

Demystifying the Use of Platelet Concentrates For Multiple Tooth Recession Coverage

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Abstract:

Overview: The aim of this study is to evaluate and compare the effects of Autologous Platelet Rich Fibrin on multiple tooth recession coverage using the Bridge Flap Technique.

Methods : Thirty patients (18 males and 12 females) of age group 20 to 55 years were selected those who had from Miller's Class I and II gingival recession. Patients were randomly allocated into two groups: - Group A: Conventional Bridge Flap Technique and Group B: Bridge Flap Technique with Platelet Rich Fibrin.

Results: Significant results were observed in recession coverage with both the groups ($p \leq 0.05$). The group with Platelet Concentrates showed statistically significant in parameters like Thickness of Gingiva which showed an increase from 1 ± 0.08 mm at baseline to 1.85 ± 0.18 mm by 6 months in Group B, the Percentage of Recession Coverage in Group A was 79.04 ± 27.05 and for Group B was 82.20 ± 28.65 by the end of 6 months.

Conclusion: Platelet Rich Fibrin showed significant results in multiple teeth Recession Coverage. Thus in areas of large pink and white discrepancy where harvesting large amount of CTG is not feasible PRF can be a better natural alternative.

Keywords: Recession coverage, periodontal plastic surgery, PRF, Bridge Flap.

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I. Introduction

Successful coverage of exposed roots for esthetic and functional reasons has been the objective of various mucogingival procedures. Multiple techniques have been developed to obtain predictable root coverage (e.g. FGG, CTG, Vista Technique, Bridge flap etc.). new techniques are proposed to increase predictability minimize patient discomfort and reduce the number of surgical sites, together with the need to satisfy the patient's aesthetic demands, which include the final color and tissue blend of the grafted area. There has always been a demand for a graft with its own blood supply, easy to harvest without causing any secondary morbidity and it sufficient amount for a wide area of regeneration (Mahajan A et al. 2007).

Platelet rich fibrin (PRF) has various applications in wide variations of procedures in both the medical and dental fields. Results from many randomized clinical trials have now pointed to its marked ability to promote soft-tissue wound healing where PRF has been documented to facilitate wound closure and speed regeneration of mucogingival recessions (Marx RE et al. 2004).

One of the major oversights found analyzing the literature is the comparative studies investigating PRF versus a connective tissue graft (Aleksic Z et al. 2009). Even though they share very similar physical characteristics by both being autologous, the mode of surgical operation and the final product obtained are different (Jankovic S et al. 2012).

A one-step surgical procedure which was described as "Double Lateral Bridging Flap" also known as "Bridge Flap Technique", for coverage of multiple denuded root surfaces. It is a combination of coronally repositioned flap and vestibule extension procedure. The bridge flap technique is a combination of two surgical techniques vestibuloplasty and lateral sliding flap. In this procedure, the flap covering the denuded root surface is supplied by plasmatic circulation from capillaries in the adjacent portion of the gingiva, permitting it to survive (Marggraf et al. 1985).

The flap creates a functional, healthy and aesthetic result that seems to be resistant to additional gingival recession. The technique offers great advantages of being a single step procedure to cover recession in areas of reduced keratinized gingiva and alongside also increases the vestibular depth increasing the width of attached gingiva. The present study entails the comparison of Bridge Flap Technique for coverage of multiple mucogingival recessions with and without the use of Autologous Platelet Rich Fibrin with a follow up of 6 months.

II. Materials And Method

Demographics:

The study included 30 patients (18 males and 12 females) within the age group of 20-55 years referred to the Department of Periodontology and Implantology, College of Dental Sciences and Research Centre, Ahmedabad. The reported patients were randomly divided into two groups Group A (n=15) and Group B (n=15). The patients in Group A were treated with only the conventional Bridge Flap Technique and Group B included patients treated with Bridge Flap Technique in addition with Choukroun's Platelet Rich Fibrin. A thorough medical and dental history was obtained and a written consent was signed by the patient before undergoing the selection criteria for the study. All patients received initial treatment consisting of oral hygiene instructions and prophylaxis or any occlusal adjustments when indicated, at least 1 month prior to the study procedures. After the initial therapy those patients who met the inclusion criteria at re-evaluation were continued in the surgical phase of treatment. Ethical Clearance from the Institutional Ethical Committee of College of Dental Sciences and Research Centre was taken to perform the procedure on patients.

Inclusion Criteria:

1. Physically healthy patients with fair to good oral hygiene.
2. Millers Class I and II defects in ≥ 2 teeth.
3. Age group 20-55 years.
4. Teeth should be vital and free of any restorations.

Exclusion Criteria:

1. Pregnant patient and lactating patients.
2. Inflammatory periodontal disease.
3. Patient with habit of tobacco use in any form.
4. Class III and Class IV Miller's Class recession.
5. Previous surgical attempt to correct gingival recession.
6. Systemic disease or immune-compromised patients or allergy to any medication.
7. Coagulation defect or anti-coagulant therapy.
8. Recession defects associated with caries or restoration and teeth with evidence of pulpal pathology.

Parameters:

All the experimental teeth were measured for:

- Recession Depth (RD), Recession Width (RW), Probing Depth (PD), Width of Attached Gingiva (WAG), Thickness of Gingiva (TG), Percentage of Root Coverage (PRC)

The measurements were recorded to the nearest millimetre using a calibrated periodontal probe (UNC-15) pre-operatively before the surgery i.e. baseline and post operatively at 1 months, 3 months and 6 months. (Figure 1)



Figure 1: Measurement of Clinical Parameters

A custom cold cure acrylic stent were fabricated for each patient to save the angulation and position of the probe made at the time of the surgery for further measurements during the followup.

Surgical technique:

The bridge flap technique was given by Marggraf et al. (1985) and later modified by Romanos et al.(1993). Under local anesthesia, an arch shaped or semilunar incision was given in the vestibule at a distance, which was twice the amount of gingival recession plus 2 mm ($2 \times$ gingival recession + 2 mm). This ensures a wide flap, which is necessary for a sufficient blood supply.

A split thickness flap was then elevated in the apico-coronal direction and it was connected with the first incision so that the two flaps communicated with each other. The patency of the reflection was checked with the help of a periosteal elevator or a periodontal probe.(Figure 2) The entire flap was then coronally positioned to cover the teeth upto 2mm above CEJ and sling sutures were placed. A piece of foil was placed over the sutures and a non- eugenol periodontal dressing (Coe-pack, GC) was given over the surgical site.



Figure 2: Bridge Flap Reflected and Coronally Advanced

The basic technique for root coverage is similar for Group A and Group B; the only difference is the use of Platelet Rich Fibrin in Group B. The prepared Autologous Platelet Rich Fibrin is placed over the root surface and the entire flap was then coronally positioned to cover the teeth and the Platelet Fibrin up to 2 mm above CEJ and sling sutures were placed (Figure 3 & 4). The whole unit is pressed over the tooth surface with light pressure using wet gauze. A piece of foil was placed over the sutures and a non-eugenol periodontal dressing (Coe-pack, GC) was given over the surgical site.



Figure 3 & 4: PRF prepared using Choukran's Protocol and placed within the Bridge flap

Post surgical care: Routine post operative instructions were given regarding dietary restrictions and care of the surgical site. Mouthwash (Chlorhexidine 0.2%) was prescribed to the patients to aid in oral hygiene maintenance. Patients were advised to refrain from brushing at the surgical site till the periodontal dressing was in place. After removing periodontal dressing, brushing was avoided at the treated site. Instead of brushing the surgical area, cotton pellet was used to clean and slightly comb the area in an apical to incisal direction for the next 4 weeks.

Patients were seen at 10 days, 1 month, 3 months, and 6 months (Figure 5). Suture removal was done 7 to 10 days after surgery. Reinforcement of oral hygiene instruction was also performed during the follow up visits.



Figure 5: Sixth month follow up

III. Statistical Analysis

The information gathered from present study was tabulated and analyzed using suitable techniques: Descriptive statistics were expressed as Mean \pm Standard deviation for all parametric variables. Statistical analysis was performed using a statistical software package Statistical Package for Social Science [SPSS], Version 20. Repeated measures ANOVA was used with 'Scheffe' Post Hoc analysis for examination of mean differences between baseline, 3 months and 6 months within the groups. Mean and standard deviation of all the parameters were estimated for the recession sites. Mean changes were compared against the null hypothesis. Unpaired *t*-test was employed to test the significance of the differences between the means at baseline, 3 months and 6 months between the groups. In the present study, $p \leq 0.05$ was considered as indicating statistical significance.

IV. Results

Each group consisted of 15 patients each. The Clinical Parameters like Recession Depth (RD), Recession Width (RW), Probing Depth (PD), Width of Attached Gingiva (WAG), Thickness of Gingiva (TG) and Percentage of Root Coverage (PRC) were recorded as changes in these parameters would signify in the effectiveness of any root coverage technique.

1. At the end of 6 months both Conventional Bridge Flap Technique and Bridge Flap Technique in addition to Autologous Platelet Rich Fibrin showed significant reduction in Recession Depth with mean reduction at 0.62 ± 0.96 mm and 0.50 ± 0.96 mm for each group respectively.
2. Similar changes were observed in the case for Recession Width for both the Groups (Conventional Bridge Flap Technique and Bridge Flap Technique in addition to Autologous Platelet Rich Fibrin) with reduction from baseline 2.38 ± 0.4 mm and 1.79 ± 0.64 mm respectively to at 6 months at 0.31 ± 0.63 mm and 0.53 ± 0.97 mm for Group A and Group B respectively.
3. The changes with Probing Depth were not significant in both the groups with staying constant at the end of 6 months.
4. The study showed an increase in the Width of Attached Gingiva in Group B but the increase was not significant with the mean values of Group A and Group B at the end of 6 months at 2.46 ± 0.35 mm and 2.64 ± 0.34 mm respectively.
5. An important finding of the current study is the significant increase in the Thickness of Gingiva in Group B which remained stable at the end of 6 months with an increase from baseline at 1.00 ± 0.00 mm to 1.85 ± 0.18 mm at 6 months whereas without the use of Autologous Platelet Rich Fibrin the thickness in Group A remained stable with no significant changes with reading at baseline 1.00 ± 0.08 mm and 1.01 ± 0.08 at 6 months.
6. After 6 months the percentage of root coverage obtained by Conventional Bridge Flap Technique and Bridge Flap Technique in addition to Autologous Platelet Rich Fibrin post-operatively was 79.04 ± 27.05 % and 82.20 ± 28.65 %. The difference was statistically significant ($p < 0.05$) between both groups.

Table 1: Inter Group Comparison of various Clinical Parameters over the period of 6 months .Group A: Conventional Bridge Flap Technique, Group B: Bridge Flap Technique with PRF(Platelet Rich Fibrin).

PARAMETERS	TIME PERIOD	GROUP A (MEAN +SD)	GROUP B (MEAN +SD)	DIFFERENCE
RECESSION DEPTH	BASELINE	2.39 ±0.88	2.33±1.00	0.06
	3 MONTH	0.66±0.99	0.76±1.02	0.1
	6 MONTH	0.62±0.96	0.50±0.96	0.12
RECESSION WIDTH	BASELINE	2.38±0.54	1.79±0.64	0.59
	3 MONTH	0.30±0.82	0.82±0.96	0.52
	6 MONTH	0.31±0.63	0.53±0.97	0.22
PROBING DEPTH	BASELINE	1.08±0.28	1.00±0.00	0.08
	3 MONTH	1.08±0.26	1.06±0.13	0.02
	6 MONTH	1.08±0.26	1.00±0.00	0.08
WIDTH OF ATTACHED GINGIVA	BASELINE	2.36±0.41	2.33±0.58	0.03
	3 MONTH	2.44±0.36	2.48±0.46	0.04
	6 MONTH	2.46±0.35	2.64±0.34	0.18
THICKNESS OF GINGIVA	BASELINE	1.00±0.08	1.00±0.00	0
	3 MONTH	1.07±0.08	1.71±0.23	0.64
	6 MONTH	1.01±0.08	1.85±0.18	0.84
PERCENTAGE OF ROOT COVERAGE	BASELINE	-	-	-
	3 MONTH	77.88±29.55	78.73±24.92	0.85
	6 MONTH	79.04±27.05	82.20±28.65	3.16

V. Discussion

An elaborate number of clinical parameters were used to measure the effect of PRF on recession coverage. The length was measured at the midline of the facial aspect of the tooth. These clinical parameters selected were in lieu of studies done by Gupta V et al. (2011), Musalaiah SVVS et al.(2012), Agarwal K et al.(2013), Thamaraiselvan M et al.(2015), Rajaram V et al. (2015) and Sandeep JN et al. (2016):

- *Recession Depth (RD).*

The changes in Recession Depth were measured at 3 months and 6 months. Both the groups showed statistically significant changes in recession depth . At the end of 3 month of the Group A showed a reduction of 0.66 ± 0.99 mm and Group B was at 0.76 ± 1.02 mm. The recession coverage remained stable over the period of 6 months some amount of creeping attachment was observed at the end of 6 months improving the recession depth in both the groups. For Group A recession depth at 6 months was 0.62 ± 0.94 mm and for Group B was 0.50 ± 0.96 mm (Table 1).

Rajaram V et al. (2015) also showed similar changes in recession depth coverage. Their study showed Conventional Bridge Flap at 0.70 ± 1.031 mm and Bridge Flap plus PRF at 0.70 ± 1.218 mm at the end of 6 months. Studies by Gupta V et al.(2011), Thamaraiselvan M et al. (2015), and Sandeep JN et al. (2016) consider only Conventional Bridge Flap Technique without any use of PRF or CTG but they all reported significant improvement in recession depth with only Conventional Bridge Flap technique. Agarwal K et al.⁹ used Bridge flap and PRF in addition with collagen membrane and reported satisfactory results in this combination with Conventional Bridge Flap Technique.

- *Recession Width (RW).*

The changes in Recession Width were measured at 3 months and 6 months. Both the groups showed statistically significant changes in Recession Width. At the end of 3 month of the Group A showed a reduction of 0.30 ± 0.63 mm and Group B was at 0.82 ± 0.96 mm. The recession coverage remained stable over the period of 6 months some amount of creeping attachment was observed at the end of 6 months reducing the recession width in both the groups. This could also be attributed to meticulous maintenance phase during recall visits. For Group A recession depth at 6 months was 0.31 ± 0.63 mm and for Group B was 0.53 ± 0.97 mm (Table 1).

The study conducted by Rajaram V et al. (2015) showed positive changes in reduction in recession width over the period of 6 months. They recorded the recession width at base line for their study for Conventional Bridge Flap Technique at 2.30 ± 0.308 mm which reduced to 0.65 ± 0.933 mm at the end of 6 months and in the Group of Bridge Flap Technique and PRF the baseline width was recorded at 2.10 ± 0.308 mm which reduced to 0.75 ± 1.209 mm. These changes in Recession Width are in accordance with the current study showing improvement in recession width using both conventional as well as in combination with a platelet derivative.

- *Probing Depth (PD).*

Probing Depth changes were also measured in the study at 3 months and 6 months. Both the groups displayed a stable Probing depth throughout the time period of the study. At the end of 3 month of the Group A showed a probing depth 1.08 ± 0.26 mm and Group B was at 1.06 ± 0.13 mm. Not much change in Probing depth were observed in both the Group this could be because of meticulous maintenance phase during recall visits. Probing Depth at 6 months for Group A was 1.08 ± 0.26 mm and for Group B was 1.0 ± 0.00 mm (Table 1). This is in accordance to a study by Rajaram V et al. (2015). The author also studied the changes in Probing Depth over a period of 6 months. They recorded a probing depth of 1.75 ± 0.550 mm in the conventional Bridge Flap Group and 1.85 ± 0.489 mm in Group of Bridge Flap Technique in addition with PRF.

- *Width of Attached Gingiva (WAG).*

There were significant changes in this specific clinical parameter seen in this study. Both the Groups started at a similar standpoint during the baseline measurements for Group A it was 2.36 ± 0.41 mm and for Group B was 2.33 ± 0.58 mm (Table 1). At 3 months a gain in width of attached gingiva was observed in both groups in Group A it was recorded at 2.44 ± 0.36 mm and for Group B it increased to 2.48 ± 0.46 mm. By the time for the next recording of clinical parameters at 6 months Group B showed further significant increase in the width of attached gingiva at a reading of 2.64 ± 0.34 mm whereas in Group A the width remained stable at 2.46 ± 0.35 mm (Table 1).

Gupta V et al. (2011) also stated an increase in width of attached gingiva with Conventional Bridge Flap similar to Group A in the current study. The author stated that their highest gain in attached gingiva was 4.6 times of the pre-operative and the least was 1.8 times with an average of 3.5 mm gain. Thamaraiselvan M et al. (2015), Sandeep JN et al. (2016) and Musalaiah SVVS et al. (2012) in the case report using the conventional Bridge Flap technique showed a gain of 2 mm of attached gingiva at the end of 9 month follow up. They concluded that the increase in attached gingiva can be attributed to the fact that the technique uses vestibuloplasty and the secondary healing occurring at the increases the amount of attached gingiva.

Rajaram V et al. (2015) also recorded gain in clinical attachment level and width of keratinized gingiva which was in lieu with the current study. The baseline parameters for the author's study for Clinical Attachment Level for Conventional Bridge Flap and Bridge Flap + PRF were 6.00 ± 0.973 mm and 5.95 ± 1.146 mm respectively and width of Keratinized gingiva for Conventional Bridge Flap and Bridge Flap + PRF were 1.70 ± 0.657 mm and 1.60 ± 0.821 mm respectively. Over the period of 6 months changes in Clinical attachment level were 1.45 ± 2.038 mm and 1.15 ± 1.899 mm for Conventional Bridge Flap and Bridge Flap + PRF respectively and the increase in width of keratinized gingiva were 4.80 ± 1.105 mm and 4.90 ± 0.553 mm respectively. These finding are similar to the results obtained in the current study.

- *Thickness of Gingiva (TG).*

Another important finding statistically significant during the course of the study was the increase in the thickness of gingiva in the Group B which used PRF in addition to the Conventional Bridge Flap Technique. The baseline parameters were almost similar in both the groups in Group A it was 1.00 ± 0.08 mm in the Group B it was 1.00 ± 0.00 mm (Table 4). The Group A findings remained stable by 3 months with a no increase of whereas in case of Group B increase in thickness was noticed to 0.71 mm (Table 9). By the 6 months completion the reading for Group A did not change and the increase in thickness in Group B was stable. The Group A thickness of gingiva at 6 month was 1.01 ± 0.08 mm and Group B was 1.85 ± 0.18 mm (Table 6).

Thamaraiselvan M et al. (2015) did a similar study using PRF in Coronally advanced flap technique (CAF) for single tooth recession coverage with a follow up of 6 months. The author also stated in an increase in the thickness of gingiva in the Group where CAF was performed with the use of PRF. The baseline parameter for the test group i.e. CAF+PRF was 0.95 ± 0.14 mm which increased to 1.25 ± 0.23 mm by the end of 6 months. The author suggested that the increase in thickness of gingiva might be due to the influence of growth factors from PRF membrane on the proliferation of gingival and PDL fibroblasts or to a spacing effect of PRF membrane. The findings of the current study are similar to the above mentioned study.

The gain in gingival thickness should be considered clinically significant since abundant empirical evidence suggests that thick tissue, resists trauma and subsequent recession, enables tissue manipulation, promotes creeping attachment and exhibits less clinical inflammation. In agreement with those Woodyard et al. (2004) reported a greater number of sites with CRC (Complete Root Coverage) when treated with Alloderm, which increased the marginal soft tissue thickness. Similarly, Pini-Prato et al. (2010) have reported a creeping attachment post-surgically at sites where GTH (Gingival Tissue Thickness) was increased using connective tissue graft.

- **Percentage of Root Coverage (PRC).**

The amount of root coverage is one of the most important clinical parameter determining the success of any root coverage technique. Both the groups in 6 months showed significant root coverage. The amount recession coverage observed at 3 months are: For Group A it was 77.88 ± 29.55 % and for Group B it was 78.73 ± 24.92 %. As there was creeping attachment observed in the recession depth parameter this also affected positively the amount of recession coverage by the end of the study at 6 months. At 6 months the Percentage of Recession Coverage for Group A is 79.04 ± 27.05 % and for Group B is 82.20 ± 28.65 %. The results show a better recession coverage in Group B when compared to Group A at the end of 6 months (Table 1).

Rajaram V et al.(2015) in his study of comparison of Bridge Flap Technique with and without PRF showed no statistically significant difference in mean root coverage with 79.95 ± 29.10 % in Conventional Bridge Flap and 78.75 ± 37.60 % with use of PRF. The author stated the 14 out of 20 cases showed 100% coverage with the use of PRF whereas in the conventional group only 13 out of 20 groups showed 100% coverage. Gupta V et al.(2011), Musalaiah SVVS et al.(2012), Agarwal K et al. (2013), Thamaraiselvan M et al.(2015), and Sandeep JN et al. (2016) concluded satisfactory recession coverage using only Conventional Bridge Flap technique.

VI. Conclusion

Within the limits of the present investigation, showed that Bridge Flap Technique is effective in multiple recession coverage. The use of Autologous Platelet Rich Fibrin in addition to Bridge Flap Technique showed better recession coverage as compared to Conventional Bridge Flap with improvement in Gingival Thickness and Width of Attached Gingiva.

In the current study, it was observed that quality of supporting tissue and the quantity of gingival recession do not affect the success of the technique. The increase in attached gingiva might be due to the transposed alveolar mucosa. The possible source of induction of keratinisation of the underlying tissues according to a study done by Bokan et al. (1997). The increase in thickness of gingiva might be due to the influence of growth factors from PRF membrane on the proliferation of gingival and PDL fibroblasts or to a spacing effect of PRF membrane.

In regard to the type of attachment obtained by Conventional Bridge Flap Technique and Bridge Flap + PRF, conclusions cannot be based on the clinical measurements taken in the present study. Histological study is required to assess the type of attachment achieved. However, for present study histological analysis was not possible as it requires biopsy specimens, which is not justified on ethical grounds. The study sample was restricted to Miller's Class I and Class II recession. Further study can be done to evaluate the effectiveness of Conventional Bridge Flap Technique and Bridge Flap + PRF with a larger sample size and greater time period of follow up.

So according to this study it can be concluded that the use of Autologous Platelet Rich Fibrin has a positive effect in recession coverage, Thickness of Gingiva and an increase in Width of Attached Gingiva when used for multiple Miller's Class I and Class II gingival recession using Bridge Flap Technique.

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