COMPARATIVE EVALUATION OF PLATELET-RICH FIBRIN WITH CORONALLY ADVANCED FLAP IN THE TREATMENT OF GINGIVAL RECESSION: A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Background: One of the most common aesthetic problem encountered in the field of periodontology is gingival recession, which is, perceived by the patients as increase in length of teeth. The treatment of gingival recession is a common requirement due to aesthetic concern or root sensitivity. This study was planned to evaluate the effect of PRF on Gingival Biotype and gingival recession coverage by Coronally Advanced Flap.

Materials and methods: On examination 65 recession sites were selected for the study. After phase I therapy, only 27 subjects were willing to participate in the study. They had total 43 recession sites for management which were included for the study. An informed written consent was taken from the selected subjects. The clinical parameters include measurement of probing depth, recession width, recession depth, clinical attachment loss, keratinized gingival width and gingival attachment thickness. They were assessed at different time intervals (at baseline, 1, 3 and 6 months) in both experimental and control group.

Results: The present study shows that PRF has a positive effect on gingival biotype when used with coronally advanced flap in gingival recession coverage. The present 6-month study shows that the addition of PRF results in significant increase in gingival/mucosal thickness. There was an increase in gingival/mucosal thickness in both groups but in control group it was non-significant whereas in test group the gain in terms of thickness was significant.

Conclusion: The successful results both in terms of root coverage and increase in gingival/mucosal thickness could be achieved using this membrane.

Key word: gingival recession, coronally advanced flap, platlet rich fibrin.

INTRODUCTION:

Besides compromised aesthetics, gingival recession also leads to a spread of other problems like root hypersensitivity, a better incidence of root caries and diminished plaque control, thus necessitating treatment.[1]

Gingival recession involves loss of both soft tissues also as hard tissue. The probability of gingival recession is more when the thickness of gingiva is less. A thicker gingival tissue is more stable and provides better resistance against recession. An initial gingival thickness was found to be the foremost predictable factor for predicting the success of complete root coverage procedures.[1] It has also been shown that subjects with thin marginal tissue are more prone to the development of mucogingival problems,

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particularly in case of thin underlying bone.

Treatment modalities for root coverage can be classified as pedicle grafts, free soft-tissue grafts or a combination of the two. Among the soft-tissue grafts, the subepithelial connective tissue graft combined with or without a coronally advanced flap (CAF), is the most widely used and predictable technique in the aesthetic treatment of gingival recession.[1,2] The goals of treatment are to revive the tissue margin to the CEJ and to make a traditional gingival sulcus with functional attachment. Among these treatment modalities, root coverage with coronally advanced flap holds the foremost promising results and hence might be considered because the "gold standard" procedure within the treatment of gingival recession defects.[2]

Although CAF has been regarded as gold standard yet long term studies have shown post-operative recurrence of recession.[3] For this purpose subepithelial connective tissue graft (SCTG) can be used. But SCTG possesses its own limitations, like lack of graft availability, need for a second surgical site, proximity to palatine neurovascular complex and unesthetic tissue contour at the recipient site.[4] to beat these limitations and to accomplish optimum root coverage by increasing the thickness of mucosa, many more recent generation biomaterials are proposed like Emdogain, Amnion-Chorion allograft, Platelet Rich Plasma etc. A more favourable biomaterial is that the autologous Platelet Rich Fibrin clot (PRF) which has the benefits of simple preparation/application, minimal expense, and lack of biochemical modification i.e. no bovine thrombin or anticoagulant is required.[5]

Platelet-rich fibrin (PRF), a second generation platelet concentrate, developed in France by Choukroun et al. (2001)VI was initially intended for specific use in oral and maxillofacial surgery. PRF consists of an intimate assembly of cytokines, glycan chains and structural proteins enmeshed with a slowly polymerized fibrin meshwork. These biochemical components have well known synergistic effects on healing processes.[6]

In comparison to similar studies and studies with different techniques of root coverage, a better clinical outcome of autologous platelet rich fibrin membrane has been reported for the treatment of localized gingival recession defects.

On the basis of this background, this study was aimed to evaluate the effect of PRF on gingival biotype in recession coverage by Coronally Advanced Flap. The objective of the study

- To evaluate the effect of CAF on recession coverage and Gingival biotype.
- To evaluate the effect of PRF on Gingival Biotype and gingival recession coverage by Coronally Advanced Flap.

MATERIALS AND METHOD:

This is a clinical study conducted to evaluate the effect of platelet rich fibrin on gingival biotype in gingival recession coverage by coronally advanced flap at The Department of Periodontology, Kothiwal Dental College and Research Centre, Moradabad, Uttar Pradesh.

30 subjects fulfilling the inclusion criteria were selected from the outpatient

department of periodontics. On examination 65 recession sites were selected for the study. After phase I therapy, only 27 subjects were willing to participate in the study. They had total 43 recession sites for management which were included for the study. An informed written consent was taken from the selected subjects.

Gingival thickness was measured by transgingival probing by no.15 K-file using digital Vernier Calliper. The clinical parameters were assessed at different time intervals (at baseline, 1, 3 and 6 months) in both experimental and control group. The selected subjects were further divided into 2 subgroups through randomized chit method on the basis of treatment to be provided.

Inclusion criteria:

1. Age ranging between 20 to 40 years of age.
2. Systemically healthy patients.
3. Patients maintaining good oral hygiene.
4. Teeth with Miller's class I
5. Patients having bilateral single or multiple recession defects.
6. Willing to comply with the study related procedures.

Exclusion criteria:

1. Patients who are unable to perform routine oral hygiene procedures or not complying with the oral hygiene instructions.
2. Use of antibiotics in past 3 months.
3. Previous surgical attempts to correct the gingival recession.
4. Mucosal disorders like high frenal attachments and ulcers.
5. Mal-aligned teeth.
6. Smokers or patients with tobacco chewing habits.
7. Medically compromised patients and Pregnant woman.

Clinical armamentarium for surgery

Mouth mirrors, Tweezers, UNC15 periodontal probe (Hu- Friedy, Chicago, IL)., Explorer, No. 15 K-file with silicon disk stopper, Digital Vernier Calliper, Metallic Scale, Kidney tray, Disposable gloves, Disposable mouth mask, Disposable syringe, 2% lignocaine HCl containing 1:80,000 adrenaline solution, Bard Parker handle with no. 11, 15 blade, Periosteal elevator, Gracey curettes, Castroviejo scissors, Tissue holding forceps, Needle holder, Suture material – 4-0 non resorbable black braided silk suture (ETHICON), Saline with sterile and disposable irrigating syringes, Cotton swabs and gauze and Periodontal pack (Coe PakTM, GC America Inc, USA).

Clinical parameters to measure:

Measurement of probing depth, recession width, recession depth, clinical attachment loss, keratinized gingival width and gingival attachment thickness.

Clinical armamentarium for PRF preparation

Armamentarium incudes Centrifuge machine, Tourniquet, Test tubes, Test tube stand,5ml syringe, Metallic plate with fine pores, Pre-weighed glass slab and a Stop watch.

Investigations

The following investigations were carried out before the surgery.

- Intraoral periapical radiographs (IOPARs) and blood investigations, Bleeding time and clotting time, Random blood sugar. (RBS), Hep. B, C, HIV.

Presurgical procedure

The compliance of each was sought. Scaling and root planing was carried out. Coronoplasty was done as indicated. Oral hygiene instructions got mainly in terms of proper brushing technique. Three weeks following this initial therapy, the periodontal re-evaluation was done for oral hygiene maintenance and to record gingival tissue response to the initial therapy. After re-evaluation surgical procedure was carried out.

Surgical procedure

Preparation of the surgical site for both test and control group:

Adequate anaesthesia with 2% lignocaine HCl containing 1:80,000 adrenaline was obtained at the surgical site. A coronally advanced flap was designed using 2 incisions:

1. This was performed by making two horizontal incisions with respect to the distal and mesial interdental papillae of the involved tooth followed by a crevicular incision,

2. Two vertical releasing incisions at the mesial and distal aspects of recession site.

3. A full thickness flap followed by a partial thickness flap was reflected.

4. A horizontal releasing incision was made within the periosteum, at the bottom of the flap, to facilitate tension-free coronal displacement.

5. Following this, thorough root planing was done using Gracey curettes to obtain a smooth and hard surface.

6. After root planing the following procedure was done.

In test group

Preparation of PRF: 19

After the recipient site preparation was completed, 10 ml of venous blood was drawn in a test tube without an anticoagulant, and centrifuged immediately. It was centrifuged for 10 minutes at 3000 rpm. After centrifugation, the PRF plug was obtained, separated from the RBC base using scissors, and placed in a sterile dapen dish. The PRF membrane was prepared by placing it in between a base having closely-arranged pores so that serum can easily escape and on top of it a pre-weighed sterile glass slab was placed. Then the membrane was placed over the denuded root surface extending beyond the defect. The flap was coronally positioned over the membrane to completely cover it and secured with 4-0 non resorbable sutures. The surgical area was covered with a non – eugenol periodontal dressing (Coe – Pak). Post-operative antibiotics and analgesics were prescribed. Post-operative instructions were given to all the patients.

In control group

After the adequate anaesthesia, incisions were given and the full thickness flap was raised. Root planning was done with Gracey curettes to obtain hard and smooth surface. Then, the flap was coronally positioned over the prepared site at desired position (2mm coronal to CEJ) and secured with 4-0 non resorbable sutures. Post-operative instructions were given to all the patients.

RESULTS:

Clinical parameters were recorded at baseline, 1 month, 3 months and 6 months respectively. The data were subjected to statistical analysis. The results were expressed as mean ± standard deviation and changes in the percentages. Intragroup comparisons (baseline to 1 month, 3 months and 6 months intervals) and Intergroup comparisons were made. All the tests with P-value of 0.05 or less were considered as statistically significant. The statistical analysis was done using SPSS Version 18.0 statistical Analysis Software. Descriptive analysis, unpaired t test and paired t test were used for data analysis.

A total of 20 patients with 30 recession sites who underwent surgery, came for the subsequent visits at 1 month, 3 months and 6 months respectively. The age range of patients was between 20 – 40 years. On Comparison of Clinical Parameters in Control Group, the mean comparison of all clinical parameters was done from baseline to 1-month follow-up period and the results were statistically significant. The mean comparison of all clinical parameters was done from baseline to 3 month and the P – value obtained was less than 0.05 for all parameters except probing pocket depth. The mean comparison of all clinical parameters was done from baseline to 6 months follow up period has shown statistically significant difference for recession width, recession depth and clinical attachment level.

Intragroup comparison

Control group

The mean keratinized gingival width at 3 months was 2.67±0.62 mm that has decreased to 1.90±0.39 mm at 6 months, mean gingival/mucosal thickness at 3 months was 1.62±0.13 mm that has increased to 1.44±0.11mm at 6 months. A significant difference was observed for mean keratinized gingival width and mean gingival/mucosal thickness.

Test group

The mean keratinized gingival width at baseline was 1.87±0.64 mm that has increased to 3.67±0.72 mm at 1 month, mean gingival/mucosal thickness at baseline was 1.29±0.13 mm that has increased to 2.40±0.24mm at 1 month. The mean comparison of all clinical parameters was done from baseline to 6 months follow up period and the P – value obtained was less than 0.05 for all parameters except probing pocket depth. -mean keratinized gingival width at baseline was 1.87±0.64 mm that has increased to 2.37±0.61 mm at 6 months, mean gingival/mucosal thickness at baseline was 1.29±0.13 mm that has increased to 1.83±0.24mm at 6 months. mean keratinized gingival width reduced to 2.37±0.61 mm at 6 months, mean gingival/mucosal thickness was reduced to 1.83±0.24mm at 6 month. There was a significant reduction in mean keratinized gingival width and mean gingival/mucosal thickness from 1 month to 6 months.

Intergroup comparison for clinical parameters

At 1 Month:

The mean comparison of all the clinical parameters was done at 1 month follow up period between both the control and test groups. Thus, the results of the parameters recession width, recession depth, probing depth and clinical attachment level, and keratinized gingival width were considered

as statistically not significant whereas mean gingival/mucosal thickness showed the significance value less than 0.05. At 3 months, the mean probing depth, and gingival/mucosal thickness showed statistically significant difference.

At 6 Month:

The mean recession width at 6 months in control group was 0.70±0.92 mm and in test group it was 0.73±0.88 mm. Mean recession depth at 6 months in control group was 0.57±0.78 mm and in test group it was about 0.60±0.74 mm. The mean probing depth at 6 months in control group was 2.00±0.27 mm and in test group it was 1.93±0.37 mm.

DISCUSSION:

Gingival recession is defined as the displacement of the marginal gingiva apical to the cemento-enamel junction with exposure of the root surface.[7] Among the various treatment modalities coronally advanced flap (CAF) procedure demonstrated a high percentage of root coverage with a high predictability and without significant and without post-surgical complications. The root coverage gained by this technique was reported as stable over long term.[8] Therefore CAF procedure has commonly served as "gold standard" to evaluate the safety and results of new root coverage techniques.

A recent innovation in dentistry is the preparation and use of platelet concentrates such as platelet rich plasma (PRP) and platelet rich fibrin (PRF), a concentrated suspension of growth factors found in platelets. These growth factors are determined as promoters of tissue regeneration and also wound healing. The mechanism of wound healing accelerates with the platelet concentrates and it maximizes the potential of regeneration.

The present study was designed to evaluate the effect of PRF on gingival biotype in gingival recession coverage by coronally advanced flap. All the subjects included in the study had Miller's Class I type of recession defects which can achieve complete root coverage.

Each patient was assessed for recession width, recession depth, probing depth, clinical attachment level, keratinized gingival width, gingival/mucosal thickness at baseline and post-operative follow up was done at 1 month, 3 month and 6 months. Eren *et al.*[8] also stated that, no significant difference was seen in probing depth of the experimental groups. In most of the studies, changes in PD were not significant. Very few studies found significant changes, but they were minimal (<0.5 mm). Our study determined that, there was no statistically significant differences observed in PD between the test and control groups. These results are according to the study results of Lien Hui Hueng *et al.*[9], Modica *et al.*[10]and Bocchi FE *et al.*[11]

In the present study the mean recession width in the test group was decreased from 3.73 mm to 3.00 mm at 6 months. In a study by Lien-Hu Huang *et al.* [9] recession width was reduced from 3.6 mm to 0.6 mm showing a reduction of 3 mm at 6 months. The mean recession width at baseline was 3.80 mm which significantly reduced to 0.70 mm over a period of 6 months showing a reduction of 3.10mm in control group. Our study was in accordance with the study by Lien-Hu Huang *et al.* [9] where the mean recession

width at baseline was 3.2 mm which significantly reduced to 0.3 mm at 6 months in control group. Both the groups showed statistically significant reduction in recession width. The difference between the two groups was statistically not significant. This result was in accordance with the results obtained by Lien-Hu Huang *et al.*[9] and Bocchi FE *et al.*[11] The authors stated that no significant difference was seen in recession width reduction of the experimental groups.

In the present study the mean recession depth in the test group was decreased from 2.40 mm to 0.60 mm at the end of 6 months showing reduction of 1.8 mm which was statistically significant. In a study by Jancovic *et al.*[12] the recession depth was reduced from 3.5 mm to 2.83 mm at 6 months in test group. In their study better outcome may be because of the long term follow up. The mean recession depth at baseline was 2.1 mm which significantly reduced to 0.23 mm over a period of 6 months in control group. Our study was in accordance with Jancovic *et al.* where the mean recession depth at baseline was 2.53 mm which significantly reduced to 0.57 mm at 6 months in control group.

The present study showed that the mean clinical attachment level (CAL) at the baseline was 4.07 mm which reduced to 2.53 mm, showing attachment gain of 1.54 mm in test group. Our study was in accordance with Jancovic *et al.* where the mean CAL at baseline was 4.35 mm which significantly reduced to 1.48mm showing attachment gain of 2.87 mm at 6 months in test group. In our study there was no statistically significant difference between control group and test group at the end of 6 months.

In the present study, the mean keratinized gingival width (KGW) at the baseline was 1.87 mm which increased to 2.37 mm showing attachment gain of 0.50 mm which was statistically significant in test group at 6 months. Results of our study was in accordance with the study results of Jancovic *et al.*[12] where the KGW at baseline was 1.31 mm which significantly increased to 2.20 mm showing attachment gain of 0.89 mm at 6 months in test group. Notably, gain in KGW in the group treated with the PRF membrane may be explained as a result of a tissue manifestation of the proliferation of gingival or periodontal fibroblasts as a result of the influence of the growth factors from platelets entrapped in the fibrin mesh. In the control group the mean KGW at the baseline was 1.93 mm slightly decreased by 6 months to 1.90. This was in accordance with the results of the study by Aroca S *et al.*85 There was statistically significant difference between the two groups at the end of 6 months. Our results were not in accordance of the results obtained by Lien-Hu Huang *et al.*[9], Hagewald *et al.* and Nemcovsky *et al.*[5] who stated that there was no statistically significant difference between the two experimental groups.

The fact that coronally advanced procedures resulted in an increased apical-coronal gingival height, might be explained by several events taking place during the healing and maturation of marginal tissue. Firstly, the tendency of mucogingival line to regain its genetically defined position following coronal dislocation with the flap procedure. Secondly, it cannot be excluded that

granulation tissue derived from periodontal ligament might have contributed to the increased gingival dimensions.

In the present study the mean gingival/mucosal thickness (GT/MT) at baseline was 1.29 mm which increased to 0.54 mm which was statistically significant in test group at 6 months. Our study was in accordance with the study results of Lien-Hu Huang *et al.* The increased GT was statistically significant in test group. But there was statistically significant difference between the two groups at the end of 6 months. This shows that addition of PRF membrane has significant effect on gingival biotype.

The study concluded that both the techniques are effective in the treatment of gingival recession defects. The test group post operatively determined a root coverage of 80.07% at 6 months. Studies by Aroca S *et al.*[13] reported root coverage of 82% and Jancovic *et al.* [12] showed root coverage of 88 % with PRF membrane. In the control group the root coverage was 91% over a period of 6 months which was statistically significant. Our study was in accordance with Aroca S *et al.*[13] and Jancovic *et al.*[12] where the mean percentage of root coverage was 91% in control group. Between the two groups at the end of 6 months follow up period statistically significant difference was seen. The results of the present study indicated that PRF and CAF could be successfully used to treat Miller's Class I gingival recession defects. Both the groups demonstrated an overall significant improvement in all the assessed clinical parameters. At the end, the results of this study found a significant difference between the two groups with regards to outcome of the treatment.

In the present study gingival/mucosal thickness was also assessed in both the groups. Thin biotype is one of the reasons for gingival recession. In our study using PRF membrane we could improve the thickness of gingiva. There was an increase in gingival/mucosal thickness in both groups but in control group it was non-significant whereas in test group the gain in terms of thickness was significant.

As the results show that the use of PRF has a positive effect on gingival biotype so further studies should be conducted with a long-term follow-up period with different criteria to establish how efficient is PRF to enhance the gingival/mucosal thickness.

CONCLUSION:

The present study shows that PRF has a positive effect on gingival biotype when used with coronally advanced flap in gingival recession coverage. The present 6-month study shows that the addition of PRF results in significant increase in gingival/mucosal thickness. Since the use of PRF improves the gingival biotype thus it reduces the post-surgical recurrence rate and promises the long-term success of the treatment. The successful results both in terms of root coverage and increase in gingival/mucosal thickness could be achieved using this membrane.

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TABLES:

S.NO.	Parameters	Baseline values Mean ± SD	At 1 month Mean ± SD	At 3 month Mean ± SD	At 6 month Mean ± SD
1.	Recession width	3.80±1.01	0.93±1.22	0.80±1.08	0.70±0.92
2.	Recession depth	2.53±0.52	0.67±0.82	0.60±0.83	0.57±0.78
3.	Probing depth	1.87±0.35	1.47±0.52	1.80±0.41	2.00±0.27
4.	Clinical attachment level	4.40±0.63	2.20±1.01	2.47±0.92	2.57±0.73
5.	Keratinized gingival width	1.93±0.46	3.40±0.51	2.67±0.62	1.90±0.39
6.	Mean Gingivalthickness	1.36±0.16	1.97±0.28	1.62±0.13	1.44±0.11

Table 1. Mean values of the clinical parameters Of baseline, 1st month, 3rd month and 6th month interval for Control Group.

S.NO.	Parameters	Baseline Values Mean ± SD	At 1 Month Mean ± SD	At 3 Month Mean ± SD	At 6 Month Mean ± SD
1.	Recession width	3.73±1.03	1.00±1.13	0.73±0.80	0.73±0.88
2.	Recession depth	2.40±0.63	0.80±0.63	0.63±0.67	0.60±0.74
3.	Probing depth	1.67±0.49	1.47±0.64	1.33±0.49	1.93±0.37
4.	Clinical attachment level	4.07±0.88	2.27±0.88	2.20±0.53	2.53±0.74
5.	Keratinized gingival width	1.87±0.64	3.67±0.72	2.90±0.81	2.37±0.61
6.	Mean Gingival thickness	1.29±0.13	2.40±0.24	1.99±0.25	1.83±0.24

Table 2. Mean values of the clinical parameters from baseline, 1st month, 3rd month and 6th month interval for Test Group

	Group	N	Mean	Standard Deviation	t-value	p-value
M6 (RW)	Control	15	0.70	0.92	0.101	0.92
	Test	15	0.73	0.88		
M6 (RD)	Control	15	0.57	0.78	0.121	0.905
	Test	15	0.60	0.74		
M6 (PD)	Control	15	2.00	0.27	0.564	0.577
	Test	15	1.93	0.37		
M6 (CAL)	Control	15	2.57	0.73	0.124	0.902
	Test	15	2.53	0.74		
M6 (KGW)	Control	15	1.90	0.39	2.497	0.019
	Test	15	2.37	0.61		
M6 (MGT)	Control	15	1.44	0.11	5.831	<0.001
	Test	15	1.83	0.24		

Table 3: Comparative Analysis of Control Group Vs Test Group at 6 Month

	Group	N	Mean	Std. Deviation	t-value	p-value
M1 (RW)	Control	15	0.93	1.22	0.155	0.878
	Test	15	1.00	1.13		
M1 (RD)	Control	15	0.67	0.82	0.487	0.63
	Test	15	0.80	0.68		
M1 (PD)	Control	15	1.47	0.52	0	1
	Test	15	1.47	0.64		
M1 l (CAL)	Control	15	2.20	1.01	0.192	0.849
	Test	15	2.27	0.88		
M1 (KGW)	Control	15	3.40	0.51	1.169	0.252
	Test	15	3.67	0.72		
M1 (MGT)	Control	15	1.97	0.28	4.51	<0.001
	Test	15	2.40	0.24		

Table 4: Comparative analysis of Control Group Vs Test Group At 1 Month