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Research Article

COMPARATIVE EVALUATION OF THE TREATMENT OF GINGIVAL RECESSION ASSOCIATED WITH NON-CARIOUS CERVICAL LESION WITH CORONALLY ADVANCED FLAP AND GLASS IONOMER RESTORATION VERSUS CORONALLY ADVANCED FLAP ALONE

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ABSTRACT

Objectives: To evaluate and compare the clinical outcome of the treatment of gingival recession associated with non-carious cervical lesions by a coronally advanced flap with glass ionomer restoration (CAF+R) versus coronally advanced flap (CAF) alone.

Methodology: 40 sites from selected subjects having bilateral Miller's class-I or II gingival recession associated with non-carious cervical lesion (NCCL), were grouped as Site-A (treated with CAF+R) and Site-B (treated with CAF). The clinical parameters assessed at baseline, 1 month, 3 months and 6 months post-operatively were: relative gingival recession, height of the non-carious cervical lesion on the root surface, keratinised tissue width and root coverage.

Results: Data obtained was analysed using paired and unpaired t test and repeated measures ANOVA. On intergroup comparison, mean change in relative gingival recession and height of the NCCL on the root surface, from baseline to 1 month, baseline to 3 months and baseline to 6 months was greater at site-A as compared to site-B. However, these differences were statistically nonsignificant ($p>0.05$). The change in keratinised tissue width from baseline to 6 months was greater at site-B as compared to site-A, but this difference was statistically nonsignificant ($p=0.514$). The mean root coverage at site-A (84.91 ± 4.58%) as compared to site-B (90.72 ± 2.58%) was statistically significant ($p<0.001$).

Conclusion: Coronally advanced flap with glass ionomer restoration was as effective as coronally advanced flap alone for the treatment of gingival recession associated with NCCLs.

INTRODUCTION

Gingival recession (GR) is an apical shift in the position of the gingival margin with exposure of the root surface.[1] It is a common finding in patients with good oral hygiene as well as in periodontally compromised populations with poor oral hygiene, especially in elderly people.[2,3] Factors influencing the development of marginal tissue recession, include plaque-induced inflammation, toothbrush trauma, tooth alignment, alveolar bone dehiscence, high muscle attachment, frenal pull, iatrogenic factors, orthodontics and restorative procedures.[2] The apical migration of gingival tissue may lead to esthetic concerns, dentin hypersensitivity, root caries and cervical wear.[4]

Non-carious cervical lesions and gingival recessions are closely related to each other, in both etiologic factors and therapeutic procedures.[5] It has been reported that gingival recession and a wedge-shaped defect in the cervical area often were seen affecting the same tooth.[6] Despite the close relationship between these two, literature shows different treatments for hard tissue reconstruction, without much consideration to the presence of gingival recession or the final overall esthetic result. Optimal functional and esthetic results require the combined use of periodontal and restorative procedures.[7]

There is a lack of information from clinical trials about the outcome of mucogingival procedures on carious or restored root surfaces and the ability of the combined procedure (coronal flap plus restoration) to provide sufficient soft tissue coverage. Hence such a study was conducted to compare and evaluate clinically the treatment outcomes of gingival recession associated with NCCL; with coronally advanced flap and type-2 glass ionomer cement (GC®) restoration versus coronally advanced flap alone.

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MATERIAL AND METHODS

Subjects for this study were selected from Out Patient Department of Periodontology. Approval by the Ethical Committee was obtained prior to commencement of the study. In this split mouth study, a total of 40 sites from selected subjects (age group of 21-55 years) having bilateral Miller's Class-I or II gingival recession with a non-carious cervical lesion (NCCL), were grouped as follows:

Site-A - 20 gingival recession sites were treated with coronally advanced flap with glass ionomer restoration (CAF+R).

Site-B - 20 gingival recession sites were treated with coronally advanced flap alone (CAF).

The subjects were selected on the basis of the following inclusion criteria: 1) systemically healthy subjects of either sex, not under any medication affecting the periodontal treatment outcome, 2) presence of bilateral Miller's class-I or class-II gingival recessions with NCCL, on the cuspids or bicuspids in the maxillary arch, 3) width of keratinised tissue > 2mm and 4) vital teeth, absence of restoration on cervical area and absence of severe occlusal interferences in the area to be treated.

The exclusion criteria were: 1) pregnant or lactating females and those on oral contraceptives, 2) smokers and tobacco chewers, 3) teeth with pulpal pathology and 4) teeth with hopeless prognosis.

Informed written consent of the subjects participating in the study was obtained.

The clinical parameters assessed were:

- Relative gingival recession (RGR), the distance from the gingival margin to a fixed reference point (FRP) on custom made acrylic stent.
- Height of the non-carious cervical lesion located on the root surface (CLH-R), the distance from the CEJ to the gingival margin. CEJ was estimated by the method described by Zucchelli *et al* (2006).[8]
- Keratinised tissue width (KTW), the distance from the gingival margin to the mucogingival junction.

A detailed case history of the subjects was recorded. Phase I therapy (scaling and root planing) was carried out and oral hygiene instructions were given. Subjects were recalled 3 weeks after phase-I therapy and the baseline clinical parameters were recorded.

The surgical procedure was performed under local anesthesia. Sulcular incisions were placed on the buccal aspect of the indicated teeth followed by two horizontal incisions at right angles to the adjacent interdental papillae, 1mm apical to the coronal border of the NCCL. Oblique vertical incisions were extended beyond the mucogingival junction on either side, and a trapezoidal mucoperiosteal flap raised upto the mucogingival junction. At this point, a split- thickness flap was extended apically, that released the tension and favoured coronal positioning. Coronal advancement of the flap over the NCCL restored with glass ionomer cement, was done at Site-A while coronal advancement of the flap alone was done at Site-B, which was operated following similar steps. (Figure-1) (Figure-2)

a b c d

Figure 1 Surgical procedure at Site-A

a- Baseline pre-operative photo
b- Incision placement
c- GIC restoration
d- Coronally advanced flap

a b c d

Figure 2 Surgical procedure at Site-B

a- Baseline pre-operative photo
b- Incision placement
c- Flap reflection
d- Coronally advanced flap

Flaps were approximated and sutured with 3-0 black braided silk sutures (Mersilk™) and periodontal dressing was placed.

a b c

Figure 3 Post-operative follow-up at Site-A

a- 1 month
b- 3 months
c- 6 months

a b c

Figure 4 Post-operative follow-up at Site-B

a- 1 month
b- 3 months
c- 6 months

Table1 Intragroup comparison of change in relative gingival recession over a period of 6 months at Site-A and Site-B

Relative gingival recession, mm	Baseline	1 month	3 months	6 months	P value (Repeated measures ANOVA)
Site-A Mean ± SD	7.00 ± 1.62	5.10 ± 1.21	5.10 ± 1.17	5.10 ± 1.17	<0.001*
Mean Change (from baseline)		1.90	1.90	1.90	
P value (post hoc Bonferroni test)		<0.001*	<0.001*	<0.001*	
Site-B Mean ± SD	7.30 ± 1.50	5.65 ± 1.57	5.70 ± 1.59	5.70 ± 1.59	<0.001*
Mean Change (from baseline)		1.65	1.60	1.60	
P value (post hoc Bonferroni test)		<0.001*	<0.001*	<0.001*	

*p<0.05 is statistically significant

Appropriate antibiotic, analgesic and anti-inflammatory drugs were prescribed and subjects were advised to rinse with 0.2%

chlorhexidine gluconate solution twice daily. The dressing and sutures were removed one week after surgery. Additional repacking was done for a week if necessary. Subjects were recalled after 1 month, 3 months and 6 months for follow-up. (Figure-3) (Figure-4)

RESULTS

Descriptive statistics were expressed as mean ± standard deviation (SD) for each group.

Intragroup and intergroup variations in the various clinical parameters over a period of 6 months, were analysed using Paired and Unpaired t test, Repeated measures ANOVA (test of significance with Bonferroni correction). In the above test, p value less than or equal to 0.05 ($p \leq 0.05$) was taken to be statistically significant. All analyses were performed using SPSS software version 17.

On intragroup comparison of the change in relative gingival recession over a period of 6 months, at both site-A and site-B, there was a statistically significant reduction in the relative gingival recession from baseline to 1 month, 3 months and 6 months ($p<0.001$).

Also the mean change in the relative gingival recession from baseline to 1 month, baseline to 3 months and baseline to 6 months was statistically significant ($p<0.001$). (Table-1)

On intergroup comparison, it was found that the change in relative gingival recession from baseline to 1 month ($p=0.208$), baseline to 3 months ($p=0.162$) and baseline to 6 months ($p=0.162$) was greater at site-A as compared to site-B. However, these differences were statistically nonsignificant. (Table-2) (Figure-5)

Table 2 Intergroup comparison of change in relative gingival recession over a period of 6 months

Change in relative gingival recession (Mean ± SD), mm	Baseline –1 month	Baseline – 3 months	Baseline – 6 months
Site-A	1.90 ± 1.48	1.90 ± 1.37	1.90 ± 1.37
Site-B	1.65 ± 0.81	1.60 ± 0.82	1.60 ± 0.82
P value (Unpaired t test)	0.208	0.162	0.162

*p<0.05 is statistically significant

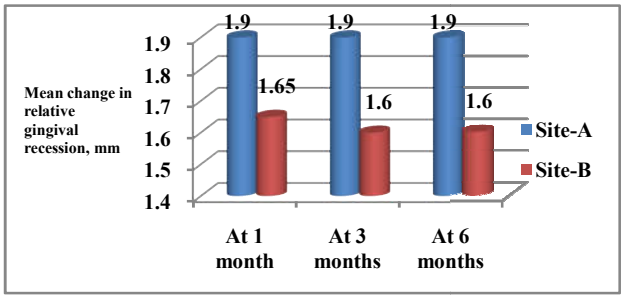

Figure 5 Intergroup comparison of change in relative gingival recession over a period of 6 months

On intragroup comparison of the change in height of the NCCL located on the root surface, at both site-A and site-B, there was a statistically significant reduction in the height of the NCCL from baseline to 1 month, 3 months and 6 months ($p<0.001$).

The mean change in the height of the NCCL on the root surface from baseline to 1 month, baseline to 3 months and baseline to 6 months, was also statistically significant ($p<0.001$). (Table-3)

Table 3 Intragroup comparison of change in height of the non-carious cervical lesion located on the root surface over a period of 6 months at Site-A and Site-B

Height of the non-carious cervical lesion located on the root surface, mm	Baseline	1 month	3 months	6 months	P value (Repeated measures ANOVA)
Site-A Mean ± SD	2.01 ± 0.59	0.20 ± 0.03	0.23 ± 0.03	0.28 ± 0.04	**<0.001***
Mean Change (from baseline)		1.81	1.78	1.73	
P value (post hoc Bonferroni test)		**<0.001***	**<0.001***	**<0.001***	
Site-B Mean ± SD	1.67 ± 0.58	0.11 ± 0.05	0.13 ± 0.05	0.15 ± 0.05	**<0.001***
Mean Change (from baseline)		1.56	1.54	1.51	
P value (post hoc Bonferroni test)		**<0.001***	**<0.001***	**<0.001***	

*p<0.05 is statistically significant

On intergroup comparison, mean change from baseline to 1 month ($p=0.160$), baseline to 3 months ($p=0.185$) and baseline to 6 months ($p=0.226$) was greater at site-A as compared to site-B. However, these differences were statistically nonsignificant. (Table-4) (Figure-6)

Table 4 Intergroup comparison of change in height of the non-carious cervical lesion located on the root surface over a period of 6 months

Change in Height of the non-carious cervical lesion located on the root surface(Mean ± SD), mm	Baseline –1 month	Baseline –3 months	Baseline –6 months
Site-A	1.81 ± 0.57	1.78 ± 0.57	1.73 ± 0.57
Site-B	1.56 ± 0.54	1.54 ± 0.54	1.51 ± 0.54
P value (Unpaired t test)	0.160	0.185	0.226

*p<0.05 is statistically significant

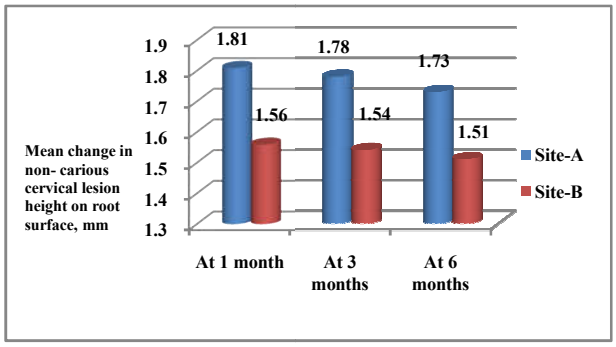

Figure 6 Intergroup comparison of change in height of the non-carious cervical lesion located on the root surface over a period of 6 months

On intragroup comparison of change in keratinised tissue width over a period of 6 months, at both site-A and site-B, there was a statistically significant increase in the keratinised tissue width from baseline to 6 months ($p<0.001$). (Table-5)

Table 5 Intragroup comparison of change in keratinised tissue width over a period of 6 months at Site-A and Site-B

Keratinised tissue width, mm	Baseline	6 months	Mean Change	P value (Paired t test)
Site-A Mean ± SD	3.33 ± 0.30	3.59 ± 0.29	-0.27 ± 0.14	<0.001*
Site-B Mean ± SD	3.47± 0.24	3.76 ± 0.19	-0.29 ± 0.15	<0.001*

*p<0.05 is statistically significant

On intergroup comparison, the change from baseline to 6 months was greater at site-B as compared to site-A. However,

this difference was statistically nonsignificant (p=0.514). (Table-6) (Figure-7)

Table 6 Intergroup comparison of change in keratinised tissue width over a period of 6 months

Change in keratinised tissue width (Mean ± SD), mm	Baseline – 6 months
Site-A	-0.27 ± 0.14
Site-B	-0.29 ± 0.15
P value (Unpaired t test)	0.514

*p<0.05 is statistically significant

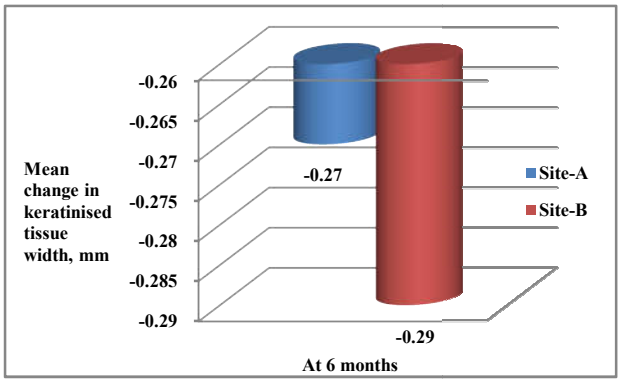

Figure 7 Intergroup comparison of change in keratinised tissue width over a period of 6 months

The percentage of root coverage obtained was calculated at the end of 6 months. The mean coverage at site-A was 84.91 ± 4.58% and at site-B it was 90.72 ± 2.58%. This difference was statistically significant (p<0.001). (Table-7)

Table 7 Intergroup comparison of root coverage at the end of 6 months

Root coverage (%)	Baseline – 6 months
Site-A	84.91 ± 4.58
Site-B	90.72 ± 2.58
P value (Unpaired t test)	<0.001*

*p<0.05 is statistically significant

DISCUSSION

Gingival recession causes periodontal attachment loss and if left untreated or unmonitored, it can be detrimental to periodontal or dental health.[9] The treatment of gingival recession is needed for reducing root sensitivity and improving esthetics.

A complex situation arises if gingival recession is associated with a NCCL. The conventional restorative techniques for NCCLs result in protection against further loss of tooth structure and sensitivity, but they do not meet the esthetic demands of the patients. If the surgical procedure for root coverage is individually performed, the coronal portion of the cervical lesion may not be covered by the periodontal flap after the healing period, leading to the impression that the procedure was unsuccessful. Therefore, to treat sensitivity and esthetics simultaneously, a combined restorative-surgical therapy is needed.[7]

The CAF has shown predictable results in terms of root coverage for Miller's Class I and II gingival recessions (Allen and Miller 1989,[9] Wennstrom and Zucchelli 1996,[10] Pini-Prato *et al*. 2000,[11] Cairo *et al*. 2008[12]). However, the long-term success of the CAF combined with a cervical restoration to treat gingival recession associated with a NCCL, has not been addressed much in literature. Hence, this split mouth study was conducted. One advantage of this integrated approach is resolution of both gingival and NCCL defects.

In this study, glass ionomer restoration was placed over the root surface to fill the NCCL as its biocompatible property in subgingival areas has been studied extensively and its therapeutic advantage over other restorative materials is known.[13]

Full-mouth visible plaque index and sulcus bleeding index scores were maintained <20% at 1, 3 and 6 months post-operatively, indicating a good standard of supragingival plaque control. The sites included in the study did not show bleeding on probing or visible plaque during the entire study period. This suggested that the restoration at site-A did not produce greater gingival inflammation and plaque accumulation. These results are similar to the findings reported by Santos *et al* (2007).[14]

Alkan *et al* (2006)[15] demonstrated that periodontal health was maintained when resin modified glass ionomer restoration was used for subgingival restorations. Similar to these findings, the present study also revealed that there was no significant difference in relative gingival recession after 6 months at both site-A and site-B. Therefore it can be presumed that the presence of a restoration in the cervical area of a tooth does not prevent the amount of soft tissue coverage that can be achieved by CAF.

The NCCL simultaneously affects parts of the root and crown of the tooth and with its progression, the CEJ generally disappears. A new line is established coronal to the original CEJ, representing the incisal border of the NCCL and it is often mistaken for the CEJ.84 Thus, only height of the NCCL on the root surface (CLH-R) could be covered predictably by soft tissue after a CAF. For all the treated teeth at site-B, part of the NCCL could be observed coronal to the gingival margin after the healing period. To explore the hypothesis that the part of the NCCL that remained exposed was composed mainly of the crown portion of the lesion, an estimation of the position of the CEJ was performed by the method described by Zucchelli *et al* (2006).[8] These findings are similar to that reported by Santamaria MP *et al* (2008).[16]

Initial keratinised tissue width (KTW) has been proposed as an essential anatomical factor associated with complete root coverage in a CAF procedure.[17] In the present study, mean gain in KTW at site-A and site-B, 6 months post-operatively was 0.27 ± 0.14 mm and 0.29 ± 0.15 mm respectively. On intergroup comparison results were statistically nonsignificant, indicating that at both sites, similar gain in KTW was achieved. This can be explained by the tendency of the mucogingival line, coronally displaced by means of surgery, to regain its original 'genetically determined' position (Ainamo *et al*. 1992).[18] These results are similar to the findings of studies conducted by Lucchesi *et al* (2007)[19] and Santamaria *et al* (2007)[20] who reported that CAF was associated with some gain in KTW on the restored root surfaces. This suggests that

subgingivally placed GIC restoration may not jeopardize the gingival features over a 6 month period.

The primary clinical outcome to evaluate the effectiveness of a mucogingival procedure is percentage of root coverage achieved. In this study, the root coverage achieved at site-A was 84.91 ± 4.58% and at site-B, 90.72 ± 2.58%, thus confirming the predictability and effectiveness of the CAF for the treatment of gingival recession. However, caution should be exercised due to the subjective component of the method used to estimate the CEJ in the present study, which differs from the direct measurement obtained in studies with intact roots. The percentage of root coverage achieved in the present study was greater than that obtained in some other studies. Cortes *et al* (2004)[21] reported 71% of root coverage and da Silva *et al* (2004)[22] showed 69% root coverage, 6 months after the CAF procedure. Differences in treatment result might be associated with differences in case selection and treatment protocol used in these studies, including baseline recession depth and amount of keratinised tissue.

The results regarding the GIC restorations obtained in the present study are in agreement with those of Garcia *et al* (1981)[23] and van Dijken and Sjostrom (1991).[24]

They reported the absence of detrimental effects on the gingiva by GIC restorations if they were carefully contoured and finished. This was related to the good marginal adaptation of the material to the tooth structure, resulting in less marginal leakage and retention of bacteria. These results are however in contrast to those of Larato DC (1972)[25] and Schatzle *et al* (2001)[26] who reported that subgingival restorations are harmful to gingival and periodontal health.

In the present study it was observed that CAF with glass ionomer restoration was as effective as CAF alone for the treatment of gingival recession associated with NCCL.

CONCLUSION

Periodontal surgery combined with the restorative procedure provided resolution of both the gingival defect and the cervical wear of the tooth, simultaneously. Thus, it has been concluded that the treatment of gingival recession associated with NCCLs by a CAF with GIC restoration is clinically favourable.

However, longitudinal observations and histological evidence is necessary to evaluate the stability of these results and establish the long-term success of this integrated approach.

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