SURGICAL TREATMENTS OF MULTIPLE GINGIVAL RECESSIONS: STATE OF THE ART and WOUND HEALING MODULATION

Ph.D. Thesis

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Szeged, Hungary 2010

INTRODUCTION

Marginal tissue recession is due to the displacement of the soft tissue margin apical to the cemento-enamel junction with exposure of the root surfaces to the oral cavity.

Both localized and multiple gingival recessions may be a concern for patients for a number of reasons. In addition to root hypersensitivity, erosion and root caries, aesthetic considerations may also come into play, particularly in those patients who have a high lip smile line.

This tissue recession is frequently associated with aesthetic impairment.

In multiple adjacent recession type defects (MARTD) the avascular surface is more extensive. Furthermore some anatomical characteristics such as thin biotype, decreased keratinized tissue (KT) width, root prominence and root proximity make much more difficult the choice of surgical treatment compared to localized gingival recession type defects.

The predictability of treatments aimed to provide root coverage in cases of localized gingival recessions (LGR) has been reviewed extensively in several systematic reviews of Miller's Class I and II recession type defects. However scientific literature is sparse regarding the treatment of MARTD and randomized control trials (RCTs) are needed to identify the indication for each surgical technique and any prognostic factors.

Multiple adjacent recession type defects (MARTD) present a further challenge since:

- in order to minimize patient discomfort and to improve clinical outcomes, several recessions must be treated in a single surgical session.
- the management of Class III recession defects, combined with interproximal bone loss and cervical recession presents a complex challenge to the periodontist for the regeneration of soft tissues and bone.

AIM OF THE STUDIES

Studies are scarce on our capacity to modify gingival biotype after treatment of MARTD.

Most studies are concerned only with percentage of root coverage. Coronally advanced flap (CAF) technique has become popular due to the simplicity of the technique and the excellent post-operative wound healing.

We choose to determine whether the addition of an autologous fibrin clot to a CAF will improve root coverage of multiple Miller's Class I or II gingival recessions when

compared to a CAF alone. We have also decided to use suspended sutures on both test and control sides. The change in biotype thickness was evaluated by measuring the thickness of marginal gingiva or mucosa, with an endodontic probe. Changes in keratinized tissue width were also measured at 6 Months.

Our second project concerned Class III Miller's recessions. In that situation there is some bone loss and papilla loss. Case series or case reports have shown with supraperiosteal envelop technique (SET) or various tunnel techniques our ability to obtain root coverage with Class I and II Miller's recession type defects. A coronally advanced modified tunnel (CAMT) technique with subepithelial connective tissue graft (CTG) was our control and on test side we evaluated the effect of an EMD application. Parameters for root coverage were monitored, but also the potential of EMD to stimulate a gain in papilla.

MATERIALS AND METHODS

1) A total of 67 recession-type defects were treated. Twenty subjects, 15 females and 5 males aged 22 to 47 years (mean age 31.7 years) were enrolled. Fifteen patients had maxillary recessions, four with mandibular and one patient had both maxillary and mandible recessions allowing test and control on the upper arch and also on the mandible arch. Therefore, a total of 21 pairs of treatment (test and control) were performed. Full mouth scaling and prophylaxis were scheduled one month before surgery. CAF was performed on both sides of the mouth, either in conjunction with a PRF membrane (test side) or without (contralateral control side) (paper n°1)

The following clinical values were recorded at baseline, then at 1, 3 and 6 months post-operatively:

- Gingival recessions (GR) were measured from the cemento-enamel junction (CEJ) to the gingival margin at the mid-buccal point of the teeth involved, using a periodontal probe.

At baseline and 6 months after surgery the following parameters were recorded:

- Keratinized gingival width (KGW) was measured from the mucogingival junction (MGJ) to the gingival margin.
- Recession width (RW) was measured at the CEJ.
- Probing pocket depth (PD), clinical attachment level (CAL) and gingival - mucosal thickness (GTH).

2) Twenty subjects (mean age 31.7 years), with multiple Miller's Class III recession type defects (Miller 1983), representing 139 recession type defects, were enrolled in the study after having signed informed consents (paper n°2)

The following clinical parameters were assessed at baseline, 6 months and 1 year postoperatively: Plaque Index (PI), Gingival Index (GI), Probing Depth (PD), Gingival Recession (REC) and Clinical Attachment Level (CAL). Additionally, the width of the Keratinized gingiva (KGW), measured as the distance from the mucogingival junction (MGJ) to the gingival margin, the width of the recession defect (RW) and the distance between the contact point and the top of the papilla at the mesial aspect of the tooth (DCP) were recorded. PD, REC, CAL, KGW measurements were made at the mid-buccal point of the teeth involved.

The CEJ was used as a reference point for these measurements, except in those cases where the CEJ was not visible; in which case, the margin of a restoration was used as a reference point.

At 28 days and at 3 months, only the measurements for REC and DCP were recorded. Any patient concerns regarding discomfort, tooth sensitivity or aesthetic appearance, or any other complaints during the study period were also recorded.

RESULTS

1) There were no statistically significant differences between the recession-type defects in the two groups at baseline. All patients completed the study and expressed improvement as far as root sensitivity was concerned. Sloughing of the flap, without infection, occurred in one patient, resulting in a recession defect without any esthetic complaint. Two patients were moderate smokers (<10 cigarettes/day) and they did not show any altered wound healing.

At one month, both treatments resulted in significant improvement in the percentage of root coverage. This amounted to 81.0 ± 16.6 % and 86.7 ± 16.6 % respectively for test and control groups The difference between the two groups was not statistically significant. At three months, there was a slight decrease of root coverage in the test group and the difference between the two groups became statistically significant (76.1 ± 17.7 % in the test group and 88.2 ± 16.9 % in the control group). At six months, when compared with the three month data, there was a statistically significant increase in root coverage in the control group (up to 91.5 ± 11.4 %). No statistically

significant differences were observed at the test sites over the same time period. Therefore, at six months, the difference of root coverage between the two groups was statistically significant. The observed values were 80.7 ± 14.7 % and 91.5 ± 11.4 %, for test and control sites respectively.

Full root coverage was achieved on 74.62% of the control sites compared with only 52.23% on the test sites.

A threshold of 0.5 mm remaining recession defect may be considered to be a clinically satisfactory esthetic outcome. This value represents a 17% lack of coverage (test sites) and 20% (control sites), when applied to the mean baseline values. In the present study, this value was obtained for 64.17% and 88.05% respectively of the test and control sites.

At patient level, at six months, the test procedure resulted in a lower percentage of root coverage than the control procedure for 15 patients. For these patients, the mean percent of root coverage was 74.1% ± 12.1% for the test side versus 92.4% ± 11.8% for the control side. Only two patients showed worse results with the control procedure. On four patients, 100% root coverage was obtained for both control and test procedures. Eleven patients showed 100% of root coverage in the control group whereas only four patients obtained this optimal result with the test procedure.

The best results were found at anterior maxillary sites where the control procedure resulted in 100% root coverage and test procedure resulted in 91.1% ± 18.8% root coverage. Worst results were obtained for maxillary molars with only 86.3% ± 17.6% root coverage for the control procedure and 70.9% ± 19.9% for the test procedure. These differences are statistically significant.

A better and significant reduction of RW was achieved at 6 months with control treatment (66.2% ± 37.5% reduction for the test sites versus 82.4% ± 33% for the control sites).

Both procedures resulted in a significant CAL gain at 6 months from 4.23 ± 1.56 mm to 1.76 ± 0.97 mm and from 3.93 ± 1.43 mm to 1.37 ± 0.62 mm, for test and control group respectively. Although there were no significant differences between the two groups at baseline, a statistically significant difference was found at 180 days.

We also observed a statistically significant decrease of PD in the two groups from baseline to 6 months. However, the difference between the two groups at six months was not statistically significant.

A significant decrease of KGW was observed from baseline to six months in both groups. However, there was no statistically significant difference between the two groups, at baseline and at six months.

A significant increase in GTH between baseline and 6 months was observed only in the test group (from 1.1 ± 0.4 mm to 1.4 ± 0.5 mm).

Finally, no significant difference in terms of root coverage was observed with a threshold of GTH ≤ 0.5 mm and ≤ 1 mm within the test and the control group.

The Kolmogorov-Smirnov test of baseline data showed a homogeneous distribution of the data ($P<0.05$).

No patient needed to be excluded from the study, nor had significant complications.

As far as root sensitivity was concerned, all patients expressed improvement.

2) Ten patients had defects in the maxillary arch and the same number had defects in the mandible arch. Ten subjects had sites involving only anterior teeth (5 on the maxilla and 5 on the mandible). Seven subjects had sites that also involved bicuspids, (2 in the maxilla and 5 in the mandible) and three subjects had sites involving maxillary bicuspids and molars.

The values of the clinical parameters at baseline, six months and at one year were measured. No statistical difference was observed within and between groups for PI, GI, PD or KGW values between baseline, 6-month and I-year measurements.

Both treatment groups showed significant post-surgical improvement in the coverage of gingival recession and CAL gain, when compared with baseline.

At the subject level, for the test sites, the mean recession depth decreased significantly from 3.5 ± 1.5 mm (baseline) to 0.6 ± 0.9 mm (28 days) and to 0.8 ± 1.1 mm (1 year), with slight variations for measurements at the other time intervals. The corresponding results for the control sites were; 3.2 ± 1.4 mm, 0.6 ± 0.8 mm, and 0.6 ± 0.9 mm. Also, both treatments resulted in a significant CAL gain (3.11 mm and 2.86 mm for test and control groups respectively). REC coverage and CAL gain were not significantly different between the two groups. Statistically significant decreases in RW and DCP measurements were observed between the baseline, the 6-month and 1-year data, but these results were not statistically different between the two treatment groups.

When the results were expressed as a percentage of root coverage at 1 year, both

treatments resulted in a root coverage of 82% and 83% for test and control groups respectively. After one year, the gain in the vertical height of the papilla (as measured by the reduction of the DCP distance), when expressed as a percentage, was 58.6% and 59.2% for test and control groups respectively. Mean mesial and distal probing were respectively 1.9 ± 0.7 mm, 2.0 ± 0.7 mm at baseline for the test group, 2.0 ± 0.6 mm, 2.1 ± 0.6 mm for the control group. These values were not statistically different between groups and no significant differences were also found at one year between groups and baseline measurements.

At 28 days, complete root coverage (100%) was observed in 8 (38%) and 7 (33%) of the test and control group surgeries respectively. At the 1-year assessment, complete root coverage was observed in 8 of the surgeries in each of the two groups. Eight of the surgeries in each group resulted in coverage in the 99%-75% range at 28 days, but only 6 at one year for the test group. The distribution of surgeries according to the percentage of root coverage is shown in. Among those patients with 100% root coverage on the control side at I year, 5 showed similar results on the test side.

CONCLUSIONS

These studies have shown that root coverage is predictable as well for class I, II and III Miller's recession defects. For class I and II a modified CAF was used and we can guess after our results with Class III, that a MCAT will give at least similar results.

The RCT of CAF with or without PRF has shown at six months a significant difference in gingival thickness. Surprisingly with the addition of suspended sutures to the original CAF design, we have no increased in KGW. A similar effect was observed with MCAT, at one year in spite of a recede amount of mean attached gingiva at baseline (1.1 mm), we had no significant creeping attachment when compared to the data of the literature for CAF.

The study on Class III recession defects has shown a similar predictability than for the treatment of Class I and II recessions. This new information shows also that with these defects, the CTG combination has a similar positive effect than the EMD-CTG combination, at one year. Again the length of the observation period may be an important parameter to evaluate in particular for the effect on periodontal ligament and or connective tissue of gingival papilla.

MARTD is a good model to evaluate surgical protocols aiming at regeneration with stimulatory wound healing agents, growth factors or tissue engineering. The complexity remains however, since it may be necessary to adapt our surgical techniques to these modulating agents, which have various physical and chemical configurations.

NEW STATEMENTS

1. Complete root coverage of Miller's class I and II multiple recessions with a CAF can be predictable.
2. Combination with PRF of an advanced coronally flap is associated with a limited increased thickness of the gingival margin at 6 months.
3. Adjunction of PRF shows some changes in gingival biotype, but the clinical relevance need to be further investigated.
4. Coverage of class III multiple recession type defects is predictable with a coronally advanced modified tunnel and CT graft at 1 year.
5. Combination with EMD in class III recession type defects is not associated with a clinical improvement at 1 year.
6. Complete root coverage is also frequently obtained with class III… but papilla gain is limited.

Acknowledgement

This thesis was made possible due to expertise and facilities provided by the Department of Periodontology of the Semmelweis University Budapest, Hungary.

I thank my husband Dr. Bruno BARBIERI who always supported my scientific and personal goals.

I would like to thank especially Dr. Daniel ETIENNE who supported and encouraged to finalize my work and for his persistent help and advice that was so significant.

I express all my gratitude to Dr. Tibor KEGLEVICH for his valuable help and support.

I express my gratitude to all person who helped me in this dissertation:

Professor Katalin NAGY, University of Szeged

Professor István GERA, Semmelweis University Budapest

Professor Anton SCULEAN, University of Bern

Dr. Dimitris NIKOLIDAKIS, University Medical Center, Nijmegen, The Netherlands

I thank my family for the support during the finalization of my work.

This work would not have been possible without the involvement of the staff of the Department of Periodontology of the Semmelweis University.

Publications related to the thesis

1) Aroca, S., Keglevich, T., Barbieri, B., Gera, I., Etienne, D. (2009). Clinical evaluation of a modified coronally advanced flap alone or in combination with a platelet rich fibrin membrane for the treatment of adjacent multiple gingival recessions. A 6-month study. *J Periodontol*, 80: 244-252.
Impact factor: 2.192

2) Aroca, S., Keglevich, T., Nikolidakis, D. Gera, I., Nagy K., Azzi, R., Etienne, D. (2010) Treatment of class III multiple gingival recessions: a randomized trial. *J Clin Periodontol,* 37: 88–97.
Impact factor: 3.549

Meeting, presentations related to the thesis

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