

Comparative Clinical Outcomes of Modified Vestibular Incision Subperiosteal Tunnel Access and Zucchelli's Technique in the Management of Miller's Class I/II Gingival Recession: A Randomized Clinical Trial

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Abstract

Introduction: Gingival recession in the esthetic zone poses both functional and esthetic challenges, often necessitating surgical intervention to restore soft-tissue harmony and patient comfort. Among the various root coverage techniques, the Modified Vestibular Incision Subperiosteal Tunnel Access (M-VISTA) and Zucchelli's coronally advanced flap technique have gained clinical acceptance for the treatment of Miller's class I and class II recession defects. This clinical study aims to evaluate and compare the clinical efficacy and patient-centered outcomes of these two techniques over a 6-month follow-up period. **Materials and Methods:** A total of 20 systemically healthy subjects with Miller's class I/II gingival recession defects were enrolled and randomly allocated into two groups (10 in each group): Group A was treated using the M-VISTA technique, and Group B with Zucchelli's coronally advanced flap technique. Clinical parameters, including recession depth (RD), recession width, gingival thickness, keratinized tissue width (KTW), and relative attachment level (RAL), were recorded at baseline, 1 month, 3 months, and 6 months. Patient-centered outcomes, such as esthetic satisfaction (patient esthetic score) and post-operative comfort (verbal rating score), were also evaluated at respective intervals. **Results:** Both techniques resulted in significant improvement in all clinical parameters from baseline to 6 months. Zucchelli's technique showed slightly better outcomes in terms of RD reduction, RAL gain, and KTW increase. The esthetic score was higher in Zucchelli's group throughout all follow-up intervals. Although both groups reported satisfactory healing and comfort, the verbal rating scale showed marginally better comfort in the M-VISTA group during the early healing phase. **Conclusion:** Both M-VISTA and Zucchelli's techniques are effective for the management of Miller's class I/II gingival recession. However, Zucchelli's technique demonstrated slightly superior clinical and esthetic outcomes, whereas M-VISTA offered better post-operative comfort during the initial healing phase. These findings support the use of both techniques depending on clinical priorities and patient preferences.

Keywords: Modified Vestibular incision, Zucchelli technique, gingival recession

INTRODUCTION

Gingival recession is the exposure of the tooth/tooth root via the apical migration of the gingiva to or beyond the cemento-enamel junction.^[1] Gingival recession affects both the esthetic and functional aspects of oral health.^[2] When such a problem affects the anterior teeth, it develops anxiety about tooth loss due to the progression of the destruction. It may also be associated with dentinal hypersensitivity, root caries, abrasion and/or cervical wear, erosion due to exposure of the root surface to the oral environment, and an increase in accumulation of dental plaque.^[3]

The coronally advanced flap, modified by Zucchelli and De Sanctis^[4], is a well-established technique that provides predictable results for single and multiple gum recession

defects. A more recent, minimally invasive approach is the Modified Vestibular Incision Subperiosteal Tunnel Access (M-VISTA). Introduced by Lee *et al.*^[5] in 2015 as a modification of the VISTA technique, M-VISTA has gained attention for its supra-periosteal tunneling and vestibular

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access, which is designed to reduce trauma and improve esthetic integration.

The presumed advantage of Zucchelli's technique is the lack of vertical releasing incision, which could damage the lateral blood supply to the flap and might result in unesthetic white scars. The split-full-split thickness flap approach does not compromise the vascular supply, resulting in more predictable healing.^[4]

M-VISTA includes the location of incision, i.e., instead of a subperiosteal incision, a suprapariosteal incision is given. This method is specifically precise because it allows more access in the vestibule by giving a single vestibular incision, providing access to an entire region. It also improves wound healing by simplifying the tunneling process.^[6]

Titanium-platelet-rich fibrin (T-PRF) was created in 2013 by Tunali *et al.*^[7] using biocompatible titanium tubes. T-PRF was developed to overcome the limitations of leukocyte-platelet rich fibrin (L-PRF). T-PRF has a more compact and thicker fibrin network than L-PRF. Such a compact fibrin structure plays an important role in prolonging intra-tissue fibrin resorption and releasing growth factors in a drop-by-drop manner over a longer period.

This randomized clinical trial compares the clinical effectiveness and patient-reported outcomes of M-VISTA and Zucchelli's technique reinforced with T-PRF, over 6 months in the management of Miller's class I and II gingival recession defects.

MATERIALS AND METHODS

This was a prospective, randomized clinical trial with a sample size of 20 subjects selected from the outpatient department of periodontics, Pacific Dental College and Hospital, Debari, Udaipur. Ethical clearance was obtained from the Ethical Committee of Sai Tirupati University, Udaipur.

Inclusion criteria

1. Systemically healthy subjects with the age group of 20–45 years
2. Patient with isolated or multiple gingival recessions
3. Subjects with plaque and a gingival index ≤ 1 .

Exclusion criteria

1. Pregnant and lactating women
2. Poor oral hygiene compliance
3. Smokers and tobacco abuse
4. Malocclusion or the presence of crowding of teeth.
5. Patients undergoing any orthodontic treatment.

Subjects were randomly allocated using the coin toss method.

GROUP A: 10 subjects with M-VISTA technique reinforced with T-PRF

GROUP B: 10 subjects with Zucchelli's technique reinforced with T-PRF

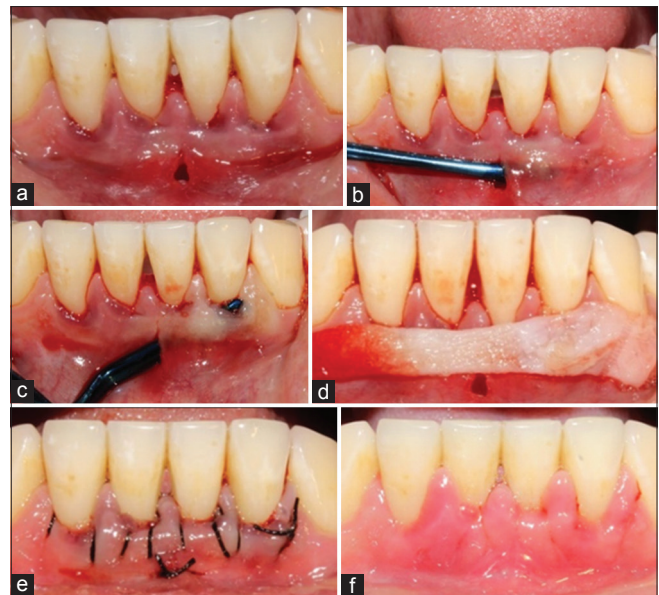


Figure 1: (a) Suprapariosteal incision (b) preparation of tunnel (c) prepared tunnel using vestibular incision subperiosteal tunnel access instruments (d) Titanium-platelet-rich fibrin (T-PRF) membrane placement (e) subpapillary continuous sling sutures placed (f) 14th day after suture removal



Figure 2: (a) Placement of oblique submarginal incision (b) flap elevation in split full split manner (c) de-epithelialization of anatomical papilla (d) Titanium-platelet-rich fibrin (T-PRF) membrane placement (e) Placement of sling sutures (f) 14th day after suture removal

Clinical parameters recorded were recession depth (RD), recession width (RW), gingival thickness, keratinized tissue width (KTW), relative attachment level (RAL), gingival index, patient esthetic score at baseline, 1 month, 3 and 6 month and patient comfort score (verbal rating scale) at baseline, 24th h, 3rd, 7th, and 14th day after surgery.

Surgical technique

All surgical procedures were performed under aseptic conditions after achieving adequate anesthesia using 2% lignocaine hydrochloride with adrenaline (1:80,000).

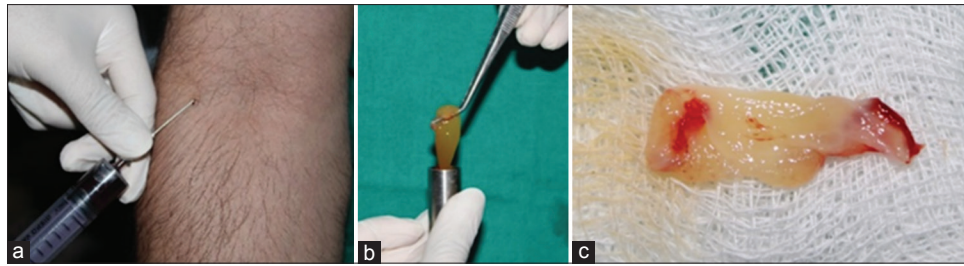


Figure 3: (a) Withdrawal of 10 mL of blood, (b) prepared T-PRF clot, (c) prepared T-PRF membrane

M-VISTA technique (GROUP A)

STEP 1: A supra-periosteal vertical incision extending to the periosteum slightly beyond the mucogingival junction was made in the most centred section, considering the extension of the teeth to be treated [Figure 1].

STEP 2: All intra-crevicular incisions were performed.

These incisions were extended to at least one of the teeth that were beyond those to be treated and toward the base of the papillae.

STEP 3: A partial-thickness tunnel was prepared with the aid of specific VISTA tunneling instruments.

VISTA 1 instrument was used to create a tunnel adjacent to the incision line, then to extend the tunnel, VISTA 2 and 3 instruments were used, and to create a tunnel in the interdental area, VISTA 4 and 5 instruments were used.

STEP 4: After creating the tunnel, the T-PRF membrane was incorporated into the tunnel from the vertical incision.

STEP 5: The incision line was secured with simple interrupted sutures.

STEP 6: Coronal mobilization of tissue was done with a subpapillary coronally advanced suture technique using 5-0 silk non-absorbable suture material.

ZUCCHELLI'S technique (GROUP B)

STEP 1: A horizontal incision as an intrasulcular incision with an oblique submarginal incision in the interdental papilla was placed at the recession defects using a 15c blade [Figure 2].

This incisional approach delineates the surgical papilla and the anatomic papilla (anatomical papilla: present in the interdental area and surgical papilla: created during the surgical procedure as part of the flap design).

STEP 2: The surgical papilla was then dissected with the blade directed parallel to the root surface, with respect to the anatomical papilla.

STEP 3: A periosteal elevator was used to raise a full-thickness flap apical to the recession defects.

STEP 4: The flap was then undermined apically to or beyond the mucogingival junction with the blade, until a tension-free reposition was achieved.

STEP 5: Anatomical papilla was then de-epithelialized to create a connective tissue bed for the surgical papilla.

STEP 6: The T-PRF membrane was then placed at the prepared site, and then coronal mobilization of the flap was done over the membrane [Figure 3].

STEP 7: The coronally advanced flap was then secured with 5-0 silk non-absorbable sutures using the sling suture technique.

At the 2-week post-operative visit, sutures were removed, and oral hygiene and plaque control were reviewed and reinforced.

T-PRF membrane preparation

10 mL of blood was drawn from the antecubital vein and immediately transferred to titanium tubes, then centrifuged at 2700 rpm for 12 min. The resulting T-PRF clot was retrieved, with red cell remnants discarded. The clot was compressed between sterile gauze to form a membrane, ensuring buffy coat placement on mesial and distal aspects. The prepared T-PRF membrane was then placed on the surgical site.

Post-operative instructions

Subjects were instructed not to brush the surgical sites for the first 2 weeks. Instead, during that time, patients were advised to rinse with 0.2% chlorhexidine gluconate. Subjects were advised to take 500 mg of amoxicillin twice daily for 5 days and tablet ketorolac tromethamine 10 mg twice daily for 3 days, and then once a day if pain persists.

RESULTS

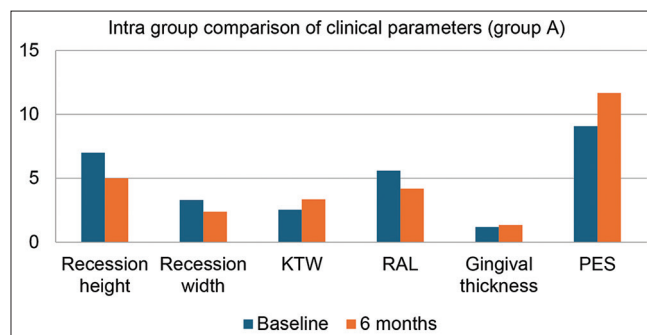
This randomized clinical trial included 20 patients with Miller's class I/II gingival recession. They were equally divided into two groups. Both groups received autologous titanium-prepared platelet-rich fibrin (T-PRF) as a biologic adjunct to enhance healing and regenerative potential. Clinical parameters were evaluated at baseline and subsequently at 1, 3, and 6 months postoperatively to assess the short-term and intermediate-term outcomes of the two surgical techniques.

At 6-month follow-up, both techniques demonstrated significant clinical improvement. The mean root coverage (MRC) was 55.4% in group A and 59.1% in group B (Graph 5). Although group B showed a numerically higher percentage of root coverage, the difference between the two groups was statistically non-significant ($P = 0.284$). RD and width were significantly reduced in both groups, with group B showing

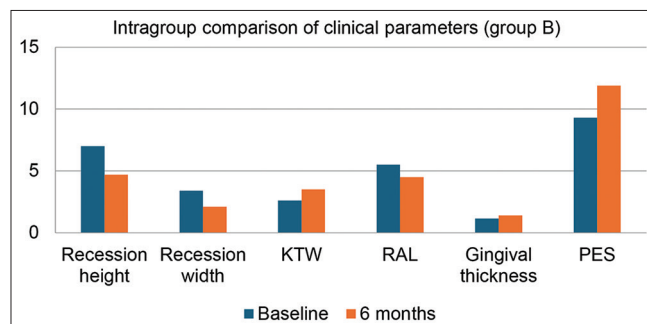
greater reduction in RD ($P \leq 0.001$) and RW ($P \leq 0.05$) (Table 1, Graph 1). Whereas the intergroup showed no significant difference (Table 2, Graph 2).

Keratinized gingival width increased significantly within both groups ($P < 0.05$) (Table 1), but the intergroup difference was not significant (Table 2). RAL was improved in both groups, with group A showing a greater gain (RAL: $P = 0.001$) (Table 1). Intergroup comparison of RAL was not significant (Table 3, Graph 3).

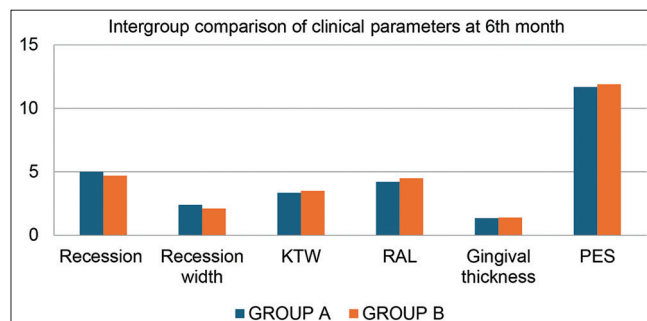
Gingival thickness was found statistically significant in group B (Table 1), with intergroup comparison showing no significant difference. Both groups showed significant improvements in the pink esthetic score (PES) (Table 1), with no significant intergroup difference (Graph 4). Post-operative discomfort assessed using the verbal rating score decreased in both groups by day 14, with group A showing a slightly better result (Graph 5).



Graph 1: Intra group comparison of Group A



Graph 2: Intra group comparison of Group B



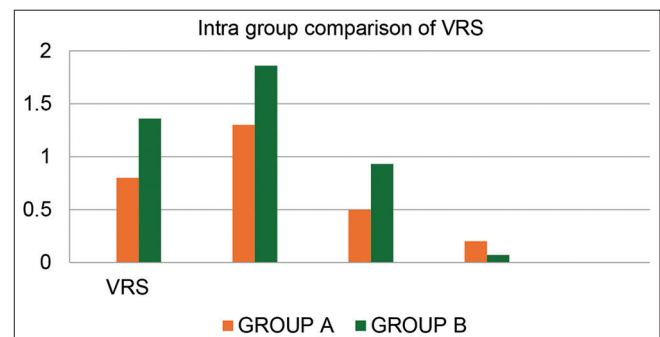
Graph 3: Intergroup comparison of clinical parameters at 6 months

Overall, the results indicate that both techniques were effective in achieving satisfactory root coverage, improved gingival dimensions, and enhanced esthetic outcomes. While both groups benefited equally in most parameters, Zucchelli's technique exhibited slightly superior performance in certain clinical outcomes, particularly in terms of RD reduction and esthetic improvement, suggesting it may offer a marginal clinical advantage in specific situations.

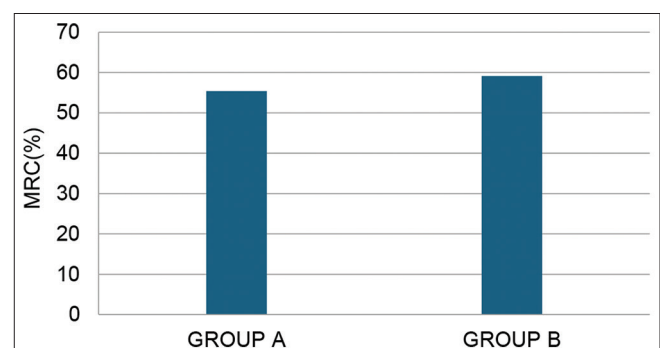
DISCUSSION

Achieving predictable root coverage remains a clinical challenge, with success rates ranging from 56% to 97.8%. While connective tissue grafts are considered the gold standard, their limitations, such as the need for a second surgical site and increased patient morbidity, have encouraged the development of minimally invasive techniques.^[8] M-VISTA and Zucchelli's technique, both evaluated in this study, offer alternatives that emphasize tissue preservation, vascular integrity, and patient comfort.^[5,9] The adjunctive use of T-PRF, a second-generation platelet concentrate with enhanced regenerative potential, further supports wound healing and soft-tissue outcomes.^[10]

Minimally invasive techniques for root coverage have gained prominence in periodontal plastic surgery due to their focus on tissue preservation, enhanced healing, and improved patient comfort. These approaches aim to limit surgical trauma by reducing flap reflection and manipulation, thereby maintaining the integrity of the vascular supply and minimizing post-operative morbidity. The advantages include



Graph 4: Intra group comparison of verbal rating score



Graph 5: Intergroup comparison of mean root coverage percentage

Table 1: Intragroup comparison of all parameters from baseline to 6 months

Parameters	Group	Baseline	1 Month	3 Month	6 Month	Change (Baseline-6month)	P Value
Recession depth	Group A	7.0 ± 2.0	4.89 ± 1.98	5.0 ± 1.87	5.0 ± 1.87	2.0 ± 0.13	≤0.001*
	Group B	7.0 ± 2.11	4.9 ± 2.08	4.7 ± 1.78	4.7 ± 1.78	2.3 ± 0.33	≤0.001*
Recession width	Group A	3.3 ± 0.46	2.2 ± 0.63	2.4 ± 0.52	2.4 ± 0.52	0.9 ± 0.06	≤0.01*
	Group B	3.4 ± 0.66	2.0 ± 1.10	2.1 ± 1.22	2.1 ± 1.22	1.3 ± 0.56	≤0.05*
KTW	Group A	2.55 ± 0.49	3.3 ± 0.94	3.35 ± 0.88	3.35 ± 0.88	0.8 ± 0.39	0.033*
	Group B	2.6 ± 0.84	3.6 ± 0.7	3.5 ± 0.53	3.5 ± 0.53	0.9 ± 0.31	0.019*
RAL	Group A	5.6 ± 1.80	4.3 ± 1.55	4.1 ± 1.45	4.2 ± 1.47	1.4 ± 0.33	0.001*
	Group B	5.5 ± 1.72	5.1 ± 1.20	4.5 ± 1.35	4.5 ± 1.35	1 ± 0.37	0.02*
Gingival thickness	Group A	1.2 ± 0.24	1.4 ± 0.38	1.35 ± 0.36	1.35 ± 0.36	0.15 ± 0.12	0.65
	Group B	1.15 ± 0.24	1.45 ± 0.35	1.4 ± 0.37	1.4 ± 0.37	0.25 ± 0.13	0.05*
PES	Group A	9.08 ± 1.78	11.50 ± 1.45	11.50 ± 1.31	11.67 ± 1.37	2.59 ± 0.41	0.018*
	Group B	9.3 ± 2.31	11.2 ± 1.32	11.8 ± 1.69	11.9 ± 1.73	2.6 ± 0.58	0.012*
	Baseline	24th hour	3rd day	7th day	14th day	Change (baseline-6month)	
VRS Group A	0.8 ± 0.63	1.3 ± 0.48	0.5 ± 0.53	0.2 ± 0.42	0	0.8 ± 0.63	≤0.001*
VRS Group B	1.36 ± 1.01	1.86 ± 0.53	0.93 ± 0.47	0.07 ± 0.27	0	1.36 ± 1.01	≤0.05*

*KWT: Keratinized tissue width, RAL: Relative attachment level, PES: Pink esthetic score, VRS: Verbal rating score

Table 2: Intergroup comparison of clinical parameters

Parameter	Time point	Group A	Group B	Mean difference	P value
Recession depth	Baseline	7.0 ± 2.0	7.0 ± 2.11	0	1
	1month	4.89 ± 1.98	4.9 ± 2.08	0.01	0.98
	3 month	5.0 ± 1.87	4.7 ± 1.78	0.3	0.66
	6 month	5.0 ± 1.87	4.7 ± 1.78	0.3	0.66
Recession width	Baseline	3.3 ± 0.46	3.4 ± 0.66	0.1	0.69
	1month	2.2 ± 0.63	2.0 ± 1.10	0.2	0.62
	3 month	2.4 ± 0.52	2.1 ± 1.22	0.3	0.48
	6 month	2.4 ± 0.52	2.1 ± 1.22	0.3	0.48
KTW	Baseline	2.55 ± 0.49	2.6 ± 0.84	0.05	0.87
	1month	3.3 ± 0.94	3.6 ± 0.7	0.3	0.42
	3 month	3.35 ± 0.88	3.5 ± 0.53	0.15	0.65
	6 month	3.35 ± 0.88	3.5 ± 0.53	0.15	0.65
RAL	Baseline	5.6 ± 1.80	5.5 ± 1.72	0.1	0.36
	1month	4.3 ± 1.55	5.1 ± 1.20	0.8	0.95
	3 month	4.1 ± 1.45	4.5 ± 1.35	0.4	0.72
	6 month	4.2 ± 1.47	4.5 ± 1.35	0.3	0.27
Gingival Thickness	Baseline	1.2 ± 0.24	1.15 ± 0.24	0.05	0.35
	1month	1.4 ± 0.38	1.45 ± 0.35	0.05	0.6
	3 month	1.35 ± 0.36	1.4 ± 0.37	0.05	0.6
	6 month	1.35 ± 0.36	1.4 ± 0.37	0.05	0.64

Table 3: Intergroup comparison of patient comfort scores (pink esthetic score and verbal rating score)

Parameter	Time point	Group A	Group B	Mean difference	P value
PES	Baseline	9.08 ± 1.78	9.3 ± 2.31	0.22	0.51
	1month	11.50 ± 1.45	11.2 ± 1.32	0.2	0.18
	3 months	11.50 ± 1.31	11.8 ± 1.69	0.3	0.51
	6 months	11.67 ± 1.37	11.9 ± 1.73	0.23	0.62
VRS	Baseline	0.8 ± 0.63	1.36 ± 1.01	0.56	0.16
	24 hours	1.3 ± 0.48	1.86 ± 0.53	0.56	0.01*
	3rd day	0.5 ± 0.53	0.93 ± 0.47	0.43	0.29
	7th day	0.2 ± 0.42	0.07 ± 0.27	0.13	0.7
	14th day	0	0	0	1

reduced intraoperative bleeding, less post-operative pain, quicker recovery times, and high patient satisfaction, all while achieving clinically effective root coverage.^[8]

Zucchelli's technique, which is a variation of the coronally advanced flap (CAF) in an envelope fashion, with the flap design considering the future position of the flap and thus delineating anatomic and surgical papilla, accordingly. Furthermore, the split-full-split thickness flap approach does not compromise the vascular supply, resulting in more predictable healing.^[9]

The M-VISTA technique is a modification of the VISTA technique, designed to be less invasive while enhancing vascularity and healing. Unlike traditional tunnel techniques, M-VISTA involves creating small access incisions in the vestibule beyond the mucogingival junction, and a supraperiosteal tunnel is raised, leaving the periosteum on the bone for additional vascularity. These minimal incisions reduce surgical trauma and improve post-operative comfort. The enhanced blood circulation contributes to improved wound healing, graft integration, and overall treatment outcomes.^[5]

Platelet-rich fibrin (PRF) was introduced by Choukroun *et al.*^[11] in 2001, as a second-generation platelet concentrate. PRF is obtained without anticoagulants, allowing for the natural formation of a fibrin matrix rich in platelets, growth factors, and leukocytes. T-PRF was introduced by Tunalı *et al.* in 2013.^[10] They developed this modification using titanium tubes instead of glass tubes for centrifugation, aiming to enhance fibrin polymerization, leading to a denser fibrin matrix, which promotes superior wound healing and tissue regeneration and also improves the biological properties of PRF.

This study included Miller's class I/II defects with a mean baseline RD of 7.0 mm in both groups. At 6 months, both groups showed significant reductions in RD and width, with group B (Zucchelli's technique) demonstrating greater reduction ($P < 0.05$). These results align with Yadav *et al.*^[12] who reported similar findings with CAF and VISTA techniques.

Keratinized gingival width significantly improved in both groups, though group B (ZUCHELLI'S) showed a greater gain in KTW. Gingival thickness increased significantly only in group B ($P = 0.05$), with no significant intergroup difference. These findings are consistent with the study done by Gurushanth.^[13] which demonstrated similar improvements in periodontal parameters following the use of biologically active regenerative material (T-PRF).

In the present study, both group A and B showed statistically significant improvements in RAL from baseline to 6 months on intragroup comparison (TG: $P = 0.001$ /CG: $P < 0.05$). However, when the outcomes were compared between the groups, the intergroup difference was found to be statistically significant ($P = 0.02$). The findings of the present study align with those reported by Jain *et al.*^[14]

Patient-centered outcomes revealed lower post-operative pain in Group A, likely due to its supraperiosteal tunnel design and minimal incision approach, consistent with findings by Rajeswari *et al.*^[9] Esthetic outcomes, assessed via the PES, significantly improved in both groups, with no statistically significant intergroup difference ($P = 0.284$), similar to findings by Fernández-Jiménez *et al.*^[15] who found no significant difference between CAF and VISTA with CTG. The MRC% ratio was observed to be 59.1% in group B and 55.4% in group A over a period of 6 months from baseline, which was found to be statistically non-significant ($P = 0.284$). These findings were in accordance with a study by Fernández-Jiménez *et al.*^[15]

Overall, both M-VISTA and Zucchelli's techniques demonstrated effective and comparable clinical outcomes. While Zucchelli's approach achieved marginally higher root coverage and gingival thickness, M-VISTA offered superior patient comfort with similar esthetic and clinical success.

CONCLUSION

Within the limitations of this randomized clinical trial, both M-VISTA and Zucchelli's technique demonstrated clinically effective and predictable outcomes in the management of Miller's class I/II gingival recession defects. However, M-VISTA showed advantages in terms of improved patient-reported outcomes and minimized surgical trauma. Zucchelli's technique, while equally effective in RD reduction, is likely due to its well-established coronally advanced flap design with tension-free positioning. Therefore, both techniques have their own merits and can be selectively used based on esthetic demands and patient-related factors. Further multicenter, long-

term studies with larger sample sizes are needed to validate these findings and refine treatment protocols.

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