Original Research

Treatment of Gingival Recession Associated with Non-Carious Cervical Lesions Using Resin Modified Glass Ionomer Cement with Connective Tissue Graft a Randomized Controlled Clinical Trial

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Received 4 November 2018 and Accepted 28 February 2019

Abstract

Introduction: Gingival recession (GR) is a common aesthetic problem associated with the cervical wear of the tooth structure and dentin hypersensitivity. Recently, periodontal-restorative approaches have been proposed for the management of GR associated with non-carious cervical lesions (NCCLs), which has proven effective. The present study aimed to evaluate this method. **Methods:** In total, 30 subjects with isolated Millers class I GR associated with NCCL in the maxillary canines and premolars were randomly assigned to group A (CTG) and group B (R+CTG). Clinical parameters, including the probing pocket depth (PPD), relative GR (RGR), keratinized tissue width (KTW), keratinized tissue thickness (KTT), relative clinical attachment level (CAL), cervical lesion height (CLH), and dentin hypersensitivity (DH), were recorded at baseline (BL) and after one and six months. In addition, maximum root coverage (MRC) was evaluated after six months. **Results:** In both groups, a statistically significant reduction was observed in the PPD, RGR, and CLH after six months (P=0.001). On the other hand, a significant increase was observed in the KTW, KTT, and CAL in both groups (P=0.001). Moreover, the visual analogue pain scores indicated a significant reduction in both groups, while the reduction was considered more significant in group B (P<0.05) compared to group A. In groups A and B, 69.24% and 61.54% of the sites showed MRC, respectively. **Conclusion:** According to the results, both groups achieved comparable root coverage, while the presence of restoration led to a greater reduction in dentin hypersensitivity.

Keyword: Gingival Recession, Resin-modified Cement, Connective Tissue Graft.

Gharat MR, Zingade AN, Metgud R, Ajbani JM, Kaderi MA. Treatment of Gingival Recession Associated with Non-Carious Cervical Lesions Using Resin Modified Glass Ionomer Cement with Connective Tissue Graft a Randomized Controlled Clinical Trial. J Dent Mater Tech 2019; 8(2): 85-94.

Introduction

Gingival recession (GR) is defined as an apical shift of the gingival margin with root surface exposure (1). GR is commonly detected on the buccal surface of the teeth, causing an aesthetic concern. Some of the etiological factors of GR have been reported to be inflammatory periodontal disease, high frenal attachment, tooth malposition, and traumatic brushing habits (2).

GR is commonly associated with the cervical wear of the tooth structure, which could be carious or non-carious. Non-carious cervical lesions (NCCLs) may be the consequence of a multifactorial process, leading to erosion, abrasion, and abfraction. Approximately 50% of GRs are associated with NCCLs, forming a combined defect on the same tooth (3). These combined lesions could cause dentin hypersensitivity, plaque retention, and root caries (4). Inadequate plaque control due to mucogingival complications, dentin hypersensitivity, and aesthetic demands could affect the treatment approaches in these conditions.

Despite the close association of GR and NCCL, restorative procedures are frequently selected as monotherapy only to reconstruct the hard tissue, while the interrelationship of the gingival and tooth complex is often neglected (5). Therefore, a combined perio-aesthetic approach is essential to the management of these cases in order to achieve optimal functional integrity and aesthetics.

Over the years, numerous surgical techniques have been introduced to manage and eliminate the defects caused by GR. Among various methods, the most promising outcomes have been attributed to subepithelial connective tissue graft (SCTG). According to a systematic review by Chambrone et al. (6); SCTG-based procedures provided superior rates of root coverage, as well as the significant increase of keratinized tissues .However, the outcomes of such root coverage procedures are compromised due to the presence of the cervical step, which is associated with technical difficulty in the repositioning of the flap/graft on a concave surface with sharp edges (4). Therefore, interdisciplinary perio-restorative approaches should be preferred in such cases (7).

Currently, resin-modified glass ionomer cement (RMGIC) is the material of choice for NCCL restoration owing to its superior physical properties compared to conventional glass-ionomer cements (8). In this regard, the findings of Franco E. et al. (9) and Dijken J. W. (10) have indicated that the clinical function of RMGIC restorations has proven superior to resin composite restorations after a five-year evaluation.

The present study aimed to compare the effectiveness of connective tissue graft alone with combined connective tissue graft and RMGIC restoration in the treatment of Miller's class I GR associated with NCCLs.

Materials and Methods

This randomized, controlled clinical trial was conducted at the Department of Periodontics in KLE VK Institute of Dental Sciences in Belagavi, India. Ethical approval was obtained from the Institutional Ethical Committee (Code-1085) The sample size included 30 patients with isolated Miller's class I GR associated with NCCL with the depth of 1-2 millimeters in the maxillary canines or premolars (Figs 1,3,4).

The inclusion criteria of the study were as follows: 1) non-smokers; 2) systemically healthy patients aged more than 18 years; 3) teeth with the probing depth of <3 mm and 4) no radiographic bone loss. The exclusion criteria were as follows: 1) patients with systemic diseases; 2) use of immunosuppressive drugs and antibiotics within the past three months; 3) current/ former smokers and 4) history of periodontal surgery within the past six months. Informed consent was obtained from the patients prior to enrollment.

Pre-surgical treatment involved supragingival and subgingival scaling in all the patients. Oral hygiene instructions were provided to all the patients, and they were asked to use a non-traumatic brushing technique with a soft toothbrush, which was provided by the researchers.

After the initial therapy, the following parameters were recorded:

1. Probing pocket depth (PPD), which was measured from the gingival margin (GM) to the base of the sulcus using William's graduated probe;
2. Relative GR (RGR), which was measured from the GM to the incisal border of the tooth;
3. Keratinized tissue width (KTW), which was measured from the GM to the mucogingival junction (MGJ);
4. Keratinized tissue thickness (KTT), which was measured by piercing an endodontic file perpendicular to the soft tissue at the midpoint between the GM and MGJ until a hard surface was detected. Afterwards, a silicone stop was placed in contact with the external soft tissue surface. After the careful removal of the file, the penetration depth was measured using a digital caliper.
5. Relative clinical attachment level (CAL), which was measured as PPD + RGR;

6. Cervical lesion height (CLH), which was measured as the distance between the coronal and apical margins of the NCCLs;
7. Dentin hypersensitivity (DH), which was measured using the pain scores of the visual analogue scale (VAS);
8. Maximum root coverage (MRC), which was calculated using the method proposed by Zucchelli et al.(11) for predetermining the cementoenamel junction (CEJ) in the teeth with GR with no evidence of CEJ. The ideal interdental papilla was identified as the distance between the contact point and CEJ angular point. The measurement was shifted apically from the tip of the actual papilla parallel to the long axis of the tooth. The point was projected on the recession margin, and two symmetrical points were identified, which were connected with a scalloped line that provided the expected line of the MRC and was considered as clinical CEJ. (Fig. 2)

The surgical procedures were performed by a single operator. The patients were randomly divided into two groups by coin flipping. Each group included 15 patients with isolated Miller's class I GR and NCCL, who received treatment with connective tissue graft alone (CTG; group A) and RMGIC restoration (GC Fuji II LC™, GC America Inc., USA) followed by connective tissue graft (R+CTG; group B).

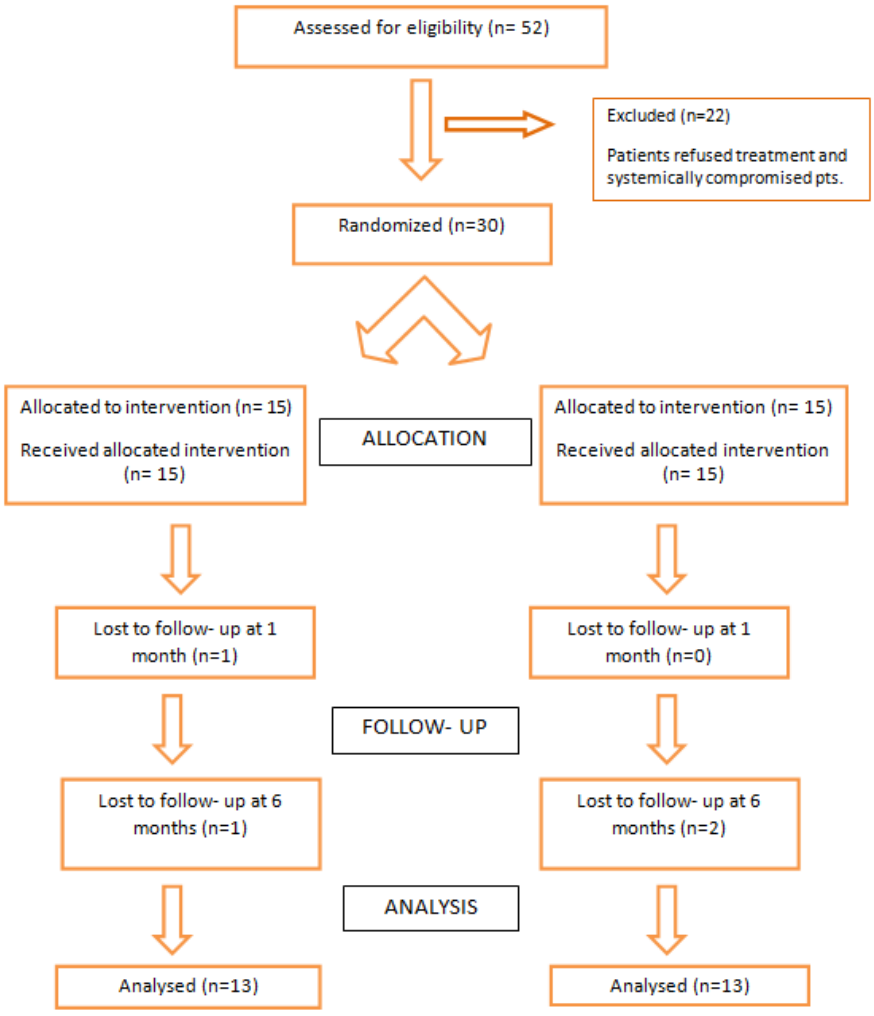

Figure 1. Flowchart of Randomization

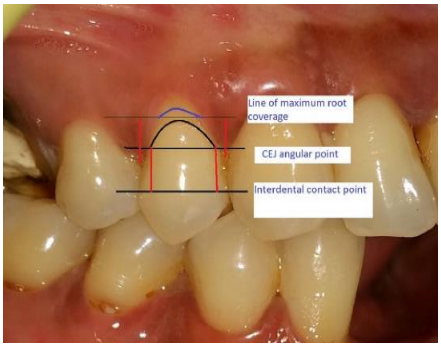

Figure 2. Predetermining CEJ for MRC Evaluation

Figure 3. Group A: Preoperative View

Figure 4. Group B: Preoperative View

Surgical Procedures

Adequate local anaesthesia was obtained at the site using 2% lignocaine HCl with adrenaline 1:80,000. An intrasulcular incision was made at the buccal point of the tooth using a No. 15 scalpel blade, and two horizontal incisions were made at the right angles to the adjacent interdental papilla. In addition, two oblique vertical releasing incisions were extended beyond the MGJ, and a trapezoidal partial thickness flap was raised through sharp dissection. The adjacent papilla was de-epithelialized in order to create a connective tissue bed.

In group A, the root and NCCL were planed curetted to obtain a smooth tooth surface. In group B, the operative field was isolated, and the entire length of the NCCL was restored using RMGIC (GC Fuji II LC™, GC America Inc., USA). The restoration was completed using polishing burs.

The length of the graft was determined, and the connective tissue was harvested based on the method proposed by Langer and Langer from the first premolar to the first molar area (12). Following that, the graft was stabilized at the recipient site using interrupted sutures. The flap was coronally positioned and sutured with sling sutures using 4-0 resorbable sutures in order to completely cover the graft, followed by periodontal dressing (Coe Pak™, GC America Inc; USA). The postoperative pharmacological regimen included the combination of amoxicillin (500 mg) and clavulanic acid (125 mg) twice daily for five days, ketorolac (10 mg) twice daily for three days, and 0.2% chlorhexidine mouth rinse for seven days. The patients were recalled 10 days postoperatively, and their clinical parameters were recorded at one- and six-month follow-ups (Fig. 5, 6, 7, 8).

Among 30 treated patients, four cases failed to report for the follow-up. As a result, statistical analysis was performed for 26 patients (each group including 13 patients). Data analysis was performed in SPSS version 21. The normality of the studied variables at different times were assessed using the Kolmogorov-Smirnov test in groups A and B, and no significant differences were observed ($P>0.05$). Median, range and sum of ranks were calculated for PPD and VAS. (Table I, II, III). In addition, mean and standard deviation were calculated for rest of the studied parameters, and Mann-Whitney U test was applied for intergroup comparison. Wilcoxon-matched paired test was also employed for the intragroup comparisons in terms of PPD and VAS, and independent t-test was used for the intergroup comparisons as well. Moreover, paired t-test was applied for the intragroup comparisons in terms of RGR, KTW, KTT, CAL, and CLH. (Table IV) The MRC between the groups was analyzed using Chi-square. In all the statistical analyses, the significance level was considered at 0.05.

Figure 5. Postoperative View (one month)

Figure 6. Postoperative View (one month)

Figure 7. Postoperative View (six months)

) **Figure 8.** Postoperative View (six months)

Table I. Intergroup Data on PPD and VAS in Median and Range

PPD (mm)	Baseline (BL)	One Month (1M)	Six Months (6M)
Median	2	2	1
Range	2	3	2
VAS	BL	1M	6M
Median	2	2	2
Range	6	6	6

Table II. Intergroup Mean Rank and Sum of Ranks for PPD and VAS

	BL		1M		6M	
PPD (mm)	Mean Rank	Sum of Ranks	Mean Rank	Sum of Ranks	Mean Rank	Sum of Ranks
Group A	16.56	281.50	17.76	302.00	17.74	301.50
Group B	18.44	313.50	17.24	293.00	17.26	293.50
P-value	0.3418		0.973		0.886	
	BL		**1M**		**6M**	
VAS	Mean Rank	Sum of Ranks	Mean Rank	Sum of Ranks	Mean Rank	Sum of Ranks
Group A	26	442	25.06	426.00	25.18	428.00
Group B	9	153	9.94	169.00	9.82	167
P-value	0.3835		0.0135*		0.001*	

A: connective tissue graft, B: RMGI + connective tissue graft.

Table III. Intragroup Data on PPD and VAS in Median and Range

		BL	**1M**	**6M**	**Changes**		
					BL-1M	BL-6M	1M-6M
RGR (mm)	Group A	12.34±1.72	10.34±1.57	10.18±1.66	P=0.0001*	P=0.0001*	P=0.055
	Group B	11.97±1.62	9.24±2.16	9.14±2.27	P=0.0001*	P=0.0001*	P=0.188
	P-value	0.5106	0.0854	0.125	0.0954	0.1958	0.10
KTW (mm)	Group A	2.84±1.01	4.28±0.75	4.26±0.75	P=0.0001*	P=0.0001*	P=0.578
	Group B	3.12±1.75	4.53±1.62	4.56±1.42	P=0.0001*	P=0.0001*	P=0.773
	P-value	0.5627	0.5646	0.434	0.8829	0.3909	0.34
KTT (mm)	Group A	1.39±0.46	2.34±0.44	2.20±0.51	P=0.0001*	P=0.01*	P=0.259
	Group B	1.62±0.74	2.59±0.81	2.23±0.90	P=0.0001*	P=0.001*	P=0.07
	P-value	0.2796	0.06	0.995	0.2125	0.497	0.09
CAL (mm)	Group A	14.34±2.06	12.34±1.81	12.81±1.80	P=0.0001*	P=0.001*	P=0.07
	Group B	13.00±2.84	11.67±2.89	11.47±2.85	P=0.001*	P=0.001*	P=0.056
	P-value	0.1113	0.406	0.464	0.053	0.100	0.490
CLH (mm)	Group A	3.08±0.87	1.9±0.64	1.46±0.69	P=0.0001*	P=0.0001*	P=0.08
	Group B	3.18±0.92	2.05±1.26	1.8±1.24	P=0.003*	P=0.0001*	P=0.08
	P-value	0.7455	0.69	0.08	0.171	0.391	0.06

A: connective tissue graft, B: RMGI + connective tissue graft.

Table IV. Mean RGR, KTW, KTT, CAL, CLH, and Their Changes at BL-1M and BL-6M

PPD	BL		1M		6M		BL-6M
	Median	Range	Median	Range	Median	Range	
Group A	2	2	2	2	1	2	P=0.003*
Group B	2	2	2	3	1	2	P=0.001*
VAS	Median	Range	Median	Range	Median	Range	
Group A	4	2	1	2	1	2	P=0.0001*
Group B	2	1	0	1	0	1	P=0.0001*

*Statistically significant difference compared to baseline

A: connective tissue graft, B: RMGI + connective tissue graft

Results

With the exception of VAS, the intergroup comparisons showed no significant differences from the one-month (1M) to the six-month (6M) follow-up, as well as the baseline to 1M, baseline to 6M, and 1M to 6M (P>0.05). According to the intragroup comparison, PPD significantly reduced from the baseline to 6M in both groups (P<0.05) (Table III). Similarly, a significant reduction was observed in the RGR, CLH, and VAS from the baseline to 1M and baseline to 6M in both groups (P<0.05) (Table II, IV)

According to the findings, KTT, KTW, and CAL significantly increased from the baseline to 1M and baseline to 6M in both groups (P<0.05) (Table IV).. In the intergroup comparison, the changes from 1M to 6M in all the parameters were not considered statistically significant (Table IV). On the other hand, the pain scores of the VAS reduced more significantly in group B compared to group A at 1M and 6M (P<0.05) (tables II and III). The sites showing MRC was 69.24% in group A and 61.54% in group B (p >0.05) (Table V).

Table V. Sites Showing MRC at 6M in Study Groups

		Total Sites	Sites Showing MRC	Percentage
MRC	Group A	13	9	69.24
	Group B	13	8	61.54
	Intergroup P-value 0.56			

*statistically significant difference compared to baseline

Discussion

Various surgical treatments have been used for the treatment of GR, among which SCTG has been considered the 'gold standard' in the treatment of Miller's class I GR (13). Along with the correction of the etiology, GR associated with NCCLs could be effectively treated using an interdisciplinary, perio-restorative approach (5). In the present study, atraumatic tooth brushing with a soft bristled tooth brush was advised preoperatively. In this regard, Santamaria M. P. et al (3) and Santamaria M. P. et al (14). have concluded that the combined perio-restorative approach in the management of GR associated with NCCLs could results in the more significant reduction of dentin hypersensitivity postoperatively. Therefore, the current research aimed to compare the treatment of Miller's class I GR associated with NCCLs using RMGIC combined with CTG and CTG alone.

In the present study, the reduction of the PPD scores from the baseline to 6M in both groups could be attributed to the better adaptation of the soft tissue to the slightly convex surface of the restoration and planed root surface, which provided resistance to the probe penetration at 6M (15). Similar results have been reported by Lops D. et al. (16) and McGuire M. K. et al (17).

In the current research, the reduction of the RGR scores from the baseline to 1M and baseline to 6M in both groups showed the post-coronal advancement of the flap, which is consistent with the studies by Keceli H. G. et al. (17) and McGuire M. K. et al (18). On the other hand, increased KTW could be attributed to the healing of the marginal gingival tissue. The CTG obtained from the hard palate and granulation tissue originating from the periodontal tissue, which resembled the gingival connective tissue, may have induced the keratinization of the covering epithelium (19). The genetic tendency of the MGJ to revert to its original position must have exposed the underlying CTG, which subsequently turned into the keratinized tissue (20). This is in line with the findings of Keceli H. G. et al (18) and Rasperini G. et al (21).

According to the results of the present study, the gingival biotype significantly improved in both groups, which could be attributed to the adjunctive use of CTG along with the coronally advanced flaps. Similar findings have been proposed by Keceli H. G et al (18) and Santamaria M. P. et al (14). Furthermore, the increased CAL scores in both groups in the current research was in congruence with the results obtained by McGuire M. K. et al (17) and Alkan E. A. et al (22), which indicated a significant increase in CAL .

NCCLs often involve parts of the crown and root. In both groups in the current research, the surgical treatment established root coverage to the predetermined CEJ level, leaving the coronal part of the cervical lesion (group A) and part of the RMGIC restoration (group B) exposed postoperatively. In this regard, Santamaria M. P. et al (3). Concluded that after the healing period, approximately 50-80% of the restoration or cervical lesion were covered by the soft tissue, thereby decreasing the CLH in both study groups. Similar findings have also been proposed by Santamaria M. P. et al (23).

According to the results of the present study, the scores of VAS decreased in both groups. However, the reduction was considered more significant in group B compared to group A at 1M and 6M as the RMGIC restoration in group B sealed all the exposed dentinal tubules, thereby reducing the intensity of dentin hypersensitivity. This is consistent with the findings of Santamaria M. P. et al (14, 15).

In group A in the present study, nine out of 13 sites showed the MRC, and in group B, eight out of 13 sites showed the MRC. In total, 69.24% of the sites in group A and 61.54% of the sites in group B showed the MRC (Table V). Therefore, it could be concluded that the presence of GIC restoration had no effects on the outcomes of the root coverage procedure in group B, which is in line with the three studies conducted by Santamaria M. P. et al (3, 14, 15).

Conclusion

According to the results, the presence of subgingival restoration had no effect on root coverage. However, a more significant reduction was observed in dentin hypersensitivity at the restored sites. Long-term follow-up is required to establish the effectiveness of this combined technique.

Conflicts of interest

None declared.

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