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Clinical Assessment of Platelet Rich Fibrin Matrix in Treatment of Gingival Recession: A Randomized Controlled Clinical Study

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ABSTRACT

Purpose: to measure platelet rich fibrin matrix PRFM in enhancing root coverage of Miller class I and II gingival recession clinically by coronally advanced flap. **Materials and Methods:** Eighteen healthy patients were randomly splitted for three groups: group I (Test group): five patients treated using Platelet Rich Fibrin Matrix (PRFM) membrane and coronally advanced flap, group II (Positive Control group): five patients treated by collagen membrane and coronally advanced flap and group III (Negative control group): five patients treated only using coronally advanced flap. Recession width (RW), recession depth (RD), and probing pocket depth (PPD) were evaluated at baseline, three months and six months respectively. **Results:** In comparing all groups at all time intervals recorded in RD and RW, a statistically significant difference was found. A great reduction in PPD were recorded at 6 months than at 3 months (P-value = 0.50). However, this difference was statistically insignificant. **Conclusion:** The use of PRFM was effective in treatment of gingival recessions. However, there was no difference recorded between the use of a coronally advanced flap alone and a coronally advanced flap combined with PRFM or collagen membrane in root coverage after 6 months.

KEYWORDS

PRFM, Recession,
Coronally advanced flap.

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INTRODUCTION

Gingival recession (GR) was first defined by Gorman (1967)⁽¹⁾ as apical migration of gingiva exposing the root. It was also known as the term used to describe the apical movement in gingival margin from position at crown to more apical position at surface the root at a level below the cemento-enamel junction (CEJ)⁽²⁾.

GR may be generalized or localized, is a clinical feature of periodontal disease⁽³⁾. Surveys reported 88% in people at/over 65 years age and 50% in people at age between 18 & 64 years have ≥ 1 site showing gingival recession⁽⁴⁾. Clinically, it appears as root surface exposure, marginal tissue loss, and loss in attachment⁽⁵⁾. Loss of gingival tissue can contribute to root sensitivity, unesthetic appearance, unnatural restorative contours, and abrasions or erosion which described as carious and non-carious cervical lesions (NCCL)⁽⁵⁾.

Like many other periodontal conditions, the etiology of gingival recessions is multifactorial and complex, with its exact mechanism not fully understood yet⁽⁶⁾. Recession may occur within normal sulci and non-diseased bone between teeth. Also, it may appear as a part in the pathogenesis within periodontal disease. The etiology of GR may be due to anatomical (developmental) or acquired (physiological or pathological)⁽⁷⁾.

Surgical operations used for treatment of recession may be classified into advanced procedures for flaps (semilunar coronally repositioned flap, coronally repositioned flap); Pedicle soft-tissue graft procedures, oblique rotated flap, double papilla flap; Graft of soft-tissue procedures (connective tissue graft & epithelialized graft) and Regenerative procedures (application of enamel matrix proteins or using barrier membrane)⁽⁸⁾.

The choice of one surgical technique in comparison with others rely on various factors; a) depth of the vestibule and the muscle pull or the presence of frenum), in addition to, b) the presence/

absence, quantity/ quality of keratinized tissue apical and lateral to the defect, c) the width and height of the interdental soft tissue (papillae), d) some related defect factors as the number and size of the recession e) need to minimize postoperative discomfort and the esthetic request which are the most important patient-related factors must be considered for selecting root coverage surgical technique, also, f) To select the most suitable surgical approach according to the clinical situation⁽⁹⁾.

The coronally advanced flap operation is a widespread approach for root coverage. CAF procedure rely on the coronal movement of the soft tissues on the exposed root surface⁽¹⁰⁾. It has the advantage of being simple technique, well tolerated by the patient and gives most favorable results from an esthetic opinion. Presence of keratinized tissue thickness and adequate height apical to the root exposure needed to make the coronally advanced flap about (1 mm in small recessions and 2 mm in recessions ≥ 5 mm)⁽¹¹⁾.

The modified coronal flap by De Sanctis & Zucchelli in 2007⁽¹²⁾ had shown some biologic and clinical benefits over the previous split–full–split thickness flap elevation⁽⁹⁾.

Using collagen membranes for tissue regeneration used for root coverage include many advantages like collagen material is a natural and can be tolerated by the host, It has absorbable nature which makes a scaffold for repair of tissues during augmentation of gingival thickness through expansion in vivo and It has a chemotactic role for host cell encouragement, attachment and migration, so facilitate the primary wound closure. These properties are essential for proper healing: wound primary closure, promote attachment of connective tissue and clot stability, maintenance/ creation of space, epithelial down-growth prevention⁽¹³⁾.

Numerous preparations for autologous platelet concentrates have been progressed and finally reached high platelets concentration entrapped in a fibrin products that can be topically applied

and used for oral and maxillofacial surgery⁽¹⁴⁾. Two generations of platelet concentrates which are (PRF) and (PRP) were invented⁽¹⁵⁾.

Among many different sorts of platelet concentrates, PRFM has been progressively used as it is the most suitable biomaterial for regeneration used in dental field⁽¹⁶⁾. PRFM play more than one functions such as scaffold, matrix and higher affinity in tissue regeneration than PRP^(17,18). Different growth factors had been found in PRFM as epidermal growth factor (PD-EGF), platelet-derived growth factor (PDGF, A+B) and insulin-like growth factor 1,2 (IGF-1,2). These growth factors have different biological activities a) Cell growth, differentiation b) Collagen synthesis c) Blood vessel growth, granulation and d) Cytokine secretion on host cells⁽¹⁹⁾.

MATERIAL AND METHODS

Study design

This study was a randomized controlled clinical trial on 18 cases were chosen from Oral Medicine & Periodontology department out-patient clinic's, faculty of Dental Medicine for Girls, Al-Azhar University.

Sample Size:

Sample size calculations achieved using power Program (University of Düsseldorf, Düsseldorf, Germany). Based on a previous study⁽²⁰⁾ A total sample size of 18 cases (6 in each of the three groups) was sufficient to detect an effect size of 0.70 at a power (1- β error) of 0.8 and using a two-sided hypothesis test and a significance level (α error) 0.05 for data. Total number of patients were divided randomly into three groups; **Group I (Test group)**: patients treated by Platelet Rich Fibrin Matrix (PRFM) membrane and coronally advanced flap; **Group II (Positive Control group)**: patients treated by collagen membrane and coronally advanced flap and **Group III (Negative control group)**: patients treated only with coronally advanced flap.

The patients were selected according to selected criteria of Systemically healthy subjects (males and females) with age > 18 years with no complicated medical history, Presence of Miller recession at buccal surface I or II classes with 2 mm or more depth of Recession (RD), depth of probing (PD) 3 mm or less and thickness of gingiva (GT) 1 mm or more limited to maxillary and mandibular incisors, canines and premolars). A consent form was signed by patients, including explanation the nature of study, side effects if any and time obligation for the proposed treatment.

Presurgical Procedure (Etio-tropic Phase)

Initial therapy (Phase I Therapy) for all patients and detailed oral hygiene instructions. All patients was subjected to full-mouth scaling and root planing. A re-evaluation for participants to confirm eligibility to inclusion criteria after four weeks following initial therapy.

Preparation of PRFM

PRFM made immediately before surgery as the manufacturer's guide (FIBRINET® Cascade Medical Enterprises, Wayne, NJ, USA). Amount of 18 ml venous blood was collected into blood collection/separation tubes from group I participants. The tubes were gently mixed and then centrifuged for 6 minutes at 1100g to get PRP. PRP was added to tube containing calcium chloride (0.25 mL CaCl₂ 1M). The tube was shaken and immediately put in a centrifuge and centrifuged at 4500g for 25 minutes at 25°C. Finally, The product was yellow-white translucent platelet-fibrin matrix was recovered at the bottom. The PRFM thus obtained was squeezed with sterilized and moist gauze piece to form PRFM membrane.

Surgical Procedure

Lidocaine was used to anesthetize the surgical sites with, 1:100,000 adrenaline. The flap design begins with intrasulcular incisions performed around involved tooth/teeth. Horizontal incisions performed at base of each IDP slightly coronal

to the CEJ. This was followed by two vertical incisions at a level below the mucogingival junction at mesiobuccal and distobuccal line angles of the affected teeth/tooth. Using a blunt dissection the elevated mucoperiosteal flap was trapezoidal till the level at MGJ. Using sharp dissection a partial thickness flap was begun at the MGJ and continued apically until the flap coronally repositioned and passively was sited, with no tension up to level of cement enamel junction.

Using 15-C blade, Incisions were made and papillae were deepithelialized to create a connective tissue bed⁽¹⁵⁾. Using area specific curettes for removal of plaque, calculus and exposed root surfaces was planed. No root conditioning procedures were done. The procedure was the same in group I, II and III except for using PRFM in group I and collagen membrane in group II to cover the recession site and extend apically at a level below the recession defects by 3 mm or more before advancing the flap coronally. For both the groups, membranes (PRFM and Collagen) placed at level of CEJ and were extended to the minimum of 2 mm mesially, distally and apically to the crestal area. In case of control Group III (CAF alone), no membrane was used to cover the recession defects.

To fully cover membrane, raised flap was positioned in more coronal direction and sutured by using 5-0 polyglycolic acid (PGA) absorbable suture (AssuCryl®Hypro-Sorb, Bioimplon GmbH, Germany). The margin of the gingival flap was repositioned on the enamel in the both experimental and control sites and was placed in that position with horizontal sling & interrupted sutures. Interrupted sutures made to close the vertical releasing incisions with the same suture material.

Clinical evaluation:

William's graduated probe was used to measure the clinical parameters at the selected sites; 1) PPD to be measured at the margin of gingiva to the base of periodontal pocket⁽²¹⁾; 2) Recession depth to be measured at CEJ to the free gingival margin (FGM) mid-facially⁽⁵⁾ and 3) Recession width

measured at the level of the CEJ in a mesio-distal direction. All parameters were recorded at baseline (On the day of surgical procedure), after 3 and 6 months respectively (Fig. 1).



Figure (1) Clinical use of acrylic stent and a William's graduated periodontal probe.

RESULTS

Recession depth (RD)

RD showed non-statistically significant difference between all groups in all time intervals at 3 months (P -value=0.68) and at 6 months (P -value=0.95). Mean and standard deviation ($M \pm Sd$) was 1 ± 1.26 in group I, 0.5 ± 0.55 in group II and 0.7 ± 1.03 in group III at 3 months while at 6 months $M \pm Sd$ values were 0.8 ± 0.98 in group I, 1 ± 0.89 in group II and 0.9 ± 0.92 in group III.

Recession width (RW)

A non-significant statistical difference was reported between three groups at 3 months (P -value=0.66) and at 6 months (P -value=0.58). In group II the $M \pm Sd$ values at 6 months were 0.5 ± 0.55 while in group I was 1 ± 1.26 and group III was 1 ± 0.89 .

Probing depth (PD)

PD showed a lower (P -value=0.13) at 6 months than at 3 months (P -value=0.50). However, this difference was statistically insignificant. Group I showed the least $M \pm Sd$ values at 3 and 6 months (Table 1).

At the finish of the study no difference was detected between all groups.

Table (1): Mean (M) and standard deviation (Sd) RD, RW and PD between the three groups after 3 and 6 months:

	RD			
	M±Sd at 3 months	M±Sd at 6 months	p-Val-ue# at 3 months	p-Val-ue# at 6 months
Group I	0.83±1.33	0.67±1.03	0.854 NS	0.821 NS
Group II	0.50±0.55	1.00±0.89		
Group III	0.67±1.03	0.92±0.92		
	RW			
Group I	1.17±1.47	0.83±1.33	0.426 NS	0.673 NS
Group II	0.33±0.52	0.50±0.55		
Group III	0.67±1.03	1.00±0.89		
	PD			
Group I	0.8±0.26	0.17±0.26	0.141 NS	0.145 NS
Group II	1.00±0.00	0.33±0.41		
Group III	1.00±0.00	0.67±0.52		

*=significant ($P>0.05$), NS= Non-Significant, #: One Way ANOVA

DISCUSSION

Periodontal surgery mainly aims to create an easily maintainable periodontal environment to prevent recurrence. Also, there are procedures to improve esthetics that come under the category of periodontal plastic surgery⁽²²⁾.

CAF has shown good results in Miller buccal recession Class I and II treatment. The predictability of the CAF in conjunction with PRFM for management of recession has not been assessed previously.

In the present study, all groups showed optimal root coverage; however, PD did not give significant

difference between the three groups. These findings correlated with the results obtained from a previous study in 2013⁽²³⁾. When Group I, II and III were in comparison, Group II showed greater reduction in RD at 6 month but it was not statistically significant. These results were in accordance with another study⁽²⁴⁾, who reported no differences in root coverage between using coronally advanced flaps with or without graft after 2 years follow up.

The fibrin matrix shows biologic functions & mechanical properties adhesive like fibrin glues. PRFM stabilize flaps at higher stable position, improves neoangiogenesis, decreases necrosis and flap shrinkage thus guarantees maximal root covering⁽²⁵⁾. Moreover, In vitro, Fibrin-based materials may be scaffolds for proliferation in periosteal and osseous cells when compared to collagen membranes^(26,27).

The advantageous effects of PRFM, Upon healing due to the many good effects of PRP growth factors. These factors stimulate wound healing, improve rate and quality of bone formation, enhance vascular in growth & soft tissue healing effects and increase bone regeneration⁽¹⁹⁾.

Nonsignificant differences statistically were seen between the three groups, suggesting that all procedures give same results to treat Miller buccal recession Class I and II recession defects. Results from these studies indicated that CAF with PRFM or collagen membranes give predictable root coverage procedures.

CONCLUSION

In the present study, various surgical techniques were found to be effective in gingival recession treatment. There were no significant differences at root coverage after 6 months between using coronally advanced flap alone against a coronally advanced flap combined with PRFM or collagen membrane. Moreover, the use of autologous platelet preparations like PRFM was a promising modality in root coverage of Miller buccal recession class I and II.

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