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ASSESSMENT OF TWO DIFFERENT ROOT COVERAGE TECHNIQUES USING ROOT ESTHETIC SCORE. RANDOMIZED CLINICAL TRIAL

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KEYWORDS

Coronally Advanced, Root Esthetic Score, Root Coverage, Tunneling, Graft.

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ABSTRACT

Introduction: The root surface and cementoenamel junction are exposed due to gingival recession, which is caused by the apical migration of the gingival tissue edge. Periodontitis, mechanical trauma (such vigorous tooth cleaning), malocclusion, or iatrogenic factors are possible causes. Clinically, it presents with root sensitivity, esthetic concerns, and increased susceptibility to root decay. Aim of the study: to evaluate and compare the esthetic outcomes of Vestibular Incision Subperiosteal Tunnel Access (VISTA) technique, with connective tissue graft; versus Coronally Advanced Flap (CAF) technique; with connective tissue graft, in treating gingival recession in esthetic zone. Patients and Methods: Thirty patients, with Miller class I or class II gingival recession, were included in the current study, with age range from 18 to 55 years. Defects were treated using either VISTA combined with connective tissue graft technique, or CAF combined with connective tissue technique. At three, six and nine months, total root esthetic (RES)score were measured using. Results: Results of the present study showed no significant difference in terms of RES between test and control group. Conclusions: Based on the results of the current study, it can be concluded that the RES revealed no significant difference between both surgical techniques.

INTRODUCTION

Friedman, in 1957, introduced the term "mucogingival surgery" as "surgical procedures designed to maintain gingiva, remove aberrant frenulum or muscle attachments, and increase the depth of the vestibule"⁽¹⁾. Miller developed the term "periodontal plastic surgery" (PPS) in 1993 to describe the treatment of alveolar ridge defects in addition to soft tissue aesthetics ⁽²⁾.

This was changed, nonetheless, in 2014, when PPS was implemented with the intention of modifying the gingival margin's location as well as the quantity and qualities of the marginal soft tissues on teeth and dental implants.⁽³⁾.

Mucogingival deformities are deviations from normal anatomical interactions between the gingiva, alveolar mucosa, and the intervening mucogingival junction (MGJ) ⁽⁴⁾. Each deformity is distinct, but as a group, mucogingival abnormalities raise varied levels of clinical concern for the esthetics, health, and comfortable function of the

marginal periodontium. Most mucogingival abnormalities exhibit a combination of gingival recession, inadequate zones of keratinized mucosa, and/or abnormal frenum attachments ⁽⁵⁾.

Mucogingival malformations and recessions can be acquired, developmental, or congenital anomalies⁽⁶⁾. Gingival recession defects are characterised by the gingival tissue margin's apical migration with respect to the cementoenamel junction (CEJ), are a common concern⁽⁷⁾. *Cairo* et al.,⁽⁸⁾ introduced a categorization system for gingival recession abnormalities The gingival recession defects with no loss of interproximal attachment were classified as recession types (RT1); the recession defects with interproximal attachment loss less than or equal to the buccal site were classified as (RT2); and the recession defects with higher interproximal attachment loss than the buccal site were classified as (RT3).

Root surface exposure may cause dentin hypersensitivity, cervical lesions as well as esthetic problems ⁽⁶⁾. Additionally, progression of untreated gingival recession may occur even with maintaining good oral hygeine ^(9, 10). The goal of mucogingival or periodontal plastic surgery is to improve the quantity of attached gingiva and/or achieve root covarege in areas with gingival recession.

To date, the majority of results from studies on periodontal plastic surgeries emphasize aesthetic enhancements, with limited information on reducing clinical symptoms. Patients often worry about dentin hypersensitivity, which can negatively affect their quality of life. Nevertheless, there is still limited evidence supporting the beneficial effects of surgical root coverage (RC) ^(11,12). A recent study analyzed patients' perception of buccal recessions and their requests for treatment ⁽¹³⁾. The study found that although clinicians observed a significant number of recessions, only a few were noticed and requested for treatment by the patients. Cairo et al., (14) introduced the root esthetic score (RES), which is a standardized evaluation tool in periodontal and restorative dentistry, designed to assess the visual success of root coverage procedures. As root exposure due to gum recession can lead not only to sensitivity but also to aesthetic concerns, treatments aim to restore both function and appearance. RES provides a comprehensive and objective method to evaluate the quality of soft tissue healing and alignment following procedures such as gingival grafts. The RES ensures a quantifiable measure of esthetic success through examination of five variables ; gingival margin (GM). marginal tissue contour (MTC), soft tissue texture (STT), Mucogingival junction (MGJ) alignment, and gingival color (GC), facilitating better patient outcomes and setting benchmarks for future treatment advancements (14). Therefore, the purpose of this study was to evaluate and compare the Vestibular Incision Subperiosteal Tunnel Access (VISTA) procedure (with connective tissue graft) to the coronally advanced flap (with connective tissue graft) in treating gingival recession in the aesthetic zone using RES.

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MATERIALS AND METHODS

Study design and setting:

This research is a randomized, singleblind clinical trial. Participants were recruited from the outpatient clinic of the Department of Periodontology at both Suez Canal University and Misr International University. The study received ethical approval from the Suez Canal University committee, Egypt, under code 19/2017. All patients received a comprehensive explanation about the study's purpose, and written consent was acquired from those who willingly chose to take part.

Inclusion criteria (15, 16):

- 1. Absence of any relevant medical conditions.
- 2. Sound teeth.
- 3. Good oral hygiene.
- Single Miller Class I or II gingival recession defects measuring ≥ 2 mm.
- Multiple (≥ 3) Miller Class I and II recession defects (≥ 1 mm deep).
- 6. Adequate amount of keratinized tissue, with a width of 3 mm.

Exclusion Criteria ^(15, 16):

- 1. Regular use of anticoagulants, antiplatelets, or glucocorticoids.
- 2. Pregnancy or lactation in female patients.
- 3. Smoking.
- 4. Parafunctional habits like clenching or bruxism.
- 5. Tooth extraction at the surgical sites.
- 6. Active periodontal disease.
- 7. Previous surgical procedures in the same area.

Sample size calculation:

This power analysis used root coverage as the primary outcome. The effect size f = (0.25) was calculated based upon the results of *Gobbato* et al., ⁽¹⁷⁾ and assuming that the standard deviation

within each group = 1, using alpha level of 5% and Beta level of 85% i.e. power = 85%. The minimum estimated sample size was a total of samples 22 (11 samples per group). Sample size calculation was done using G*Power version $3.1.9.2^{(18)}$. To consider possibility of dropouts, a total of 30 patients were included in the current study.

Allocation, Randomization and Grouping:

Patients were randomly divided into two groups using a coin flip method:

Test group: VISTA combined with CTG technique. Control group: CAF combined with CTG technique.

Patient Preparation & Pre-surgical Procedures:

Before the surgery, all patients underwent a thorough periodontal examination. Pre-surgical preparations involved providing instructions on oral hygiene to address habits associated with gingival recession (GR) development, along with professional prophylaxis or scaling and root planning. Patients were also educated on proper oral hygiene techniques to ensure effective plaque control prior to the procedure.

Patient Assessments:

In line with the study's objectives, outcome regarding root esthetic score was assessed. These assessments were conducted post-operatively at 3, 6, and 9 months for both groups.

Outcomes:

• Outcome:

1. Root coverage (gingival margin):

Measured using the first variable of the root esthetic score; Score of 6 means complete root coverage, 3 means partial root coverage while zero means no Coverage.⁽¹⁴⁾

2. Esthetic score:

Measured using the other four variables of the root esthetic score; gingival margin (GM). marginal tissue contour (MTC), soft tissue texture (STT), Mucogingival junction (MGJ) alignment, and gingival color (GC)⁽¹⁴⁾

3. Total Root Esthetic Score:

The Total Root Esthetic Score (Total RES) is the sum of individual scores from each of the five RES parameters, with the maximum possible score usually being 10. Adding up these scores across all five parameters gives the Total RES, with a higher score reflecting a more favorable esthetic result. Total RES thus provides a quantitative measure of the overall success of the root coverage procedure. (Table 1)

Table	(1)	Total	Root	Esthetic	Score	prop	osed	by	Cairo	et	al.	(14)
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	Zero Points	1 Point	3 points	6 points
GM	No root coverage		Partial root coverage	Complete root coverage
MTC	Irregular gingival margin (not following CEJ)	Proper marginal contour with scalloped margin (following CEJ)		
STT	Scar formation and/or keloid- like appearance	No scar or keloid formation.		
MGJ	MGJ not aligned with the MGJ of adjacent teeth	MGJ aligned with the MGJ of adjacent teeth		
GC	Tissue color is different from that of the surrounding teeth	Integrity and colour with the surrounding soft tissues are normal. Therefore, 10 was the perfect aesthetic score.		

For the patients in the Test Group: (Figure 1)

- A full-thickness vestibular incision (VISTA) was made through the periosteum. The tunnel was extended beyond the gingival margin.
- The CTG graft was harvested from the palate using a vertical full-thickness incision from the distal canine to the mesial upper 6 with a new 15c blade.
- The CTG was stabilized within the tunnel tissue using a simple interrupted suture, and the tissue was advanced using sling sutures around the teeth.

For the patients in the Control Group: (Figure 2)

Coronal advanced flap (CAF) procedures were performed using a split-full-split flap technique. Following anesthesia, a full-thickness vertical incision was made at the sulcular incision until the mucogingival junction (MGJ).

A split-thickness releasing incision was made at the base of the flap, with full-thickness flap reflection to the MGJ. The CTG was harvested and secured at the donor site with a simple interrupted suture. The flap was then coronally placed and sutured.



Fig. (1) (A) VISTA incision, (B) Elevating the periosteum using VISTA instrument, (C) Tissue release by VISTA instrument, (D) Harvesting of CTG from the palate, (E) Adaptation of the CTG, (F) Suturing of CTG to the tunnel.



Fig. (2) (A) Sulcular Incision in the labial aspect of teeth, (B) Full Thickness Flap Reflection, (C) Adaptation of the harvested graft, (D) Connective tissue graft suturing at the recipient site, (E) Suturing of the graft.

Postsurgical Care

Patients were instructed to rinse twice daily with a chlorhexidine solution for 7 to 10 days. They were also given postoperative instructions to use a cold pack, follow a soft food diet, avoid hot food or drinks, and refrain from strenuous physical work or exercise. Patients were prescribed antibiotic treatment with, For five days, take 625 mg of clavulanic acid plus amoxicillin every eight hours along with Ibuprofen (600 mg) as a non-steroidal anti-inflammatory drug (NSAID). Two weeks after the surgery, patients were advised to resume mechanical tooth brushing using a toothbrush with soft bristles.

Statistical analysis

Categorical data were shown as frequencies and percentages and were analyzed using the chisquare test. The Shapiro-Wilk test was used to determine whether the numerical data were normal and were shown as means and standard deviations. When analysing parametric data, repeated measures ANOVA was used for comparisons between groups, and Bonferroni post hoc tests were used for comparisons within groups. The Mann-Whitney U test was utilised to analyse non-parametric data for between-group comparisons, while Friedman's test together with Nemenyi post hoc testing was employed for within-group comparisons. A significance level of p<0.05 was used for all tests. Statistical analyses were carried out with R statistical software version 4.1.3 for Windows⁽¹⁹⁾.

RESULTS

1. GM score:

Intergroup comparisons, mean and standard deviation (SD) values of the GM score for different groups were presented in **table (2)**.

At all intervals the control group had higher mean value and the difference between groups was not statistically significant (p>0.05).

For both groups, there was no significant difference between values measured at different intervals (p>0.05).

Table (2) Intergroup comparisons, values for the mean and standard deviation (SD) of GM score for different groups.

_	GM score	p-value	
Interval	Test group		
3 months	4.20±1.52 ^A	4.40±1.55 ^A	0.735ns
6 months	4.20±1.52 ^A	4.40±1.55 ^A	0.735ns
9 months	4.20±1.52 ^A	4.40±1.55 ^A	0.735ns
p-value	1ns	1ns	

Means with different superscript letters within the same vertical column are significantly different. *; significant ($p \ge 0.05$), ns; non-significant (p > 0.05)

2. Esthetic score:

Intergroup comparisons, mean and standard deviation (SD) values of the esthetic score for different groups were presented in **table (3)**.

After 3 months test group had higher mean values, while after 6 and 9 months the control group had higher mean value and at all intervals the difference between groups was not significant statistically (p>0.05). Values evaluated at different intervals did not significantly differ for either group (p>0.05).

Table (3) Comparisons between groups, as well as the mean and standard deviation (SD) of the aesthetic score for each group.

I	Esthetic sco			
Interval –	Test group	Control group	p-value	
3 months	3.67±0.72 ^A	3.33±1.11 ^A	0.393ns	
6 months	3.80±0.56 ^A	3.93±0.26 ^A	0.550ns	
9 months	3.87±0.52 ^A	3.93±0.26 ^A	1ns	
p-value	0.549ns	0.069ns		

Means with different superscript letters within the same vertical column are significantly different. *; significant ($p \le 0.05$), ns; non-significant (p > 0.05)

3. Total root esthetic score:

Intergroup comparisons, mean and standard deviation (SD) values of the RES score for different groups were reported in **table (4)**.

After 3 months test group had higher mean values, while after 6 and 9 months the control group had higher mean value and at all intervals the difference between groups was not statistically significant (p>0.05).

For both groups, there was no significant difference between values measured at different intervals (p>0.05).

Table (4) Intergroup comparisons, mean and standard deviation (SD) values of RES score for different groups.

T A I	RES score	p-value	
Interval -	Test group		
3 months	7.87±1.68 ^A	7.73±2.19 ^A	0.948ns
6 months	8.00±1.77 ^A	8.33±1.63 ^A	0.614ns
9 months	8.07±1.71 ^A	8.33±1.63 ^A	0.745ns
p-value	0.717ns	0.166ns	
Overall	7.98±1.69	8.13±1.82	0.660ns

Means with different superscript letters within the same vertical column are significantly different.

*; significant ($p \le 0.05$), ns; non-significant (p > 0.05)

DISCUSSION

Evaluating the aesthetic results of mucogingival plastic surgeries can be very subjective, leading to varying assessments. The Root Coverage Esthetic Score (RES) offers a standardized method to help practitioners assess results consistently and communicate more In effect^(14, 20).

To our knowledge, there are no studies that examine how reliable the RES is in a dental school setting, compare results based on the experience levels of the evaluators, or check if the same person's assessments are consistent over time.

The root coverage esthetic score (RES) was assessed in this study through the system proposed by *Cairo* et al., ⁽¹⁴⁾ Root Esthetic Score (RES) depends on a set of parameters; gingival margin, marginal tissue contour, soft tissue texture, mucogingival junction, and gingival color, that are given a score to assess each case. The total score is 10, where the complete coverage constitute score of 6, 3 represents partial coverage, while 0 means failure of coverage. The evaluation was performed three, six and nine months after surgery⁽¹⁴⁾.

Our study showed an increase in gingival margin level for both groups. CAF resulted in more root coverage (4.40 ± 1.51) than that of VISTA (4.20 ± 1.49) without significance difference between either of them.

Patients' aesthetic requirements are highly demanded; therefore, root covering procedures must ideally produce anatomy of soft tissue that cannot be distinguished from the surrounding tissues. Despite the change we found in esthetic outcome of 3 and 6 months, it was statistically insignificant. Hence, *Cairo* et al., ⁽¹⁴⁾ evaluated the RES at 6 months which is the ideal time of tissue maturation.

Mean overall RES of the present study for three, six and nine months was (7.98±1.69) for group 1 and (8.13 ± 1.82) for group 2. There was no statistical significance difference between both groups, although the CAF group had a mean RES value that was higher than the VISTA group. Despite the change in mean of esthetic outcome between 3 and 6 months for both groups, it was statistically insignificant. No difference was found between 6 and 9 months for both groups. The finding of the present study was in accordence to the findings of the research carried out by Santamaria et al.,⁽²¹⁾ which used the RES to evaluate the esthetic outcomes and found out that there was no significant difference in RES between TUN + CTG and CAF + CTG. Tavelli et al.,⁽²²⁾ conducted a systematic review and metaanalysis which concluded no difference in RES between TUN and CAF, this is based on the fact that 60% of RES is affected by CRC (which was higher in CAF), while the other 40 % is based on the aforementioned other parameters.

CONCLUSION

Based on the results of the present study, it can be concluded that:

Coronally advanced flap, in conjunction with connective tissue graft, can be slightly superior than vestibular incision subperiosteal tunnel access, in conjunction with connective tissue graft, in terms of root esthetic score but with no statistically significant difference.

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