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

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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.

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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 anticoagulant 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. **(c)** Collagen membrane in place at lower right central as it represent group(II) and lower left central incisor represent group (I). **(d)** Flap suturing. **(e)** 6th month postoperative.

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.

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_{mm} which decreased to 2.75_{mm} after 6 months, (Group II) at base line was 4.2_{mm} which decreased to 2.1_{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_{mm} which decreased to 3.4_{mm} after 6 months, (Group II) at base line was 4.75_{mm} and decreased to 2.85_{mm}

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 baseline 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.

TABLE (1) *Demonstrates the statistical comparisons of clinical parameters at time intervals; baseline, 1,3 and 6 months in group I and group II.*

Parameter	Intervals	Group I	Group II
PI	Baseline	0.15^{aC}	0.18^{aB}
	3m	0.38^{aB}	0.33^{aA}
	6m	0.48^{aA}	0.38^{aA}
	P-value	0.001*	0.021*
GI	Baseline	0.10^{aC}	0.08^{aB}
	3m	0.20^{aB}	0.30^{aA}
	6m	0.30^{aA}	0.33^{aA}
	P-value	0.002*	0.001*
GR	Baseline	3.90^{aA}	4.20^{aA}
	3m	2.95^{aB}	2.50^{aB}
	6m	2.75^{aB}	2.10^{aC}
	P-value	<0.001*	<0.001*
CAL	Baseline	4.50^{aA}	4.75^{aA}
	3m	3.50^{aB}	3.30^{aB}
	6m	3.40^{aB}	2.85^{aC}
	P-value	<0.001*	<0.001*
PSD	Baseline	0.60^{aA}	0.55^{aA}
	3m	0.55^{aA}	0.70^{aA}
	6m	0.65^{aA}	0.75^{aA}
	P-value	0.549ns	0.903ns
HKG	Baseline	0.00^{aC}	0.00^{aC}
	3m	1.00^{bB}	1.70^{bB}
	6m	1.40^{bA}	2.10^{aA}
	P-value	<0.001*	<0.001*

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

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 3rd and 6th 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.

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تقييم تأثير استخدام الفيبرين الغني بالبلازما وغشاء الكولاجين في علاج انحسار اللثة

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الملخص:

الهدف: كان الغرض من هذه الدراسة هو المقارنة بين استخدام الفيبرين الغني بالبلازما وحده مقابل استخدام الفيبرين الغني بالبلازما وغشاء الكولاجين في علاج انحسار اللثة من الصنف الثاني والثالث وفقًا لتصنيف ميلر.

المواد والأساليب: أجريت الدراسة الحالية على مرضى يتمتعون بصحة جيدة من كلا الجنسين . وتم تشخيصهم بسن واحد على الأقل مصاب بعيب انحسار اللثة من الدرجة الثانية أو الثالثة وفقًا لتصنيف ميلرو ذلك بعد علاج المرحلة الأولى.تم إختيار جميع المرضى من المترددين علي العيادة الخارجية لقسم طب الفم و أمراض اللثة, كلية طب الأسنان, جامعة الأزهر, فرع أسيوط. تم تقسيم جميع المرضى إلى مجموعتين متساويتين:المجموعة (1): 10 مواقع مصابة بانحسار اللثة تمت معالجتهم جراحياً عن طريق رفع حافة اللثة المتقدم باستخدام الفيبرين الغني بالبلازما وحده. المجموعة (2): 10 مواقع مصابة بانحسار اللثة تمت معالجتهم جراحياً عن طريق رفع حافة اللثة المتقدم باستخدام الفيبرين الغني بالبلازما وغشاء الكولاجين. تم تقييم جميع الحالات إكلينيكياً قبل الجراحة, بعد الجراحة مباشرة, بعد 3, 6 أشهر.

النتائج: أظهرت الدراسة عدم وجود فروق إحصائية بين نتائج المجموعتين و ذلك عند مقارنة بداية التقيم, 3 و 6 أشهر بعد الجراحة.

الخلاصة:أثبتت كل من طرق العلاج أنها مواد فعالة من حيث تغطية الجذور.أظهر استخدام الفيبرين الغني بالبلازما وغشاء الكولاجين تأثيرًا فائقًا مقارنة بـأستخدام الفيبرين الغني بالبلازما وحده, مما يشير إلى أن استخدام الفيبرين الغني بالبلازما وغشاء الكولاجين يمكن أن يوفر فوائد إضافية في علاج التراجع اللثوى.

الكلمات المفتاحية: الفيبرين الغني بالبلازما, وغشاء الكولاجين, انحسار اللثة, اللثه الملتصقه, تغطية الجذور.