Evaluation of The Effect of Platelet Rich Fibrin (PRF) Combined With Collagen Membrane in Management of Gingival Recession

Hossam Hassan Ibrahim*1, Mohamed Mahgob Al Ashmawy2, Salem Abdelmonem Waly3, Khalid Seddiek Hassan1

ABSTRACT

Aim: The purpose of this study was to evaluate the efficacy of the (PRF) combined with collagen membrane in the management of gingival recession compared to the use of (PRF) alone. Subjects and methods: 10 sites including at least one tooth with Miller’s class II or class III buccal/labial gingival recession defect after phase I therapy were divided randomly into 2 groups, Group (I) was treated with open flap surgery while using (PRF) and Group (II) was treated with open flap surgery while using (PRF) combined with collagen membrane. Clinical parameters were recorded at baseline, 3and 6 months postoperatively. Results: both treatment groups showed no significant root coverage. Probing sulcus depth (PSD) reduction, Clinical attachment level (CAL) gain 6-months after surgery when compared with baseline between two groups. However, there was a significant increase of Height of keratinized gingiva (HKG) between (Group I) and (Group II) at 3-months and 6-months. Conclusion: Both the treatment modalities proved to be effective techniques in treatment of root coverage and Using of PRF + Collagen membrane showed superior effect compared to PRF alone, suggest that PRF + Collagen membrane can provide additional benefits not in the treatment of gingival recession but in increasing of the width of attached gingiva

KEYWORDS

Platelet Rich Fibrin, collagen membrane, gingival recession, attached gingiva, root coverage.

INTRODUCTION

Gingival recession can be defined as the displacement of the marginal tissue apical to the cemento-enamel junction (CEJ), causing exposure of the root surface of a tooth(1).

Gingival recession can be categorized using Miller’s classification. This classification remains the most widely employed system for local recession defects. It is based on the morphological evaluation of the defect and the likelihood of achieving full or at least partial root coverage following surgery. Class I and class II recession defects of less than 5 mm have been shown to be favorable for complete root coverage. Class III recession defects have a poor prognosis for complete root coverage. When dealing with class IV defects, root coverage is unlikely to be achieved (2).
Treatment of recession defects associated with multiple teeth poses greater challenge to clinician as avascular root surface area is more extensive. Also, thin biotype, decreased Keratinized tissue width, root prominence and root proximity make the choice of surgical treatment difficult, main indication for root coverage procedures are aesthetic concern, dentinal hypersensitivity, prevention of root caries and cervical abrasion, improve plaque control efforts (3).

Platelet Rich Fibrin (PRF) a second generation platelet concentration, has been used extensively for periodontal regeneration, ridge augmentation, sinus lift procedures and for coverage of gingival recession defects in the form of a membrane. It has become a focus of current studies because of its potential to accelerate healing (4).

Guided Tissue Regeneration (GTR) is a technique for the prevention of epithelial migration along the cemental wall of the pocket and maintaining space for clot stabilization, (GTR) has successfully shown to prevent the migration of epithelial and gingival connective tissue cell in previously disease surfaces, excluding the epithelium and the gingival connective tissue from root surface during the postsurgical healing phase not only prevents epithelial migration into the wound but also favors repopulation of the area by cells from the periodontal ligament and the bone (5).

Barriers and membranes are materials used to separate the raised flap (gingival epithelial and connective tissue) from the periodontal ligament and the bone, Resorbable barrier provided the advantage of eliminating the second surgery to retrieve the undergraded barrier membrane (6).

**SUBJECTS AND METHODS**

**Study setting and population:**

This study was designed as a randomized clinical controlled trail carried out on periodontitis patients with gingival recession. Those were selected from the outpatient clinics of department of Oral Medicine and Periodontology, Faculty of Dental Medicine, Al-Azhar University, Assiut, On the basis of patient history, clinical and radiographic examination, all patients diagnosed with Miller’s Class II and III.

**Inclusion and Exclusion criteria:**

- The presence of at least one tooth with Miller’s Class II buccal/labial gingival recession defect following phase I therapy (scaling and root planning).
- All patients had a good compliance, acceptable for oral hygiene instructions, non-smokers and cooperative.
- Female patients were neither pregnant nor taking contraceptive pills.
- No previous history of periodontal surgery in the diseased region in the last 6 months or taking antibiotics or anti-inflammatory drugs in the last 3 months.

**Patients grouping and randomization:**

Patients were divided randomly into 2 groups using online software (https://www.randomizer.org); numbers were concealed in closed envelopes:

**Group (I):** 10 sites with gingival recession received coronally advanced flap surgery using (PRF) alone.

**Group (II):** 10 sites with gingival recession received coronally advanced flap surgery using (PRF) combined with collagen membrane.

**Periodontal intervention:**

All patients received phase I therapy including Full-mouth scaling and root planning using manual scalers and curettes or ultrasonic scaler.

**PRF preparation:**

A blood sample of the patient was drawn in 10 ml test tubes without an anticogulant and centrifuged immediately. Blood was centrifuged...
for 10 min at 3000 rpm (7). The resultant product consisted of the following three layers; the upper layer of acellular PPP (platelet-poor plasma), PRF clot in the middle and red blood cells at the bottom. PRF was easily separated from red corpuscles base using sterile tweezers and scissors. The fibrin clot was then placed on the grid in the PRF box with the compressor and lid. This produces an inexpensive fibrin membrane in approximately one minute.

**Surgical procedure:**

- The patients were anaesthetized using infiltration or nerve block technique, A full thickness open flap surgery was performed the incision was extended to interproximal line angles of teeth to provide adequate flap reflection (CEJ) with surgical blade no.15 followed by an intrasulcular/crevicular incision on the buccal aspect.

- A full thickness mucoperiosteal flap was elevated up to the mucogingival junction followed by a partial thickness flap to enable passive coronal displacement of the flap.

- Complete debridement of exposed root surfaces was performed by combination of ultrasonic & hand instruments, The surgical field was irrigated with normal saline solution (0.9%).

- The surgical site was flushed with previously prepared PRF fluid which also contains multiple growth factors. PRF membrane was positioned on the recession defect at the height of the cementoenamel junction (CEJ) for group (Group I, II).

- For (group II), collagen membranes were hydrated in sterile saline, trimmed and adapted over the PRF in such a manner that the entire defect and ≥ 2mm of the surrounding alveolar bone was completely covered to avoid membrane collapse.

- The flaps were sutured coronally with 3% black silk with vertically or horizontally interrupted technique.

**Clinical photographs:** In all groups, every procedure was documented by photographs at different observation periods of the study (Fig 1, 2)

---

Fig. (1) Clinical photographs of a female patient 22 years old with class III (GR) in lower central incisors. (a) Before treatment. (b) Flap reflection and PRF Membrane in place. (e) Collagen membrane in place at lower right central as it represent group(II) and lower left central incisor represent group (I). (d) Flap sutting. (e) 6th month postoperative.
Periodontal evaluation:

All patients were evaluated clinically at baseline, 1, 3 and 6 months post surgically using the following parameters: Plaque index (PI), Gingival index (GI), Gingival recession (GR), Clinical attachment level (CAL), Probing sulcus depth (PSD), Height of keratinized gingiva (HKG).

Statistical analysis:

The mean and standard deviation values were calculated for each group in each test. Data were explored for normality using Kolmogorov-Smirnov and Shapiro-Wilk tests. PI, GI, Probing sulcus depth and HKG data showed non-parametric (not-normal) distribution (scores) while the rest of data showed parametric (normal) distribution.

The significance level was set at $P \leq 0.05$. Statistical analysis was performed with IBM® SPSS® Statistics Version 20 for Windows.

RESULTS

Changes in plaque index (PI): There was no statistically significant difference between (Group I) and (Group II) at base line, 1, 3 and 6 months where ($p=0.648$), ($p=0.522$), ($p=0.391$) respectively.

Changes in gingival index (GI): There was no statistically significant difference between (Group I) and (Group II) at base line, 1, 3 and 6 months where ($p=0.648$), ($p=0.111$) and ($p=0.752$) respectively.

Changes in gingival recession (GR): The mean value of (Group I) at base line was $3.9_{\text{mm}}$ which decreased to $2.75_{\text{mm}}$ after 6 months, (Group II) at base line was $4.2_{\text{mm}}$ which decreased to $2.1_{\text{mm}}$ after 6 months. While there was no statistically significant difference between (Group I) and (Group II) at base line, 1, 3 and 6 months where ($p=0.600$), ($p=0.448$) and ($p=0.301$) respectively.

Changes in clinical attachment level (CAL): The mean value of (Group I) at base line was $4.5_{\text{mm}}$ which decreased to $3.4_{\text{mm}}$ after 6 months, (Group II) at base line was $4.75_{\text{mm}}$ and decreased to $2.85_{\text{mm}}$.

Fig. (1) Clinical photographs of a female patient 28 years old with class II& III gingival recession in the lower incisors. (a) After phase I therapy. (b) Flap reflection. (c) PRF membrane in place. (d) Collagen membrane in place at lower right incisors as it represent Group (II); PRF membrane in place at lower left incisors as it represent Group (I). (e) Flap suturing. (f) 6th month postoperative.
after 6 months. While there was no statistically significant difference between (Group I) and (Group II) at base line, 3 and 6 months where ($p=0.685$), ($p=0.757$) and ($p=0.411$) respectively.

**Changes in Probing sulcus depth (PSD):** There was no statistically significant difference between (Group I) and (Group II) at base line, 3 and 6 months where ($p=0.687$), ($p=0.251$) and ($p=0.327$) respectively.

**Changes in Height of keratinized gingiva (HKG):** The mean value of (Group I) at base line was 0 mm which increased to 1.4 mm after 6 months, (Group II) at base line was 0 mm which increased to 2.1 mm after 6 months. While there was no statistically significant difference between (Group I) and (Group II) at baseline and 1 month, while There was a statistically significant difference between (Group I) and (Group II) at (3m) and (6m) where ($p=0.001$) and ($p=0.002$) respectively.

**DISCUSSION**

Treatment of recession defects associated with multiple teeth poses greater challenge to clinician as a vascular root surface area is more extensive. Also, thin biotype, decreased keratinized tissue width, root prominence and root proximity make the choice of surgical treatment difficult, main indication for root coverage procedures are aesthetic concern, dentinal hypersensitivity, prevention of root caries and cervical abrasion, improve plaque control efforts (8).

The split-mouth design was used in the present study because it was realized that split-mouth design is very successful design in many oral health researchers due to the removal of much of the inter-subject variability thereby increasing the power of the study compared to the whole-mouth design (9).

All baseline parameters were found to be similar without statistically significant differences in all groups. This homogeneity in the baseline criteria and randomization protocol led to the elimination of bias in case selection (10).

Regarding Plaque index (PI) and Gingival index (GI), the insignificant difference between the two groups are attributed to the maintenance of oral hygiene by the patients as per instructions given to them during the study periods.

Regarding root coverage, a significant reduction in recession depth was noted in group (I,II) from

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Intervals</th>
<th>Group I</th>
<th>Group II</th>
</tr>
</thead>
<tbody>
<tr>
<td>PI</td>
<td>Baseline</td>
<td>0.15(^{aA})</td>
<td>0.18(^{ab})</td>
</tr>
<tr>
<td></td>
<td>3m</td>
<td>0.38(^{ab})</td>
<td>0.33(^{A})</td>
</tr>
<tr>
<td></td>
<td>6m</td>
<td>0.48(^{ab})</td>
<td>0.38(^{A})</td>
</tr>
<tr>
<td></td>
<td>P-value</td>
<td>0.001(*)</td>
<td>0.021(*)</td>
</tr>
<tr>
<td>GI</td>
<td>Baseline</td>
<td>0.10(^{bC})</td>
<td>0.08(^{ab})</td>
</tr>
<tr>
<td></td>
<td>3m</td>
<td>0.20(^{ab})</td>
<td>0.30(^{A})</td>
</tr>
<tr>
<td></td>
<td>6m</td>
<td>0.30(^{ab})</td>
<td>0.33(^{A})</td>
</tr>
<tr>
<td></td>
<td>P-value</td>
<td>0.002(*)</td>
<td>0.001(*)</td>
</tr>
<tr>
<td>GR</td>
<td>Baseline</td>
<td>3.90(^{aA})</td>
<td>4.20(^{A})</td>
</tr>
<tr>
<td></td>
<td>3m</td>
<td>2.95(^{ab})</td>
<td>2.50(^{a})</td>
</tr>
<tr>
<td></td>
<td>6m</td>
<td>2.75(^{ab})</td>
<td>2.10(^{c})</td>
</tr>
<tr>
<td></td>
<td>P-value</td>
<td>&lt;0.001(*)</td>
<td>&lt;0.001(*)</td>
</tr>
<tr>
<td>CAL</td>
<td>Baseline</td>
<td>4.50(^{aA})</td>
<td>4.75(^{A})</td>
</tr>
<tr>
<td></td>
<td>3m</td>
<td>3.50(^{ab})</td>
<td>3.30(^{a})</td>
</tr>
<tr>
<td></td>
<td>6m</td>
<td>3.40(^{ab})</td>
<td>2.85(^{c})</td>
</tr>
<tr>
<td></td>
<td>P-value</td>
<td>&lt;0.001(*)</td>
<td>&lt;0.001(*)</td>
</tr>
</tbody>
</table>

**TABLE (1) Demonstrates the statistical comparisons of clinical parameters at time intervals; baseline, 1,3 and 6 months in group I and group II.**
baseline to 6 months, at group (I) related to use of PRF membrane alone, a statistically significant achievement in a recession reduction was reported at both 3 and 6 months when compared to baseline, at group (II) related to use of PRF combined with collagen membrane, a statistically significant achievement in a recession reduction was reported at both 3 and 6 months when compared to baseline\(^{(11)}\).

The findings of the present study are contrasting to the results of a study \(^{(12)}\), concluded that PRF membrane didn’t improve the root coverage, and keratinized mucosa width on clinical attachment compared to other treatment modalities due to its rapid degradation on the surgical site which could interfere with the early stabilization of periodontal tissues during healing. Therefore, our study has been used PRF+collagen membrane to over willing this drawbacks.

Regarding clinical attachment level, a significant gain in CAL was obtained in group (I, II) from baseline to 6 months. This finding is in agreement with previous studies who reported a superior length of new bone and cementum in sites treated by GTR for the treatment of dehiscence-type gingival recession defects \(^{(13,14)}\).

Regarding Probing sulcus depth, there was no statistically significant difference was found between baseline, 3 months and 6 months. This findings may be due to the small value and the little amount of change in the probing sulcus depth.

Regarding height of keratinized tissue, an increase was noted at 3\(^{rd}\) and 6\(^{th}\) month compared to baseline in group (I, II). Since the mucogingival line has a tendency to regain its genetically defined position, increase of gingival tissue can be advocated by coronally positioned flaps \(^{(15)}\), also we found that there was a statistically significant difference between (Group I) and (Group II) at (3m) and (6m), this may be due to the role of the GTR-based root coverage gained its KG via new tissue regeneration from periodontal ligament cells and mucogingival junction migrated apically overtime previous studies also showed similar results of more keratinized gingiva in GTR if a longer healing period was allowed \(^{(16,17)}\).

**CONCLUSIONS**

Within the limitations of the present study, we can conclude that, both the treatment modalities proved to be effective techniques in treatment of root coverage and using of PRF + Collagen membrane showed superior effect compared to PRF alone, suggest that PRF + Collagen membrane can provide additional benefits not in the treatment of gingival recession but in increasing of the width of attached gingiva.

**REFERENCES**

Evaluation of The Effect of Platelet Rich Fibrin (PRF) Combined With Collagen Membrane in Management of Gingival Recession


Evaluation of The Effect of Platelet Rich Fibrin (PRF) Combined With Collagen Membrane in Management of Gingival Recession

Hossam Hassan Ibrahim, et al.

Abstract:

The aim of this study was to compare between using platelet rich fibrin (PRF) alone versus patients using PRF combined with collagen membrane in management of second and third degree gingival recession according to Miller’s classification.

The study was conducted on healthy patients of both sexes, with one tooth at least infected with one of the gingival recessions of the second or third degree according to Miller’s classification. The patients were divided into two groups: group 1 was treated using PRF only, while group 2 was treated using both PRF and collagen membrane. All cases were clinically evaluated before surgery, immediately after surgery, and 6 months after surgery. The results showed no statistically significant differences between the two groups at the beginning of the evaluation, and after 6 months, it was found that all the cases were treated effectively in terms of root coverage. However, the use of both PRF and collagen membrane showed a significant effect compared to using PRF alone, which indicates that the use of PRF and collagen membrane can provide additional benefits in treating gingival recession.

Keywords: Platelet rich fibrin (PRF), Collagen membrane, Gingival recession, Root coverage.