

**To evaluate the clinical efficacy of the collagen membrane versus platelet-Rich fibrin in pinhole surgical technique for the management of miller’s class I and class II gingival recessions**

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**Abstract**

**Aim:** To evaluate the clinical efficacy of the collagen membrane versus platelet-rich fibrin in pinhole surgical technique for the management of Millers Class I and Class II gingival recessions.

**Materials & Methods:** 15 patients exhibiting Miller’s class I & II multiple gingival recessions were selected randomly. The teeth were assigned to site 1 treated with collagen membrane & site 2 with platelet rich fibrin. All the clinical parameters: recession depth, probing depth, clinical attachment level, keratinized tissue width, percentage of root coverage, gingival thickness were recorded at baseline, 24<sup>th</sup> week post-operatively.

**Results:** The data were analyzed using the Friedman test, the Mann-Whitney U test. From baseline to post-operative both the experimental groups showed a clinical & statistical improvement in the parameters. On clinical examination of RD, PD, CAL, the percentage of root coverage between both the experimental groups showed

no statistically significant difference. There is a significant gain in KTW, GT was observed for the sites treated with PRF membrane.

**Conclusion:** Pinhole surgical technique with the combination of collagen membrane & PRF is a predictable procedure for the management of multiple gingival recessions. Also suggests the PRF assisted GTR for root coverage can be potentially used as an alternative to the commercially available collagen membrane (Periocol®) in the management of MGRD. Further longitudinal multicenter and histological clinical trials are required for a more conclusive interpretation of results.

**Keywords:** pinhole surgery, Platelet Rich Fibrin, collagen membrane, gingival recessions

**Introduction**

Gingival recession is the apical migration of the gingival margin to the cemento-enamel junction. These can appear as localized or generalized gingival recessions.<sup>1</sup> It

is one of the main esthetic complaints of patients affecting almost all middle and older aged to some degree. This also exposes patients to sensitivity and greater risk for root caries. To overcome these problems effective treatment of gingival recessions is required.<sup>2</sup>

Since the mid-1950 various periodontal plastic surgical procedures were developed and have shown predictable results in correcting gingival recession defects. Traditional approaches like free gingival grafts (FGG), sub-pedicle and subepithelial connective tissue grafts (SCTG) require the harvesting second surgical site, which often resulted in post-operative complications like pain, persistent bleeding, and secondary healing at the donor site.<sup>3,4</sup> Chao JC (2012) has introduced the Novel pinhole surgical technique for the management of Miller's class I and II gingival recessions, which overcomes the problems of the above procedures.<sup>5</sup>

The benefits of utilizing the collagen material include promoting wound healing, wound stability, and hemostasis, augmenting flap thickness by providing a collagenous scaffold.<sup>6</sup> The Platelet-rich fibrin was first introduced by Choukroun et al.( 2001) and it is regarded as a second-generation platelet concentrate. It is proclaimed to release high quantities of growth factors, and it has a natural fibrin network that can provide protection to growth factors proteolysis.<sup>7</sup>

So far, as there are no studies in the literature evaluating the efficacy of the collagen membrane and platelet-rich fibrin in the pinhole surgical technique. So, the present study focuses on evaluating the clinical efficacy of these two materials in pinhole surgical technique for the management of Millers Class I and Class II gingival recessions.

## Materials and Methods

A simple randomized, double-blinded, prospective, split mouth clinical study was designed. A total of 30 sites from 15 patients were selected amongst the patients visited the Department of Periodontology, Lenora Institute of Dental Sciences for the study and were randomly divided by using the lottery method. Site I was treated with pinhole surgical technique with collagen membrane. Site II was treated with pinhole surgical technique with PRF membrane. The nature of the study was explained to all the patients, and a written informed consent form was obtained. Patients were included in the study after taking a case history, and haematological examination was done at baseline. For each patient, both the site I and site II was recorded with: a. Recession Depth (RD) b. Probing Depth (PD) c. Clinical Attachment Level (CAL) d. Keratinized tissue width (KTW) e. Percentage of Root Coverage f. Gingival thickness (GT).

## Subject selection

### Inclusion criteria

1. Patients with age group 20-55 years.
2. Patients with Miller's class I & II, multiple buccal gingival recessions in anteriors and premolars.
3. Patients who can maintain good oral hygiene.
4. Patients willing to comply with all study-related procedures and those available for follow-up.

### Exclusion Criteria

1. Patients who had a history of prolonged use of antibiotics.
2. Patients who had periodontal therapy in the preceding 6 months.
3. Patients who use tobacco in any form.
4. Pregnant and lactating women.
5. Patients who had a history of systemic diseases.

6. Patients unwilling for treatment.
7. Patients with insufficient platelet count.

### Methods

After recording the clinical parameters in the selected patients at baseline, thorough scaling and root planing were done using ultrasonic scalers and curettes. The surgical procedure was carried out after 2 weeks of initial periodontal therapy. Intraoral asepsis was done with 0.2% Chlorhexidine digluconate rinse. Extraoral antisepsis was done with povidine iodine solution.

### Surgical Procedure

The surgical procedure was done under local anesthesia. A small pinhole incision of 2 to 3mm using a no.12 scalpel was made in the alveolar mucosa near the base of the vestibule. Apical to the recession site, with the help of specially designed instruments (ABS™ gingival elevators), was inserted through the entry incision to elevate a full-thickness flap. Then the flap was extended coronally and horizontally to allow for elevation of the adjacent papillae on each side of the denuded roots. Then the flap was positioned coronally to extend beyond the CEJ. In the site I, commercially available collagen membrane (Periocol®) was introduced through the pinhole and packed properly for the stabilization of the flap. After two weeks in the site II, pinhole surgery was carried out followed by placement of PRF membrane through the pinhole. The flap was advanced coronally to cover the recessions by passing a suture at the gingival margin and securing it onto the tooth with the help of composite. A periodontal dressing was given at both site I and site II.

### Statistical Analysis

Statistical analysis of the data was performed by using Statistical Package for the Social Sciences (SPSS) software version 23 (IBM, Chicago, USA). All the values

were subjected for statistical analysis by using Friedman's test and Mann Whitney U Test.



Fig. 1: Preoperative & postoperative RD at site I



Fig. 2: Preoperative & post-operative RD at site II



Fig 3: pinhole incision placement using no.12 scalpel at site I



Fig 4: full thickness flap elevation carried out through pinhole incision with the help of gingival elevators at site I



Fig 5: placement of collagen membrane through the pinhole access at site I



Fig 6: passive advancement was done and it is secured by using a 4-0 silk sutures with the help of composite restoration at site I



Fig 7: pinhole incision placement using no.12 scalpel at site II



Fig 8: full thickness flap elevation carried out through pinhole incision with the help of gingival elevators at site II



Fig 9: placement of PRF membrane through the pinhole access at site II



Fig10: passive advancement was done and it is secured by using 4-0 silk sutures with the help of composite restoration at site II

### Results

The following results were obtained

Table 1: Comparative analysis of clinical parameters at different time intervals

Clinical parameters	Groups	Observation Period	Mean±SD	P-Value
Recession depth	Site I	Baseline	2.80 ± 0.66	0.00001
		24 <sup>th</sup> week	0.95± 0.53	
	Site II	Baseline	2.90 ± 0.55	
		24 <sup>th</sup> week	0.87 ± 0.47	
Probing depth	Site I	Baseline	1.34 ± 0.47	0.0001
		24 <sup>th</sup> week	0.90± 0.31	
	Site II	Baseline	1.28 ± 0.45	
		24 <sup>th</sup> week	0.82± 0.37	
Clinical attachment level	Site I	Baseline	3.90 ± 0.65	0.00001
		24 <sup>th</sup> week	1.90 ± 0.66	
	Site II	Baseline	4.20± 0.73	
		24 <sup>th</sup> week	1.67± 0.69	
Keratinized tissue width	Site I	Baseline	2.82 ± 0.68	0.00001
		24 <sup>th</sup> week	3.31 ± 0.55	
	Site II	Baseline	2.81 ± 0.64	
		24 <sup>th</sup> week	3.66 ± 0.65	
Gingival thickness	Site I	Baseline	0.92 ± 0.15	0.0001
		24 <sup>th</sup> week	1.33 ± 0.16	
	Site II	Baseline	1.0 ± 0.12	
		24 <sup>th</sup> week	1.42 ± 0.16	

Table 2: Intergroup analysis of clinical parameters at different time intervals

Clinical parameters	Groups	Observation period	P-Value
Recession depth	Site I Site II	Baseline	0.62
		24 <sup>th</sup> week	0.39
Probing depth	Site I Site II	Baseline	0.5
		24 <sup>th</sup> week	0.39
Clinical attachment level	Site I Site II	Baseline	0.11
		24 <sup>th</sup> week	0.22
Keratinized tissue width	Site I Site II	Baseline	1.0
		24 <sup>th</sup> week	0.04
Gingival thickness	Site I Site II	Baseline	0.02
		24 <sup>th</sup> week	0.02

### Recession Depth

The mean RD at baseline, 24<sup>th</sup> week was 2.80 ± 0.57mm, 0.95± 0.53mm, respectively for site I. It was found to be 2.90 ± 0.55mm, 0.87 ± 0.47mm, respectively for site II (Table 1).

### Intra group comparison (Table 1)

On intragroup comparison of RD from baseline to 24<sup>th</sup> week shows a significant reduction at both site I and site II.

### Intergroup comparison (Table 2)

On intergroup comparison of RD in site I & II from baseline to 24<sup>th</sup> week there was no statistically significant difference seen (p>0.05).

### Probing Depth

The mean PD at baseline, 24<sup>th</sup> week was 1.34± 0.47mm, 0.90 ± 0.31mm, respectively for site I. It was found to be 1.28± 0.45mm, 0.82 ± 0.37 mm, respectively for site II (Table 1).

### Intra group comparison (Table 1)

On intragroup comparison of PD from baseline to 24<sup>th</sup> week shows a significant reduction at both site I and site II.

### Intergroup comparison (Table 2)

On intergroup comparison of PD in site I & II from baseline to 24<sup>th</sup> week there was no statistically significant difference seen.

### Clinical Attachment Level

The mean CAL at baseline, 24<sup>th</sup> week was 3.90 ± 0.65 mm, 1.90± 0.66mm, respectively for site I. It was found to be 4.20 ± 0.73 mm, 1.67 ± 0.69 mm, respectively for site II (Table 1).

### Intra group comparison (Table 1)

On intragroup comparison of CAL from baseline to 24<sup>th</sup> week shows a significant reduction at both site I and site II.



### Intergroup comparison (Table 2)

On intergroup comparison of CAL at site I & II from baseline to 24<sup>th</sup> week there was no statistically significant difference seen.

### Keratinized Tissue Width

The mean KTW at baseline, 24<sup>th</sup> week were  $2.82 \pm 0.68$  mm,  $3.31 \pm 0.55$  mm, respectively for site I. It was found to be  $2.81 \pm 0.64$  mm,  $3.66 \pm 0.65$  mm, respectively for site II (Table 1)

### Intra group comparison (Table 1)

On intragroup comparison of KTW from baseline to 24<sup>th</sup> week shows a significant difference at both site I and site II.

### Intergroup comparison (Table 2)

On intergroup comparison of KTH in site I & II from baseline to 24<sup>th</sup> week there was a statistically significant difference seen in site II at the end of 24<sup>th</sup> week.

### Gingival Thickness

The mean GT at baseline, 24<sup>th</sup> week were  $0.92 \pm 0.15$  mm,  $1.33 \pm 0.16$  mm, respectively for site I. It was found to be  $1.0 \pm 0.12$  mm,  $1.42 \pm 0.16$  mm respectively for site II (Table 1).

### Intra group comparison (Table 1)

On intragroup comparison of RD at various time intervals shows a significant reduction at both site 1 & 2.

### Intergroup comparison (Table 2)

On intergroup comparison of gingival thickness at site I & II from baseline to 24<sup>th</sup> week there was a statistically significant difference in site II at the end of 24<sup>th</sup> week.

### Discussion

This clinical study was performed to evaluate the clinical efficacy of the collagen membrane versus platelet-rich fibrin in the pinhole surgical technique for the management of Miller's class I and class II gingival recessions.

Reduction in the mean RD demonstrates the amount of root coverage obtained with the surgical modality and directly correlates to its success rate. The mean reduction RD was significant from baseline to 24<sup>th</sup> week in both site I & site II, whereas there is no statistically significant difference on intergroup comparison ( $p=0.39$ ). The reduction in the RD at site I was in accordance with the results obtained from previous studies.<sup>8,9</sup> The reduction in RD at site II was in accordance with the previous studies.<sup>10,11,12</sup>

This reduction in recession depth at site 1 is due to the use of collagen membrane (Periocol®) which is hemostatic possesses an ability to stimulate platelet attachment & enhances fibrin linkage, which may facilitate initial clot formation and stabilization leading to enhanced regeneration. In site 2 the reduction in RD is due to the growth factors secreted by PRF that might have improved the attachment of cells in the overlying flap to the membrane and the membrane to the underlying root surface resulting in the prevention of the flap shrinkage.

It's crucial to compare PPD before and after treatment since a decrease in probing depth suggests a decrease in the inflammatory response rather than an increase in attachment. The mean reduction in the PPD at the site 1 & 2 showed a significant reduction postoperatively, whereas there is no statistically significant difference on intergroup comparison ( $p=0.39$ ). The reduction in the PPD was in accordance with the results obtained by previous studies.<sup>8,9,13</sup> The reduction in the PPD at the 24<sup>th</sup> week was in accordance with the results obtained by previous studies.<sup>14,15</sup>

The inclusion of probing depth as an assessment criterion was done to see if there was a direct negative effect of the therapy on facial probing depth. This could be

attributed to gingival tissue shrinking as a result of SRP, which was part of the study procedure. Collective evidence of changes in PPD might be suggestive of the release of growth factors by PRF and the stimulation of PDL cells may result in some type of new attachment to the root. The collagen membrane serves as a barrier between the surgical flap and the root surface, preventing gingival epithelial cells and connective tissue from interfering with the healing process.

The mean value of CAL at the site 1 & 2 showed a significant reduction postoperatively, whereas there is no statistically significant difference on intergroup comparison ( $p=0.22$ ). The observations made in the study were in accordance with the previous studies.<sup>8</sup> The observations made in our study were in accordance with observations made by previous studies.<sup>10,12</sup>

Changes in CAL might be suggestive of some form of new attachment to the root due to the growth factors released by PRF. PRF promotes primarily angiogenesis, regulates migration, proliferation, and survival of mesenchymal cells, and promotes the synthesis of collagen fibers, thereby, promoting regeneration. Collagen membrane has been found to be chemotactic for fibroblasts in vitro, a property that may enhance cell migration and formation of a new attachment on a portion of the covered root surface.

The presence of a minimal amount of keratinized gingiva for the maintenance of periodontal health is a controversial topic. **Kennedy et al** advocated that gingival health could be maintained with almost zero attached gingiva.<sup>16</sup>

The mean gain of KTH at both the site 1 and site 2 was statistically significant from baseline to 24<sup>th</sup> week, whereas on intergroup comparison significant results were observed at site 2 ( $p=0.04$ ). The observations made

in the study were in accordance with observations made by previous studies.<sup>8,17</sup> The reduction in KTH at the end of the 24<sup>th</sup> week was in accordance with observations made by previous studies.<sup>10,11</sup>

The gain in KTW could be due to collagen membrane placement, which delays the epithelial migration and also due to formation of new connective tissue, which determines the character of the surface epithelium. The superior gain in KTH at site 2 could be due to PRF membrane placement which accelerated regeneration as it contains several growth factors, which in turn influences tissue proliferation and manifestation.

The mean gain of GT at site 1 and 2 was statistically significant from baseline to 6 months, whereas on intergroup comparison significant results were observed in test site 2 ( $p=0.02$ ). The mean gain in GT was in accordance with observations made by previous studies.<sup>18</sup>

When the collagen barrier is placed there maybe subsequent collagenolytic breakdown of the barrier may provide a comparable accessory space. This secondary space has been suggested to contribute to the regenerative response on the root side of the barrier or to produce an increase in gingival tissue thickness when the barrier is replaced by host connective tissue. The gain in soft tissue thickness may be the result of a proliferation of gingival and periodontal ligament fibroblasts which, in turn, may be due to the influence of growth factors from PRF or to a spacing effect of the PRF membrane.<sup>20</sup>

The percentage of root coverage is the main variable that projects the effectiveness and predictability of a technique and the graft material used. The mean percentage of root coverage obtained for site 1 and site 2 was 58.4% and 62.8% respectively at the end of the 24<sup>th</sup> week. The observations made at site 1 & 2 were in accordance with observations made by previous

studies.<sup>13,19,20</sup> There is no statistical difference between the percentages at both the sites.

The lack of achievement of RC in most of the treated sites could be due to: The disproportion between the prepared tunnel and graft material led to the compromised availability of the graft to the teeth present at the extremities of the recipient site. Technique sensitive preparation of subperiosteal tunnel, particularly in cases with thin gingival biotype causing niches and tear in the flap, which ultimately leads to graft exposure and compromised blood supply at the site. The variation in the initial recession depth at the recipient site, as shallow and deep recessions could respond differently.

### Conclusion

Thus, it can be concluded that pinhole surgical technique with collagen membrane and PRF membrane led to clinically effective outcomes for the management of Miller's class I and class II multiple gingival recession defects. Hence, suggesting that PRF membrane also paves the way as an alternative graft to collagen membrane for GTR assisted periodontal plastic surgery. However, histological analysis and larger sample size are needed to establish a definitive proof of periodontal regeneration.

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Conflict of Interest- Nil

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