Case report

ENVELOPE GRAFT TECHNIQUE FOR THE TREATMENT OF SINGLE GINGIVAL RECESSION: A 17-YEAR FOLLOW-UP CASE REPORT

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ABSTRACT

Gingival recession is one of the most common problems affecting the periodontium. About 50% of the population has at least 1 mm gingival recession, and 5-32% of adults have an advanced gingival recession. Recession is not only an aesthetic problem but can increase root sensitivity and hinder optimal oral hygiene. A deviation from the norm necessitates diagnosis, prognosis prediction, and treatment planning, all needing classification. These injuries pose a common clinical challenge in dentistry, demanding a targeted and advanced approach to ensure optimal aesthetic and functional outcomes. Among various proposed surgical methodologies, the "envelope graft technique" has garnered increasing attention and consideration for its effectiveness in treating individual gingival recessions. This article explores the "envelope" technique as a surgical approach. A case report is described, and the recent literature is discussed.

KEYWORDS: *gingival recession, envelope graft technique, periodontal stability, interdental papilla*

INTRODUCTION

Gingival recessions present significant clinical implications. Beyond aesthetic concerns, exposed roots increase the risk of dentin hypersensitivity, root caries, and compromise of periodontal stability (1). Understanding the causes and effects of gingival recessions is crucial for developing targeted therapeutic approaches.

Before planning a treatment, a proper diagnosis is paramount to selecting the right therapy. Published almost 40 years ago (2), Miller's original classification proposes a schematic and clear subdivision of the various types of gingival recessions commonly detectable in clinical practice. It classifies recessions into four main groups, and the clinical parameters that allow their subdivision is represented by the involvement or lack of involvement of the mucogingival line by the recession, the loss of periodontal attack, and the underlying bone loss. Due to these three parameters, it is possible to identify Class I as a gingival recession that does not extend beyond the mucogingival line, devoid of bone loss at the interdental level; this type of recession allows it to be, in the absence of complications of surgery, complete coverage of the injury site. Class II involves an extension of the lesion beyond the mucogingival line, but there is no loss of bone tissue in the interdental area; also, complete coverage of the recession can be performed with a high predictability index for this class. Class III recessions provide extension beyond the mucogingival line with the loss of interdental bone and

periodontal attachment, which may or may not be associated with the extrusion of the dental element. In most cases, this type of recession does not allow surgery that may result in full root coverage. Class IV predicts that there is a recession extending beyond the mucogingival line, associated with severe bone loss and periodontal attack at the interdental level, as well as frank dental malposition. This type of recession does not foresee that there can be surgically full coverage of the tooth root.

In 1992, Tarnow identified (3) the physiological height of the interdental papilla: it must extend coronally to the bone crest for 5mm at the interdental level. Starting from this definition, in 1998, a system of classification of the recessions of the interdental papilla according to the cement-enamel junction (CEJ) was published (4). This classification divides the recessions of the papilla into three types, called Type A, Type B, and Type C, and in relation to the class of belonging, the kind of treatment and its possible outcomes vary. Type A includes all cases where the papilla extends 5 mm coronally to the bony crest, has a width greater than or equal to 3mm at the level of its base, and there is no loss of interdental bone tissue underneath. In these situations, it is predictable surgery that can fully cover the portion of the exposed root. Type B differs from the previous one only for the width of the base, which must be less than 3mm; in this case, the integral root cover cannot be predicted. Type C integrates cases where there is a substantial loss of bone tissue underneath the papilla and possibly a dental extrusion, such that the papilla may not 'cover' the interdental space. In these conditions, a complete root cover is hardly obtainable. At this point, going to combine the concepts contained by the classification of Miller and those of the classification of Tarnow and Nordland, it can be asserted that Miller classes I and II typically present recessions of the papilla type A or B, type C papillae recessions characterize Classes III and Classes IV are often devoid of interdental papillae.

The previously reported classifications have surgical implications. From the surgical point of view, a type A papilla guarantees a greater blood supply in cases of tissue grafting, with a consequent increase in the possibility of its survival. Type B papillae provide a lower nutritional intake that decreases proportionally to the decrease in the width of their base, reducing the predictability of a complete root cover. Another aspect to keep in mind is the thickness of the papilla, as this is crucial for the tissue graft's survival and the suture's tightness. In detail, the thickness of the papilla in the anterior sector varies according to the arch: in the upper jaw, unless there is a malocclusion, the thickness of type A papillae is greater than or equal to 3mm, and this guarantees a positive prognostic factor for the survival of the graft; differently, in the lower arch, especially in case of dental crowding, the thickness of the papilla is reduced, and this reduces the possibility of being able to obtain a complete root cover, especially in Miller Class III recessions (5).

Periodontal plastic surgery techniques often involve the transplantation of epithelialized or non-epithelialized gum tissue, i.e., connective tissue, harvested from the palate. The two techniques used are the connective tissue, graft, and Envelope Techniques.

In particular, the Envelope Technique consists of a horizontal intrasulcular incision within the gingival margin of the recession and the subsequent placement of connective tissue taken from the palatal fibromucosa. This incision allows lifting a gingival flap without compromising the vascular supply due to the absence of release incisions. After lifting, the surgeon prepares the surgical bed, removing any damaged soft tissue and reducing the possibility of recurrence.

The Envelope Technique is, therefore, a surgical approach that stands out for its versatility and ability to treat single gingival recessions with precision. Here, we reported a case of single recession treated with the Envelop Graft Technique.

CASE REPORT

A 23-year-old man presented to Clinique with a sensitivity problem at level 1.3. An objective examination and endo-oral Rx were performed to assess the integrity of the interproximal periodontal support (bone and attachment), a fundamental factor in achieving complete root coverage.

On examination and intraoral inspection, two recessions in elements 1.3 and 2.3 with an extension in the apical coronal direction of 5 mm were easily visible. It was decided to treat the recession in 1.3 first. In addition, the radiological diagnosis showed the integrity of the osseous and periodontal support of element 1.3, which was a positive prognostic factor for complete root coverage (Fig. 1).

Fig. 1. *Initial intraoral photo (front view) and periapical x-rays of element 1.3.*

The treatment plan proposed to the patient to resolve the recession and associated tenderness in the tooth element (1.3) was root coverage with a subepithelial connective graft harvested from the palatal fibro-mucosa. The patient consented to the treatment, and the Envelope Surgical Technique was chosen. As a first step, the exposed root surface was smoothed and etched with tetracycline for decontamination (Fig. 2).

Fig. 2. *Decontamination of the root surface using tetracycline.*

Palatal connective sampling has certain advantages over epithelial-connective sampling: sampling can be extended more mesially, including the palatal crevicular sector. Haemostasis control is easier to achieve because the sampling site is closed by first intention, favoring a better postoperative course (Fig. 3).

Fig. 3. *Intraoperative photos.*

However, there are some disadvantages: if the palatal fibro-mucosa is thin, the quantity and quality of tissue that can be harvested is reduced, and the technique requires good manual dexterity and experience from the surgeon.

The envelope harvesting technique uses a single incision line through which the subepithelial connective tissue was harvested (Fig. 3). This allowed the palatal creases to be included.

After achieving adequate anaesthesia with adrenaline 1:50,000, a horizontal incision was made from distal to the canine to mesial to the first molar, at least 1 mm from the sulcular depth of the adjacent teeth, staying above the periosteum. Using a periosteal cutter, the incision line was gently opened to allow the insertion of a 15c scalpel blade.

The blade was inserted parallel to the plane of the bone along its entire length, remaining superficial to separate the epithelium from the connective tissue. The blade was then inserted at a deeper level to separate the connective tissue from the periosteum. Two vertical incisions, one mesial and one distal, allowed the release of the connective tissue on all four sides, which was removed from the sheath using forceps. The incision line on the palate was sutured with simple detached stitches to facilitate healing by first intention. Fig. 3 shows the newly harvested piece of connective tissue with a length of 12 mm and a width of 5 mm.

The flap was then designed (Fig. 4), starting with an intra-sulcular incision with an internal bevel to remove the sulcus epithelium.

Fig. 4. *Intraoperative photos.*

Once this was done, a partial thickness incision was made to create an 'envelope' apically of the lesion, extending 3 to 5 mm beyond the muco-gingival joint, mesially and distally, to create the housing for the connective graft. The operator used a periodontal probe to ensure that there were no intact fibers within the incision margin that would compromise the passive fit of the graft.

The graft was then positioned, paying attention to positioning, passivity, and stability within the resulting envelope. Based on the stability of the graft, fixation with 2 simple sutures was chosen. One week later, the sutures were removed, and the graft was well anchored, with a pink mucosa showing some traces of inflammation (Fig. 5), which can be assimilated to the physiological postoperative healing phase.

Fig. 5. *One week later after removing the suture. First healing.*

At the 17-year follow-up, complete root coverage, gingival margin at the level of the CEJ, and adequate support were observed. There was a clear recovery of the keratinized tissue, completely restoring the physiological aesthetics of the periodontium, and the patient reported the complete disappearance of the symptoms of algal hypersensivity due to the root coverage (Fig. 6).

Fig. 6. *The first photo shows the initial situation with the exposure of the root surface of element 1.3. The second photo is a 17-year follow-up.*

DISCUSSION

The present case report aims to evaluate a case of coverage of a Miller Class II gingival recession on a 1.3. The technique used a partial-thickness papillary flap without release incisions, with an autologous connective tissue graft harvested from the palate and inserted to cover tooth recession.

The periodontal surgery technique used in the presented case includes the transplantation of a subepithelial connective tissue graft. This technique harvests a partial thickness graft of connective tissue without the epithelial component, which covers the palatal periosteum, excluding that there can be healing by the second intention of the donor site. The advantages are that it can be extended for several teeth, also affecting the area of palatine wrinkles and that the closure by first intention guarantees a post-operative course with less discomfort. On the other side, the use of this method of sampling is limited to cases in which the palatine fibro-mucosa is thick enough to be dissected. In addition, the thin superficial epithelial layer often undergoes necrosis, and the healing occurs by second intention if the palatal mucosa is too thin. A further disadvantage lies in the fact that this technique requires excellent manual skill and experience from the surgeon. Despite the abovementioned disadvantages, the subepithelial connective tissue harvesting technique is preferable to epithelial-connective tissue harvesting.

In recent years, synthetic connective tissue substitutes have been introduced to reduce post-operative problems related to the donor site and avoid needing a second surgical site to harvest connective tissue (6). These biomaterials consist of collagen and elastic fibers and mimic both the appearance and function of connective tissue grafts, making them a viable alternative in patients where harvesting connective tissue is impossible due to anatomical problems.

Using autologous connective tissue from a palatal harvest is considered the gold-standard treatment for gingival recessions. However, it is important to consider some negative aspects during the preoperative period. This approach requires the creation of a second surgical site, which can cause pain and post-operative bleeding for the patient.

Furthermore, making one or more incisions at the palatal level significantly prolongs the surgical procedure. Additionally, there is a risk of necrosis in the palatal epithelial layer, which may result in the lesion healing by second intention and causing further discomfort for the patient. Therefore, it is advisable to consider using a biomaterial graft to cover the gingival recession. According to the study conducted by Rampinelli et al. (7), these tissues are designed to overcome the disadvantages of autologous grafts. Allogenic grafts present several advantages over autologous grafts, including reduced morbidity and shorter surgery duration. Autologous grafts, on the other hand, have several unfavorable aspects, such as the need for a second surgical site, limited availability of material, difficulty in manipulation, longer operating times, high patient morbidity, and unsatisfactory aesthetic results. Additionally, allogenic grafts can significantly reduce intraoperative and postoperative discomfort. For these reasons, biomaterials may be a viable alternative to autologous harvesting. Regarding aesthetic performance, studies suggest that these materials provide effective camouflage, but further research is needed (8).

A different technique that can be used is the Bilaminar Technique (9) that consists of a coronal advancing flap with autologous grafting of connective tissue from the palate. This type of technique is particularly effective, especially

in cases where there is a loss of mesial and distal bone tissue and/or a loss of tooth substance due to collar caries (9). The bilaminar technique consists of an intrasulcular incision with partial thickness accompanied by two release incisions, one mesial and one distal to the defect, and also involves a de-epithelialization of the papillae. The resulting flap is surpassed to cover the grafted material and is sutured with two sling sutures at the papillary level and simple sutures on the release incisions (10). This guarantees root coverage and stability of results over time in most cases (9).

However, Bilaminar Technique has a series of disadvantages: first of all, the presence of release incisions, which have a higher biological cost - despite making surgery easier - which means longer healing times; less blood flow to the flap and greater risk of necrosis (11) to the detriment of predictability similar to the classic envelope method. In fact, the use of this technique in Miller's class II guarantees predictability of the result equal to 84% (10), a percentage that rises to 89.7% according to the retrospective study carried out by Cordioli et al. (12). Another main point in the choice of the surgical method is, certainly, to be able to guarantee the patient not only good predictability of the root coverage but also a good result from a chromatic point of view (13).

CONCLUSIONS

In conclusion, the Envelope Technique is a reliable surgical procedure to treat single recession in selected cases. Proper classification prior to surgery and appropriate surgical technique are essential to obtain good result over time. Envelope Technique guarantees less invasive surgery, a flap with excellent blood supply due to the absence of release incisions, highly predictable root coverage results, and the papillae preservation. In addition, it guarantees an excellent rendering both from a chromatic point of view and surface matching of keratinized gums.

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