

Comparative evaluation of gingival fiber retention technique and conventional periodontal flap technique (kirkland and technique) in the treatment of patients with chronic periodontitis – A clinical study

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Abstract

Background: The primary goal of periodontal therapy is to arrest and eliminates the inflammatory disease process as well as their risk factors which are associated with periodontal disease. Periodontal surgery generally indicated to treat deep pockets that are less responding to non-surgical therapy. The aim and objective of this study was to assess and compare the clinical outcomes of the effect of periodontal muco-periosteal flap surgery with gingival fiber retention technique in treating supra-bony periodontal pockets and minimizing the post-surgical recession.

Material And Methods: 4 patients, with moderate to severe chronic periodontitis patients were selected and randomly divided into two groups/sites:- Group 1/ Site 1 – Experimental Site - Flap surgery with gingival fiber retention technique. Group 2/ Site 2– Control Site – Conventional periodontal flap technique (Kirkland technique). Clinical parameters included plaque index, gingival index, periodontal disease index, clinical probing attachment level, recession length, recession width, area of recession were recorded at baseline, 4 weeks, 8 weeks and 12 weeks.

Results: In both intergroup and intragroup comparison of in terms of recession length and recession width were found to be statically non-significant ($p \leq 0.05$) with comparative reduction in recession length and recession width from baseline to 12 weeks-time interval. Moreover, the mean area of recession in intra-group comparison was found to be statically non-significant (p) at baseline 4weeks, 8weeks and 12 weeks-time interval. The mean area of recession in intragroup comparison was found to be no-significant at 4weeks, 8weeks but at 12 weeks-time interval it was significantly higher in control group.

Conclusion: Gingival fiber retention technique is simple requires less working time and excellent results. It also showed less post-operative surgical recession throughout the study.

Keywords: Gingival fiber retention, Post- surgical recession, Periodontal therapy, Periodontal pocket, Muco-periosteal flap.

Introduction

Periodontitis is a multifactorial disease resulting in inflammation with the destruction of the connective tissue attachment of the teeth. Periodontitis exists in three forms: Chronic periodontitis, aggressive periodontitis and periodontitis as a manifestation of systemic disease. Chronic periodontitis is the most common amongst three forms. The most important goal of periodontal therapy is to reduce or eliminate the sub-gingival microorganisms associated with periodontal disease.

The treatment of various types of periodontal disease associated with attachment loss has involved numerous surgical and non-surgical approaches over the years. The objective of the surgical periodontal therapy is to achieve pocket elimination or reduction by apical shift of the gingival margin and the correction of anatomic defects that may favour plaque accumulation and recurrence of the disease.¹ Several surgical procedures have been proposed to treat the soft tissue lesion of periodontitis as well as to gain access to the tooth, root and supporting bone. The most often utilise surgical procedure have included Kirkland flap, gingival fiber retention flap, undisplaced flap, apically displaced flap and modified Widman flap and papilla preservation flap for gaining access to the tooth root and underlying bone.²

The ultimate goal of periodontal therapy is to maintain the teeth in relative health function and comfort while at the same time maintaining the aesthetic expectations of the patients. The results of surgical therapy that is gingival recession and interproximal spacing are not acceptable by the patient. Surgical recession is presently defined in the glossary of periodontal term as “location of the marginal tissues apical to the cement-enamel-junction as a result of periodontal surgery.” Therefore need for a surgical procedure which will produce minimal or no post-surgical gingival recession.³

Most of the progress in periodontal surgery was associated with **Robert Neumann**⁴, **Leonard Widman**⁵ and **A. Cieszinski**.⁶ **Neumann**⁴ published several papers on various surgical subjects but early in his career became interested in periodontal disease and proposed a surgical technique as mucoperiosteal flap in **1912** which consisted of vertical incisions not bisecting the interdental papilla- followed by crevicular incisions to the bone margin to separate a flap that was then elevated to gain clear view of the entire field of operation and the area was thoroughly debrided. The margin of the flap was then trimmed and scalloped with scissors to reach exactly the bone margin and sutured.

Olin Kirkland, a prominent dentist in **Alabama presented in 1932**, a technique for the purpose of reattachment that he called a modified flap operation. It was used for isolated deep periodontal lesions. He used the basic gingival mucoperiosetal flap design by **Neumann**⁴ in **1920** for initial but instead of trimming the flap for surgical pocket elimination, he attempted to eliminate the crevicular epithelial lining and inflamed connective tissue by curettage of the flap. The procedure consisted of splitting mesiodistally the papilla of the involved space and retracting the gingiva using separators to keep the area open, followed by scaling and removal of granulation tissue on the soft tissue flap and closure of the wound with suture.

In 1972 Levine⁷ described the “fiber retention technique” in conjunction with access flap surgery. The histologic results demonstrated no loss of attachment during healing, along with reduced epithelial migration on teeth treated with the fiber retention technique, whereas apical migration of the epithelium occurred on control teeth, where connective fibers were removed. The fiber retention technique was gradually abandoned because of the difficulties in identification of the fiber system connected to the root surface and the time consuming nature of the procedure.

Recently, **Carnival**⁸ reviewed the fiber retention technique and applied it during osseous resective surgery (fiber retention osseous resective surgery [FibReORS]). This technique changes the clinical approach to the bony defect, considering the coronal level of the attached fibers as the bottom of the defect.

Hiatt⁹ (1968) introduced muco-periosteal flap surgery with full gingival fiber retention technique. He stated that when flap is re-adapted on root surfaces with full gingival fiber retention, the proliferation and down growth of the epithelial attachment does not occur, thus giving rise to minimal post-surgical recession.

Therefore, the present clinical study was conducted with an aim to evaluate the efficacy of periodontal flap surgery with gingival fiber retention technique with respect to:

- 1 Its efficacy in elimination of periodontal pocket.
- 2 Its efficacy in reducing post-surgical gingival recession.
- 3 Its efficacy on the maintenance of oral hygiene of the affected areas.

Materials and Methods

Study Population

This was the pilot study done in Department of Periodontology and Oral Implantology, National Dental College & Hospital, Derabassi, Punjab. An ethical approval for the study was taken from the Institutional Ethical Board Committee at National Dental College & Hospital, Derabassi. A total of 4 patients with chronic periodontitis patients were enrolled in the study and were randomly assigned to receive treatment with either Gingival fiber retention technique or conventional flap technique (Kirkland flap) were randomly treated as follows:

Group 1/ Site 1 – Experimental Site - Flap surgery with gingival fiber retention technique.

Group 2/ Site 2 – Control Site – Conventional periodontal flap technique (Kirkland technique)

Inclusion Criteria

- Patients who will be diagnosed as suffering from generalised moderate to severe chronic periodontitis in the age group of 20-40 years.
- Patients who would be physically healthy and present no detectable clinical sign and symptoms of any systemic disease.
- Each segment selected for treatment should have minimum recession and adequate width of attached gingiva.
- In each patient, at least six teeth were included in the surgery.
- Enthusiastic, well-motivated, and co-operative patients, who can visit the hospital for frequent check-ups for evaluation of study for a period of at least three months, were selected.
- Patients who are not receiving any antibiotic therapy for past six months.

Exclusion Criteria

- Patients diagnosed as aggressive periodontitis or having periodontitis due to systemic diseases.
- There should be no observable radiographic evidence of vertical or angular bone loss.
- Patients showing severe malocclusion leading to traumatic bite, which cannot corrected by occlusal adjustment procedure, were rejected.

- Patients with smoking habit.
- Any tooth with periapical disease.
- Tendency for increased mobility of tissues.
- Patients with healing disorders.
- Chronic alcoholic patients.

Assessment of Clinical Parameters

Baseline plaque index (PI) and Gingival index (GI), Periodontal disease index (PDI) score were recorded according to Tureskey's modification and Quigley and Hein (1962), Loe and silness and ramjford respectively. Clinical probing attachment level was measured from CEJ to the bottom of the sulcus. Recession width (RW) was measured from the greater mesio-distal dimension of gingival recession defects. Length of recession (RL) was measured from the CEJ to the depth of free gingival margin. Area of recession (RA) was calculated by total sum of recession width (RW) and length of recession (RL). Clinical parameters were assessed at the mid-facial surface of the teeth using CEJ as the reference point. All measurements were recorded using UNC-15 periodontal probe at baseline, 4weeks, 8 weeks, and 12weeks. Measurements were recorded to the nearest millimetre.

Surgical Procedure

Phase-I

After taking complete case history along with clinical examination initial phase I therapy was performed by scaling and root planning. Oral hygiene instructions were given and chlorhexidine mouth was prescribed for 2 weeks as adjunct to routine tooth brushing. Patient was be recalled after 3weeks for re-evaluation of probing pocket depth and clinical attachment level. If the probing pocket depth exceeds the critical depth, the subjects were selected for surgery. Pre-operative evaluation of all the above mentioned clinical parameters were done before phase-I (**figure 1 A, 2 B**) The patients were recalled after a week for the surgical phase and antibiotic and anti-inflammatory drugs were prescribed which were taken one day prior to surgery.

Phase-II

After about a week of completion of phase-I therapy, phase-II were carried out. The surgical site (either maxilla or mandible) were divided into two halves.

- 1 Distal of right canine to the mesial of right central incisor.
- 2 Distal of left canine to the mesial of left central incisor.

Both the surgical procedure were carried out in the same patient and in the same sitting to avoid the biological variability under local anesthesia of 2% lignocaine hydrochloride with 1:80,000 adrenaline.

Group 1/ Site 1 – Experimental Site Flap surgery with gingival fiber retention technique.

An internal bevel labial incision (**Figure 1 B, C**) were made approximately 2mm apical to the free gingival margin. Vertical or oblique releasing incisions were made, if required. A muco-periosteal flap were reflected with blunt periosteal elevator (**Figure 1 D**). Excision of detached gingiva (**Figure 1 E**) coronal to attached epithelial cuff was done with precision. The surgical blade no. 11 is held parallel to the gingival surface and free gingival epithelium was gently dissected out. The root surface were thoroughly scaled and planed. This was followed by osseous recontouring if needed,

removal of unhealthy granulation tissue and removal of specks of calculus. This was followed by irrigation with normal saline and flap closure by means of interrupted sutures (**Figure 1 F**). A periodontal dressing was placed and left for seven days. (**Figure 1 G**)

Group 2/ Site 2 – Control Site Conventional periodontal flap technique (Kirkland technique)

A full thickness muco-periosteal flap was reflected with crevicular incision (**Figure 2 B**) followed by blunt elevation with periosteal elevator (**Figure 2 C**). The root surface were thoroughly scaled and planned. This was followed by osseous re-contouring if needed, removal of unhealthy granulation tissue and removal of specks of calculus. This was followed by irrigation with normal saline and flap closure by means of interrupted sutures. (**Figure 2 D**) A periodontal dressing was placed and left for seven days. (**Figure 2 E**)

Phase-III

Patients were asked to report after one week for removal of suture and periodontal dressing.

Phase-IV

Patient was recalled after 4 weeks, 8 weeks, and 12 weeks for recording of clinical parameters. (**Figure 1 H**)

Results

Statistical Analysis

Descriptive statistical analysis was expressed as mean ± standard deviation (SD) for each group. Inter and intra variations in various clinical parameters over a period of 12 weeks were analysis using ANOVA and Independent t test. In the above test p value less than or equal to 0.05 ($p \leq 0.05$) was taken to be statistically significant. All analysis were performed using software version IBM SPSS version 21.

Table 1: Average mean value of plaque index (PI), gingival index (GI), Periodontal disease index level (PDI) in both treatment groups

	Plaque index (PI)	Gingival index (GI)	Periodontal disease index (PDI)
baseline	2.33±0.53	2.21±0.35	1.83±0.33
4 weeks	2.03±0.45	2.05±0.35	1.53±0.45
8 weeks	1.88±0.26	2.08±0.31	1.70±0.47
12 weeks	1.747±0.33	1.80±0.38	1.25±0.50
P value	0.001*	0.001*	0.001*

*p value < 0.05 (stastically significant)

**p value > 0.05 (non- stastically significant)

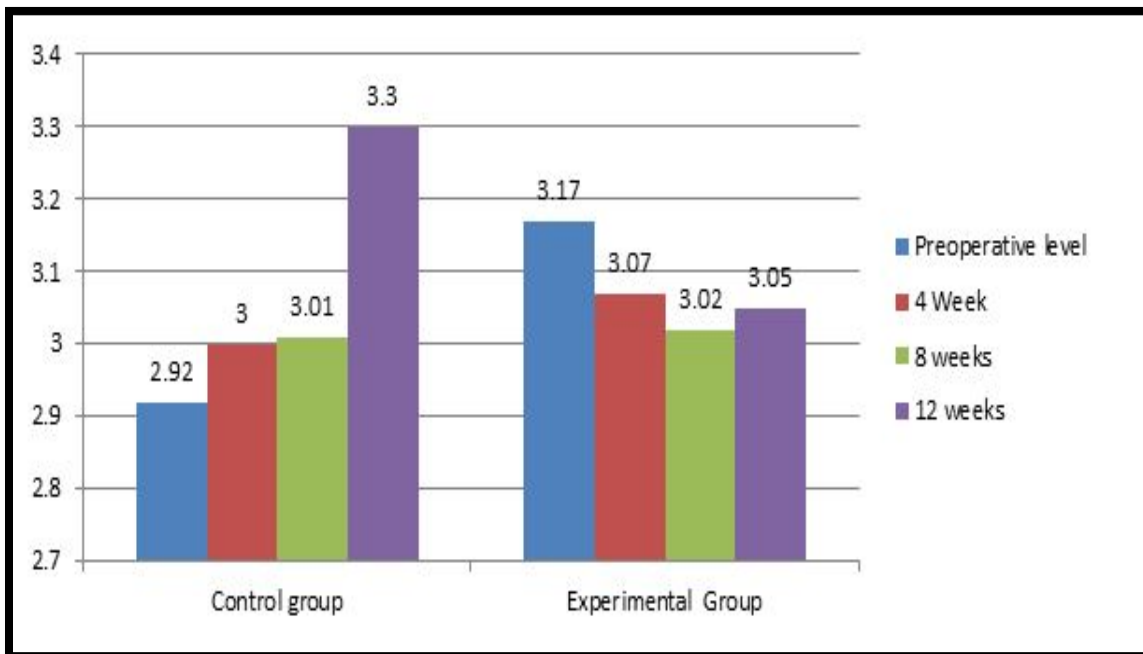
Table 2: Intra-group comparison of mean value of Clinical probing attachment level, recession length (RL), recession width (RW) and area of recession for both treatment groups at baseline, 4 weeks, 8 weeks and 12 weeks (in mm)

*p value < 0.05 (statistically significant)

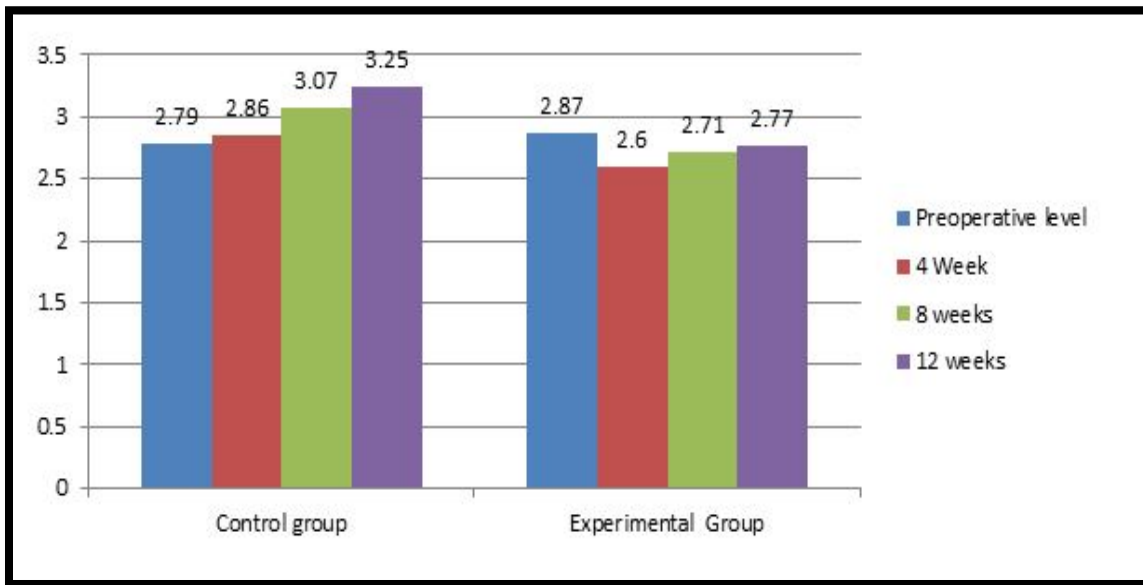
	Clinical probing attachment level (in mm)		Recession Length (RL) (in mm)		Recession width (RW) (in mm)		Area of Recession (RA) (in mm)	
	Group I/ Site I	Group II/ Site II	Group I/ Site I	Group II/ Site II	Group I/ Site I	Group II/ Site II	Group I/ Site I	Group II/ Site II
Baseline	4.77±1.52	5.02±1.38	3.17±0.20	2.92±0.57	2.87±0.56	2.79±0.47	4.41±0.94	4.05±1.04
4 weeks	4.37±0.46	4.92±0.51	3.07±0.15	3.00±0.35	2.60±0.43	2.86±0.94	4.21±0.76	4.16±1.01
8 weeks	4.62±0.95	5.51±1.13	3.02±0.15	3.01±0.64	2.71±0.44	3.07±0.73	4.09±0.85	4.75±1.96
12weeks	4.15±1.71	4.72±1.84	3.05±0.12	3.30±0.16	2.77±0.46	3.25±0.79	4.22±0.80	6.00±1.10
P value	0.001*	0.001*	0.580**	0.700**	0.878**	0.826**	0.959**	0.201*

**p value > 0.05 (non- statically significant)

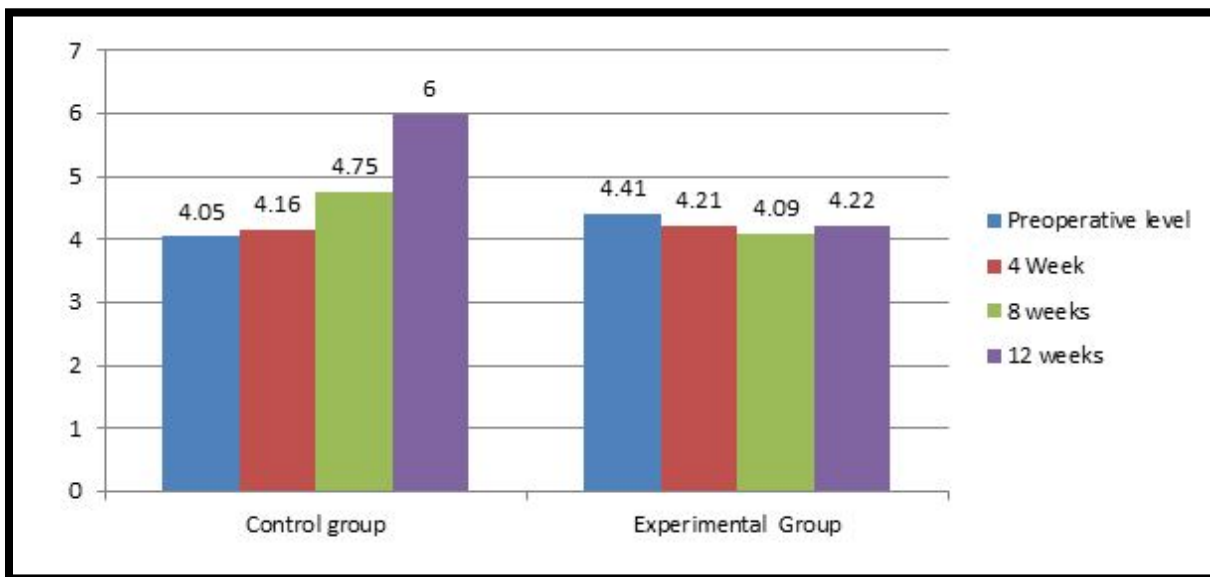
Graph 1: comparison of length of recession between the experimental (group i/site i) and control groups (GROUP II/SITE II)



Graph 2: Comparison of Mean Width of Recession between The Experimental (Group I/Site I) And Control Groups (Group II/Site II)



Graph No. 3: Comparison of Mean Area of Recession between the Experimental (Group II/Site I) and Control Groups (Group II/Site II)



Evaluation of plaque index (PI), gingival index, periodontal disease index (PDI) at baseline, 4 weeks, 8 weeks and 12 weeks.

Table 1 represent average mean value of full mouth plaque index score, full mouth gingival index score and full mouth periodontal disease index score at baseline, 4 weeks, 8 weeks and 12 weeks. Following the phase I therapy, the mean full mouth plaque index score revealed stastically significant reduction in the plaque score from baseline to 12 weeks in both the groups. The mean plaque index score at baseline was 2.33 ± 0.53 and at 12 weeks' time interval 1.74 ± 0.33 ($p > 0.05$) indicating a significant reduction in plaque score in both the treatment group.

A statistically significant decrease in mean full mouth gingival index score was recorded from baseline (2.08) to 12 week time interval (2.05) ($p > 0.05$) among two groups. This implies that the gingival index score was decreased significantly throughout the time period of the study (12 weeks).

In intragroup comparison of periodontal disease index level in both the treatment group was to be found to be stastically significant ($p > 0.05$). The mean score of periodontal disease index at baseline was 1.83 ± 0.33 and at 12 week time interval $1.25 \pm .50$ representing the significant reduction in the periodontal index score in both the treatment groups.

Evaluation of clinical probing attachment level at baseline, 4weeks, 8weeks and 12 weeks.

In table no. 2, the clinical probing attachment level showed a significant reduction from baseline in both treatment groups indicating a gain in attachment level. The mean probing attachment level at baseline in control group was 5.02 ± 1.38 and in experimental group was 4.77 ± 1.52 which was reduced to 5.15 ± 1.13 and 4.62 ± 0.95 at 8 week's time interval showing a statistical significant reduction in probing attachment level ($p > 0.05$). similarly at 12 week time interval clinical probing attachment level reduced to 4.72 ± 1.84 in control group and 4.15 ± 1.71 in experimental group showing a stastically significant reduction in probing attachment level ($p > 0.05$). This implies that there was a significant gain in clinical attachment level in both treatment groups compare to baseline and periodontal flap technique was equally effective in producing in clinical probing attachment level gain at 4 weeks, 8 weeks and 12 weeks post- treatment intervals.

Evaluation of length of gingival recession at baseline 4 weeks, 8 weeks and 12 weeks.

Table no. 1 and graph no. 1 represent intragroup comparison of length of recession in both the treatment groups at various time intervals. The mean length of recession at baseline was 2.92 ± 0.57 in control group and 3.17 ± 0.20 in experimental group. At 4 weeks, 8 weeks, 12 weeks' time interval there was stastically non-significantly increase in length of recession in control group. When control group was compares with experimental group, there was non-significant reduction in length of recession from baseline to 12 weeks' time interval ($p < 0.05$).

Evaluation of Width of gingival recession at baseline 4 weeks, 8 weeks and 12 weeks.

In terms of recession width, on intragroup comparison the mean width of recession in control group at baseline was 2.79 ± 0.47 . There was statistically non-significantly increase in width of recession from baseline to 12 week time interval. When control group was compared with experimental group, there was non-significantly reduction in the recession width from baseline 2.87 ± 0.56 to 12 week time interval 2.77 ± 0.46 ($p < 0.05$) (table no. 1 graph no. 2).

Evaluation of Area of gingival recession at baseline 4 weeks, 8 weeks and 12 weeks.

On intragroup comparison in terms of area of recession (table no. 1, graph no. 3) when both the treatment group was compared there was stastically non- significant reduction in the area of recession from baseline 4.41 ± 0.94 to 12 week time interval 4.22 ± 0.80 in an experimental group ($p < 0.05$).

Discussion

The main objective of periodontal surgical therapy (Phase II) is establishment of healthy gingival unit in the most coronal position possibly on the side of the root of the tooth along with preservation and retention apparatus. This surgical modality is based on the principle that the removal of supracrestal gingival fibers, attached epithelial cuff, pocket epithelium and granulation tissue adjacent to the pocket.⁷ With development of various surgical techniques of periodontal therapy one of the most important outcome has satisfactory healing and regeneration of the periodontal tissue.¹⁰ The post-

operative phase is one of the important phase after the surgical therapy (Phase II) as it shows outcome and results after the periodontal surgical procedures. The clinician used to avoid periodontal surgical procedure in anterior aspect as it may lead to post-surgical gingival recession, even if periodontal surgery was done by fabricated the plastic mask which is similar to color of gingival tissue. These plastic masks inserted over the labial aspect of the remaining gingiva and fill the wide contact area of the teeth.³

All types of surgical periodontal therapy give rise to post-surgical recession therefore there was a need for a surgical procedure which will produce minimum or post-surgical gingival recession. In the year (1960) **Kohler and Ramfjord**¹¹ introduced gingival fiber retention technique in the treatment of chronic periodontitis. Various reports in the literature stated that this technique has successfully minimizing the post-surgical gingival recession in anterior teeth.

By keeping all the relevant points in mind, the split mouth pilot study has been planned with an aim to assess and compare the clinical outcomes of the effect of periodontal muco-periosteal flap surgery with gingival fiber retention technique in treating supra-bony periodontal pockets and minimizing the post-surgical recession.

The result of the preset study demonstrated gingival fiber retention technique and Kirkland flap technique with were treated for moderate to severe chronic periodontitis during the 12 weeks period showed improvement in their periodontal condition. This was disclosed by fact that both the groups at 12 weeks post treating period exhibited overall improvement in plaque index score, gingival index score, periodontal index score when compare to baseline value. This could be due to the strict recall visits of all the patients with strong emphasis motivation in reinforcing oral hygiene maintenance of the patients.

There was statistically significantly gain in clinical probing attachment level in both the treatment groups compare to baseline during the entire duration of the study. This signifies that irrespective of both the surgical procedures performed, there was clinical probing attachment level reduction in all the patients of the two groups. The result was in agreement with the previous study conducted by **kohler C and Ramfjord in (1960)**.¹¹ They reported that when mucoperiosteal flap separates the gingiva from the teeth with retention of gingival fibers it, may heal without any significant loss of periodontal attachment in all the cases.¹¹

The recession width (RW), recession (RL) and area of recession (RA) are three important clinical parameters which were evaluated in both the treatments groups. Minimizing the post-surgical gingival recession and maintaining the gingival contour for aesthetic reasons in anterior teeth is the major clinical outcome of gingival fiber retention technique. In the present study, on intergroup comparison, the mean recession length (RL), recession width (RW) were found to be non-significantly in both the groups from baseline to 12 weeks post operatively. Similar results were found in terms of mean recession length (RL) and mean recession width (RW) on intragroup comparison, i.e., statistically non-significant in both the treatment groups.

From the results, it was observed that in intragroup comparison, there was an increase in the area of recession of the control site from baseline to weeks to 8 weeks and 12 weeks' time interval. The reduction in the area of recession on the experimental site was statistically non-significant to their pre-operative level whereas on the control site, the increase in the area of recession was statistically non-significant to their pre-operative level. On intergroup comparison at 12 weeks' time interval the area of recession was significantly higher in control group.

The results were in accordance with the studies by **levine and stahl (1962¹², 1972⁷, 1977¹³, 1981)^{12, 7,13,14}**. They reported that minimum post-surgical recession after 3 months at the site, where mucoperiosteal flap surgery was done with retention of gingival fiber retention technique. The also postulated that the connective tissue on the inside surface of mucosal flap would join with sharpey's fiber on the root forming with the new physiochemical attachment similar to cicatrix. The fiber retention procedure maintenance the healthy sharpey's fiber on the root resulting in true connective tissue reattachment. **Stahl and Levine (1972⁷)** also suggested that the retention of viable collagen fibers already inserted into the cementum may insure the most coronal post-surgical repair maximum protection against the loss of supporting bone.

The results obtained are in accordance with the previous studies conducted by **Russo¹⁵ (1981)** showed that the gingival contour to be esthetically pleasing after 12 weeks post-surgically.

Hyatt⁹ and his associated **1968 Melcher¹⁶ (1976) and longhorn¹⁷ at al. (1951)** reported that 1-3 mm post-surgical recession in the region where gingival fibers were not retained.

Based on the clinical studies case-reports and limited data available in the literature along with combining the result of the present study it may be hypothesized that gingival fiber retention technique is successful in treating in generalized moderate to severe chronic periodontitis cases in anterior aspect with minimum post-surgical recession. However the present pilot study has some limitation small sample size and short time period (12 weeks follow up) and lack of histological analysis union between the retention of viable collagen fibers and flap margins may test the hypothesis in more authenticated way.

Conclusion

As for the recession parameter, the experimental site showed less post-surgical recession indicating clinical superiority of treatment over control site. The advantage of gingival fiber retention technique is that it does not cause any additional surgical trauma to the patient and also does not require any special additional post-operative care. Esthetic results were also excellent in experimental site as compare to control site.

It may be concluded that the gingival fiber retention technique is simple requires less working time if performed skillfully, thus offering excellent result however future results and more clinical studies with large sample size are required to provide evidence for the excellent benefits of using the gingival fiber retention technique.

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Legend Figures

Group 1/ Site 1: Experimental Site Flap surgery with gingival fiber retention technique.



Figure 1 (A): Pre-operative view



Figure 1 (B): bleeding points marked with UNC-15 probe



Figure 1 (C): Internal bevel Incision given



Figure 1 (D): Flap elevation



Figure 1 (E): Excision of detached gingiva



Figure 1 (F): Interrupted suture given (3-0)



Figure 1 (G): Periodontal Dressing given (Coe-pak™)

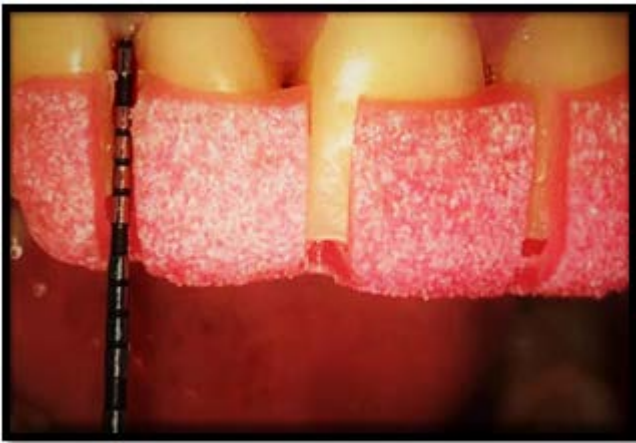


Figure 1 (H): 12 weeks Post – operative view

Group II/ Site II: conventional flap technique (kirkl and flap)

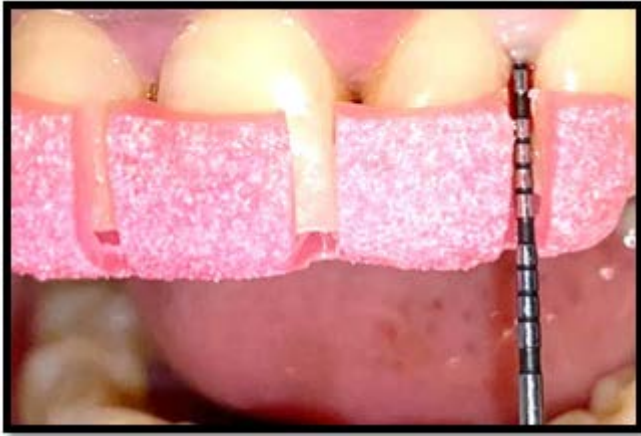


Figure 2 (A): Pre- operative view



Figure 2 (B): Incision crevicular incision given

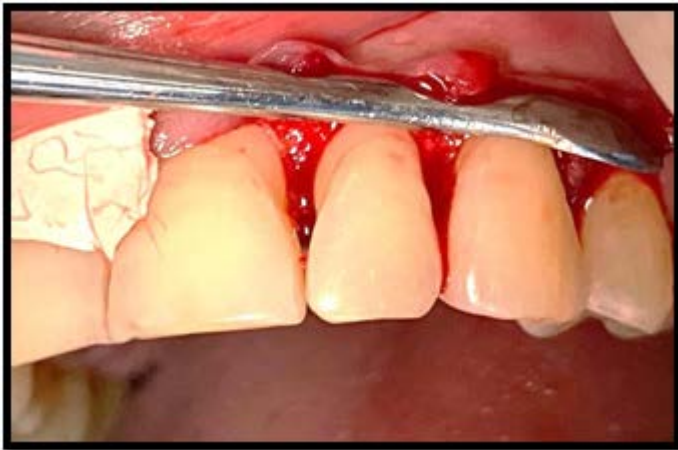


Figure 2 (C): Flap elevation



Figure 2 (D): Interrupted (3-0) Suture given



Figure 2 (E): Periodontal Dressing given(Coe-pak™)



Figure 2 (F): 12 weeks Post – operative view