment loss 3 mm (tooth No. 5); 4 mm (tooth No. 6).

Figure 15—Patient No. 5. Posttreatment 6-month recall appointment revealed 100% root coverage on teeth Nos. 5 and 6.

resumed locally by 4 to 6 weeks when a healthy attachment to the tooth has been achieved.

Because the primary etiologic factor in creating the areas of recession is usually toothbrush abrasion and trauma, modification of the patient's brushing habits is necessary to prevent further recession. A rotary toothbrush (Rotadent®[*]), used clinically as described by the manufacturer, has been shown to be very effective in plaque removal while relatively nonabrasive to tooth structure when used without toothpaste. These findings have been noted by H. Efraimsen and E. Haugen (unpublished data, 1991). The rotary head and bristles slow down and stop if brushing pressure is excessive, unlike a manual toothbrush.

The patient is followed up at 10 days, 3 weeks, and 6 weeks. A gingivoplasty is usually performed at 6 weeks when the surgical recipient site is thickened significantly as a result of placement of the graft under the coronally positioned pedicle flap (Figure 7). This second procedure should be anticipated and discussed with the patient when surgical treatment is planned. A round diamond gingivoplasty bur and a No. 15 scalpel blade are used to remove the mucosal covering of the flap, which has covered the connective tissue graft up to this point. Little bleeding is generally seen, with minimal discomfort postoperatively (Figure 8). A periodontal dressing is placed again to be removed at 5 to 7 days. An analgesic is generally not needed. Since the connective tissue genetically dictates whether a tissue will become keratinized or not,[10] the tissue that has been exposed by plasty will in a short time become totally keratinized as it had been on the palate (Figure 9).

Representative Clinical Results

The author conducted a clinical study of 10 patients in his private periodontal practice (Table 1). The patients were selected based on their esthetic concerns regarding single or multiple areas of deep-wide recession in the maxillary jaw; nonsmoker status; and general good health. The results were measured at a minimum of 3 months' follow-up, when a periodontal probing examination of the treated area was performed. The average midbuccal attachment loss on 21 teeth was 3.86 mm at presentation. By 3 months postsurgery the average percentage of root coverage gained was 97.04%. Five representative cases are presented:

Patient Number 1

A 45-year-old, nonsmoking, healthy female presented with esthetic concern about facial attachment loss on tooth No. 11 (Figure 10). A 3-month postsurgical examination revealed 100% root coverage (Figure 11).

Patient Number 4

A 40-year-old, nonsmoking, healthy male presented with esthetic concern regarding teeth Nos. 5 and 6 (Figure 12). A 30-month follow-up revealed 83% root coverage on tooth No. 5 (5 out of 6 mm) and 100% achieved on No. 6 (Figure 13).

[*] Pro-Dentec Corporation, Batesville, AR 72503