

Platelet-Rich Fibrin Versus Connective Tissue Graft Using Vestibular Incision Subperiosteal Tunnel Access (VISTA) Technique in Multiple Gingival Recessions: Randomized Controlled Trial

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Abstract

Background: One of the most common esthetic concerns in dentistry is gingival recession (GR), and despite the various treatment strategies for root coverage, multiple recessions still present a great challenge, especially Miller Class III/RT2. Thus, this study aimed to compare the effect of platelet-rich fibrin (PRF) versus connective tissue graft (CTG) using vestibular incision subperiosteal tunnel access (VISTA) in patients with Miller class III/RT2 multiple recessions for root coverage. **Methods:** Twenty-eight patients with multiple Class III/RT2 gingival recessions were randomly allocated to two equal groups – group 1 (VISTA+PRF) and group 2 (VISTA+CTG). Recession depth (RD) and width (RW), probing depth (PD), clinical attachment level (CAL), gingival thickness, keratinized tissue width, and root coverage esthetic score (RES) were measured at 0, 3, and 6 months. Statistical analysis was performed using repeated measures analysis of variance (ANOVA). Bonferroni's post-hoc test was used for pair-wise comparisons when ANOVA was significant. For non-parametric data, the Mann-Whitney U test was used to compare between the two groups. **Results:** Within each group, a significant difference from baseline to six months was found. However, between groups, the results for the VISTA+CTG group significantly surpassed the VISTA+PRF group in most clinical outcomes; gingival recession depth (0.5 [0.25-1.75] and 1.33 [0.75-2], respectively), and width (1 [0.38-3.75] and 2.33 [1.33-3], respectively), gingival thickness at three and six months (2.62±0.36 and 2.63±0.36, respectively) and (1.85±0.2 and 1.87±0.18, respectively), and keratinized tissue width (3.98±0.72 and 3.33±0.56, respectively). However, CAL and PD showed a statistically insignificant difference when comparing both groups. **Conclusion:** The use of CTG is superior to PRF in root coverage of Miller Class III/RT2 when the VISTA technique is used. Connective tissue grafts can be considered the gold standard for root coverage.

Keywords: VISTA; connective tissue graft; platelet-rich fibrin; gingival recession

Introduction

Gingival recession (GR) is defined as the apical displacement of the gingival margin beyond the cemento-enamel junction leading to the exposure of the root surface.¹ Gingival recession impacts physical attractiveness, self-image, and consequently self-esteem.² Denuded root surfaces may also be associated with dentin hypersensitivity and carious and non-carious cervical lesions,

such as abrasions or erosions.³ The most widely used techniques for coverage of GR defects are pedicle soft tissue grafts (rotational flap procedures, advanced flap procedures, and tunneling), free soft tissue grafts (epithelialized and subepithelial connective tissue grafts), and regenerative procedures (barrier membranes or biologic mediators).⁴

In 1985, Raetzke was the first to introduce the envelope flap technique for covering isolated GR as a modification of the coronally advanced flap; a connective tissue graft (CTG) is inserted in the envelope created by an undermining split-thickness preparation around the denuded root surface.⁵ Allen modified this approach in 1994 by creating a partial thickness supraperiosteal envelope to be used in the treatment of multiple adjacent GRs.⁶ An intrasulcular incision is used to create a supraperiosteal envelope through which the CTG is secured, partially exposed, and sutured, thereby minimizing trauma to the blood vessels supplying the graft in the recipient site, preserving intact papillae, and promoting esthetic color blending.⁷

In 1999, Zabalegui et al. introduced the “tunnel approach” by connecting multiple envelopes mesially and distally without detaching the papillae, thereby forming a mucosal tunnel. No coronal advancement of the envelope was described and coverage of the recession defect was dependent on the exposed portion of the CTG only.⁸ The tunnel was prepared in a full-thickness or split-thickness fashion depending on soft tissue dimensions.⁹ Azzi et al. made a modification in 2002 by creating a mucoperiosteal-mucosal tunnel including the papillary tissues and a CTG was used to thicken tissues. Then, the flap was coronally positioned with horizontal mattress sutures anchored at the incisal edge of the contact area.¹⁰

In 2007, Zuhr et al. introduced a microsurgical approach with newly developed tunneling instruments. This technique involved converting the full thickness flap into partial thickness in the buccal region thereby eliminating any exposure of the alveolar bone that may contribute to the subsequent resorption of the bony structure. In addition, better nutrition is provided for the grafted tissue from the blood supplied from both the outer flap and underlying periosteum. The two tunneling knives minimize the risk of tissue perforation and facilitate a preparation that allows an uninterrupted passage for *tunneling* in gingival recession defects. Microsurgical blades are used to ensure

atraumatic access, and 6-0 or 7-0 suture material is used to reduce any surgical trauma. This technique has a broad application especially in high-risk cases with thin biotype, multiple recessions that lack keratinized tissue, and a shallow vestibule.¹¹

Later, the “coronally advanced modified tunnel technique” was proposed by Aroca et al. in 2010 for the treatment of multiple Miller Class III GRs with a full-thickness flap elevation separating the entire interproximal papillae from the underlying bone and placing sutures suspended from composite stops at teeth contact points to prevent the flap from collapsing during healing.¹² Afterwards, the modified coronally advanced tunnel (MCAT) was proposed by Sculean et al. in 2014 for multiple recessions. The MCAT is prepared with a full thickness flap, without vertical releasing incisions, thus preserving the papillae and enhancing vascularization and stabilization of the soft tissue graft. Moreover, the soft tissue graft is completely covered, thereby improving graft survival.¹³

In 2011, Zadeh introduced the vestibular incision subperiosteal tunnel access (VISTA) – a novel minimally invasive technique for achieving root coverage. It starts by a single vestibular incision down to the periosteum to create a subperiosteal tunnel exposing the root dehiscence and underlying osseous plate. Gingival margins are mobilized by extending the tunnel one or two teeth beyond the recessed area to facilitate coronal positioning. He claimed that this technique overcomes the limitation of previous intrasulcular tunneling techniques, which obtained access through a small sulcular entry, with the risk of traumatizing and perforating sulcular tissues with a probability of unfavorable healing outcomes. In VISTA, a single vertical incision provides optimal blood supply, since horizontal incisions may jeopardize healing potential. Moreover, no visible scar is detected using VISTA, which also maintains the integrity of the interdental papillae by avoiding papillary reflection.¹⁴ Gingival margin stabilization during the initial healing phase is achieved in VISTA with coronally anchored sutures to the facial surface of each tooth, reducing micromotion, muscle pull, and the

probability of incomplete root coverage or relapse.¹⁵

In a 2020 case report by Mitra, the VISTA approach was applied in combination with a CTG for the treatment of multiple Class I recessions in the maxillary anterior region, achieving complete root coverage in three teeth out of four, and it was concluded that VISTA along with a CTG can be successfully used in multiple root coverage procedures.¹⁶ In a systematic review and meta-analysis performed by Fernández-Jiménez et al. in the year 2021 to assess the evidence on complete root coverage achieved by different periodontal plastic techniques in the treatment of Miller Class III/RT2 GR, they concluded that complete root coverage can be achieved but the long-term stability is not yet predictable. Therefore, more randomized clinical trials with longer follow-ups are needed.¹⁷

Since the minimally invasive VISTA technique allows better access with coronal positioning and stabilization of the gingival margin, the present study aimed to use VISTA with platelet-rich fibrin (PRF) and CTGs in patients with Miller class III/RT2 multiple recessions for root coverage.

Materials and Methods

A total of 28 systemically healthy patients with Miller Class III/RT2 multiple GRs, aged 25-50 years, were selected from the outpatient clinic of the department of Oral Medicine and Periodontology, Cairo University, Egypt. Sample size was calculated in the Evidence-Based Dentistry Center using the PS: Power and Sample Size Calculation software,^a with a power set at 80% and a 5% significance level. The patients were randomly allocated into two equal groups (14 patients each); group 1 (test group) was treated with the VISTA technique combined with PRF and group 2 (control group) was treated with the VISTA technique combined with a de-epithelialized subepithelial CTG. The present study was

approved by the Research Ethics Committee of the Faculty of Dentistry, Cairo University (#18-7-8) and registered in the US National Library of Medicine (ID: 4061989).

Patients were randomly selected using computer generated randomization.^b Allocation was concealed in sealed opaque envelopes. The supervisor generated the sequence and assigned participants to interventions. Due to the difference in procedures, it was not possible to blind the researcher and the participants for the treatment protocol. However, the outcome assessor and the analyst were both blinded.

Each patient was informed about the details of the procedure, including benefits and side effects, and signed an informed written consent. Afterwards, a thorough medical evaluation was performed in accordance with the Cornell Medical Index.¹⁸

Periodontal parameters were recorded, including probing depth (PD), clinical attachment level (CAL), gingival recession depth (RD) and width (RW), width of keratinized tissue, gingival thickness, and root coverage esthetic score (RES) at six points of each selected site using the UNC-15 probe.^{c,19} Periapical radiographs were taken to confirm Miller Class III/RT2 GR. Initial periodontal therapy consisting of supragingival scaling and subgingival debridement was performed using an ultrasonic device^d and Gracey curettes,^e and oral hygiene instructions were given. Patients were reevaluated 4-6 weeks following initial therapy and clinical photographs were taken at baseline and later for the surgical phase, at three and six months postoperatively.²⁰

The recipient site was prepared using the VISTA technique for both groups, where a vertical vestibular access incision was made after administration of local anesthesia^f through the periosteum to elevate a subperiosteal tunnel, exposing the facial osseous plate.¹⁴ The tunnel was

^a Vanderbilt University, Nashville, Tennessee, USA (Version 3.1.2)

^b Research Randomizer computer software (Version 4.0). Retrieved on August 16, 2015, from <http://www.randomizer.org/>

^c University of North Carolina-15 (UNC-15) probes, Kohler – Germany

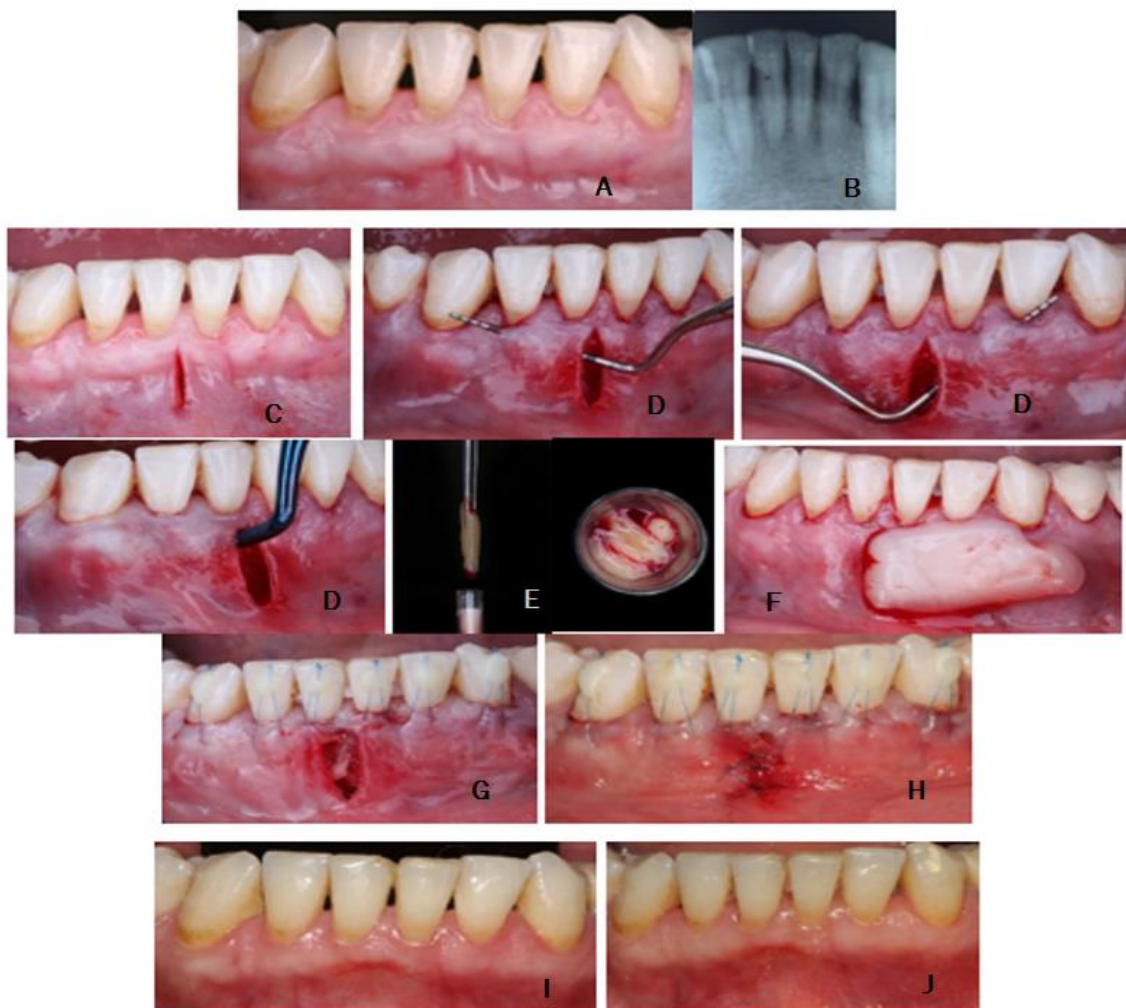
^d Woodpecker ultrasonic scaler

^e Gracey, Nordent® Manufacturing Inc – USA
^f Artinisba 40 mg/0.01 mg/ml. Articaine (D.C.I) 40.00 mg hydrochloride, epinephrine (D.C.I) (tartrate) 0.01 mg. Insibia Dental S.L.U.

extended at least one or two teeth beyond the teeth indicated for root coverage to mobilize gingival margins and facilitate coronal positioning. The subperiosteal tunnel was created through the vestibular access incision using a VISTA tunneling kit[§] inserted between the periosteum and bone to elevate the periosteum. The tunnel elevation was extended sufficiently beyond the mucogingival junction and through the sulci of the teeth being augmented to allow for low-tension coronal positioning of the gingiva. Extension was carried out interproximally as far as the embrasure space permitted.

For the test group, PRF was prepared by collecting intravenous blood in 10 ml glass-coated plastic tubes without anticoagulants, as recommended by the manufacturer, and immediately centrifuged at 3,000 rpm for 10-12 minutes. A fibrin clot was obtained containing the PRF in the middle of the tube, between the RBC layer at the bottom and acellular plasma at the top. The PRF was transferred with sterile tweezers from the tube to a sterile gauze, where the attached RBCs were scraped off and discharged, and the PRF was slightly squeezed between two glass slabs to obtain the PRF membrane. Finally, the membrane was placed at the CEJ to cover the recession defect (Figure 1).^{20,21}

Figure 1.



PRF Group: A. Preoperatively after complete scaling and root planing; B. Periapical radiograph showing bone level; C. Vestibular access incision; D. Subperiosteal tunnel elevation from the vestibular incision and through gingiva sulci; E. PRF obtained after centrifugation; F. PRF membrane insertion into the tunnel; G. Tunnel coronally repositioned on the midfacial aspect of each tooth with sutures secured with composite; H. Approximating and suturing the vestibular incision; I. Three months follow-up; J. Six months follow-up

For the control group, the CTG (de-epithelialized free graft) was harvested from

the palate using Zucchelli's technique. A free graft of appropriate size was obtained

[§]Vista tunneling kit, Wise Linkers LLC

through two horizontal incisions at the midpalatal area; the coronal one was 2 mm away from the gingival margin and two vertical incisions were traced to border the grafted area. A uniform thickness of 2.5 mm was maintained while proceeding apically with the blade. The periosteum was preserved to protect the underlying bone and any fatty tissue was removed after graft separation. Afterwards, the graft was de-epithelialized with a 15c blade and positioned on sterile gauze dampened with saline solution.²² The palatal wound was covered with a gelatin sponge with crisscross sutures.

The freshly prepared PRF or CTG was trimmed to fit the dimensions of the recipient site and the width was adjusted to extend 3-5 mm beyond the bony dehiscence overlying the root surfaces. Once proper coronal advancement of the gingival margin was achieved, the PRF/CTG was secured in the tunnel through the vestibular incision, and well adapted below the gingival margin of each tooth to cover the root dehiscence. If during coronal repositioning excessive tension was detected, the subperiosteal tunnel was further elevated in all directions to facilitate mobilization of the marginal gingiva. The graft and mucogingival complex were then advanced coronally and stabilized in the new position using a coronally anchored suturing technique.

Horizontal mattress sutures, using 6.0 sutures,^h were placed 2-3 mm apical to the gingival margin of each tooth within the band of keratinized gingiva. The sutures were then tied with the knot positioned at the midcoronal point of each tooth. The facial enamel surface of each tooth was etched for less than 5 seconds with acid etch,ⁱ thoroughly washed, and dried. After applying the bonding agent,^j sutures were secured to the facial aspect with a small amount of flowable composite^k over the knot

to avoid apical relapse of the gingival margin during the initial stages of healing. The vestibular access incision was then approximated and sutured with interrupted sutures (Figure 2).

Postoperative oral analgesic (Brufen® 400 mg b.d.s.)^l was prescribed for the first three days, then whenever needed. Patients were instructed to rinse with 0.12% chlorhexidine gluconate antiseptic^m oral rinse b.d.s. for two weeks. They were also instructed to avoid brushing or flossing at the surgical site for three weeks in order to avoid excessive muscle pull or trauma, while resuming normal brushing and flossing in uninvolved areas. Only soft foods and beverages were allowed during the first postoperative week. Sutures in the vestibular area were removed after one week, while bonded sutures were removed three weeks postoperatively. The same periodontal parameters were recorded at the selected sites using the UNC-15 probe at three and six months postoperatively. These measurements included PD, CAL, RD, RW, keratinized gingival width, gingival thickness, and RES.

Statistical analysis was performed using repeated measures analysis of variance (ANOVA) for intergroup and intragroup comparisons via statistical software.ⁿ The Bonferroni post hoc test was used for pair-wise comparisons when ANOVA was significant. For non-parametric data, the Mann-Whitney U test was used to compare between groups. The Friedman test and the Wilcoxon signed-rank test were used to study the changes within each group. Dunn's test was used for pair-wise comparisons when the Friedman test was significant. Qualitative data were presented as frequencies and percentages. The Chi-square test and Fisher's exact test were used to compare between the two groups. The significance level was set at $p \leq 0.05$.

^hEGYPROLENE 6/0, synthetic polypropylene monofilament dyed (blue) suture

ⁱAny-Etch, 37% phosphoric acid semi-gel, MDCLUS, Korea

^jTe-Econom Bond – Ivoclar Vivadent, Principality of Liechtenstein

^kPrime-Dent Flowable Light Cure Dental Composite – USA

^lIbuprofen 400 mg, Kahira Pharm. & Chem. Ind. Co. Egypt, under license from: Abbott Laboratories

^mHexitol®, Chlorhexidine HCl 0.125%. The Arab Drug Company (ADCO)

ⁿ IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp

Figure 2.

CTG Group: A. Preoperatively after complete scaling and root planing; B. Periapical radiograph showing bone level; C. Vestibular access incision; D. Subperiosteal tunnel elevation from the vestibular incision and through gingiva sulci; E. Free gingival graft; F. Graft after de-epithelialization; G. CTG insertion into the tunnel; H. Tunnel and CTG coronally repositioned on the midfacial aspect of each tooth using mattress sutures secured with composite; I. Approximating and suturing the vestibular incision; J. Three months follow-up; K. Six months follow-up

Results

The present study enrolled a total of 28 patients (18 females and 10 males) suffering from multiple Miller Class III/RT2 GR. Patients were randomly allocated into two equal groups – a test group (VISTA+PRF) and a control group (VISTA+CTG). Four patients were lost to follow-up – two in the test group and two in the control group. The remaining 24 patients were followed up for six months. The total number of recessions was 92 – 42 in the test group and 50 in the control group.

At baseline, there was no statistically significant difference in median RD values between the two groups. After three months, the PRF group showed a statistically significantly higher median RD than the

CTG group (1.33 (0.75-2) and 0.5 (0.25-1.75), respectively) with a p-value of 0.036. After six months, there was no statistically significant difference between median RD values in the two groups. Within each group, there was a statistically significant change in median RD values by time, and a significant reduction in RD after three months, followed by a statistically nonsignificant change from three to six months (Table 1).

Regarding the RW, there was no statistically significant difference between median values in the two groups at baseline. After three as well as six months, the PRF group showed a statistically significantly higher median RW (2.33 [1.33-3]) than the CTG group (1 [0.38-3.75]), with a p-value of 0.001 and 0.002, respectively. Within each group, there was a statistically significant

change in median RW values by time. There was a statistically significant reduction after three and six months compared to baseline

with a statistically nonsignificant change from three to six months (Table 2).

Table 1. Descriptive statistics and results of Mann-Whitney U test for comparison between RD (mm) in the two groups and the Friedman test for changes within each group

Time	PRF (n = 12)		CTG (n = 12)		P-Value	Effect Size (d)
	Median (Range)	Mean (SD)	Median (Range)	Mean (SD)		
Baseline	2.59 (2-3.67) ^A	2.71 (0.54)	2.25 (1.5-3.25) ^A	2.23 (0.51)	0.064	0.937
3 Months	1.33 (0.75-2) ^B	1.38 (0.4)	0.5 (0.25-1.75) ^B	0.84 (0.56)	0.036*	0.973
6 Months	1.33 (0.75-2) ^B	1.33 (0.35)	0.5 (0.25-1.75) ^B	0.84 (0.56)	0.062	0.814
P-Value	<0.001*		<0.001*			
Effect Size (w)	0.956		0.917			

*Significant at $p \leq 0.05$; SD: standard deviation; different superscripts in the same column indicate a statistically significant change over time.

Table 2. Descriptive statistics and results of Mann-Whitney U test for comparison between RW (mm) in the two groups and the Friedman test for changes within each group

Time	PRF (n = 12)		CTG (n = 12)		P-Value	Effect Size (d)
	Median (Range)	Mean (SD)	Median (Range)	Mean (SD)		
Baseline	3 (2-4) ^A	2.93 (0.63)	2.49 (2-3.75) ^A	2.57 (0.57)	0.116	0.671
3 Months	2.33 (1.5-3) ^B	2.35 (0.41)	1 (0.38-3.75) ^B	1.28 (0.92)	0.001*	1.785
6 Months	2.33 (1.33-3) ^B	2.21 (0.46)	1 (0.38-3.75) ^B	1.28 (0.92)	0.002*	1.625
P-Value	0.003*		<0.001*			
Effect Size (w)	0.486		0.917			

*Significant at $p \leq 0.05$; SD: standard deviation; different superscripts in the same column indicate a statistically significant change over time.

Concerning gingival thickness, there was no statistically significant difference in mean values between groups at baseline. After three and six months, the PRF group showed a statistically significantly lower mean gingival thickness (1.85 ± 0.2 and 1.87 ± 0.18 , respectively) than the CTG group (2.62 ± 0.36 and 2.63 ± 0.36 , respectively). Within each group, there was a statistically significant increase in gingival thickness after three and six months compared to baseline with a statistically nonsignificant change from three to six months (Table 3).

At baseline and after six months, there was no statistically significant difference between mean keratinized tissue widths between groups. After three months, the PRF group showed a statistically significantly lower mean value than the CTG group (3.33 ± 0.56 and 3.98 ± 0.72 , respectively). Within groups, there was a statistically significant change in mean keratinized tissue width by time. In the PRF group, there was no significant change in

keratinized tissue width after three months, while a significant increase from baseline to six months and from three to six months was noted. In the CTG group, there was a significant increase in keratinized tissue width after three and six months compared to baseline, with a nonsignificant change from three to six months (Table 4).

After three and six months, the PRF group showed a statistically significantly lower median RES than the CTG group (7 [6.5-8.5] and 8 [6.2-9.25], respectively). Within each group, there was no statistically significant change in mean RES after six months (Table 5). There was no statistically significant difference in mean PD, neither intergroup nor intragroup (P value of 0.8) (Table 6). At baseline, and after three and six months, there was no statistically significant difference in mean CAL between both groups. Within each group, there was a significant reduction in CAL after three and six months compared to baseline, with a

statistically nonsignificant change from three to six months (Table 7).

Table 3. Descriptive statistics and results of repeated measures ANOVA for comparison between gingival thickness (mm) in the two groups and the changes within each group

Time	PRF (n = 12)		CTG (n = 12)		95% CI for the Mean Difference		P-Value	Effect size (Partial Eta Squared)
	Mean	SD	Mean	SD	Lower Limit	Upper Limit		
Baseline	1 ^B	0	1 ^B	0.18	-0.111	0.111	1	0
3 Months	1.85 ^A	0.2	2.62 ^A	0.36	-1.018	-0.523	<0.001*	0.655
6 Months	1.87 ^A	0.18	2.63 ^A	0.36	-1.003	-0.526	<0.001*	0.667
P-Value	<0.001*		<0.001*					
Effect Size (Partial Eta Squared)	0.851		0.952					

*Significant at $p \leq 0.05$; SD: standard deviation; different superscripts in the same column indicate a statistically significant change over time.

Table 4. Descriptive statistics and results of repeated measures ANOVA for comparison between keratinized tissue width (mm) in the two groups and the changes within each group

Time	PRF (n = 12)		CTG (n = 12)		95% CI for the Mean Difference		P-Value	Effect Size (Partial Eta Squared)
	Mean	SD	Mean	SD	Lower Limit	Upper Limit		
Baseline	3.46 ^B	1.22	2.89 ^B	0.69	-0.268	1.413	0.172	0.083
3 Months	3.33 ^B	0.56	3.98 ^A	0.72	-1.19	-0.099	0.023*	0.214
6 Months	3.87 ^A	0.57	4.02 ^A	0.82	-0.749	0.449	0.609	0.012
P-Value	0.002*		0.006*					
Effect Size (Partial Eta Squared)	0.444		0.389					

*Significant at $p \leq 0.05$; SD: standard deviation; different superscripts in the same column indicate a statistically significant change over time.

Table 5. Descriptive statistics and results of Mann-Whitney U test for comparison between RES in the two groups and Wilcoxon signed-rank test for the changes within each group

Time	PRF (n = 12)		CTG (n = 12)		P-Value	Effect Size (d)
	Median (Range)	Mean (SD)	Median (Range)	Mean (SD)		
3 Months	7 (6.5-8.5)	7.1 (0.54)	8 (6.2-9.25)	7.92 (0.88)	0.014*	1.104
6 Months	7 (6.5-8.5)	7.1 (0.54)	8 (6.2-9.25)	7.92 (0.88)	0.014*	1.104
P-Value	1		1			
Effect Size (d)	0		0			

*Significant at $p \leq 0.05$; SD: standard deviation

Discussion

In 2013 Nunn and Miyamoto conducted a systematic review to assess the efficacy of a coronally advanced flap (CAF) alone and with different materials. They concluded that CAF+CTG was the most effective and reliable method in terms of root coverage (RC) and CAL gain, and it was therefore considered the gold standard for the management of GR.²³ However, multiple recession defects present challenges; larger

avascular areas impose a difficulty in restoring blood supply to grafted tissue, which is crucial for healing, and a large amount of donor tissue is needed. The challenging non-carious cervical lesions that need restoration may also hinder tissue reattachment. Miller Class III/RT2 multiple recessions are even more challenging due to interproximal bone and soft tissue loss which results in a larger avascular surface and a reduced interproximal periosteal bed.

Therefore, a technique that is minimally invasive, that does not compromise blood supply, and that improves all clinical

parameters is what is sought by clinicians today.²⁴

Table 6. Descriptive statistics and results of repeated measures ANOVA for comparison between PD (mm) in the two groups and the changes within each group

Time	PRF (n = 12)		CTG (n = 12)		95% CI for the Mean Difference		P-Value	Effect Size (Partial Eta Squared)
	Mean	SD	Mean	SD	Lower Limit	Upper Limit		
Baseline	1.64	0.25	1.86	0.31	-0.456	0.017	0.068	0.144
3 Months	1.7	0.29	1.79	0.34	-0.355	0.18	0.505	0.02
6 Months	1.69	0.17	1.79	0.5	-0.42	0.21	0.497	0.021
P-Value	0.874		0.833					
Effect Size (Partial Eta Squared)	0.013		0.017					

*Significant at $p \leq 0.05$; SD: standard deviation

Table 7. Descriptive statistics and results of repeated measures ANOVA test for comparison between CAL (mm) in the two groups and the changes within each group

Time	PRF (n = 12)		CTG (n = 12)		95% CI for the Mean Difference		P-Value	Effect Size (Partial Eta Squared)
	Mean	SD	Mean	SD	Lower Limit	Upper Limit		
Baseline	4.17 ^A	0.52	4.12 ^A	0.82	-0.531	0.632	0.859	0.001
3 Months	3.1 ^B	0.5	2.69 ^B	0.73	-0.12	0.937	0.123	0.105
6 Months	2.99 ^B	0.38	2.67 ^B	0.76	-0.191	0.821	0.211	0.07
P-Value	<0.001*		<0.001*					
Effect Size (Partial Eta Squared)	0.7		0.79					

*Significant at $p \leq 0.05$; SD: standard deviation; different superscripts in the same column indicate a statistically significant change over time.

The original pouch and tunnel technique offered advantages such as optimal healing, adequate blood supply, and good esthetics. However, there was insufficient graft coverage and a limited ability to advance the flap coronally for an RD >5 mm. The VISTA technique introduced by Zadeh, fulfilled most of the requirements, where incisions are made far from the gingival margin, thus reducing the risk of marginal tissue loss. The coronalization of the flap is enhanced due to the subperiosteal tissue detachment which prevents stretching of the gingival margin while the graft is being placed beneath the flap.¹⁴ In 2016, Dandu and Murthy conducted a split mouth study comparing VISTA with a collagen membrane versus CAF with a periosteal pedicle graft in patients with multiple Miller Class I and II GR, and showed that the VISTA technique was less invasive, less time consuming, and

required less clinical manipulation. The esthetic outcome was also superior to CAF.²⁵

Connective tissue grafts are considered the gold standard for RC procedures. They have great predictability for management of soft tissue recession, and augment both the zone of keratinized gingiva and gingival thickness owing to the double blood supply mechanism from the underlying periosteum and the overlying flap.^{15,26} However, the need for multiple surgeries to obtain adequate graft material and a shallow palate with decreased connective tissue limits its application.²⁷ Therefore, PRF emerged as an alternative, which contains cytokines, platelets, and stem cells, and gives a predictable and reproducible result in restoring the amount of keratinized tissue, root coverage, and esthetic outcome. Moreover, it is easy to prepare and acceptable to patients.²⁴ Several systematic reviews compared the use of CTG versus PRF in the treatment of Miller Class I

and II GR using classic RC techniques.^{28,29,30} However, scarce data exist regarding their use combined with VISTA in treating Miller Class III/RT2. Therefore, our study employed the use of the VISTA technique using CTG and PRF for RC in Class III/RT2 multiple GR.

The present study demonstrated that CTG+VISTA was significantly more effective than PRF+VISTA in treating Miller Class III/RT2 multiple recessions. Within each group there was a significant improvement from baseline to six months. Our results are in accordance with Subbareddy et al. who compared PRF and CTG using the VISTA technique in treating multiple Miller Class I and II GR, and similarly reported that both PRF and CTG, resulted in RC to a variable extent.²⁴ However, VISTA with subepithelial CTG was distinctly superior to VISTA with PRF in all the parameters. In contrast, Hegde et al. who similarly used PRF+VISTA versus CTG+VISTA in treating multiple Miller Class I and II GR showed a nonsignificant difference between groups in all parameters after six months.³¹

This study demonstrated a significant decrease in RD from baseline to six months within the PRF and CTG groups, which is in accordance with Hegde et al. However, our intergroup comparison was in favor of the CTG group, which showed a greater reduction in RD, contrary to Hegde et al. who reported nonsignificant differences between both groups.³¹ Regarding the RW, our study illustrated a significant decrease within each group by time. However, the VISTA+CTG group showed better results compared to the VISTA+PRF group. Our results are in accordance with Subbareddy et al. and Joshi et al. who compared CTG and PRF using CAF in Miller Class I GR, and observed a significant decrease in RW from baseline to two and six months in both groups.^{24,27}

The current study showed a significant increase in gingival thickness from baseline to three months within each group. However, when comparing both groups, the gingival thickness increased significantly in favor of the CTG group. Our results are in accordance with Subbareddy et

al., Joshi et al., and Kumar et al. who reported a significant increase in gingival thickness in the CTG group, thereby improving the gingival biotype.^{24,27,32} Gingival thickness is crucial for maintaining a stable clinical outcome when treating GR.³¹ Therefore, PRF can be suggested in treating patients with inadequate soft tissue thickness at the graft donor site and in patients unwilling to undergo the graft harvesting procedure.²⁷

Our study also showed a significant increase in keratinized tissue width within each group at six months compared to baseline. However, the intergroup comparison showed a nonsignificant difference at the end of six months. Our results reflected that the CTG group reached the peak increase by the end of three months, then remained relatively stable, while the PRF group needed six months to reach comparable results to the CTG group. Our results are in accordance with Hegde et al. and contradictory to Subbareddy et al. who reported a significantly increased width of keratinized gingiva in favor of the CTG group.^{24,31} A systematic review conducted by Miron et al. recommended the use of PRF in conjunction with CAF as an effective treatment modality for GR only for those with adequate baseline keratinized mucosa width.²⁹ Our results can be explained by the ability of the palatal connective tissue to induce keratinization of the epithelium in the CTG group, while in the PRF group, it can be attributed to gingival or periodontal fibroblast proliferation influenced by growth factors released by the platelets in the fibrin mesh. However, such an explanation must be further explored through histological studies.²⁷

The RES of the CTG group significantly exceeded that of the PRF group. Our results are in accordance with Subbareddy et al. who reported that out of 33 recessions in the VISTA+PRF group, 10 recessions (30.3%) obtained complete RC, and the remaining 23 (69.67%) obtained partial coverage. Meanwhile, in the VISTA+CTG group, out of 25 recessions, 15 recessions (60%) were completely covered and 10 (40%) were partially covered.²⁴ Joshi et al. also reported better RC in the CTG

group compared to the PRF group, although using PRF offered the benefit of avoiding a second surgical site.²⁷ Moreover, Chambrone and Tatakis conducted a systematic review evaluating different periodontal soft tissue RC procedures, and concluded that CTG procedures provide the best outcomes for clinical practice due to their greater percentages of RC.³³ However, Hegde et al. reported a nonsignificant difference in the percentage of RC between VISTA+CTG and VISTA+PRF.³¹ The contradicting results of Hegde et al. shed light on the fact that the success of RC depends on several factors such as anatomical features, periodontal status, flap design, tissue biotype, flap tension, and operator skill.

The present study showed a nonsignificant difference in PD between the PRF and CTG groups. Furthermore, no statistically significant difference was observed in PD at the end of six months in the CTG group and PRF group when compared with baseline scores. Our study also showed no difference between groups in CAL. Whereas, within each group there was a statistically significant reduction in CAL from baseline to three months. Our results are in accordance with those of the systematic review conducted by Rodas et al. which revealed that CAL and PD in the PRF group were statistically equal to those of the CTG group ($P=0.05$).³⁰ In contrast, Subbareddey et al. and Joshi et al. reported significantly better results in the CTG group at six months.^{24,27}

Our study showed that both CTG and PRF produced significant stable results after a period of six months. However, VISTA+CTG gave overall superior results when compared to VISTA+PRF. It can hence be concluded that CTG still counts as the gold standard for periodontal plastic surgeries despite the morbidity of the second surgical site and the need for a skilled operator. It is also imperative to state that the VISTA technique is highly predictable and efficient in treating Miller Class III/RT2 multiple GR.

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