Root recession coverage made predictable using resorbable barriers

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_**Gingival recession is defined** as the location or displacement of the marginal gingiva apical to the cemento-enamel junction (CEJ).[1] Recession is the exposure of root surface, resulting in a tooth that appears to be of longer length. From a patient's perspective, recession means an unaesthetic appearance and is associated with ageing.

The gingiva consists of free and attached gingival tissue, as seen macroscopically. The free marginal gingiva, located coronal to the attached gingiva (AG), surrounds the tooth and is not attached to the tooth surface. The AG is the keratinised portion of gingival tissue (KG) that is dense, stippled and firmly bound to the underlying periodontium, tooth and bone. In ideal health, the most coronal portion of the AG is located at the CEJ, where the most apical portion is adjacent to the muco-gingival junction (MGJ). The MGJ represents the junction between the AG (keratinised) and alveolar mucosa (non-keratinised).[2]

There are numerous aetiological factors that may result in recession. Generally, the aetiology can be categorised as either mechanical or as a function of periodontal disease progression. Recession usually occurs due to tooth malposition,[3-5] alveolar bone recession,[6,7] high muscle attachments and frenal pull,[8] and iatrogenic factors related to restorative and periodontal treatment procedures.[3,9]

The detrimental effects of recession include compromised aesthetics, an increase in root sensitivity to temperature and tactile stimuli, and an increase in root caries susceptibility due to cementum exposure. Thus, the main therapeutic goal of recession elimination is gingival root coverage in order to fulfil aesthetic demands and prevent root sensitivity.

Miller classifies recession defects into four categories:

_class I: marginal tissue recession does not extend to the MGJ;
_class II: marginal tissue recession extends to the MGJ, with no loss of interdental bone;
_class III: marginal tissue recession extends to or beyond the MGJ; loss of interdental bone is apical to the CEJ but coronal to the apical extent of the marginal tissue recession;
_class IV: marginal tissue recession extends beyond the MGJ; interdental bone extends apical to the marginal tissue recession.[10]

A possible treatment modality for recession includes restorative/mechanical coverage, such as cervical composite restorations. This kind of treatment may effectively manage root sensitivity and root caries. However, such treatment entails a long-term compromise from an aesthetic perspective. Composite restorations stain over time, and any marginal leakage may lead to secondary caries, recurrence of sensitivity and/or local inflammatory changes. Additionally, colour matching can be difficult and such restorations may involve the undesirable removal of vital tooth structure in order to create adequate retention form. Thus, clinicians must determine whether the restorative benefits outweigh the aesthetic shortcomings and whether is it possible to employ a treatment modality with few, if any, functional and aesthetic disadvantages.

Another treatment modality for recession is muco-gingival surgery. Muco-gingival surgery refers to periodontal surgical procedures designed to correct defects in the morphology, position and/or amount and type of gingiva surrounding the teeth.[11]

In the early development of muco-gingival surgery, clinicians believed that there was a specific

Fig. 1


Fig. 2

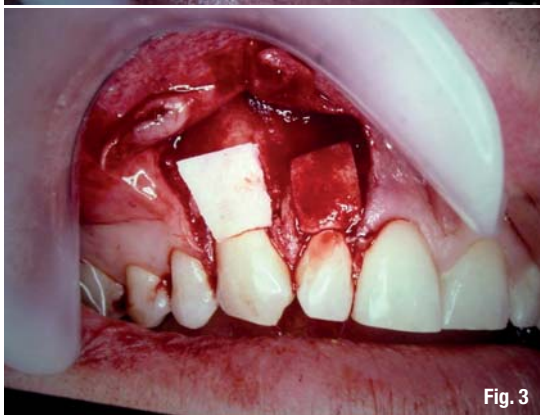
Fig. 3

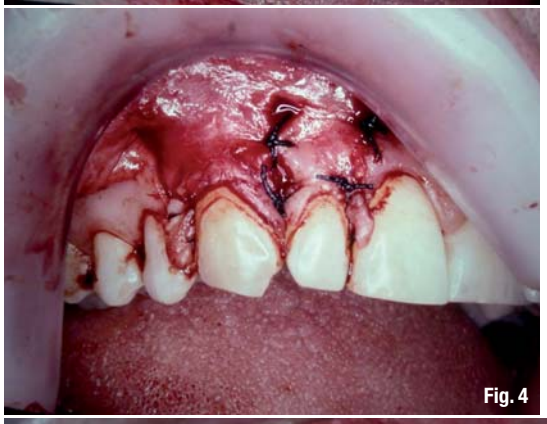
Fig. 4

Fig. 1_Pre-op labial view of anterior teeth: recession on tooth #6; tooth #7 surrounded by a small adequate zone of keratinised apical tissue.
Fig. 2_Flaps reflected preserve the interproximal tissue, which preserves the blood supply and prevents black triangles (unaesthetic interproximal spaces).
Fig. 3_The GTR membrane was shaped and placed over the root surfaces of teeth #6 and 7.
Fig. 4_Gingival tissue was coronally repositioned, covering the membranes and the roots of teeth #6 and 7, and sutured in place.
Fig. 5_Post-op view: the previously recessed roots of teeth #6 and 7 are covered with attached pink, keratinised gingival tissue, with no pocket depth upon probing.

Fig. 5

minimum apical-coronal dimension of AG that was necessary to maintain periodontal health. However, subsequent clinical[12–15] and experimental studies[16,17] have demonstrated that there is no minimum numerical value necessary. However, for aesthetics, a uniform colour and value of AG is desirable amongst adjacent teeth.[18]

Some of the earliest techniques for correcting recession involved extension of the vestibule.[19] The subsequent healing usually resulted in an increase of AG. However, within six months, as much as a 50 % relapse of the soft-tissue position was reported.[20,21] Thus, these techniques did not adequately address recession.

In order to improve aesthetics and increase KG for root coverage procedures, current periodontal surgery largely involves the use of gingival grafts. There are a multitude of surgical techniques, which can be distinguished based on the relationship between the donor and recipient sites. Gingival graft procedures involve either (a) pedicle soft-tissue grafts, which maintains the pedicle blood supply, or (b) free autogenous soft-tissue grafts. Techniques involving the latter type require the clinician to prepare two surgical sites: one to harvest the tissue (1) and another one to prepare the recipient site (2). In this case, the autogenous soft-tissue graft has a separate blood supply to the recipient site. Combinations of (a) and (b) have also been reported.[22–24]

The pedicle soft-tissue graft was first described by Grupe and Warren in 1956.[25] This involved raising a full thickness flap and laterally positioning and then suturing donor tissue into place from an adjacent area, while maintaining a pedicle blood supply. This technique and others that followed were designed to increase the zone of AG. Later modifications of the technique included the double papilla flap[26]—introduced by Cohen and Ross in 1968—the oblique rotational flap[27] and the rotational flap.[28] Another type of gingival movement flap was described later as the coronally repositioned flap.[29] This technique involves mobilising a full thickness flap and repositioning the tissue to the CEJ, thereby covering the exposed recession.

The use of free gingival grafts was described in the 1960s by Sullivan and Atkins.[30] The free auto-

genous graft can be made up of either epithelialised gingiva or connective tissue. Initially, the therapeutic goal was to increase the zone of KG. The clinical objective has now evolved to covering the recessed root with a zone of attached KG. This can be achieved in one or two stages. Initially, Sullivan and Atkins described a one-stage procedure in 1968. Its purpose was to increase the zone of KG without concentrating on coverage of a recessed root. In the 1980s, a two-stage modification was suggested for an increase in root coverage, which proved to be more successful with increased predictability. This involves first placing the free gingival graft or the free connective tissue graft apical to the area of recession, and using the coronally repositioned technique after healing.

Free autogenous grafts are predominantly harvested from the palate. Recently, materials other than gingival grafts have been explored. Using a guided tissue regeneration (GTR) technique, an acellular dermal matrix has been reported to yield favourable outcomes in root coverage.[31,32] This material may provide the patient with a less invasive alternative than a palatal donor site, in order to achieve root coverage.

Procedures combining both free grafts and pedicle techniques have also been detailed. For instance, when a connective tissue graft is employed, the graft is placed sub-epithelially with a coronal advancement of the overlying keratinised tissue. GTR techniques have also been developed more recently. In 1992, Pino Prato et al. described a combination technique of sub-epithelial placement of a membrane with coronal advancement of the flap, such as e-PTFE.[33] The function of the membrane is to maintain space during the healing period for tissue regeneration to occur. From a patient's perspective, biodegradable membranes with GTR might be preferable in order to avoid a second-stage surgery for membrane removal.

The goal is to restore gingival health, colour and aesthetics by covering the exposed root predictably with healthy gingival tissue and in doing so decrease sensitivity. Using GTR and coronal repositioning techniques, we achieve predictably covered roots.

Variations in muco-gingival procedures have been developed to include root surface bio-modifications by treating the root surfaces with a variety of materials. These measures enhance the regeneration process of a new connective tissue attachment. In order to increase root coverage, a new clinical attachment is necessary. Root surface bio-modification involves treating the root surfaces with citric acid, tetracycline or EDTA in order to remove the smear layer and expose dentinal tubules and thus facilitate a new fibrous attachment. An enamel matrix derivative claimed to support the action of enamel matrix proteins by inducing acellular cementum, periodontal ligament and alveolar bone formation is also available in the range of root surface bio-modification materials.

The following case report considers predictable aesthetic root coverage by comparing a GTR technique to a non-GTR technique in a split-mouth procedure involving the same patient.

_Case report

A young, adult male patient presented with recession bilaterally in his maxilla. The upper right maxilla had extensive recession on teeth #6 and 7 (Fig. 1). The upper left maxilla had similar recession on teeth #11 and 12. Additionally, tooth #11 had a cervical groove, which was stained and hard but not decalcified.

After local anaesthesia using lidocaine, the desired flap design was completed. There was an adequate zone of KG present before treatment, which was preserved and repositioned coronally. Upon reflection of the tissue, the full extent of the underlying recession was evident (Fig. 2). The area and recession were uncovered following removal of debridement and granulomatous tissue. The resorbable membrane material was shaped and placed on the exposed roots. The membrane was first placed on tooth #6 and thus the tooth appeared darker as it absorbed blood. The membrane was placed on tooth #5 second and thus the tooth had not absorbed the blood at the time of the photograph, which accounts for the colour difference at this time.

The coronally repositioned flap was sutured in place with the flap covering the now submerged membranes and previous recession (Figs. 3 & 4). Periodontal dressing (Coe-Pak, GC) was utilised as a bandage and placed over the surgical area. It was removed a week later at the same time as the sutures. The patient then lavaged and returned to the usual oral hygiene routine, initially lightly and gradually more vigorously. Once healed and oral health was maintained, the recession was covered and health regenerated. Upon periodontal probing, no pockets were present (Fig. 5). The final view presents a visual symmetry of health and colour that is maintainable.

Recession was also present at the maxillary left side (teeth #11 and 12; Fig. 6). After local anaes-

Fig. 6


Fig. 7

Fig. 6_Pre-op labial view of anterior teeth.
Fig. 7_Cervical groove on tooth #11 is solid, hard and non-carious.

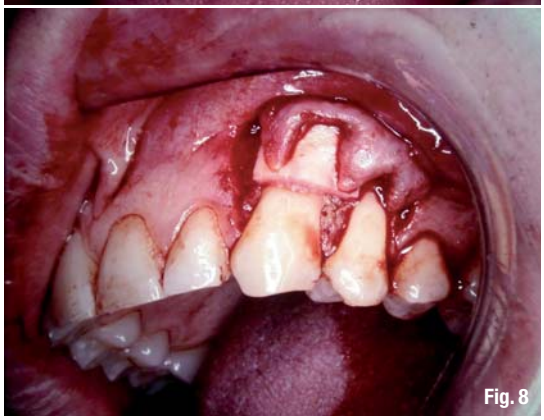
Fig. 8


Fig. 9

Fig. 8_GTR membrane placed over the root surface of tooth #11 only; no membrane was placed on the surface of the recession of tooth #12.
Fig. 9_Gingival tissue coronally repositioned to cover the GTR membrane on tooth #11 and tooth #12.

Fig. 10_Post-op view.

Fig. 10

thesia of the areas involved, a full thickness muco-periosteal flap was completed. This exposed the extent of the recession defects (Fig. 7). Tooth #11 was treated, as was the other side of the mouth, by utilising the GTR technique using an acellular connective tissue membrane to preserve the space for regeneration. Tooth #12 was treated the same way, except that no membrane barrier, resorbable or non-resorbable, was used (Figs. 8 & 9). Thus, there was no use of a GTR technique on tooth #12. Both teeth had the flap manipulated with the coronally repositioned graft, covering the recessed root and suturing to the CEJ level. Both sides were covered with periodontal dressing. Antibiotics (tetracycline) and an analgesic (Tylenol-Codeine) were prescribed for the first week after the operation.

One week after the surgical phase, the dressing and sutures were removed and the mouth lavaged. Oral hygiene was restored to good, maintainable habits following the healing phase of over two months. Upon observation, tooth #11, for which the GTR membrane had been employed, had re-attached healthy gingiva that was not probable. The recessed root and the stained cervical groove were covered. In contrast, tooth #12, for which no GTR membrane had been utilised, displayed recession as prior to the surgery (Fig. 10).

In summary, this split-mouth technique demonstrated that using an acellular resorbable barrier membrane is more predictable for achieving root recession coverage than coverage of a recessed root without such a membrane._

Editorial note: A complete list of references is available from the publisher.

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