Treatment of Gingival Recession in the Anterior Mandible Using the Tunnel Technique and a Combination Epithelialized-Subepithelial Connective Tissue Graft—A Case Series

Since the development of the envelope technique, the procedure of covering gingival recessions has changed. Open flap techniques, first described in the early 1980s, with additional vertical releasing incisions are now used less frequently. Covering recessions in combination with free gingival grafts is only rarely done because of the poor esthetic results seen with this technique.

In the 1990s, techniques were described where the roots were covered using the tunnel technique and only sulcular incisions. Therefore, scars from vertical releasing incisions were avoided, and wound healing was facilitated without raising a flap. Also, the results of root coverage were better. Raetzke, Allen, and Zabalegui et al all described techniques in which a tunnel was created only for introducing the graft without coronal advancement. Therefore, the portion of the graft that covers the recession is not covered by the flap. Nutrients for this exposed portion come from the lateral and apical portions of the graft, and keratinization results because of

Covering exposed roots becomes more and more difficult as the gingiva becomes thinner and the vestibule becomes more shallow. Also, the outcome becomes less predictable. In addition, where there is high frenial attachment or muscle pull, such as the mentalis muscle in the mandibular anterior region, secondary retraction of a coronally advanced flap will likely occur. Therefore, a transplanted connective tissue graft may not completely cover the recession. This case series presents a technique where the roots are covered with a combination epithelialized-subepithelial connective tissue graft. The epithelialized portions of the graft are positioned directly over the exposed roots to aid in resistance to the environment of the mouth, and there is no displacement of the mucogingival junction or flattening of the vestibule. (Int J Periodontics Restorative Dent 2011;31:165–173.)

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secondary wound healing and lateral migration of epithelial cells.\textsuperscript{13,14} Blanes and Allen\textsuperscript{15} and Tözüm et al\textsuperscript{16} recommended covering the transplanted graft with a laterally or coronally advanced flap. Zuhr et al\textsuperscript{12} recommended covering the connective tissue graft only partially in sites with a flat vestibule and a thin periodontal morphotype.\textsuperscript{17,18} However, following this recommendation, the possibility of necrosis of the exposed graft portion and the failure rate of covering the recession will increase.\textsuperscript{15} A flat vestibule, cervical insertion of the frenulum, and a thin periodontal morphotype are common in the mandibular anterior region.\textsuperscript{15} This is often a concern in young patients during or just after orthodontic treatment. A coronally advanced flap over a graft with the presence of a cervically inserted frenulum may result in flattening of the vestibule or in failure because of strong tension on the mucosa from the mentalis muscle (Fig 1).

Fig 1a  A 21-year-old woman with recession at the mandibular right central incisor.

Fig 1b  Immediate postoperative appearance after root coverage with the unilateral tunnel technique, a connective tissue graft, and coronal advancement.

Fig 1c  Clinical view at 3 months postoperative. Complete root coverage was obtained but the vestibule was flattened.

Fig 1d  Six months postoperative. Recession relapse was noted as a result of tension in the mentalis muscle.
To address these problems, the tunnel technique with a combination epithelialized-subepithelial connective tissue graft was developed. Just as in socket seal surgery with immediate implant placement or socket preservation, the epithelialized portion of the graft is more resistant against the environment of the mouth than a simple connective tissue graft. Originally, combination grafts were used for augmentation of edentulous ridges and proved to be much less prone to resorption. Later, these grafts were used in socket seal surgery in implant dentistry.

This technique was originally used for only singular recessions. However, because of the good results, it was later applied to recessions covering two adjacent teeth. The following case report details the surgical procedure step by step.

Case report

A healthy 24-year-old woman had a piercing in the lower lip. Through mechanical friction of the intraoral portion of the piercing, 4-mm-deep Miller Class II recessions developed facial to the central incisors. The sulcular gingiva showed severe inflammation (Fig 2a). The piercing was removed 3 months before surgery.

Surgical technique

First, all inflamed tissue was removed using a curette, and the root was scaled and planed (Fig 2b). The prepared root was acid etched for 3 minutes with tetracycline mixed with sterile saline (Tetracycline 250 mg, Wolff). Next, a buccal sulcular incision, described by Allen, was performed facial to the lateral incisors. Then, a buccal supraperiosteal tunnel was made facial to all four incisors. The tunnel for accommodating the connective tissue portion was sharply dissected using a 15C blade (Swann Morton) and tunnel instruments by Allen and Iglhaut (Hu-Friedy) (Figs 2c to 2e). Additionally, the superior fibers of the mentalis muscle were dissected. The dimension and position of the recessions were measured using a periodontal probe.

Graft harvesting and placement

The epithelialized-subepithelial connective tissue graft was harvested from the hard palate in the region of the maxillary left first premolar to second molar, leaving the palatal rugae alone. The size, form, and position of the recessions was transferred to the hard palate and outlined using a periodontal probe. Then, a 1-mm-deep incision was made perpendicular to the palatal surface for outlining the epithelialized component of the graft. This was followed by mesial and distal 1-mm-deep horizontal releasing incisions to gain access to the subepithelial connective tissue portion of the graft (Fig 2f). Then, a split-thickness flap was raised toward the midline to expose the complete graft, which was outlined with an incision straight to the bone (Fig 2g). Finally, the graft was harvested without periosteum with another split-thickness flap parallel to the palatal bone (Fig 2h). The donor site was sutured with a transverse row of single sutures (Medilene 6-0, Stoma), with care taken to preserve the anatomical structures of the palate.

Through the sulcular access of the left central incisor, the graft was introduced into the tunnel with horizontal mattress sutures. This was done by placing a suture at the left lateral incisor from outside into the tunnel and leading it out at the sulcus of the left central incisor. Then, the connective tissue component was picked up, and the suture was carried back through the tunnel and exited parallel to the puncture at the left lateral incisor. The same procedure was performed on the right side. However, the needle was not led out of the tunnel at the sulcus of the right central incisor, but rather at the sulcus of the left central incisor. By pulling at the suture ends in the lateral incisor regions, the mattress sutures were completed, and the graft was gently pulled into the tunnel (Fig 2j). Then, the adaptation and fixation of the epithelialized portions of the graft at the central incisors was accomplished using sling sutures. The knot came to lie lingual to the teeth. To complete the procedure, the sulcular margins and the epithelialized components of the combination graft were adapted and secured with interrupted sutures (Fig 2k). Monofilic 6-0 (Medilene, Stoma) and 7-0 (Seralon, Serag-Wiessner) suture material were used.
To facilitate wound healing, the donor site was covered with a palatal stent (Erkodur 1.5 mm, Erkodent) for 3 days. The patient was urged to do no mechanical home care in the graft area for 6 weeks, but rinsing with camomile solution was suggested. Also, the patient was instructed not to use her mandibular anterior teeth for mastication for 6 weeks.
Wound healing

Wound healing was uneventful. The single sutures at the donor site were removed 7 days postoperative, and the sutures in the grafted site were removed 10 days postoperative. While there was some superficial epithelial sloughing, a partial fibrinous healing was observed (Fig 2l). At 4 weeks postoperative, the graft was completely incorporated and reepithelization was complete (Fig 2m). Figure 2n shows the 1-year outcome. The graft shows a normal appearance, adequate attached gingiva without any signs of inflammation, and the recession covered completely.
Table 1 shows the results of 10 patients treated with a combination epithelialized-subepithelial connective tissue graft. The patients were selected specifically for this technique. This approach was performed only in the mandibular anterior region on patients with a flat vestibule and missing keratinized gingiva apical to the exposed roots. Probing depth (PD), vertical recession (Rec), and keratinized tissue (KT) values were collected at baseline and 6 months after treatment. Gain in clinical attachment level (CAL) and the percentage of root coverage (RecCov) were also calculated.

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**Table 1** Baseline and 6-month descriptive statistics (mm)

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*PD = probing depth; Rec = vertical recession; KT = keratinized tissue; CAL = clinical attachment level; RecCov = % root coverage.
*FDI tooth-numbering system.
Discussion

The authors began covering exposed roots in the mandibular anterior region characterized by a thin periodontal morphotype and a flat vestibule using a tunnel technique with a combination epithelialized-subepithelial connective tissue graft in 2008. To date, 11 recessions in 10 patients have been treated with this technique, with a mean root coverage of 92.5%. Thus, the prognosis of this technique seems to be as good as coronally advanced flaps in combination with simple connective tissue grafts. Only two patients failed to achieve 100% root coverage. In patient 9, orthodontic treatment was completed before the grafting surgery. The tooth was positioned too far buccally and the root was prominent. Therefore, total root coverage was compromised. An interproximal stripping of the mandibular anterior teeth and lingual orthodontic movement of the tooth should have been performed prior to surgery. In patient 5, partial necrosis of the cervical margin of the exposed portion of the graft was observed. The connective tissue portion of the graft might have been too small or movement of the graft that compromised the revascularization could have occurred.

In patient 10, two adjacent exposed roots were covered with one combination graft. The result was complete root coverage, possibly because of a large tunnel preparation and connective tissue portion, which enlarges the blood supply to the graft. Introducing the relatively large graft through the sulcus of the mandibular central incisor in the tunnel was difficult. If it is not possible to place the graft through the sulcus, an additional vertical access incision could be placed in the vestibule at the mesial or distal end of the tunnel for introduction of the graft.

Survival of connective tissue grafts is greatest when covered completely with a coronally or laterally advanced flap. In defects with a flat vestibule and a cervically inserted frenulum, especially in the anterior mandible, coronal flap advancement is subject to retraction. Therefore, in such defects, connective tissue grafts cannot be covered completely, resulting in a higher possibility of necrosis of the exposed graft portion that covers the root. In such cases, a larger graft in the tunnel increases the possibility of capillary ingrowth and reduces the risk of necrosis.

In the authors’ opinion, the advantage of the combination epithelialized-subepithelial connective tissue graft in comparison with a simple connective tissue graft is the potential resistance of the epithelialized portion to the environment of the mouth. It appears to protect the underlying connective tissue over the exposed root surface, although this observation is not substantiated by current literature and needs further investigation. However, the donor site for a combination graft shows more morbidity than a simple connective tissue graft donor site because of the secondary wound healing required in the open wound.
area. Because of that, a palatal postsurgical stent is made for the patient to wear for a minimum of 3 days and nights. After that, the healing of the palate appears to be the same as a simple connective tissue graft donor site. The epithelialization of the donor site area of the onlay component is complete in approximately 1 week, depending on the size of the recession and the dimension of the epithelialized portion. There appears to be no difference in postsurgical pain for the patient at the donor site after harvesting a combination epithelialized-subepithelial or a simple connective tissue graft. A split-mouth study to compare postoperative complications after harvesting these grafts is in preparation.

Covering of exposed roots in the mandibular anterior region using the tunnel technique and a combination epithelialized-subepithelial connective tissue graft provided a predictable surgical result. The key to this technique is covering roots without displacement of the mucogingival junction or flattening of the vestibule. This reduced the possibility of a relapse from the tension of the mentalis muscle in the mandibular anterior area, especially in a thin periodontal morphotype with a shallow vestibule. In this report, root coverage was only attempted for single or two adjacent recessions. In the future, all four mandibular anterior teeth will be treated with a combination graft.

Conclusions

Based on the placement of 10 epithelialized-subepithelial connective tissue grafts in combination with covering recessions in the mandibular anterior region, the technique described was observed to result in:

- Predictable root coverage without displacing the mucogingival junction
- No flattening of the vestibule
- Possible reduction of graft necrosis over the root surface because of the epithelial layer on the exposed portion of the graft
References