Coronally Positioned Flap with Subepithelial Connective Tissue Graft for Root Coverage: Various Indications and Flap Designs

Antonio Fernando Martorelli de Lima¹², Robert Carvalho da Silva, PhD student¹, Julio Cesar Joly, PhD¹ and Dimitris N. Tatakis, DDS, PhD¹

¹Department of Prosthodontics and Periodontics, Dental School, Unicamp, Piracicaba, SP, Brazil; ²Section of Periodontology, College of Dentistry, The Ohio State University, Columbus, OH, USA

Abstract

Aesthetic concerns and functional abnormalities, such as dentin hypersensitivity, are often associated with gingival recession defects. Root coverage procedures aim to restore both gingival aesthetics and function in recession defects. The coronally positioned flap combined with the subepithelial connective tissue graft is one of the most widely used root coverage procedures. The present report illustrates four different indications where this procedure has been successfully employed. An isolated Miller class II recession defect associated with frenum pull, multiple adjacent Miller class I defects in the aesthetic zone, an isolated Miller class I defect associated with dentin hypersensitivity, and an isolated Miller class II defect on a retained deciduous tooth are the four diverse conditions treated by periodontal plastic surgery. Different approaches were used to create the coronally positioned flap. Treatment resulted in complete root coverage, resolution of hypersensitivity, and satisfaction of the patients' aesthetic concerns. An effective and predictable treatment modality, such as the coronally positioned flap combined with the subepithelial connective tissue graft, should be considered when treatment planning for gingival recession defects.

Key words: Gingival recession/therapy, gingival recession/surgery, coronally positioned flap, connective tissue graft, dentinal hypersensitivity, esthetics

Introduction

Gingival recession, defined as the apical displacement of the gingival margin in relation to the cemento-enamel junction (Glossary of Periodontal Terms, 2001), may result in patient complaints regarding aesthetics, dentin hypersensitivity, and inability to perform proper oral hygiene procedures. In addition, exposure of root cementum and/or dentin to the oral environment may render the tooth more susceptible to root caries, abraision lesions, and chemical erosion (Seichter, 1987; Canadian Advisory Board on Dentin Hypersensitivity, 2003). Because of these concerns, several periodontal surgical procedures have been developed over the years to treat gingival recession defects (Wennström, 1996).

Although the predictability of the various surgical treatment modalities varies, several have been found to provide complete root coverage in a high percentage of cases (Wennström, 1996).

Among the most important factors in determining treatment success are the anatomical characteristics of the recession defect (Wennström, 1996; Miller, 1985). Miller (1985) proposed a useful recession defect classification based on the height of the interproximal papillae adjacent to the defect area, and the relation of the gingival margin to the mucogingival junction (MGJ). Four categories were described: class I = marginal tissue recession not extending to the MGJ and no loss of interdental bone or soft tissue; class II = recession extending to or beyond the MGJ and no loss of interdental bone or soft tissue; class III = recession extending to or beyond the MGJ with loss of interdental bone or soft tissue; class IV = recession extending to the cemento-enamel junction (CEJ) but coronal to the most apical level of the recession defect; class IV = recession extending to...
or beyond the MGJ with loss of interdental bone or soft tissue apical to the CEJ and reaching the most apical level of the recession defect. According to this classification, 100% root coverage can be anticipated in class I and class II defects, while less than 100% coverage is expected in class III defects, and no root coverage can be anticipated in class IV defects (Miller, 1985). The results of numerous subsequent studies have supported the prognostic value of Miller’s classification. Among the various surgical approaches used to treat recession defects, the subepithelial connective tissue graft (SCTG) in combination with a coronally positioned flap has demonstrated excellent predictability (Wennström, 1996). The SCTG technique (Raetzke, 1985; Langer and Langer, 1985) is considered the gold standard for treating gingival recession (Bouchard et al., 2001). Because the success of this technique is thought to rely on the coverage of the graft by overlying tissue (Raetzke, 1985; Langer and Langer, 1985; Bouchard et al., 2001), several technical variants have been proposed to cover the graft (Raetzke, 1985; Langer and Langer, 1985; Bouchard et al., 2001; Nelson, 1987; Harris, 1992). Among them, the coronally positioned flap is the most widely used (Langer and Langer, 1985; Sbordone et al., 1988; Bouchard et al., 1994; Wennström and Zucchelli, 1996; Paolantonio et al., 1997; Trombelli et al., 1998; Tatakis and Trombelli, 2000; da Silva et al., 2004). The purpose of this case report is to illustrate the use of coronally positioned flaps of varying design in combination with SCTG for the treatment of diverse recession defects.

Clinical case reports

General considerations

All 4 patients were systemically healthy non-smokers and were treated at the Piracicaba Dental School. All patients provided written informed consent, after receiving appropriate information on the advantages, disadvantages, risks, and potential complications of the proposed therapy. When necessary, patients received initial periodontal therapy at least two weeks prior to any periodontal plastic surgical procedure. Initial therapy included oral hygiene instructions and root instrumentation. Oral hygiene instructions were thoroughly explained individually to each subject, with emphasis on the correct use of toothbrush and dental floss. Root instrumentation was accomplished using either manual or ultrasonic devices. To proceed to surgery, each patient had to achieve full mouth plaque index and gingival index scores of less than 20%, with no plaque on the defect teeth.

One hour prior to periodontal plastic surgery, to avoid postoperative pain and swelling, each patient was prescribed a single dose of 4 mg betamethasone† and 750 mg acetaminophen‡. Additionally, 5 mg diazepam§ was administered to patients experiencing anxiety.

For extraoral antisepsis a 2.0% chlorhexidine solution was used, while for intraoral antisepsis a 0.12% chlorhexidine digluconate¶ rinse for one minute was given to the patients. Local infiltration with 2.0% lidocaine with 1:100,000 epinephrine¶ was used for anesthesia.

For postoperative pain control, 750 mg acetaminophen q.i.d as needed was prescribed. Patients were instructed to discontinue tooth brushing, flossing and any other mechanical oral hygiene procedures, and to avoid any trauma to the surgical site(s) until suture removal (14 days). Patients were also instructed to rinse with 0.12% chlorhexidine solution for one minute and to gently clean the wound area with a cotton pellet soaked in the same solution twice daily for four weeks. No periodontal dressing was used in either donor or recipient sites. The patients were seen for professional plaque control weekly for the first 4 weeks, and then monthly for 3 months.

Case one: isolated Miller class II defect associated with frenum pull

A 26-year old female presented with a wide, localized Miller class II gingival recession on tooth 31, associated with frenum pull. The recession defect was 4 mm deep, exhibiting inflammation and lack of attached gingiva associated with frenum pull (Figure 1A). The patient’s chief complaint was tenderness during tooth brushing and concerns over possible loss of the tooth.

The patient was reassured regarding the long-term prognosis for the tooth. The treatment of choice was frenectomy, followed by the coronally positioned flap with SCTG.

The frenectomy procedure (Figure 1B) was performed to eliminate any muscular attachment to the involved gingival margin and to minimize any frenum-associated mobility during the healing of the graft. Three weeks after the frenectomy (Figure 1C), the gingival tissues adjacent to the recessions were considered adequately healed for the root coverage procedure.

A partial-thickness trapezoidal flap was raised, according to the procedure described by Allen and Miller (1989). The SCTG was then harvested from the palatal area between the canine and first molar, accord-

† Celestone® - Schering - Plough Ind. Quím. e Farm. S/A, Rio de Janeiro, RJ, Brazil.
‡ Tylenol® - Cilag Farmacêutica Ltda., São Paulo, SP, Brazil.
§ Valium® - Roche Produtos Quím. e Farm. S/A, São Paulo, SP, Brazil.
II Proderma Farmácia de Manipulação Ltda, Piracicaba, SP, Brazil.
¶ DFL Ind. e Com. Ltda, Rio de Janeiro, RJ, Brazil.
" Poliglactina 910 vicryl, Ethicon, Johnson and Johnson Prod. Prof. Ltda, São José dos Campos, SP, Brazil.
†† Nylon monofilament, Ethicon, Johnson and Johnson Prod. Prof. Ltda, São José dos Campos, SP, Brazil.
ing to the procedure described by Langer and Langer (1985). The graft was shaped and trimmed to fit the recipient site at the level of the CEJ, completely covering the defect and adjacent connective tissue recipient bed. Absorbable 6.0 sutures were used to immobilize the graft in place (Figure 1D). In this case, as well as the remaining three cases presented here, the SCTG was secured in place with marginal sutures. The flap was coronally placed at the CEJ level, completely covering the SCTG. Non-absorbable 6.0 sutures were used interproximally and at the vertical incisions to position and secure the flap (Figure 1E). Both recipient and donor sites healed uneventfully. Three months postoperatively, there was complete root coverage (Figure 1F) with normal sulcus depth (probing depth = 2 mm).
Case two: multiple Miller class I defects in aesthetic area.

A 45-year-old female presented with multiple adjacent Miller class I recession defects on teeth 11, 12 and 13 (Figure 2A). The patient’s chief complaint was aesthetic concerns, which represented the indication for treatment.

The recession defects ranged from 2 to 4 mm in depth. The treatment of choice was the coronally positioned flap with SCTG. A partial thickness envelope flap was raised according to the technique described by Bruno (1994) with de-epithelization of the interdental papillae (Figure 2B). The SCTG was obtained and fixed in position to cover the defects, as described above. The flap was coronally positioned and immobilized with interrupted sutures (Figure 2C). Three months postoperatively, there was complete root coverage (Figure 2D) with normal sulcus depth. The result fully met the patient’s aesthetic expectations.

Case three: isolated Miller class I defect in aesthetic area and associated with dentin hypersensitivity.

A 26-year-old female presented complaining of aesthetic concerns and hypersensitivity regarding tooth 14. The tooth was in slightly buccal position, and the 4 mm deep Miller class I recession defect was associated with a root abrasion lesion (Figure 3A). In this case, and in contrast to the Bruno (1994) flap design used in case two, a partial-thickness envelope flap was raised by intrasulcular incisions that included the interdental papillae adjacent to the defect. Neither horizontal nor vertical incisions were performed. Sharp dissection was used to elevate the flap beyond the MGJ until no tension was felt during coronal positioning of the flap (Figure 3B). The SCTG was harvested as described previously, placed over the recession and sutured interproximally (Figure 3C). The flap was positioned coronally and sutured with two interrupted proximal sutures and one midbuccal suspensory suture, leaving part of the SCTG uncovered (Figure 3D). Three months postoperatively, there was complete root coverage (Figure 3E), with normal sulcus depth, resolution of hypersensitivity, and satisfaction of the patient’s aesthetic concerns.

Case four: isolated Miller class II defect on deciduous tooth

A 26-year-old female (a different patient than the one described in case three) presented with a retained deciduous molar (tooth 85) due to agenesis of tooth 45. The patient was referred to the periodontal department by the general dentistry clinic, because of concerns regarding the recession present and the decision to retain the deciduous tooth. The recession defect
was almost 3 mm deep over the mesial root and 1 mm over the distal root, without any attached gingiva on the mesial root (Figure 4A). The coronally positioned flap with SCTG was performed as described in case three above. The graft was secured with proximal sutures (Figure 4B), followed by coronal positioning of the envelope flap at the CEJ level (Figure 4C). Healing was uneventful, resulting in complete root coverage three months postoperatively (Figure 4D).

**Discussion**

This case report illustrates the suitability of the coronally positioned flap with SCTG for the treatment of diverse Miller class I and II gingival recession defects. The cases presented demonstrate that this surgical approach can be successfully employed to treat a variety of defect sizes and locations.

In the treatment of gingival recession, as in the treat-
ment of any other condition, the etiology has to be identified and controlled prior to any corrective surgery. The etiology of gingival recession includes several factors, such as bacterial plaque-induced inflammation, improper oral hygiene practices, other types of mechanical trauma, and anatomical factors, such as tooth position, frenum pull, and gingival dimensions (Wennström, 1996; Gorman, 1967; Tugnait and Clercough, 2001). Once the etiology is determined and appropriately addressed, then periodontal plastic surgery can be pursued.

The type of surgical procedure chosen should be dictated by several factors, such as the anatomy of the site, the existence of aesthetic considerations, the desired outcome and the evidence-based predictability of various procedures. Since the mid 1980’s, when the SCTG procedure was first introduced (Raetzke, 1985; Langer and Langer, 1985), several studies have reported on the excellent predictability of this surgical technique (Wennström, 1996, Bouchard et al., 2001, Wennström and Zucchelli, 1996; Paolantonio et al., 1997; Trombelli et al., 1998; Tatakis and Trombelli, 2000, Da Silva et al., 2004). Because of predictable and aesthetically pleasing outcomes, the SCTG procedure is considered the procedure of choice for most gingival recession defects (Bouchard et al., 2001), with the exception of shallow (2 mm or less) Miller class I defects in patients with average or higher buccolingual tissue thickness, where a coronally advanced flap alone might be a preferable choice (Bouchard et al., 2001, Allen and Miller, 1989; Harris and Harris, 1994).

In the first case presented here, the deep recession defect was associated with a frenum pull. In this case, a frenectomy procedure preceded the SCTG surgery, in order to minimize any frenum pull and consequent tension on the flap during healing (Pini Prato, 2000). The chosen flap design included vertical releasing incisions, in order to permit adequate advancement of the flap to cover the SCTG. The end result restored gingival architecture and recreated conditions favorable for maintenance of optimal plaque control.

In the second case, multiple adjacent defects in the aesthetic zone were treated with an envelope type flap, avoiding vertical releasing incisions that could result in scarring (Kon et al., 1984), an undesirable sequela in an aesthetic case. The third case presented similar aesthetic considerations, with the added concern of dentin hypersensitivity. The slight difference in flap design between case #2 (Bruno technique) and case #3 (intrasulcular incision including the papillae) does not provide differences in treatment outcome. The flap design used in case #3 (intrasulcular incisions elevating the papillae) makes it easier to suture the flap. However, the limited mesiodistal length of the envelope flap in case #3 (single tooth defect), compared to
case #2 (three adjacent defects), provides for reduced mobility of the flap, resulting in greater exposure of the graft (compare Figures 2C and 3D). Clinical evidence indicates that exposure of a marginal portion of SCTG does not compromise root coverage outcome, as long as the relative size of the exposed SCTG surface area is within certain proportions of the total graft surface area (Yotnuengnit et al., 2004).

In recession defects associated with hypersensitivity it is important to consider a surgical approach that will provide complete root coverage. Should the operation fail to achieve complete defect resolution, the patient’s hypersensitivity will not be resolved and could be, at least temporarily, exacerbated during the early postoperative period. This especially may occur if root biomodification, such as use of citric acid (Vanuspong et al., 2004).

The last case presented here is a rare example of recession defect on a retained deciduous tooth. Gingival recession in deciduous teeth is a rare finding, usually associated with self-inflicted injury in children (Tatakis and Milledge, 2000). To the best of our knowledge, the present report describes the first surgical management of a gingival recession defect on a deciduous tooth. Although the presented root coverage results are of a short duration (3 months), there is abundant evidence of the long-term stability of the outcomes of SCTG procedures when optimal, non-traumatic plaque control is maintained (Bouchard et al., 2001; Harris, 2002). In summary, the coronally positioned flap with SCTG can resolve aesthetic and functional problems in a variety of defects.

Acknowledgement

The authors dedicate this paper to the memory of Dr. Antonio Fernando Martorelli de Lima, who was tragically killed in a motor vehicle accident in December, 2003. He used to say, “One man's success is only evident when his ideas are carried forward by others.” He was a dear friend, colleague, and mentor who inspired and continues to inspire his students and colleagues.

References


Vanuspong, W., Eisenburger, M. and Addy, M. Cervical tooth wear and sensitivity: erosion, softening and rehardening of dentine,

