



Evaluation of MCAT Technique with SCTG and Conjugated with Melatonin in the Treat Gingival Recession Using Minimally Invasive Surgical Approach in the Esthetic Zone: A Randomized Clinical Trial.

Dina H. Younes ¹, Eatemad A. Shoreibah ², Hala H. Hazza ²

Codex : 37/1907

azhardentj@azhar.edu.eg

http://adjg.journals.ekb.eg

DOI: 10.21608/adjg.2019.5459.1011

ABSTRACT

Purpose : This randomized split mouth study was designed assessing complete root coverage (CRC) in treating gingival recession Miller class I and II site defects with minimal invasive surgical approach in the esthetic zone using MCAT in conjugation with SCTG alone or soaked in 0.1 % melatonin gel .**Method and Materials:** six healthy patients (6 females) of total 22 Miller Class I, II site defect were treated with MCAT combined with SCTG alone (control group) and with MCAT in combined SCTG soaked with 0.1% melatonin gel (test group). Measurements of clinical parameters (CAL,RD,RW,KTW,PI) was evaluated before surgery and at 6 months after surgery. The primary objective was complete root coverage (CRC). Gingival crevicular fluid sampled and analyzed for anti-oxidative stress marker the GCF protein carbonyl (PC) before surgery, 2 days, 2 weeks and 3 months postoperatively. **Results:** Healing was uneventful in all cases without any complications. 6 months post-surgery CRC and other soft tissue clinical parameters were obtained in all patients within each group whereas, no statistically significant difference between the studied groups .CRC for control group was 58.3%, whereas for test group was 60%. **Conclusion:** The current findings found the treatment modality results in predictable coverage of Miller Class I and II site defects. The influence of melatonin addition to SCTG on clinical parameters, although non- significant, seems to be better than SCTG alone. GCF PC is a reliable oxidative marker stress that showed significant lower level at 3 months in the melatonin group representing the antioxidant properties of melatonin.

KEYWORDS

Modified coronally advanced tunnel;
gingival recession;
root coverage;
subepithelial connective tissue graft.

- A paper extracted from Doctor Thesis entitled “Evaluation of MCAT Technique with SCTG and Conjugated with Melatonin in the Treat Gingival Recession Using Minimally Invasive Surgical Approach in the Esthetic Zone: A Randomized Clinical Trial.”
1. Dental Specialist at Ministry of Health. Email: dinayounes14@yahoo.com
 2. Professor of Oral Medicine, Periodontology, Oral Diagnosis and Dental Radiology Department, Faculty of Dental Medicine for Girls, Al-Azhar University.

INTRODUCTION

Gingival recession (GR) was defined as an apical migration of the gingival margin from its' position on the crown on the root surface beyond the CEJ),⁽¹⁾ where bone dehiscence is a mandatory anatomic pre-requisite for its' initiation and development^(2,3). GR has a multifactorial etiology associated with mechanical, iatrogenic, and anatomical factors⁽⁴⁾. treatment of the causative factor is of great importance before performing root coverage surgery. objectives of treating GR are to accomplish favorable esthetics and decrease hypersensitivity⁽⁵⁾.

In 1985⁽⁶⁾ GR was classified according to the position of soft tissue margin to the muco-gingival junction and inter-dental soft and bone tissue loss. This has been the most agreed and extensively applied classification for GR.

Different treatment techniques have been used including Non -surgical and surgical treatment. Surgical treatments encompass laterally positioned flaps⁽⁷⁾, free gingival grafts⁽⁸⁾, (SCTG)⁽⁹⁾, coronally advanced flaps⁽¹⁰⁾, guided tissue regeneration⁽¹¹⁾, and acellular dermal matrix allografts⁽¹²⁾. Among treatment modalities, SCTG have demonstrated high successful rates⁽¹³⁾. Root coverage achieved using the SCTG procedure is very stable, and thus the technique is proposed to be a "Gold Standard".

The modified coronally advanced tunnel technique (MCAT) was shown to achieve predictable coverage Miller Class I, II, and III multiple GR. The MCAT composed of preparing a full thickness flap and absence of vertical incisions to enhance vascularization and stability of the wound^(14,15). Coronal positioning of the tunneled flap with SCTG are totally covered, thus maximizing graft survival and recession coverage, when used combined with SCTG or other types of grafts⁽¹⁵⁾.

Melatonin is a substance produced by multiple organs including the pineal gland. Its' principle function is regulation of circadian rhythm day and

night⁽¹⁶⁾. Possessing anti-inflammatory, anti-oncotic, and immune-modulatory role by scavenging free-radicals⁽¹⁷⁾.

Protein carbonyl (PC) is broadly used biomarker for oxidative stress. It reflects oxidative damage to proteins elicited by various types of reactive oxygen species⁽¹⁸⁾.

MATERIALS AND METHODS

Subject selection

Six healthy adult patients, aged between (18-55) years; seeking for GR treatment in the esthetic zone were enrolled. Participating patients attending the outpatients' clinic of the Department of Oral Medicine and Periodontology, Faculty of Dental Medicine for Girls ,Al-Azhar University , Egypt.

Sample size calculations and randomization:

CRC was considered the primary outcome. Sample size was calculated with an assumed power of 80% to predict a minimum clinically significant difference in root coverage of 1 mm (using $\alpha = 0.05$) and a standard deviation of 1 mm. A sample size of $N = 6$ patients was calculated⁽¹⁹⁾.

Criteria for patient selection

A detailed history plus proper clinical examination were taken from each patient to make sure of the suitability for our study design.

Inclusion criteria:

- Presence of at least one defect at each side Miller class I or II (4) GR esthetic zone.
- Patients with adequate oral hygiene level, full-mouth plaque score $\leq 15\%$ and full mouth bleeding score $\leq 15\%$ ⁽²⁰⁾.
- Presence of ≥ 2 mm width of keratinized gingival tissue apically.

Exclusion criteria

- Patients with para-functional habits or any source of occlusal trauma.
- Smokers or former smokers.
- Presence of cervical caries lesion or filling.
- Patients with periodontitis stage III and IV ⁽²¹⁾.

The treatment protocol:

In this randomized clinical trial, all the selected sites were randomly assigned as following:

Group I (control): Patients of this group treated with MCAT technique conjugated with (SCTG) alone.

Group II (test): Patients of this group treated with MCAT technique conjugated with SCTG soaked with 0.1 % melatonin gel for 5 minutes.

Clinical parameters:

Clinical measurements were performed by a single examiner with a periodontal probe (UNC 15, Hu-Friedy, Chicago, IL, USA) at before surgery , 3 and 6 months postoperatively as followed:

1. Probing pocket depth (PPD) at mid-buccal of teeth from a gingival margin to the base of the sulcus or pocket with a calibrated periodontal probe⁽²²⁾.
2. Recession depth (RD) distance between the (CEJ) and the GM ⁽²³⁾.
3. Recession width (RW) distance between the mesial GM and distal GM (estimated on horizontal line tangential to the CEJ ⁽²³⁾).
4. Keratinized tissue width (KTW) distance from the MGJ to the GM ⁽²³⁾.
5. Clinical attachment level (CAL): measured on midbuccal side (mm), from the CEJ to the bottom of the gingival sulcus ⁽²⁶⁾.

6. CRC percentage of total gingival recession coverage measured after 3 and 6 months (%).
7. Plaque index (PI) ⁽²⁴⁾.
8. Gingival index (GI) ⁽²⁵⁾.

Clinical data assessed at baseline, 3 and 6 months after surgery . (GCF) was obtained prior to surgery, 2 days, 14 days and 3 months post-surgically.

Surgical procedure

The surgical site was anesthetized with 2% xylocaine HCl with adrenaline (1:200000). After local anesthesia administration, root planning was exerted with gracey curettes. Intra-sulcular incisions were performed using microsurgical blades (15c, Micro Blades) . Full thickness muco-periosteal flap was raised with differently designed tunneling knives (Tunneling Knives®, Helmut Zepf, Germany) beneath the level of the MGJ leaving papillae untouched. muco-periosteal pouch extended mesially and distally underneath the neighboring papillae until papillae connection . Attached muscles and collagen fibers released with specially designed tunneling knife.

As a result of this procedure, flap could be freely advanced coronally. After tunnel preparation, dimensions of the SCTG were calculated. SCTG of a thickness of 1 to 1.5 mm was harvested by means of single incision technique. SCTG was soaked in melatonin gel in test groups. The graft insertion facilitated with a packing instrument and support suture. Whole gingiva-papillary complex advanced coronally and stabilized with sling sutures 6-0 sutures to completely cover the SCTG.

Statistical analysis:

The Statistical Package for the Social Sciences (SPSS Inc,v.20 software, Chicago, IL, USA) was used for all analyses. The Kolmogorov-Smirnov test was used to analyze the distribution of continuous variables. Significance level was set at 0.05.

RESULTS

Table (1): The mean and standard deviation for the intergroup comparison of clinical soft tissue parameters between the control and the test group at 6 months postoperatively showing non statistical significant difference.

Study parameters	Control group (melatonin) (Mean \pm SD)	Test group (Mean \pm SD)	Mann-whitney U test	p-value
CAL	2.00 \pm 0.95	1.70 \pm 1.05	Z=0.95	P value=0.341
PPD	1.41 \pm 0.51	1.20 \pm 0.63	Z=0.80	P value=0.423
RD	0.58 \pm 0.79	0.50 \pm 0.70	Z=0.18	P value=0.851
RW	3.50 \pm 0.52	3.80 \pm 0.42	Z=1.42	P value=0.155
KTW	3.58 \pm 1.37	4.10 \pm 1.97	Z=1.00	P value=0.313
PI	0.29 \pm 0.31	0.55 \pm 0.45	Z=1.33	P value=0.18
GI	0.18 \pm 0.30	0.12 \pm 0.13	Z=0.00	P value=1.000

Significance (*) was set as p value < 0.05 SD: standard deviation

Control group, The intragroup comparison of clinical soft tissue parameters at baseline, 3 months and 6 months post-surgically showed statistical significant difference in CAL, PPD, RD, KTW, PI and GI from baseline to the end of the study. The RW is the only clinical parameter that didn't show any significant statistical difference from the baseline up to the end of the study within the control group, being at the same value at both baseline and 3 months which was 3.58 \pm 0.51. **Test group :** The intragroup comparison of clinical soft tissue parameters for the test group before surgery, 3 and 6 months postoperatively showed a statistical significant difference in terms of CAL, PPD, RD, KTW, PI and GI from baseline to the end of the study. The RW was the only clinical parameter that didn't show any change in value from the baseline up to the end of the study to record 3.80 \pm 0.42.

Complete root coverage (CRC) was obtained to be 7/12 (58.3%) in the control group and 6/10 (60.0%) in the test group respectively showing non-significant statistical difference between the control and test group in CRC. Mean root coverage percentage (MRC) at 6 months was 77.77 \pm 28.72 for control group and 80.00 \pm 25.60 for test one showing non-significant statistical difference between the control and test group in MRC.

DISCUSSION

Results of the ongoing split mouth design have shown that the selection of the autogenous SCTG as grafting material in the treatment of GR and increasing the keratinized gingival strip centered on its' excellent biomimetic capacity, demonstrating the induction potential of two fundamental criteria: the keratinization of the gingival mucosa and the new adhesion of periodontal connective tissue ⁽²⁷⁾.

Our current findings were consistent with a systematic review that reported that the soft tissue augmentation procedures using the autogenous SCTG aimed not only to gain coverage of the exposed roots and blending of natural tissue but also to augment gingival width and thickness to guarantee the long-term stability considering SCTG as the gold standard ⁽²⁸⁾.

In our ongoing study, one of the main advantages of the MCAT surgical technique was the preparation of a full-thickness pouch and the avoidance of vertical releasing incisions ⁽¹⁵⁾. In the current study, the MCAT surgical technique combined with SCTG achieved CRC 58.3% and 60% for the control and test group respectively with statistical significant increase from baseline to the end of the study.

This was in accordance with systematic review that showed⁽²⁹⁾ that the MCAT with SCTG was one of the most promising technique to assess CRC in Miller Class I and II defects.

In agreement to our current results using SCTG with MCAT in achieving predictable CRC that was in test group 60% and in control 58.3%,⁽¹⁴⁾ showing high level of efficacy when compared between MCAT plus SCTG yielded CRC to be 85% of control sites and MCAT with resorbable collagen matrix (CM) to be 42% of test sites concluding that SCTG achieved higher CRC than the CM in treating Miller Class I and II with MCAT.

In the current study, concerning the clinical outcomes which were apparent showed significant statistical improvement in the mean values of all soft tissue clinical parameters in the terms of CAL, PPD, RD, KTW, GI and PI from the baseline up to the end of the study (6 months) in studied groups (intra-group comparison). Meanwhile, no statistical significant difference between in the mean values of all soft tissue parameters, CRC and MRC at baseline, 3 and 6 months directing slight improvement toward the test one (melatonin group).

The nonsignificant statistical difference in the ongoing study, in the percentage of (CRC), (MRC) and other parameters between the test and control one was owing to the utilization of SCTG in both groups that resulted in high root coverage predictability at the end of the study. This was in accordance with another research that demonstrated that SCTG under the flap, considered as biological filler, could adapt the inner of the flap to the root surface so, restricting the post-surgical contraction in both groups.⁽³⁰⁾

In the current study the slight improvement of the test group (melatonin group) over the control one at the end of the study in terms of CRC, MRC and clinical parameters could be justified due to soaking the SCTG with melatonin gel in the test group. In agreement with our current study, another study showed that melatonin might be a valuable

modality after oral surgical intervention by avoiding complications of inflammation and infection elicited by oxidative stresses.⁽³¹⁾

In the current study the reduction of PC level in the test group at 3 months post operatively beyond the baseline level, may somewhat reflect the benefits of melatonin utilization as an anti-inflammatory. This was in agreement with another research reported that topically applied melatonin in the evacuated sockets of the beagle dogs after tooth removal reduced oxidative stress and inflammation and enhanced the healing mechanism⁽³²⁾.

In respect to the application of the melatonin gel to SCTG in the current study to the test group, it recorded a slight improvement over the control one in terms of none significant statistical difference in CRC, MRC, soft tissue clinical parameters and the biochemical assessment of protein carbonyl (PC) marker over the control one. This may be attributed to the small sample size and short duration follow up period, However in the ongoing study, resembling our concluding remarks in terms of using topical melatonin found that other enhancers of wound healing as PRF or EMD did not achieve pronounced benefit to the tested techniques. Justification that that most probably, the techniques MCAT plus SCTG to which enhancers were added along with minimal invasive approach were already satisfying the healing capacity^(33,34).

CONCLUSION

MCAT conjugated with SCTG along with MIS is a predicatble technique achieved CRC (58.3%, 60%) and MRC (77.7%, 80%) in control and test groups respectively. The influence of melatonin addition to SCTG on clinical parameters, although non- significant, seems to be better than SCTG alone. GCF PC is a reliable oxidative marker stress that showed significant lower level at 3 months in the melatonin group representing the antioxidant properties of melatonin.

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