

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service Available Online at:www.ijdsir.com

Volume – 8, Issue – 1, January – 2025, Page No. : 43 - 52

Efficacy of Lateral Pedicle Flap vs Coronally Advanced Flap with Tunnelling and Connective Tissue Graft in Isolated Class I & Class II Anterior Gingival Recession Defects- A Parallel Arm Randomized Interventional Study ¹Dr Tata Sai Lakshmi Harika, PG Student, Department of Periodontics, Panineeya Institute of Dental Sciences, Dilsukhnagar, Hyderabad

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Citation of this Article: Dr Tata Sai Lakshmi Harika, Dr Koduganti Rekha R, "Efficacy of Lateral Pedicle Flap vs Coronally Advanced Flap With Tunnelling and Connective Tissue Graft in Isolated Class I & Class II Anterior Gingival Recession Defects- A Parallel Arm Randomized Interventional Study", IJDSIR- January – 2025, Volume – 8, Issue – 1, P. No. 43 - 52.

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Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Context: Tunnelling (TUN) procedures for gingival recession treatment has often been employed in recent times with successful outcomes. Though many studies were done using lateral pedicle flap (LPF) and coronally advanced flap (CAF), a study comparing the techniques using tunnelling and connective tissue graft (CTG) has not been addressed.

Aims: The main focus was to assess the outcome of root coverage by doing LPF Vs CAF with Tunnelling and CTG in isolated Miller's class I &II (MCI & MCII) anterior gingival recession defects.

Settings and Design: This was a double blinded study conducted on 16 patients of both sexes, visiting the outpatient ward of an institution in Hyderabad. **Methods and Material:** Subjects were divided uniformly. Patients in Group 1 underwent LPF with tunnelling technique using CTG and in Group 2 CAF with tunnelling technique using CTG for MCI and MCII defects. The parameters assessed were Probing Depth (PD), Complete root coverage (CRC), Gingival recession depth (RD), Gingival recession width (RW), Visual analogue scale (VAS) and Root surface aesthetic score (RES).

Statistical analysis used: Intragroup analysis was done by repeated one-way analysis of variance test and. Intergroup comparison used independent sample t test. All p values less than 0.05 were considered as significant Results: An improvement in RD was observed within both the groups. However, intergroup comparison yielded superior results in Group 2 though not statistically significant.

Conclusions: Group 2 (CAF+TUN) using CTG, showed better CRC over Group 1 (LPF +TUN) with CTG, however the outcome was not statistically significant.

Keywords: Gingival recession, Lateral pedicle flap, Coronally advanced flap, Tunnelling, Connective tissue graft.

Introduction

Gingival recession (GR) is the displacement of the gingival margin apical to the cementoenamel junction (CEJ).^[1] Obtaining predictable results is the goal of every clinician. GR usually creates an aesthetic problem, also be associated and mav with dentinal hypersensitivity, and/or root caries, abrasion and/or cervical wear.^[2] Several techniques have been used for root coverage, such as free gingival grafts, guided tissue regeneration, subepithelial connective tissue grafts (SCTG), laterally sliding flaps, double papilla flaps (DPF), coronally advanced flaps (CAF), and acellular dermal matrix grafts (ADMG), tunnelling techniques (TUN), or bilaminar techniques, with varied clinical effectiveness. Among these techniques, a CTG combined with CAF (bilaminar technique) is the best for Miller class I (MCI) & class II (MCII) GR defects, because of its high predictability for root coverage. The ideal requisite of a pedicle flap or CAF is that it should be tension free, hence, newer clinical approaches are warranted to predictably cover the defects and minimize complications caused by unfavourable anatomic situations. Lateral pedicle flap (LPF) with split thickness tunnel technique is one among the newer techniques proposed for recession defects. This study aimed to compare LPF Vs CAF with tunnelling and CTG in isolated MCI & MCII Anterior recession defects.

Subjects and Methods: This study was conducted from November 2020 to October 2021 and was approved by the institutional ethical committee. (PMVIDS & RC/ IEC/PERIO/DN/0289-19). Ethical standards established by the World Medical Association (WMA) in the Declaration of Helsinki was followed and all the participants gave a written informed consent to participate in the study. This study was registered in CTRI. (CTRI/2020/11/028793).

Inclusion and exclusion criteria: Patients with MC1 & MCII GR defects on anterior teeth with PD \ge 3mm, CAL \ge 5mm, KTW \ge 2mm were included, and systemically compromised patients, pregnant and lactating women, subjects who had undergone periodontal therapy within 6 months and on antibiotics for 3 months, were excluded from the study,

Sample size calculation: As per the statistician's suggestion, to get a difference in CRC between the groups with power at 80% and 1% alpha error, 8 patients had to be included in each group. The primary outcome variables assessed were the RD, RW and CRC, whereas PD, CAL, VAS and RES were the secondary outcomes measured.

Estimation of clinical parameters: A standard periodontal probe (UNC-15) was used to assess the clinical parameters at baseline (D_0) and post operatively at 3(D_3) and 6 (D_6) months. VAS was recorded for each patient at 10th day and 1month. RES was recorded for each patient after 3 months (D_3) and 6 months (D_6).

Randomization: One investigator KRR allotted the cases by randomly picking them up from sealed envelopes and investigator SLH performed the surgeries in all the groups. Both the patient and statistician were blinded to the investigation. (Fig1)

Figure 1: CONSORT Flow diagram



Groups: Group 1 included eight patients who underwent LPF+TUN and CTG, and Group 2 also included eight patients who were treated with CAF+TUN and CTG respectively.

Presurgical procedure: The patients initially received a comprehensive periodontal examination and complete plaque control program including oral hygiene to eliminate habits related to the aetiology of recession. scaling, root planing and occlusal adjustments were done.

Surgical procedure: On completion of the baseline examination and thorough initial therapy, patient was asked to rinse the mouth with 1:1 ratio of 0.2% chlorhexidine solution. The operative site was anesthetized with 2% Lignocaine HCL with adrenaline (1:80,000) using block and infiltration techniques.

Connective tissue graft procurement: The connective tissue graft was harvested from the hard palate. Single Incision was made approximately 2mm away from the gingival margin to gain access to the connective tissue. The incisions create a trap door effect where a flap was raised on the palate and then the connective tissue was harvested and the donor site was sutured. (Figs 2a, b, c)

Figure: 2: a) Single incision for CTG Harvest b) CTG harvested from the palate c) Donor site sutured



Group 1: After infiltration of local anaesthetic, the recipient bed was prepared. The inflamed tissue collar was removed, and starting from the distal line angle of the CEJ, a horizontal incision, whose length was greater than RW, was made distally, maintaining a distance of at least 1 mm from the gingival margin of the adjacent tooth. The distal point of the horizontal incision was connected to a vertical incision which extended beyond the mucogingival junction (MGJ) and ended with a cutback preparation, to prevent excessive tension of the flap after its lateral displacement. A split-thickness pedicle was elevated, and particular care was taken to avoid perforations and to preserve a homogenous thickness of the flap in its entirety. Mesial to the recession, a split thickness tunnel was prepared using tunnelling instruments. (Stoma Tunnelling instruments, Medco Instruments, Inc.7732 West 96th Place, Hickory Hills, IL 60457708-237-3750). The partial dissection was extended to the base of the interdental papilla and the soft tissues beyond the MGJ. The CTG was harvested from the palate, using the single incision technique and a 1.5mm thick graft was obtained. After achieving complete haemostasis, the donor site was sutured. The graft was then adapted onto the recipient bed using resorbable sutures. Finally, the pedicle was positioned 1 mm coronal to the cementoenamel junction of the recipient's tooth and sutured by 4-0 absorbable sutures. The area was protected with a periodontal dressing. (Figs 3 a, b, c, d, e)

Figure 3: a) Preop Photo of recession in Group 1 b) Intraoperative LPF +TUN in Group1 c) Placement of

CTG + LPF d) Recipient site sutured e) Postoperative photo after 6 months.



2: Local anaesthetic Group was administered, intrasulcular incision was made along the recession margins with a submarginal incision of the adjacent papillae using a micro scalpel blade. Vertical releasing incisions were made starting laterally at the base of the papillae, 2 mm apical from the sulcus of adjacent teeth, up to and beyond the mucogingival junction. The denuded root surface was covered by tunnelled fullthickness CAF, prepared by giving submarginal horizontal incision connected to two vertical releasing incisions extending to the mucogingival junction adjacent to the defect. A CTG was harvested from the palate and properly adapted over the denuded root surface using resorbable sutures. The CAF was then coronally advanced and was secured in position with 4-0 absorbable sutures. The surgical site was protected by a periodontal dressing. (Figs 4 a, b, c, d, e)

CTG +CAF d) Recipient site sutured e) Postoperative photo after 6 months.



Postoperative protocol: The patients were advised to take analgesic (Aceclofenac100 mg 3 times a day for 5 days) and antibiotics (amoxicillin 500 mg) thrice every day for 5 days after surgery and instructed to refrain from brushing and flossing at surgical site. They, were also instructed to rinse with chlorhexidine mouthwash (0.12%) twice daily for a period of 1 month. The donor site suture removal was done 7 days post-surgery. Patients were reinstructed for proper oral hygiene measures and seen immediately after 1^{st} week and thereafter at D₁, D₃ and D₆ respectively.

Results:

Group 1: The RD values decreased significantly from D_0 , D_3 to D_6 (p=0.000). The RW values did not show improvement from D_0 , D_3 to D_6 (p=0.742). The PD values decreased significantly from D_0 , D_3 to D_6 (p=0.000). The CRC at D_3 and D_6 was 60.31, 69.93 respectively. The CRC values increased significantly from 3 months to 6 months (p=0.04). Therefore, there was a significant decrease from D_0 , D_3 to D_6 for RD and PD in Group 1, except the RW values which were not statistically significant (Table 1)

Figure	4:	a)	Preop	Photo	of	recess	ion	in	Group	2	b)
Intraop	era	tive	CAF-	+TUN	in	Group	2 0	:) F	laceme	nt	of

Table1: Intra group comparison of clinical parameters at different time intervals in Group 1(LPF with tunnelling + CTG)

Clinical parameters	Time Interval	N	Mean	Std. Deviation	F value	P value
RD	D ₀	8	3.7500	.70711		
	D ₃	8	1.5000	.84515	44.41	0.000*
	D ₆	8	1.1250	.95431		

D ₀	8	2.5625	.49552		
D ₃	8	2.5625	.41726	0.30	0.742‡‡
D ₆	8	2.5000	.46291		
D ₀	8	2.7500	.46291		
D ₃	8	2.0000	.53452	21.0	0.000*
D ₆	8	2.0000	.53452		
D ₃	8	60.3125	22.21797		
D ₆	8	69.9375	25.11465	9.625	0.04*
	$\begin{array}{c c} D_{0} \\ \hline D_{3} \\ \hline D_{6} \\ \hline D_{0} \\ \hline D_{3} \\ \hline D_{6} \\ \hline D_{3} \\ \hline D_{6} \\ \hline \end{array}$	$\begin{array}{c c c} D_0 & 8 \\ \hline D_3 & 8 \\ \hline D_6 & 8 \\ \hline D_0 & 8 \\ \hline D_3 & 8 \\ \hline D_6 & 8 \\ \hline D_3 & 8 \\ \hline D_6 & 8 \\ \hline D_6 & 8 \\ \hline \end{array}$	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $

Statistical test applied: Repeated measures ANOVA; *P<0.05 statistically significant, †N-Sample size; ‡SD-Standard deviation, §RD- Recession depth, ||RW-Recession width, ¶PD-Probing depth, **CRC- Complete root coverage, ++D0-At Baseline, D3- At 3 months, D6-At 6 months, ‡‡ Not Significant.

Group 2: The RD values decreased significantly from D_0 , D_3 to D_6 (p=0.000). The RW values also decreased significantly from D_0 , D_3 to D_6 (p=0.005). The PD

values did not show improvement from D_0 , D_3 to D_6 (p=0.39). The CRC at 3 months and 6 months was 61.87, 72.00 respectively. A significant improvement in CRC values was observed from D_3 to D_6 (p=0.002). Therefore, there was a significant decrease from D_0 , D_3 to D_6 for all the clinical parameters in Group 2, except the PD values which were not statistically significant. (Table 2)

Table 2: Intra group comparison of clinical parameters at different time intervals in Group 2 (CAF with tunnelling + CTG)Statistical test applied: Repeated measures ANOVA;root coverage, ++D0-At Baseline, D3- At 3 months, D6-

Clinical parameter	Time Interval	Ν	Mean	Std. Deviation	F value	P value
RD	D ₀	8	4.1875	.75297		
	D ₃	8	1.6875	1.13192	56.49	0.000*
	D ₆	8	1.2500	1.28174		
RW	D ₀	8	2.8750	.69437		
	D ₃	8	2.5000	.65465	8.13	0.005*
	D ₆	8	2.4375	.67810		
PD	D ₀	8	2.6250	.51755		
	D ₃	8	2.5000	.53452	1.000	0.39 ‡‡
	D ₆	8	2.5000	.53452		
CRC	D ₃	8	61.8750	22.72467		
	D ₆	8	72.0000	25.19637	10.125	0.02*

*P<0.05 statistically significant, †N-Sample size; ‡SD-Standard deviation, §RD- Recession depth, ||RW-Recession width, ¶PD-Probing depth, **CRC- Complete At 6 months, ‡‡ Not Significant.

Intergroup comparison from D_0 to D_6 : A comparison between the groups related to the mean RD did not give significant results with p=0.56 at D_3 and p=0.80 at D_6

respectively. The mean RW between the groups was significant (p=0.03) at D_3 but was not (p=1.00) at D_6 respectively. Intergroup comparison related to the mean PD also yielded significant results (p=0.009) at D_3 but was not at D_6 respectively. The mean CRC in Group 1, Group 2 from 3 months to 6 months was 9.62, 10.12

respectively showing better results in Group 2 when compared to Group 1. Though, the CRC improved in both the groups from D_3 to D_6 on intergroup comparison the results were not significant statistically with p=0.89 at D_3 and p=0.77 at D_6 . (Table 3,4,5).

Clincal Parameters	Groups	Ν	Mean	Std. Deviation	t value	p value
RD	Group 1	8	2.2500	.88641	0.59	
	Group 2	8	2.5000	.80178	-0.39	0.56 ++
RW	Group 1	8	.0000	.26726	-2.39	0.03*
	Group 2	8	.3750	.35355		0.03
PD	Group 1	8	.7500	.46291	3.03	0.000*
	Group 2	8	.1250	.35355		0.009
CRC	Group 1	8	60.3125	22.21797		
	Group 2	8	61.8750	22.72467	-0.13	0.89 ++
Statistical tast appl	iod: Indonona	lont t to	xet: *D<0.05	width PD Probi	ng donth **	CPC Complete re

Table 3: Intergroup comparison of different parameters from baseline to 3 months

Statistical test applied: Independent t test; *P<0.05 statistically significant, †N-Sample size; ‡SD-Standard deviation, §RD- Recession depth, ||RW- Recession

width, ¶PD-Probing depth, **CRC- Complete root coverage, ++Not Significant.

 Table 4: Intergroup comparison of different parameters from 3 months to 6 months

Clinical parameters	Groups	Ν	Mean	Std. Deviation	t value	p value
RD	Group 1	8	.3750	.44320	-0.24	0.80
	Group 2	8	.4375	.56300		0.80++
RW	Group 1	8	.0625	.17678	0	1.00
	Group 2	8	.0625	.17678		1.00
PD	Group 1	8	.0000	.00000ª	_	-
	Group 2	8	.0000	.00000ª		
CRC	Group 1	8	9.6250	11.81932	-0.29	0.77++
	Group 2	8	10.1250	12.21752		0.7711

Statistical test applied: Independent t test; *P<0.05 statistically significant, †N-Sample size; ‡SD-Standard deviation, §RD- Recession depth, ||RW- Recession width, ¶PD-Probing depth, **CRC- Complete root coverage, ++ Not Significant.

Clinical parameters	Groups	Ν	Mean	Std. Deviation	t value	p value
RD	Group 1	8	2.6250	1.09381	-0.57	0.57 ++
	Group 2	8	2.9375	1.08356	-0.37	
RW	Group 1	8	.0625	.32043	-2.01	0.06 ++
	Group 2	8	.4375	.41726	2.01	
PD	Group 1	8	.7500	.46291	3.03	0.009*
	Group 2	8	.1250	.35355	5.05	
CRC	Group 1	8	69.9375	25.11465	-0 164	
	Group 2	8	72.0000	25.19367		0.87++

Table 5: Intergroup comparison of different parameters from baseline to 6 months

Statistical test applied: Independent t test; *P<0.05 statistically significant, †N-Sample size; ‡SD-Standard deviation, §RD- Recession depth, ||RW- Recession width, ¶PD-Probing depth, **CRC- Complete root coverage, ++ Not Significant.

VAS scores improved in both the groups and was statistically significant. On intergroup comparison it was observed that the VAS score improved significantly in Group 1, followed by Group 2. Therefore, pain perceived by the patients was less in Group 1 (LPF+TUN). (Graph1).

Graph 1: Intergroup Comparison of VAS Score



The RES scores improved in both the groups and on intergroup comparison it was observed that Group 1 (LPF+TUN+CTG) performed better than Group 2 (CAF+TUN+CTG), though the result was not statistically significant (Graph 2) Graph 2: Intergroup Comparison of RES Score



Discussion

In the present study an inter group comparison between LPF+TUN with CTG (Group1), CAF+TUN with CTG (Group2) showed statistically significant results in RW and PD from baseline to D_3 and CRC values from D_3 to D_6 in Group 2 when compared to Group 1. However, the PD values from baseline to D_6 was found to be statistically significant in group 1 when compared to group 2. Thus, both the groups showed appreciable improvements in recession coverage from baseline to D_6 Surgical techniques to correct gingival recession were introduced way back in 1926 by using coronally repositioned flap. ^{[3].} The lateral pedicle flap was introduced in 1956 and it has been modified since then by many researchers to improve the success of treatment ^[4,5] The Coronally advanced flap is commonly used to

treat multiple recession defects. Optimum root coverage results, good colour matching to adjacent soft tissues, and recuperation of the original morphology of the gingival margin can be accomplished using this surgical approach,^[6] however, it necessitates giving buccal vertical incisions which hampers blood supply and consequently retards early aesthetic results. Therefore, newer techniques have been developed to increase predictability, reduce patient discomfort, minimize the number of surgical sites, and satisfy the patient's aesthetic demands. The CTG has been proven to be the gold standard in recession coverage as it has a viable source of cells for repopulating the epithelium ^[7] Also it is a predictable source for increasing the zone of attached gingiva. ^[8,9] Many modifications to the technique of harvesting of the graft have been advocated from the initial design suggested by Langer and Langer. In this study the graft was harvested using a single incision line. ^[10,11] Tunnelling has been included as a minimally invasive approach in periodontal plastic surgical procedures as it has the added advantage of the papillary height between two preserving mucogingival defects and also maintaining adequate blood supply to the underlying graft. Thus, including this protocol has improved the treatment outcomes. ^[12,13].

A case series study was conducted on three patients which evaluated the effect of LPF +Tunnelling with CTG in Miller class III cases with interproximal bone loss and wide and deep defects. A mean initial defect of 7.7 ± 1.5 mm was observed at baseline in all the three cases which showed a marked improvement at 3, 6 and 36 month follow up with the residual defect measuring1.7±1 mm. The results demonstrated that the combination of LPF and tunnelling with SCTG was promising for treating these advanced cases. ^[14] Another study was conducted on three patients with Cairo RT1 or RT2 gingival recessions on mandibular anterior teeth which were treated with the LPF and tunnelling + SCTG technique. PD, CAL, CRC, MRC, RD, and KTW were assessed at baseline and in the follow-up periods of 18, 24, and 48 months. The researchers concluded that LPF and tunnelling + CTG with the modifications presented was a predictable approach for the treatment of deep isolated RT1 and RT2 GRs in mandibular incisors that are well positioned in the bone envelope with the presence of KTW adjacent to GR and adequate vestibule depth in the donor area of the flap. ^[15]

Studies available to date related to LPF and tunnelling + SCTG have only been case reports or case series. However, in this study it was observed that except for RW, there was a significant improvement in PD, CAL, RD and CRC in group 1 after 6 months.

CAF is the treatment of choice for multiple anterior gingival recession defects (MAGR). In another study twenty-two patients with a total of 156 Miller Class I and II gingival recessions participated. Recessions were randomly treated according to a split-mouth design by means of either modified coronally advanced tunnelling (MCAT) + Collagen membrane (CM) (test) or MCAT +CTG (control). The primary outcome variable was CRC, secondary outcomes were MRC, change in KTW, GT, patient acceptance and duration of surgery. CRC was found at 42% of test sites and at 85% of control sites respectively (p < 0.05). MRC measured $71 \pm 21\%$ mm at test sites versus $90 \pm 18\%$ mm at control sites (p < 0.05). Mean KTW measured 2.4 ± 0.7 mm at test sites versus 2.7 ± 0.8 mm at control sites (p > 0.05). The authors concluded that the use of CM may represent an alternative to CTG by reducing surgical time and patient morbidity, but yielded lower CRC than CTG in the

treatment of Miller Class I and II MAGR when used in conjunction with MCAT.^[16]

In a randomized controlled trial CAF with tunnel technique + CTG versus CAF + enamel matrix derivative was assessed in the treatment of shallow localized gingival recession defects. Clinical outcomes were evaluated at 6 and 12 months. TUN + CTG resulted in significantly better clinical outcomes compared with CAF+ Enamel matrix derivative. ^[12]

Some other researchers presented a novel surgical technique for deep labial recessions on mandibular incisors, based on a modified tunnel technique + CTG in combination with simultaneous frenotomy. Significant changes were seen in CRC at 5 years with completely satisfactory aesthetic outcomes. They concluded that treatment of single deep mandibular anterior recessions with a combined tunnelled CTG approach in addition to frenotomy appears to lead to complete long-term root coverage in one surgery with lasting aesthetic results. ^[17] This study except for the PD, showed significant improvement in CAL, RD, RW and CRC in group 2 after 6 months, which was in accordance with the above cited studies.

An inter group comparison between the test groups showed better PD, CAL, RD and CRC values in group2 (CAF and tunnelling + CTG) over group 1, though statistically insignificant. Related to the RES and VAS, group1 (LPF and tunnelling +CTG) performed better. (Graph1 and 2).

Limitations: This study did not follow a split mouth design. Moreover, the sample size was not large and the follow up was short.

Conclusions

Both techniques LPF and CAF with tunnelling and CTG are highly technique sensitive procedures, which can be performed in specific cases with good prognosis to achieve long lasting results. In this study it was observed that CAF and tunnelling+ CTG was more effective in treatment outcomes. However, these results have to be validated by future studies with larger sample size.

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