Journal of Microbial & Biochemical Technology - Open Access

www.omicsonline.org

Case Report
OPEN ACCESS Freely available online
doi:10.4172/1948-5948.1000033

JMBT/Vol.2 Issue 4

Flapless Technique for Periodontal Bone Grafts in Treatment of Severe Periodontitis. Presentation and Long-Term Retrospective Study

Marco Antonio Argento[1,2]*, Lucia Regina Barros Manara[2], Vania Clara Berni[2] and Angelo Luiz Cortelazzo[1]

[1]*Department of Cell Biology, State University of Campinas, Campinas, SP, Brazil*
[2]*Brazilian Association of Dentistry (ABO), Campinas, SP, Brazil*
[3]*Rua Cel. Pedro Penteado, 512, suite 19, 13930-000, Serra Negra, SP, Brazil*

Abstract

The goal of this study was to retrospectively evaluate the clinical outcomes of the Flapless technique in treatment of severe periodontitis after three year. A non-aggressive technique for periodontal bone grafts was developed and tested on 19 subjects. The technique involved scaling and root planing, and the insertion of single grains of bone mineral through the crevicular space into the pocket until it's completely filled. All patients received monthly periodontal maintenance therapy for six months and then every three months for 2.5 years. Clinical parameters were assessed at baseline and after three years; these included probing depth (PD), clinical attachment level (CAL), and gingival recession (GR); the presence of bone defects was determined radiographically. The significance of the data was confirmed statistically. There was significant reduction in PD (4.9mm, $P<0.005$) and CAL gain (3.73mm, $P<0.005$), and a slight increase of in GR (1.16mm, $P<0.005$). After six months, it led to radiographic resolution of osseous lesions. Flapless Technique resulted in clinically relevant amounts of CAL gains, shallow pockets, minimal gingival recession, and radiographic osseous defect fill. This minimally invasive approach offers an efficient, safe and well-tolerated alternative for the long-term treatment of severe periodontitis in interproximal pockets of single-rooted teeth.

Keywords: Biomaterial(s); Bone graft(s); Graft(s); Non-surgical periodontal therapy; Osseous defects; Periodontal regeneration; Periodontal surgery; Periodontal treatment; Scaling and root planning; Repair; Ridge preservation

Abbreviations: PD: Probing Depth; CAL: Clinical Attachment Level; GR: Gingival Recession

Introduction

Periodontal disease is one of the most prevalent diseases affecting humans worldwide, and its advanced forms, with deep periodontal pockets (> 6 mm), affect approximately 10-15% of the adult population (Petersen and Ogawa, 2005).

The efficacy of grafts in treatment of deep pockets and regeneration or repair of lost alveolar bone is well established by clinical studies, and the surgical techniques used for such grafts are, however, quite critical (Fugazzotto, 2006; Kenney et al., 1985). Most grafts involve the incision of the soft tissue and the insertion of the graft material, but the resulting flap of primary soft tissue must then be sutured so it covers the graft. When the soft tissues overlying a graft do not completely cover the inserted material, contraction occurs and the graft material is exposed to exfoliation, as well as to contamination of the graft site (Fugazzotto, 2006). Various types of flap have been proposed in order to provide better coverage of the graft, including mucoperiosteal flap, modified Widman flap, papilla preservation flap, variation of papilla preservation flap, and minimally invasive surgery (Kenney et al., 1985; Takey et al., 1985; Cortellini et al., 1995; Harrel et al., 1999).

The present paper presents a flapless procedure designed to overcome the risk of contraction. After great scaling and root planing, the bone graft material was inserted through the crevicular space into the pocket, grain by grain (Figure 1). There was no cutting of the soft tissue, thus, avoiding all of the problems caused by contamination and exfoliation of graft. Moreover, the gingival covering provides irrigation with blood, which leads to the rapid repair of the tissues. Furthermore, since there is no incision, the papilla is maintained intact and little retraction occurs; the clinical attachment level thus can improves significantly, and the alveolar osseous crest can recover. The aim of the present case series study was to evaluate longitudinally the clinical and radiographic effectiveness of Flapless technique (FT) in treatment of severe periodontitis.

Material and Methods

This retrospective study was approved by the Ethics Committee for Human Research of the Faculty of Medical Sciences of the State University of Campinas (UNICAMP), Brazil.

One tooth from each of the nineteen patients with severe periodontitis was treated with the FT. 58% of the patients were women and 42% were men; aged from 33 to 59 years old, a mean 49 years. All patients enrolled in the study had clinically identified inflamed pockets (minimum depth of 7 mm) (Figure 2A, Figure 3A and Figure 4A) associated with radio graphically determined alveolar bone loss, and at least 2 mm of keratinized gingival attachment, both bucally and lingually; moreover, all of them presented O'Leary plaque rate of 10% or less. Patients with pockets around furcated teeth and smokers were eliminated from the study, as were non-compliant patients, defined as those failing to return for treatment or developing plaque on the relevant tooth. Other exclusion criteria were pregnancy or lactation; serious chronic medical conditions (e.g., diabetes mellitus, kidney or liver disease); acute systemic infection; patients requiring chronic (2 weeks or more) antibiotic therapy or who participated in a periodontal clinical trial within 24 months of baseline, and previous dental prophylaxis.

The parameters measured included probing depth (PD), clinical attachment level (CAL), and gingival recession (GR); the presence of osseous defects was also determined radiographically by technique

***Corresponding author:** Marco Antonio Argento. Rua Cel. Pedro Penteado, 512, room 19, Serra Negra, CEP 13930-000, SP, Brazil, Tel: +55 19 91778809; Fax: +55 19 38927916; E-mail: argentoma@yahoo.com

Received March 22, 2010; **Accepted** July 23, 2010; **Published** July 23, 2010

Citation: Argento MA, Manara LRB, Berni VC, Cortelazzo AL (2010) Flapless Technique for Periodontal Bone Grafts in Treatment of Severe Periodontitis. Presentation and Long-Term Retrospective Study. J Microbial Biochem Technol 2: 107-110. doi:10.4172/1948-5948.1000033

of parallelism (non-standardized). PD and GR were measured to the nearest mm using a probe PCP-UNC15™ (Hu-Friedy, Chicago, IL, USA) graduated at 1 mm intervals. All teeth were probed at six positions: mid-buccally, mid-lingually, meso-lingually and meso-buccally, and disto-bucally and disto-lingually, despite only interproximal pockets having been included in the study. Hard tissue closure of bone defects was assessed radiographically by a single examiner, and all other measurements of the soft tissue were determined by arithmetic average by three independent examiners. The material xenogenic bone mineral matrix used (manufactured in the Cell Biology Laboratories of UNICAMP) was implanted in all sites (Argento and Cortelazzo, 2004). Clinical assessments were recorded at baseline and after three years; three periapical radiographs were also taken, one at baseline, one after six months, and the third after three years.

All patients received standard periodontal treatment, comprising orientation about oral home care, as well as monitored brushing and professional dental cleaning, with treatment and instructions based on individual needs. After orientation about hygiene and an observation period of fourteen days, the baseline data were recorded and radiographs were taken. The presence of all tooth mobility was eliminated using occlusal adjustment and/or by joining teeth together in a splint.

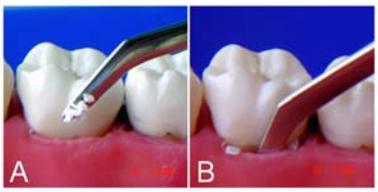

Figure 1: A) Photograph showing the graft been inserted into gingival sulcus with spatula. **B)** Graft having just been inserted into the sulcus.

Figure 2: A) Photograph showing the region of tooth #9 before treatment. **B)** Fourteen days after scaling and root planing. **C)** Just after Flapless technique. **D)** One week after graft and before removal of the excess material. **E)** The same time as Fig. D, but after cleaning of the material and plaque. **F)** At 1.5 months following FT. **G)** At 6 months following FT. **H)** At 3 years following FT. **I)** Initial photoradiograph showing bone defect in mesial region of tooth #9. **J)** A space between graft and bone defect is seen after 1.5 months of FT. **K)** A resolution of defect is shown 6 months after FT. **L)** Stability of the graft is observed after 3 years.

Scaling and root planing (SRP) was carried out until no rough spots or deposits could be detected, and the surface felt hard, velvety smooth, and glass-like. After 7-14 days, the extent of sulcus depth was determined by probing, and patients were submitted to more careful planing to remove plaque residual. Delicate curettage of the soft walls of the pockets and debridement of the bone opened a space to accommodate the graft material. The xenograft granules were inserted, one by one, and packed into the pocket using light pressure with a spatula #1 Duflex (Juiz de Fora, MG, Brazil) until the sulcus was totally filled (Figure 1 and Figure 2C). Periodontal dressings were used for two weeks, being changed after the first week (Figure 2D and Figure 2E), and the patients were asked to rinse their mouths twice daily for 2 weeks with a solution of 0.12% chlorhexidine gluconate Periogard™ (Colgate-Palmolive, São Bernardo do Campo, SP, Brazil). Systemic amoxicyline (3 x 500mg) was prescribed for 7 days, along with analgesics (paracetamol; 3 x 500mg) for pain, if necessary. The SRP and FT were performed under local anesthesia using Lidocaine with felinephrine. All patients received monthly periodontal maintenance therapy for six months, and every 3 months thereafter up to three years; this included diagnosis of gingivitis by bleeding on probing, reinforcement of the instructions about oral hygiene, plaque control with rubber cup prophylaxis and root planing if necessary; also eliminate the tooth mobility and endodontic treatment, and cosmetic contour and bonding with resin. The first sounding was carried out only 3 months after FT procedure.

Preoperative baseline measurements were compared to results after three years for PD, CAL and GR, using a Wilcoxon sign-rank test

Figure 3: A) Photograph showing the probe introduced 9mm into the pocket. **B)** After 6 months of FT. **C)** After 3 years of FT. **D)** Initial photoradiograph showing the bone defect in mesial region of tooth #25. **E)** Six months postoperatively, showing the material above crestal bone. **F)** Three 3 years postoperatively, showing the graft on the crestal bone.

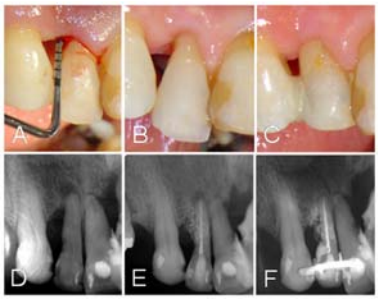

Figure 4: A) Photograph showing the probe introduced 9mm into the pocket. **B)** Flapless graft at 6 months postoperatively. **C)** Gingival aspect at 3 years postoperatively. Incisal cosmetic contour and bonding at distal of tooth #7 were performed. **D)** Initial photoradiograph showing the bone defect of tooth #7. **E)** The material over crestal bone at 6 months postoperatively. **F)** The stability of graft at 3 years postoperatively.

Case Report
OPEN ACCESS Freely available online
doi:10.4172/1948-5948.1000033
JMBT/Vol.2 Issue 4

	Baseline			3 years		
	Probing Depth	Gingival Recession	Clinical Attachment Level	Probing Depth	Gingival Recession	Clinical Attachment Level
*Measurement (mm)	8.21±1.08	0.15±0.37	8.36±1.11	3.31±0.58†	1.31±0.47††	4.63±0.89†
Change (mm)				- 4.9†	1.16††	- 3.73†
Change (ratio)				- 0.59†	7.7††	- 0.44†

Probing + standard deviation. † P = 0.0001. †† P = 0.0003.

Table 1: Clinical measurements and changes before and after treatment.

to evaluate treatment effectiveness and significance by computer program BioEst 8.0™ (BioEstat, Belém, PA, Brazil). The significance inter-examiner comparisons using unpaired T-test revealed a non-significant variation between observers ($P>0.05$).

Results

All treatment sites healed without incidents, the postoperative healing period was uneventful, and patients reported little discomfort (Figure 2E and Figure 2F). The adverse events that occurred are considered normal sequelae following any scaling and root planing. The height of the interproximal soft tissue and the papilla appearance were preserved (Figure 2F-2H, Figure 3B, Figure 3C, Figure 4B and Figure 4C). Moreover, no scar tissue developed, and after three months the PD remained almost constant throughout the study yielding practically no bleeding on probing. Measurements of PD, CAL, and GR taken at baseline and after three years are shown in Table 1; all measurements underwent significant changes. The PD decreased from the initial 8.21mm to 3.31mm, a statistically significant reduction of 4.9 mm ($p=0.0001$). The CAL also decreased from the initial 8.36mm to 4.63mm, a significant decrease of 3.73 mm ($p=0.0001$). The GR increased from 0.15 mm to 1.31 mm, and this increase of 1.16 mm was also significant ($p=0.0003$). The changes in PD, CAL and GR were significant highly, rejected a null hypothesis (H_0) and accepted the alternative (H_1) ($\alpha=0.01$). Despite having receded immediately after surgery, the gingival margin almost returned to its initial position after three weeks, stabilized after three months, and, in 3 years, a small GR was observed (Figure 2B-2H, Figure 3B, Figure 3C, Figure 4B and Figure 4C). The ratio of change in probing compared to three years treatment had a mean of -59% in PD and -44% in CAL. The radiographic analysis showed that after six months the bone defects had been totally eliminated (Figure 2K, Figure 3E and Figure 4E), and the situation remained constant throughout the three years of follow-up (Figure 2L, Figure 3F and Figure 4F). In some cases, the graft particles could be discerned some 4 mm alveolar coronal to the osseous crest (Figure 3E, Figure 3F, Figure 4E and Figure 4F).

Discussion

FT is the result of various experimental surgeries aimed at gradually reducing flaps and ultimately resulting in a flapless procedure. The aim of this innovative development in grafts was to enable primary closure during regenerative therapy. This technique is similar to the flapless surgery technique for dental implantations in aesthetic regions, and it is also similar to the Osteotome technique for sinus floor elevation, which used to be employed in the treatment of periodontal disease (Summers, 1994). This study has presented a type of graft procedure along with comparisons between clinical and radiographic data obtained over three years. The repair of tissues in all areas showed clinical signs of normality just after the second week. Furthermore, results demonstrated improvement in almost all clinical and radiographic parameters. When baseline values were compared after 3 years, FT proved to be significantly better than initial value of PD and CAL, but not of GR (Table 1). Further comparative studies contrasting clinical parameters with other procedures or materials are still mandatory, because this technique is new in literature and must be realized to others authors.

Radiographic resolution of periodontal defect occurred immediately after the procedure and the implant was found over the bone crest. The material can be radiographically seen because it is mineralized, and it is similar to the mineral bone xenograft (Bio-Oss, Geistlich, Wolhusen, Switzerland) already widely accepted and used (Argento and Cortelazzo, 2004). Immediately after the implantation of the xenograft material, a slight radiolucent void at the bottom of the defect was revealed by radiography (Figure 2J). This void was presumably due to the upwelling of blood under the graft, and later radiographs showed that it had totally disappeared, despite that, the bone graft material remained in place (Figure 2k). The material implanted filled the defect, and supracrestal graft apposition could be seen up to 4,0mm (Figure 3E, Figure 3F, Figure 4E and Figure 4F). If another type of material is used, it could change the process by which neoformed bone ossifies, osteocondution and/or osteoinduction. The association of products or inducer proteins that increase cellular activity, such as enamel proteins, synthetic 15-amino acid sequence, bone morphogenetic protein-2, platelet-rich plasma, platelet-derived growth factor, and chips plus clorexidine or irrigation with clorexidine, may enhance the outcomes of the Flapless technique.

GR and height of the bone crest are important components of periodontal aesthetics. The height of the marginal gingiva decreased immediately after surgery and between the first and the second postoperative week, it regressed to its original height. In up to three months, it was stabilized and in three years there was only a small recession. The big ratio from initial (0,15mm) to three years (1,31mm) is due the initial score is most little (Table 1), but in the treatment of 7 or more mm pockets, a 1.1 mm recession could be considered clinically small after 3 years (Figure 2A, Figure 2B and Figure 2H). Despite that, the final GR obtained was significantly higher than its initial value. Furthermore, the gain of alveolar bone crest and slight recession of gingival papillae, in several cases, render the Flapless technique suitable for aesthetic regions.

Little nutrition to the wound area results in necrosis and graft loss with material exfoliation. Also, it may lead to the appearance of an interproximal crater which, in turn, will ultimately result in a greater aesthetic problem. The interproximal tissues did not suffer necrosis, the graft increased the bone crest, which provided support to the papillae, and there was almost no evidence of graft exfoliation through the sulcus. Soft tissue interproximal craters did not develop, making it easier for patients to maintain optimal oral hygiene. Healthy gingiva covering the area of the grafts allowed for pyramidal-shaped interproximal papilla to appear in less than 1 month and remain present for the 3 years of the study. When the dental root interproximal space was wide, even wider was the scaffold adapting the graft, which resulted in larger amounts of material being placed over of the alveolar crest. The gingival papillae resilience seemed to be important for the final outcome, because the more resilient the papillae, the larger the amount of material deposited inside the sulcus.

The use of histological sections from human biopsies is essential for the assessment of healing of bone defects. However, bleeding on probing, PD and radiographs are adequate parameters for the evaluation of the status of the periodontium in clinical practice (Reddy and Jeffcoat, 1999). The American Academy of Periodontology has established the parameters for the treatment of chronic periodontitis

with advanced loss of periodontal supporting tissues, and the desired outcomes include: significant reduction of clinical signs of gingival inflammation, reduction of probing depths, stabilization or gain of clinical attachment, radiographic resolution of osseous lesions, progress towards occlusal stability and progress towards the reduction of clinically detectable plaque to a level compatible with gingival health (American academy of Periodontology, 2000). Those expected outcomes are consistent with the results of this study. The American Academy of Periodontology has also reported that the primary function of mineral xenografts is to be biocompatible space fillers, and the use of these materials produces similar clinical results to other bone replacement grafts or guided tissue regeneration (GTR) procedures, despite the fact that little, if any, periodontal regeneration can be expected (American academy of Periodontology, 2005). FT showed positive clinical and radiographic results, but in the future, reentry and histological studies must be conducted.

The optimal treatment of periodontitis should not only involve the elimination and control of periodontal infection, but also the regeneration of the lost periodontium. Graft surgeries basically include flap creation for root surface exposure, debridement and SRP, implant of biomaterial, and flap closure. The periodontium routinely heals by producing long junctional epithelium between soft tissues/material and root surface, after a disruption of the fibrin clot formed at root surface interface in early wound-healing events (Listgarten and Rosenberg, 1979; Wikesjo et al., 1992). However, there is conclusive evidence that limited regeneration and new connective tissue attachment may occur after graft procedures without GTR procedures (American academy of Periodontology, 2005; Egelbert, 1987; Bowers et al., 1989). The present procedure, may have promoted slight regeneration of deeper parts of the pocket. Furthermore, the graft material having filled the sulcus and periodontal defect may have impaired epithelial-cell proliferation.

Authors have been demonstrating clinical and histological favorable results using calcium sulfate barriers in inserting bone grafts for the treatment of all types of periodontal defects (Orsini et al., 2001, Aichelmann-Reidy et al., 2004). FT may be a type of GTR because the material graft can be regarded as a barrier. The technique employed in this study filled sulcus and defect, the graft was fixed and epithelial proliferation may also have been blocked, enabling predictable periodontal regenerative response. In the future, we must observe whether there is external histological root resorption because the filling on the bottom of the defect may also impair the repopulation of ligament and epithelial cells. In addition, bone cells may contact the root through the graft, also causing bone resorption (Karring et al., 1980). Nevertheless, no root resorption was detected by radiography over the 3 years.

Results of long-term studies using GTR and periodontal surgery procedures suggest that regenerated periodontium is stable over time in patients who are compliant with plaque control and maintenance intervals (Becker and Becker, 1993). However, patients who were non-compliant regarding plaque control and maintenance visits showed significant disease reoccurrence in treated sites (Machtei et al., 1994). Non-compliant patients and smokers were eliminated from this study in order to avoid the negative effects documented in the literature.

In the future, treatment of severe periodontitis with extensive loss of soft, as well as hard tissues will potentially eliminate periodontal disease, which will be followed by soft tissue augmentation around teeth and increase of alveolar crest. This will be made possible by the insertion of bone grafts using FT along with regeneration of periodontal ligament/cementum with GTR and/or inducer protein. Histologically, it is probable that the periodontium will not be totally reestablished. However, treatment will render the teeth more longevity. The FT hereby presented has treated advanced periodontal disease, presenting results as good as those obtained by related studies in the literature for almost all clinical parameters investigated. This procedure may improve predictability of periodontal grafts regarding clinical attachment level gain and probing depth reduction and it is even able to increase the height of the bone crest. The Flapless Technique is easily performed in a fast, less aggressive, minimally invasive, safe and efficient way. However, further comparative studies are necessary to fully understand the actual healing process of periodontal bone defects.

Acknowledgments

This study was in part supported by the Brazilian National Research Council (CNPq). The authors are grateful to Dimas Matedi for English revision.

References

1. Aichelmann-Reidy ME, Heath CD, Reynolds MA (2004) Clinical evaluation of calcium sulfate in combination with demineralized freeze-dried bone allograft for the treatment of human intraosseous defects. J Periodontol 75: 340-347.
2. American Academy of Periodontology (2000) Parameter on chronic periodontitis with advanced loss of periodontal support. J Periodontol 71: 856-858
3. American Academy of Periodontology (2005) Position paper. Periodontal regeneration. J Periodontol.76:1601-1622.
4. Argento MA, Cortelazzo AL (2004) Polylactic Acid study, and associated with hydroxyapatite or bone protein matrix: in vitro, in rats and humans (in Portuguese/English). [Doctoral thesis]. Campinas, SP, Brazil: State University of Campinas (UNICAMP) 126.
5. Becker W, Becker BE (1993) Treatment of mandibular 3-wall intrabony defects by flap debridement and expanded polytetrafluorethylene barrier membranes. Long-term evaluation of 32 treated patients. J Periodontol 64: 1138-1144.
6. Bowers GM, Chadroff B, Carnevale R, Mellonig J, Corio R, et al. (1989) Histologic evaluation of new attachment apparatus formation in humans. J Periodontol 60:683-693.
7. Cortellini P, Prato GP, Tonetti MS (1995) The modified papilla preservation technique. A new surgical approach for interproximal regenerative procedures. J Periodontol 66:261-266.
8. Egelbert J (1987) Regeneration and repair of periodontal tissues. J Periodontol 22:233-242.
9. Fugazzotto PA (2006) Maintaining primary closure after guided bone regeneration procedures: introduction of new flap design and preliminary results. J Periodontol 77:1452-1457.
10. Harrel SK, Nunn ME, Belling CM (1999) Long-term results of a minimally invasive surgery approach for bone grafting. J Periodontol 70:1558-1563.
11. Karring T, Nyman S, Lindhe J (1980) Healing following implantation of periodontitis affected roots into bone tissue. J Clin Periodontol 11:41-52.
12. Kenney EB, Lekovic V, Han T, Carranza FA Jr, Dimitrijevic B (1985) The use of solid implants in periodontal bony defects. I. Clinical results after six months. J Periodontol 56: 82-87.
13. Listgarten MA, Rosenberg MM (1979) Histological study of repair following new attachment procedures in human periodontal lesions. J Periodontol 50: 333-344.
14. Machtei EE, Cho MI, Dunford R, Norderyd J, Zambon JJ, et al. (1994) Clinical, microbiological, and histological factors which influence the success of regenerative periodontal therapy. J Periodontol 65: 154-161.
15. Orsini M, Orsini G, Benlloch D, Aranda JJ, Lazaro P, et al. (2001) Comparison of calcium sulfate and autogenous bone graft to bioabsorbable membranes plus autogenous bone graft in the treatment of intrabony periodontal defects: A split-mouth study. J Periodontol 72: 296-302.
16. Petersen PE, Ogawa H (2005) Strengthening the prevention of periodontal disease: The WHO approach. J Periodontol 76: 2187-2193.
17. Reddy MS, Jeffcoat MK (1999) Methods of assessing periodontal regeneration. Periodontol 2000 19: 87-103.
18. Summers RB (1994) A new concept in maxillary implant surgery: the Osteotome technique. Compendium 15: 152-162.
19. Takey HH, Han TJ, Carranza FA, Kenney EB, Lekovic V (1985) Flap technique for periodontal bone implants. Papilla preservation technique. J Periodontol 56: 204-210.
20. Wikesjo UM, Niveus RE, Selvig KA (1992) Significance of early healing events on periodontal repair. A review. J Periodontol 63: 158-165.