

Laterally closed tunnelling technique in isolated Class I and Class II gingival recession defects with connective tissue graft VS platelet rich fibrin - A comparative study

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Abstract

Objective: The efficacy of Connective Tissue Graft (CTG) Vs Platelet Rich Fibrin (PRF) was studied in isolated class I and II gingival recession defects using laterally closed tunneling (LCT) technique.

Material and Methods: Eighteen chronic periodontitis patients aged between 20-50yrs participated. They were split equally into two groups. Subjects in Group I were treated using Laterally Closed Tunneling technique (LCT) with CTG and Group II using LCT with PRF.

The variables assessed were Probing depth (PD), Percentage root coverage (PRC), Gingival recession depth (RD) and Keratinized tissue width (KTW).

Results: The RD, KTW and PRC fared equally well in LCT+CTG and LCT+PRF groups postoperatively. However, the PD remained unchanged. On intergroup evaluation the values of the parameters though showing improvement from D⁰ to D⁶, were not statistically significant.

Conclusion: The study results indicate that LCT is an efficient but a sensitive method to use for recession management. Intergroup evaluation yielded no significant results. However, long term studies with a larger sample size are mandatory to gain insight into the advantages of LCT technique.

Keywords: Gingival recession, Lateral closed tunnel, Connective tissue graft, Platelet rich fibrin, Recession depth.

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Introduction

When the gingival margin is displaced apically gingival recession occurs and could be caused by trauma, aberrant frenal attachment, periodontal disease, post orthodontic therapy to list a few of the etiological factors.^[1-4] Recession causes cosmetic and functional impairments which could be managed with gingival auto grafts, pedicle grafts, connective tissue grafts (CTG), guided tissue regeneration(GTR) employing Coronally advanced flap(CAF) or tunnelling techniques for root coverage.^[5-7] CTG and CAF in combination have given most optimal results in recession management^[8] CTG harvesting is a very technique sensitive procedure causing discomfort postoperatively. Thus, the advent of PRF was initiated. PRF is loaded with growth factors

and hence is employed to augment receded gingivae.^[9,10] The primary outcome assessed in this study was percentage of root coverage (PRC) while the recession depth (RD), probing pocket depth (PD), keratinized tissue width (KTW), were the secondary outcomes examined. Newer techniques to treat gingival recession with favorable outcomes is the aim of every clinician, therefore this study was done to assess the benefits of employing the laterally closed tunnelling technique (LCT) with CTG or PRF as adjunctive tools for management of isolated shallow class I and class II recession defects, though the pioneers of LCT technique made use of the same after root biomodification with ethylene diamine tetra acetic acid followed by application of emdogain in deeper mandibular recession defects.^[11]

Material and methods

Preliminary Plan and Moral Statement

Designed as a randomized, parallel arm, clinical trial, this study compared the efficacy of root coverage using LCT with CTG and LCT with PRF in Miller's class I and class II gingival recession in 18 patients visiting the outpatient ward of an institution in Hyderabad. The ethical committee of the college approved the study (PMVIDS&RC/IEC/PERIO/DN/0220-2018) which was conducted from May 2019 to October 2020. The ethical standards established by the World Medical Association (WMA) in the Declaration of Helsinki was complied with and all the participants were given a detailed verbal and written description of the study, and a signed consent form was obtained. The flow chart of the study design is presented in Fig. 1.

Inclusion and Exclusion criteria

Patients with Miller's class I and II recession defects on anterior teeth with PD >3mm, CAL >5mm and KTW >1mm were included in the study. Pregnant and lactating

women, smokers, systemically compromised patients, subjects who had undergone periodontal therapy within the last six months, and those who were on antibiotics three months prior were excluded from the study.

Sample Size Calculation

As per the statistician's suggestion, to get a difference in PRC (Primary outcome) of 1.80mm between the groups with power at 80% and 95% confidence interval, 9 patients had to be included in each group.

Estimation of clinical parameters.

The recession depth (RD), probing pocket depth (PD), keratinized tissue width (KTW) and percentage root coverage (PRC) were recorded using a UNC15 probe at baseline(D⁰), 3 months (D³) and 6 months(D⁶) post-surgery Randomization.

Investigator KRR allotted the cases by randomly picking them up from sealed envelopes and Investigator RR performed the surgeries.

Groups

Group A --- 9 patients underwent laterally closed tunnelling with CTG

Group B --- 9 patients underwent laterally closed tunnelling with PRF.

Presurgical Procedure

The patients initially received a comprehensive periodontal examination and complete plaque control program including oral hygiene to eliminate habits related to the etiology of recession. Scaling, root planning and occlusal adjustments were done. The patients were randomly allocated into Group A (Fig 2) and Group B (Fig3).

Surgical Procedure

Patient was seated comfortably on the dental chair and then asked to rinse the mouth with 1:1 ratio of 0.2% chlorhexidine di-gluconate solution. The operative site was anesthetized with 2% Lignocaine HCL with

adrenaline (1:80,000) using block and infiltration techniques.

Group A (CTG Group)

After local infiltration, root planning of the exposed root surface was performed with Gracey curettes. Subsequently, slightly beveled intrasulcular incisions were made using microsurgical blades and a full thickness (tunnel) was prepared using specially designed tunnelling instruments (Stoma Tunnelling instruments, Medco Instruments, Inc.7732 West 96th Place, Hickory Hills, IL 60457708-237-3750). The tunnel created was then extended apically beyond the mucogingival junction and mesial and distal papillae were also undermined without splitting the papillae creating a full thickness pouch in the papillary region too. Internal muscle and fiber attachments were removed to create a tension free pouch enabling its free displacement from mesial, distal and apical directions. (Fig 4)

CTG Procurement

The hard palate was the donor site for the CTG. The incision was given 5-6 mm away from the gingival margin of maxillary premolars and first molar on the palatal aspect to enable ideal thickness of CTG to be obtained at that

location.^[12] Single Incision was employed for CTG harvesting and the site was sutured using a gut suture. [Johnson & Johnson Ethicon Vicryl Absorbable Surgical Suture (2-0)]. The CTG harvested should be ideally 1-1.5mm thick ^[12]The graft obtained measuring 1.5mm in thickness was then transferred to the recipient site where it was sutured to the periosteum using resorbable sutures and was anchored at the cemento enamel junction using sling suture with 4.0 Ethicon resorbable suture material. (Figs 5,6,7)

The displaced tunnel margin (Mesial, distal and apical regions of gingiva of affected tooth) was then

approximated enabling a greater part of the root surface to be covered by it. The tunnel margins were pulled close over the graft, making sure to fully cover the CTG, and sutured with interrupted sutures using 3.0 black silk enabling tension free coverage of the denuded root surface. (Fig 8)

Periodontal dressing was applied over the surgical area for one week such that the surgical site was protected during the initial healing period.

PRF membrane preparation

It was procured from a simple blood sample (2ml) drawn from the patient's antecubital vein at the time of surgical procedure. It was then centrifuged at 2700rpm for 12 minutes. At the end of centrifugation procedure, 3 distinct layers were formed of which the intermediate layer was that of a dense platelet rich fibrin clot. This dense platelet rich fibrin clot was used as a membrane.

Group B (PRF GROUP)

The same surgical procedure as group A was performed in Group B but PRF membrane was inserted and securely positioned to the level of the Cementoenamel junction (CEJ) by means of a sling suture (4-0 Ethicon resorbable sutures.). (Figs 9,10&11) The pouch margins were then approximated and sutured such that there was tension free complete coverage of both the graft and root surface. (Fig 12).

Periodontal dressing was applied over the surgical area for one week, such that the surgical site was protected during the initial healing period.

Post operative Protocol

The patients were systemically healthy and therefore advised to take analgesic (Aceclofenac 100 mg 3 times a day for 5 days) and antibiotics (amoxicillin 500 mg) thrice every day for 5 days post-surgery and instructed to refrain from brushing and flossing at surgical site until removal of sutures after one week. They were also

instructed to rinse with chlorhexidine mouthwash (0.12%) twice daily for a period of 1 month to prevent plaque accumulation at the surgical site. Each patient was reinstructed for proper oral hygiene measures using super soft tooth brushes and the patients were seen immediately after 1 week and thereafter monthly until the end of the 6th month. Professional scaling and oral hygiene reinforcement were provided at each follow-up visit whenever indicated till 6th month. (Figs13 &14)

Statistical Analysis

Data was analyzed by Microsoft Excel and Graph pad prism software. It was summarized by Mean \pm SD for continuous data. The intragroup comparison was done by repeated one way analysis of variance test for continuous data followed by Bonferoni's multiple comparisons test. Intergroup comparison was by independent simple t test. Power was set at 80% and the confidence interval was 95% with p value ≤ 0.05 considered as statistically significant.

Results

Group A

The RD at D⁰, D³ and D⁶ was 3.33, 1.78, 1.78 mm. It was observed that RD values decreased from D⁰ to D³ and remained the same at D⁶ (p<0.001), thus RD values did not improve from D³ to D⁶. The PD at D⁰, D³ and D⁶ was 1.44, 1.33, 1.56 mm. There was no significant change from D⁰ to D³ to D⁶ for PD values (p>0.001). The KTW at D⁰, D³ and D⁶ was 2.33, 3.33, 3.44mm. There was an increase in KTW values from D⁰ to D³ to D⁶ (p>0.001). There was a decrease in RD (P<0.01) and increase in KTW (P<0.002) from D⁰ to D⁶ within LCT+CTG group. However, no significant difference in the PD was observed for the same time period within the group. (P<0.415) (Table 1)

Group B

The RD at D⁰, D³ and D⁶ was 2.67, 1.72, 1.72mm respectively. It was observed that RD values decreased significantly from D⁰ to D³ remained the same at D⁶ (p<0.001) thus RD values did not improve from D³ to D⁶. The PD at D⁰, D³ and D⁶ was 1.67, 1.56, 1.56mm. There was a reduction from D⁰ to D³ and remained same at D⁶ for PD values (p>0.001). The KTW at D⁰, D³ and D⁶ was 1.89, 2.78, 2.67mm. There was significant increase in KTW values from D⁰ to D³ and decreased marginally at D⁶ (p>0.001). There was a statistically significant decrease in RD (P<0.002) and increase in KTW (P<0.038) from D⁰ to D⁶, however the PD displayed no significant difference for the same time period within the LCT+PRF group. (P=0.594) (Table 2)

The PRC at D³ and D⁶ in the CTG group was 46.89, 46.89 respectively. There was no improvement in PRC values from D³ to D⁶. The PRC at D³ and D⁶ in the PRF group was 44.33, 44.33 respectively. There was no change in PRC values from D³ to D⁶. In both the CTG & PRF groups the PRC remained same at D³ and D⁶. (Table 3)

Independent sample t test displayed no statistically significant difference among different parameters between LCT+CTG Group and LCT+PRF Group at D⁰, D³ and D⁶ time intervals (P>0.05).

Discussion

Gingival recession is a very common feature seen in patients afflicted with periodontitis. The etiological factors causing recession are innumerable - excessive or inadequate tooth brushing, destructive periodontal disease, tooth malposition, alveolar bone dehiscence, high muscle attachment, aberrant frenal pull, occlusal trauma, iatrogenic factors and smoking are some of them. [13,14] The same factors also cause isolated recessions.

CTG is considered the best because of its high predictability for root coverage, dual blood supply, superior esthetics, and resultant increase in the width of attached gingiva.^[15]

CTG success after surgical procedure relies on the nature of defect/cervical abrasion defect, recession severity, flap thickness, flap designs for the recipient site, harvesting technique, presence/ absence of the epithelial collar, graft thickness, flap tension, suturing techniques, and the effect of smoking^[16]

A study evaluated three Miller class III cases which were managed with a combined procedure of a modified laterally positioned flap (mLPPF) and CTG. The mean initial defect recorded was 7.7±1.5 mm and the mean residual defect was 1.7±1 mm 6 months postoperatively. Patients were satisfied with the surgical outcome and reported an improvement in hypersensitivity which was their main complaint.^[17]

Another study done for 6 months compared clinical outcomes of laterally positioned pedicle graft (LPPG) and CTG for treatment of Sixty Miller's Class I and II gingival recession defects. Isolated deep narrow defects showed good improvement with LPPG whereas in deep and wide isolated or multiple defects CTG proved to be superior.^[18]

Platelet rich fibrin (PRF) is enmeshed with cytokines, and cells and has been the material of choice in periodontal regeneration. PRF can be used as a graft as well as a membrane and in both its roles it has shown moderate success. As PRF is rich in proteins, which aid in the signaling of stem cells that undergo differentiation and promote healing its role in periodontal regeneration has been undisputed.^[19]

PRF has been used successfully in combination with CAF for root coverage in isolated and multiple gingival recessions. PRF membrane is rich in growth factors like

platelet-derived growth factor (PDGF), transforming growth factor (TGF), vascular endothelial growth factor (VEGF) and epidermal growth factor (EGF) which are released for three weeks and thus play a crucial role in tissue remodeling. The fibrin matrix acts as a scaffold promoting the ingress of blood vessels which are essential for wound healing to progress.^[20]

A study conducted for 6 months compared PRF to CTG in recession defects. It was observed that the PRF group showed better healing and less patient discomfort than CTG group, however, both materials were equally effective in root coverage.^[21]

Some other researchers evaluated clinically the effect of modified Lateral pedicle flap (m LPF) with platelet-rich fibrin (PRF) for the treatment of denuded root surfaces. Fifteen isolated Miller's Class I and II gingival recession of single-rooted teeth were treated and the results emphasized that m LPF with PRF produced statistically significant reduction in RD and gain in both CAL and WKT by the end of 6 months.^[22]

Tunnelling procedure was introduced way back in 1985^[23] and was later modified by other researchers^[24] to treat multiple adjacent recession defects with some alterations, including papilla mobilization and graft suturing.

Some pioneers in the field of plastic surgery conducted a study in which 24 patients with deep isolated mandibular recessions were treated with a Laterally closed tunneling (LCT) technique in conjunction with connective tissue graft and enamel matrix derivative. PD, CAL, CRC, MRC, RD and KTW were assessed at baseline and 12 months and it was observed that LCT was a valuable approach for the treatment of isolated mandibular recessions with good improvement in all the variables assessed.^[11]

Another study wherein a 37 years old patient presented with pain, irritation and Millers class II recession in the mandibular lingual area was examined. The present case was treated with connective tissue graft (CTG) using minimally invasive tunneling technique for the lingual surface of the mandibular lateral incisor. Post treatment results after 6 months showed an enhanced width of keratinized tissue with a mean root coverage of 3.5 mm. It was concluded that lingual recessions could be successfully treated using minimally invasive full-thickness tunneling technique and subepithelial palatal CTG.^[25]

Another study evaluated twelve healthy patients exhibiting one isolated mandibular Miller Class I or II (Cairo Class 1) gingival recession of a depth of ≥ 3 mm, which were consecutively treated with the modified coronally advanced tunnel (MCAT) or LCT in conjunction with Hyaluronic acid and CTG. CRC was measured in six out of the 12 cases (50%), four cases showed a root coverage of over 95%, while the remaining two cases reached 80% and 85%. After six months of follow up predictable root coverage of isolated mandibular Miller Class I and II (Cairo Class 1) gingival recessions were observed.^[26]

In the present study, laterally closed tunneling technique using CTG (Group A) vs PRF (Group B) was employed in Isolated Miller's class I and class II gingival recessions. Clinical Parameters like RD, PD, KTW and PRC at D⁰, D³ and D⁶ was assessed. The observations displayed statistically significant improvement in all the parameters excepting for PD in Group A (Table1) and Group B (Table 2). However, when an intergroup comparison was made the outcomes were not statistically significant. (Tables 3&4).

Limitations

The Lateral Closed tunnel is a very technique sensitive procedure, perhaps microsurgical loops could have helped ease the strain on the clinician. Moreover, gingival thickness was not assessed in this study. Assessing the gingival thickness in both the groups could have ascertained whether CTG or PRF was superior in improving the phenotype of the gingiva.

Conclusion

It can be thus concluded that both CTG and PRF were both equally effective in treating isolated Miller's class I & II gingival recessions. Perhaps a larger sample size would have validated the results better.

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Legend Tables

Table 1: Intragroup Comparison of the clinical parameters in Group a using repeated one-way analysis of variance & Bonferoni’s test

Variables	Duration	LCT+CTG					
		N	Minimum	Maximum	Mean	SD	P Value
Recession Depth (RD)	D ⁰	9	2	5	3.33	1	0.001**
	D ³	9	1	3	1.78	0.83	
	D ⁶	9	1	3	1.78	0.83	
Probing Depth (PD)	D ⁰	9	1	2	1.44	0.53	0.415*
	D ³	9	1	2	1.33	0.5	
	D ⁶	9	1	2	1.56	0.53	
Width of Keratinized Tissue (KTW)	D ⁰	9	2	3	2.33	0.5	0.002**
	D ³	9	3	4	3.33	0.5	
	D ⁶	9	3	4	3.44	0.53	

**P<0.05 statistically significant, *P>0.05 not significant, N-Sample size; SD-Standard deviation, LCT+CTG- Laterally closed tunnel + Connective tissue graft, D⁰-At Baseline, D³. At 3 months, D⁶- At 6 months.

Table 2: Intragroup Comparison of the clinical parameters in Group B using Repeated one-way analysis of variance & Bonferoni’s test

Variables	Duration	LCT+PRF					
		N	Minimum	Maximum	Mean	SD	P Value
Recession Depth (RD)	D ⁰	9	1	5	2.67	1.22	0.002**
	D ³	9	0	5	1.72	1.52	
	D ⁶	9	0	5	1.72	1.52	
Probing Depth (PD)	D ⁰	9	1	2	1.67	0.5	0.594*
	D ³	9	1	2	1.56	0.53	
	D ⁶	9	1	2	1.56	0.53	
Width of Keratinized Tissue (KTW)	D ⁰	9	0	3	1.89	1.27	0.038**
	D ³	9	0	4	2.78	1.3	
	D ⁶	9	0	4	2.67	1.32	

**P<0.05 statistically significant, *P>0.05 not significant, N-Sample size; SD-Standard deviation, LCT+PRF- Laterally closed tunnel + Platelet Rich Fibrin, D⁰-At Baseline, D³. At 3 months, D⁶- At 6 months.

Table 3: Pair wise comparison of the Percentage of root coverage at different time intervals (D³- and D⁶) in both Group A and Group B using Paired t-test

Variable	Groups	Duration	N	Mean	Std. Deviation	Std. Error of Mean #
Percentage of root coverage (PRC)	LCT+CTG (Group A)	D ³	9	46.89	16.19	5.40
		D ⁶	9	46.89	16.19	5.40
	LCT+PRF (Group B)	D ³	9	44.33	33.55	11.18
		D ⁶	9	44.33	33.55	11.18

N-Sample size, LCT+CTG- Laterally closed tunnel + Connective tissue graft, LCT+PRF- Laterally closed tunnel + Platelet Rich Fibrin, D⁰-At Baseline, D³. At 3 months, D⁶- At 6 months.

Table 4: Intergroup Comparison of clinical parameters using independent sample t test

Variables	Duration	Groups	N	Mean	SD	P Value
Recession Depth (RD)	D ⁰	LCT+CTG	9	3.33	1.00	0.224*
		LCT+PRF	9	2.67	1.22	
	D ³	LCT+CTG	9	1.78	0.83	0.925*
		LCT+PRF	9	1.72	1.52	
	D ⁶	LCT+CTG	9	1.78	0.83	0.925*
		LCT+PRF	9	1.72	1.52	
Probing Depth (PD)	D ⁰	LCT+CTG	9	1.44	0.53	0.372*
		LCT+PRF	9	1.67	0.50	
	D ³	LCT+CTG	9	1.33	0.50	0.372*
		LCT+PRF	9	1.56	0.53	
	D ⁶	LCT+CTG	9	1.56	0.53	1*
		LCT+PRF	9	1.56	0.53	
Width of Keratinized Tissue (KTW)	D ⁰	LCT+CTG	9	2.33	0.50	0.343*
		LCT+PRF	9	1.89	1.27	
	D ³	LCT+CTG	9	3.33	0.50	0.249*
		LCT+PRF	9	2.78	1.30	
	D ⁶	LCT+CTG	9	3.44	0.53	0.121*
		LCT+PRF	9	2.67	1.32	
Percentage of root coverage (PRC)	D ³	LCT+CTG	9	46.89	16.19	0.84*
		LCT+PRF	9	44.33	33.55	
	D ⁶	LCT+CTG	9	46.89	16.19	0.84*

*P>0.05 not significant, N-Sample size, LCT+CTG- Laterally closed tunnel + Connective tissue graft, LCT+PRF- Laterally closed tunnel + Platelet Rich Fibrin, D⁰-At Baseline, D³. At 3 months, D⁶- At 6 months.

Figures with legend

Fig 1: consort flow diagram

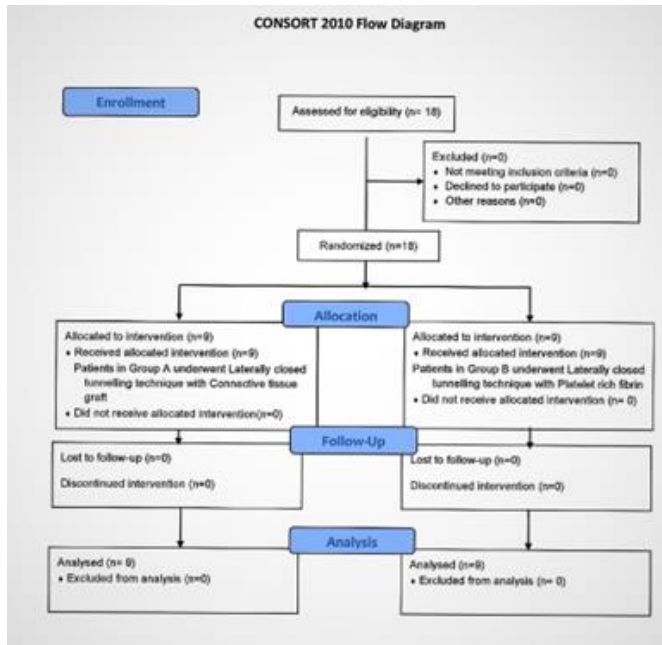


Fig 8: Suturing of LCT in Group A



Fig 9, 10 & 11: LCT preparation, PRF obtained, Placement of PRF in Group B



Fig 12: Suturing of LCT in Group B



Fig 2 & 3: Baseline recession depth measurement in Group A & Group B



Fig 4: Lateral Tunnel preparation in Group A



Fig 13 & 14: Recession depth after 6 months in Group A & Group B



Fig 5, 6 & 7: Palatal incision, Harvested CTG, Placement of CTG in Group A

