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Original Research Article

Comparative evaluation of coronally advanced flap using amniotic membrane and platelet rich fibrin in the treatment of Cairo's recession Type-I defects: A split mouth study

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Abstract

Background: The Coronally Advanced Flap (CAF) combined with Connective Tissue Graft (CTG) is the standard approach for managing gingival recession defects. However, it may cause increased patient discomfort due to the need for an additional surgical site. This study evaluates the efficacy of Amniotic Membrane (AM) and Platelet-Rich Fibrin (PRF) as alternatives for treating Cairo's Recession Type I defects.
Aim: To compare the clinical outcomes of CAF with AM (CAF+AM) and with PRF (CAF+PRF) in root coverage for Cairo's Recession Type I defects.
Materials and Methods: Ten patients aged 20 to 40 years with bilateral Cairo's Recession Type I defects were enrolled. Sites were randomly assigned to receive either CAF+AM (test group) or CAF+PRF (control group). Clinical parameters including probing depth (PD), clinical attachment level (CAL), recession depth (RD), recession width (RW), gingival biotype (GB), width of keratinized tissue (WKT), and wound healing index (WHI)—were recorded at baseline, and at 1, 3, and 6 months postoperatively. Statistical analysis was performed using t-tests, Wilcoxon signed-rank tests, and Friedman's test depending on data distribution.
Results: Both groups showed statistically significant improvements in CAL, RD, RW, and WKT from baseline to 6 months ($p < 0.05$). However, the AM group demonstrated significantly greater root coverage (95.5% vs 77%; $p < 0.01$) and keratinized tissue gain. No significant differences were found between the groups for PD, GB, or WHI ($p > 0.05$). Healing was uneventful in both groups with good patient compliance and no adverse events.
Conclusion: Both AM and PRF in combination with CAF are effective in treating Cairo's Type I gingival recession defects. However, AM gave superior clinical outcomes in terms of root coverage and keratinized tissue width. These findings suggest AM may serve as a viable alternative to PRF. Further large scale and long term studies are warranted to validate these results and assess the stability of treatment outcomes.

Keywords: Amniotic membrane, Gingival recession, Guided tissue regeneration, Platelet rich fibrin

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1. Introduction

Miller characterizes gingival recession as the apical displacement of the gingival margin, resulting in the exposure of the root surface.[1,2] Addressing this condition is particularly challenging for periodontists due to its sensitivity to technique and the subjective nature of the esthetic results perceived by patients. Gingival recession can stem from various causes, including bone dehiscence or fenestration defects, insufficient keratinized gingiva, and aberrant frenal attachments. Contributing factors might include improper brushing techniques, dental plaque leading to periodontal inflammation, self-inflicted trauma, inappropriate orthodontic treatment, traumatic deep bites, and sub-gingival restorations. The multifaceted nature of these factors makes the treatment of gingival recession complex. Available treatment options include rotational pedicle flaps, advanced pedicle flaps, and both non-submerged and submerged grafts.

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Careful planning is crucial to prevent esthetic dissatisfaction, increased clinical attachment loss, and root hypersensitivity. Cairo and Chambrone did a systematic review and concluded coronally Advanced Flap (CAF) along with Connective Tissue Graft (CTG) as the standard for gingival recession coverage.[3-5] Nevertheless, this method has limitations, comprising the prerequisite for an additional surgical site and amplified patient discomfort.[3-5] Alternatives to CTG, like Amniotic Membrane (AM) and Platelet-Rich Fibrin (PRF), have demonstrated comparable results.[6-8] PRF is particularly notable for its high levels of growth factors, platelets, and cytokines along with its excellent hemostatic properties, has been explored as a CTG viable substitute.[6-8] AM, a biological membrane from the chorion, contains an epithelial lining, a robust basement membrane, and avascular mesenchymal connective tissue, making it a suitable allograft. Literature suggests that AM, due to its fibronectins, proteoglycans, and collagen types, can achieve significant root coverage by closely resembling gingival tissue.[9-12] Nonetheless, there is limited evidence directly comparing AM with CTG, indicating a need for further research. While case reports and case series have highlighted the effectiveness of AM for treating gingival recession, a split-mouth study comparing these methods directly has yet to be conducted.[12-15] The present study aims to evaluate and compare the clinical efficacy of CAF with AM versus CAF with PRF for treating Cairo's Recession Type-I recession defects.[16]

2. Materials and Methods

This double-blinded randomized control trial was conducted in accordance with the Helsinki Declaration, with patient consent obtained and institutional ethics board approval secured. Armamentarium used is shown in **Figure 1**. The study included 10 participants, aged 20 to 40 years, who met the inclusion criteria of being free from non-carious cervical lesions, not having undergone periodontal surgery in the past 12 months, and having no local predisposing factors, smoking history, lactation, or systemic diseases that could affect treatment outcomes.[17]

Baseline measurements were collected (**Figure 2**) after basic oral prophylaxis, including sulcus probing depth (PD), gingival biotype (GB), clinical attachment level (CAL), recession depth (RD), width of recession (RW), and keratinized gingiva width (WKT).[17,18] A split-mouth design was employed, with bilateral Cairo's Type-I recession defects treated using CAF+AM (test group) (**Figure 3**) and CAF+PRF (control group), (**Figure 4**) assigned through computer-assisted randomization. Patients were blinded to procedure being performed on each site.

These parameters were assessed at baseline, 1 month and every three months upto 6 months postoperatively. Additionally, Index of Wound Healing (WHI) was recorded post-surgery, with scores assigned as follows: Score 1 for uneventful healing, Score 2 for slight complications, and Score 3 for poor healing. Measurements were standardized using a UNC-15 periodontal probe, a stent, and a vernier caliper.

The CAF procedure involved horizontal and vertical incisions, followed by root planing and EDTA treatment. PRF was prepared by centrifuging patient blood, while AM was cut to size and applied to the recession site. The gingival flaps were coronally advanced, secured with interrupted sutures, and covered with a periodontal pack. Postoperative care included systemic analgesics, 0.2% chlorhexidine gluconate, and the Charters brushing technique. Statistical analyses were performed using the independent t-test, Wilcoxon signed-rank test, and Friedman's test, depending on data distribution.

3. Results

In this split-mouth randomized control trial, 10 subjects with 20 bilateral cairo's type I recession defects sites were treated with either AM combined with CAF or PRF combined with CAF. Single calibrated examiner recorded the records of all participants included in the study. Various clinical parameters recorded by the calibrated examiner were PD, RD, WKT, GB, CAL, RW and WHI. All these parameters were re-examined at 1, 3, and 6 months (**Figure 5**). **Table 1** describes the gender distribution in the study and **Table 2** depict the site involved. There were eight males (80%) and two females (20%) among the ten patients involved. **Table 3** explains the parameters recorded. As indicated in **Table 3**, there were no statistically significant changes in probing depth (PD), gingival biotype (GB), and wound healing index (WHI) from baseline to 6 months. Though, significant alterations were detected in clinical attachment level (CAL) (p=0.045, 0.034, 0.014 for 1, 3, and 6 months, respectively), recession depth (RD) (p=0.031, 0.016, 0.001), recession width (RW) (p=0.035, 0.001, 0.007), and width of keratinized tissue (WKT) (p=0.042, 0.001) at the 3 and 6-month marks. **Table 4** describes an analysis of the mean root coverage percentages amongst the control and test groups during the follow-up period. Significant differences were observed supporting the test group (p=0.001, 0.003, and 0.001) at 1, 3, and 6 months, respectively.

Figure 1: A: Armamentarium used; **B:** Customized acrylic stent

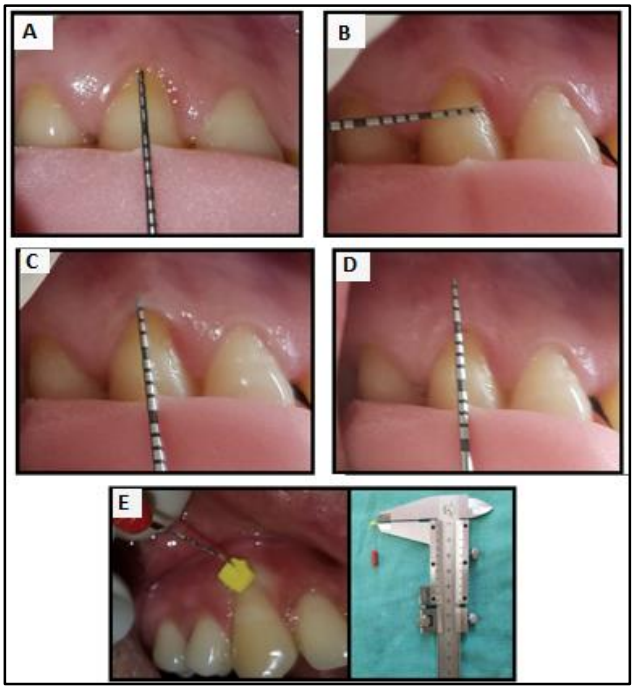

Figure 2: Clinical measurements recorded before surgical procedure; **A:** Recession height (RH); **B:** Recession width (RW); **C:** Probing depth (PD); **D:** Width of keratinized tissue (WKT); **E:** Gingival biotype (GB)

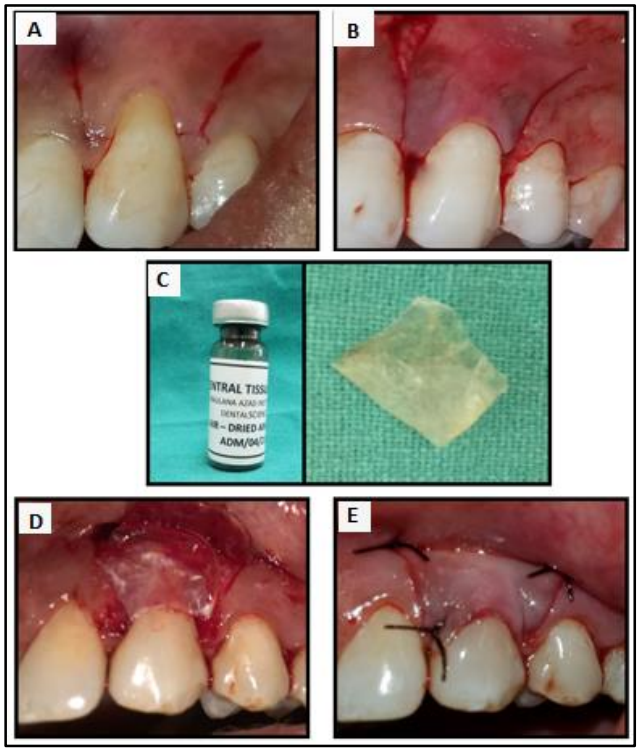

Figure 3: Coronally advanced flap with amniotic membrane (test site); **A:** Incision design; **B:** Flap elevation and coronal advancement; **C:** Air dried amniotic membrane; **D:** Placement of membrane; **E:** Suturing

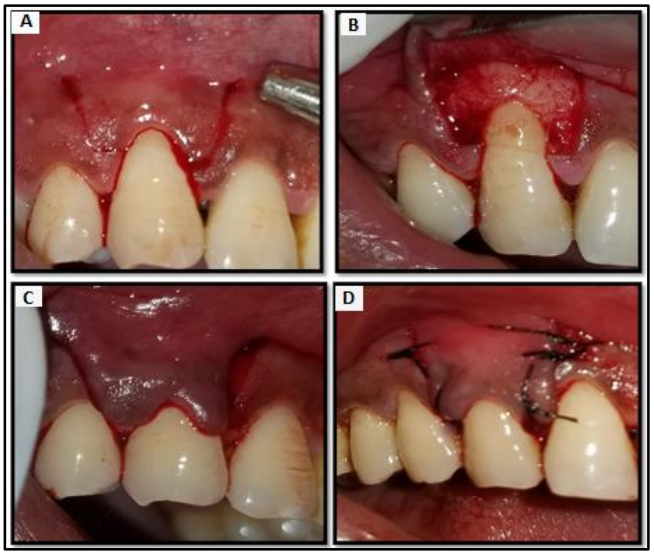

Figure 4: Coronally advanced flap with amniotic membrane (Control site); **A:** Incision design; **B:** Flap elevation and coronal advancement; **C:** Coronal advancement of flap with PRF placement; **D:** Suturing

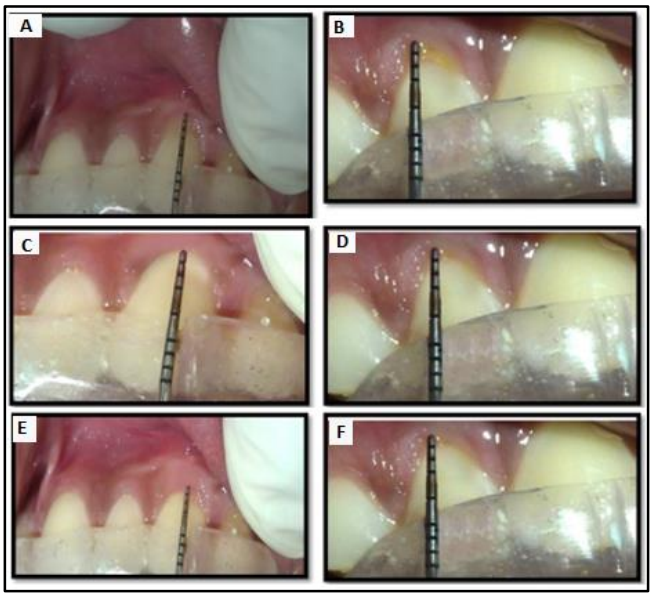

Figure 5: Follow up for test and control group at baseline, 3 month and 6 months; **A:** At baseline (Test group); **B:** At baseline (Control group); **C:** Post-operative 3 month (Test group); **D:** Post-operative 3 month (control group); **E:** Post-operative 6 month (Test group); **F:** Post-operative 6 month (control group)

Table 1: Gender distribution of patients included into the study.

	Number	Percentage
Male	8	80.0%
Female	2	20.0%
Total	10	100%

Table 2: Distribution of sites for the surgical technique performed.

Tooth Number	Groups	
	Test group	Control group
13	1	1
	10.0%	10.0%
23	1	1
	10.0%	10.0%
33	6	2
	60.0%	20.0%
43	2	6
	20.0%	60.0%
Total	10	10
	100.0%	100.0%

Table 3: Showing the intergroup comparisons of various parameters evaluated during the 6- month follow-up (p Value < 0.05 was considered as statistically significant).

	Test group		Control group		MD	P value
	Mean	SD	Mean	SD		
PD						
Baseline	1.50	0.53	1.40	0.48	0.20	0.388
At 1 month	1.50	0.53	1.40	0.48	0.20	0.388
At 3 months	1.50	0.53	1.40	0.48	0.20	0.388
At 6 months	1.50	0.53	1.40	0.48	0.20	0.388
CAL						
Baseline	4.50	0.97	4.40	0.70	0.10	0.795
At 1 month	2.98	0.71	3.42	0.72	-0.44	0.045*
At 3 months	2.21	0.58	2.73	0.72	-0.52	0.034*
At 6 months	1.44	0.41	2.05	0.57	-0.61	0.014*
RD						
Baseline	2.90	0.88	2.90	0.57	0.00	1.000
At 1 month	1.48	0.56	2.01	0.57	-0.53	0.031*
At 3 months	0.71	0.43	1.27	0.51	-0.56	0.016*
At 6 months	0.16	0.24	0.68	0.37	-0.52	0.001*
RW						
Baseline	3.13	0.46	3.12	0.38	0.01	0.958
At 1 month	1.73	0.45	2.03	0.41	-0.30	0.035*
At 3 months	0.52	0.39	1.18	0.40	-0.66	0.001*
At 6 months	0.21	0.25	0.59	0.30	-0.38	0.007*
WKT						
Baseline	0.98	0.43	1.00	0.45	-0.02	0.920
At 1 month	1.98	0.53	1.86	0.37	0.12	0.562
At 3 months	3.03	0.32	2.72	0.34	0.31	0.042*
At 6 months	3.76	0.33	3.15	0.35	0.61	0.001*
GB						
Baseline	1.22	0.32	1.29	0.20	-0.07	0.574
At 1 month	1.30	0.22	1.29	0.23	0.01	0.922
At 3 months	1.25	0.20	1.27	0.22	-0.02	0.833
At 6 months	1.28	0.15	1.31	0.17	-0.03	0.688
WHI						
Baseline	1.20	0.42	1.30	0.48	-0.10	0.628
At 1 month	1.00	0.00	1.00	0.00	0.00	1.000
At 3 months	1.00	0.00	1.00	0.00	0.00	1.000
At 6 months	1.00	0.00	1.00	0.00	0.00	1.000

*Statistically significant

Table 4: Shows the intergroup comparison of percentage of root coverage evaluated during the 6- month follow-up (p Value < 0.05 was considered as statistically significant and p value ≤ 0.001 was considered as statistically highly significant).

Percentage root coverage	Groups	Mean	Std. Deviation	Mean difference	t-test value	p-value
1 month	Test group	49.83	10.44	3.80	3.799	0.001*
	Control group	31.33	11.33			
3 months	Test group	77.17	12.82	3.48	3.484	0.003*
	Control group	57.00	13.07			
6 months	Test group	95.50	6.66	4.29	4.294	0.001*
	Control group	77.33	11.61			

*Statistically significant

4. Discussion

This split-mouth randomized control, double-blind clinical study was conducted to assess the clinical efficacy of AM combined with CAF technique for treating Cairo's Type-I defects. At baseline, there were no statistically significant differences between the groups evaluated in any of the measured clinical parameters. Bleeding on probing and plaque presence were recorded at all follow-ups to monitor oral hygiene and inflammation, and all patients maintained good oral hygiene, with no signs of inflammation or bleeding on probing.

Throughout the study, no significant changes in probing depth (PD) ($p>0.05$) were observed from baseline to 6 months in either group, consistent with findings from Agarwal et al.[9] and Gautam.[19] However, Wallace et al.[20] reported a 0.8 mm reduction in PD over the same period when comparing amniotic membrane to acellular dermal matrix.

Both the AM and PRF groups showed significant improvements in clinical attachment level (CAL) from baseline to 6 months, indicating effective root coverage by both techniques. Nonetheless, a significant difference was noted in CAL gain between the groups. AM's composition, resembling the basement membrane of oral mucosa and containing laminin 5, may contribute to improved gingival cell adhesion and CAL enhancement, as highlighted by Gurinsky,[21] Meller et al.,[22] and Riau et al.[23]

Our study found a greater percentage of root coverage in the AM group (95.5%) compared to the PRF group (77%), contrasting with Agarwal et al.,[10] who reported greater root coverage with PRF. Studies by Gurinsky,[21] Agarwal et al.,[9] and Gautam[19] showed varying levels of root coverage with AM, while Aroca et al.,[24] Jankovic et al.,[8] and Agarwal et al.[9] reported diverse results with PRF. Despite AM's superior root coverage in this study, neither method achieved 100% root coverage.

Significant improvement in recession width (RW) was observed at 3 and 6 months in both groups, similar to findings by Atilla et al.,[25] Aroca et al.,[24] and Uraz et al.[26] for PRF-treated sites. Agarwal et al.[9] noted a greater reduction in RW for PRF at 3 months, but similar values at 6 months, with AM showing increased RW. The preservation of the mucogingival junction and granulation tissue from the periodontal ligament might enhance keratinized gingiva. Agarwal et al.[9] and Gautam[19] reported significant increases in attached gingiva (AG) with PRF and AM, though PRF showed more width increase. Other studies by Jankovic et al.[8] and Uraz et al.[26] noted greater increases in keratinized tissue width with PRF compared to SCTG, while Wallace et al.[20] reported a 0.2 mm increase with AM at 4 months.

Gingival biotype improvement was statistically significant in both groups from baseline to 6 months, with no significant difference between them ($p>0.05$), suggesting both materials effectively enhance gingival thickness. This finding is consistent with Shetty et al.,[27] though Agarwal et al.[9] found more substantial thickness increases with PRF compared to AM.

The Wound Healing Index (WHI) did not show significant differences between the groups ($p>0.05$) at 6 months, indicating uneventful healing for both treatments. This aligns with the properties of both materials used.

Agarwal et al.[9] also assessed patient satisfaction, finding higher comfort scores for AM and better esthetic scores for PRF. Based on our results, AM appears superior to PRF for treating gingival recession, though neither method achieved complete root coverage. Variations in clinical parameter measurement methods among studies can affect comparisons. The study's limitations include a small sample size, short duration, and lack of histological evaluation due to ethical constraints. Also patient centered outcome like pain assessment was not taken into consideration. Larger, long-term, multicenter randomized controlled trials with patient centered outcomes are needed to further evaluate AM's efficacy compared to PRF.

5. Conclusion

Based on the findings, it can be concluded that both AM and PRF, when used with CAF technique, are effective treatments for Cairo's recession type-I defects. Both materials effectively reduced recession width and depth, and augmented width of keratinized tissue. They also demonstrated positive outcomes in improving gingival

thickness and facilitated good and rapid healing. However, AM provided greater root coverage and better keratinized tissue width compared to PRF. Therefore, AM may be considered a superior option over PRF for treating recession defects. Nonetheless, additional research is needed to evaluate the long term stability of the tissue thickness and root coverage achieved. Future studies with larger sample sizes and longer follow-up periods are necessary to further confirm AM's superior efficacy compared to PRF.

6. Source of Funding

None.

7. Conflict of Interest

None.

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