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ANALYSIS OF EXCISIONAL NEW ATTACHMENT PROCEDURE (ENAP) VERSUS GINGIVAL CURETTAGE FOR PERIODONTAL POCKET REDUCTION IN CHRONIC PERIODONTITIS PATIENTS: A CLINICAL ASSESSMENT STUDY

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Abstract

Background: Chronic periodontitis is a prevalent inflammatory disease resulting in progressive destruction of the supporting structures of teeth, leading to periodontal pocket formation and clinical attachment loss. Non-surgical periodontal therapy remains the first line of treatment; however, in sites with persistent deep periodontal pockets, adjunctive surgical or semi-surgical procedures may be required to achieve optimal clinical outcomes. Excisional New Attachment Procedure (ENAP) and gingival curettage are two such therapeutic modalities aimed at eliminating diseased pocket epithelium and inflamed connective tissue to promote periodontal healing. This study aims to comparatively evaluate the effectiveness of ENAP and gingival curettage in reducing periodontal pocket depth and improving clinical attachment levels in patients with chronic periodontitis.

Materials & Methods: A total of 20 systemically healthy patients diagnosed with moderate to severe chronic periodontitis, presenting with probing pocket depth (PPD) ≥5 mm, were selected from the Outpatient Department of Periodontology. Patients were randomly allocated into two groups (n = 10 each). Group I underwent gingival curettage following thorough scaling and root planing, while Group II was treated with Excisional New Attachment Procedure after initial periodontal therapy. Clinical parameters including, Gingival Index (GI), Plaque Index (PI), Modified Sulcus Bleeding Index (mSBI), PPD, and Clinical Attachment Level (CAL) were recorded at baseline and at 3 months post-treatment. The collected data were subjected to appropriate statistical analysis.

Results: Both treatment modalities demonstrated significant improvements in clinical parameters from baseline to 3 months. However, Group II (ENAP) showed a greater reduction in PPD and a more pronounced gain in CAL compared to Group I (gingival curettage). The differences between the two groups were found to be statistically significant, suggesting superior clinical efficacy of ENAP in managing deeper periodontal pockets.

Conclusion: Within the limitations of the study, ENAP proved to be more effective than gingival curettage in achieving periodontal pocket reduction and clinical attachment gain in patients with chronic periodontitis. ENAP may therefore be considered a valuable therapeutic option in cases where non-surgical therapy alone is insufficient to control periodontal disease progression.

KEYWORDS: Chronic periodontitis, Clinical attachment level, Excisional new attachment procedure, Gingival curettage, Periodontal pocket reduction

INTRODUCTION

The periodontal disease is a multi-factorial inflammatory disease caused by the extension of bacterial infection into the gingiva and to the deeper periodontium resulting in pathological lesions and eventually to the loss of tooth. The etiology and cyclic evolution of periodontal disease determines a progressive, site-specific destruction of the supporting tissues of the tooth [1].

The most prevalent reason for tooth loss in the globe is periodontal disease. The studies on the prevalence of periodontal diseases in India have reported that approximately 30-90% of the population is affected by it, which is thought to be a contributing factor to the country's oral health issues [2].

The ultimate goal of periodontal therapy is the formation of new attachment apparatus, which is achieved by several treatment modalities classified broadly into either surgical or non-surgical. Conventional mechanical debridement (scaling and root planing) is considered to be the gold standard for inflammatory periodontal disease. Over the years, various modes of therapy have been suggested which includes soft tissue curettage, various types of flap procedures including Modified Widman flap, Guided Tissue Regeneration and, more recently Lasers [3].

Gingival curettage is a surgical procedure designed to remove the soft tissue lining of the periodontal pocket with a curette, leaving only a gingival connective tissue lining. It is a distinct procedure that may be performed along with, or following scaling and root planing (SRP). The SRP is aimed at the complete removal of bacteria, biofilm, calculus, and diseased root structure to achieve a biologically acceptable root surface. Gingival curettage, as originally conceived, was designed to promote new connective tissue attachment to the tooth, by the removal of pocket lining and junctional epithelium. The result obtained with curettage is most often a long junctional epithelium, which is the same result obtained with SRP alone [4].

The Excisional New Attachment Procedure (ENAP) has been known as "curettage with a scalpel" and it aims at removal of pocket epithelium. It was developed by US Naval Dental Corps and unlike scaling and curettage, ENAP ensures the complete removal of sulcular epithelium, epithelial attachment, granulated and inflamed connective tissue and softened cementum [5]. After ENAP procedure epithelial cells from the residual gingival margin migrate swiftly in an apical direction along the instrumented root surface resulting in the development of a long junctional epithelium rather than true periodontal regeneration. ENAP is particularly indicated for localized, shallow to moderate periodontal pockets, especially in esthetic regions where conservation of gingival tissues is essential [6].

Hence the present study compares the efficacy of ENAP and conventional gingival curettage in reduction of probing depth in patients with periodontitis.

MATERIALS & METHODS

The study was carried out in the Department of Periodontology, Seema Dental College & Hospital, Rishikesh, Uttarakhand with the approval of the ethical committee. The subjects were selected from out-patient department and each patient was given detailed verbal and written description of the risks and benefits of the treatment with the consent to treatment agreement.

Subject Selection

The patient selection was based on the following criteria.

Inclusion criteria

1. Patients with shallow to moderate chronic periodontitis with probing pocket depth (PPD) of ≥ 5 mm
2. Patients of age group 25-60 years including both genders
3. Patients with more than 20 teeth present
4. Patients who have not received antibiotics or corticosteroids in past 3 months

Exclusion criteria

1. Pregnant or lactating females
2. Patients with poor oral hygiene
3. Medically compromised patients
4. Uncooperative patients

Study design

Patients fulfilling the above criteria were recruited for the study. A total of 20 patients were randomly assigned into two groups:

1. **Group I:** Patients to be treated with SRP + Gingival Curettage
2. **Group II:** Patients to be treated with SRP + ENAP

Clinical parameters: The following clinical parameters will be assessed:

1. PPD
2. Clinical Attachment Level (CAL)
3. Gingival Index (GI)
4. Plaque Index (PI)
5. Bleeding on Probing (BOP)

Pre-operative protocol

1. Detailed medical history
2. Periodontal assessment using clinical parameters
3. Clinical photographs

Clinical parameters assessed

Indices

- **GI (Loe and Silness 1963)** at baseline, 1 month and 3 months.

- **PI (Silness and Loe 1964)** at baseline, 1 month and 3 months.
- **Modified Sulcus Bleeding Index (mSBI) (Mombelli et al. in 1987**) at baseline, 1 month and 3 months.

Other clinical parameters

- **PPD** at baseline and 3 months
- **CAL** at baseline and 3 months

Post-therapy follow-up:
1 month and 3 months after the therapy, all the above-mentioned clinical parameters were re-evaluated.

Procedure Performed:
Group I: Local anesthesia was administered into the selected site following SRP. Inflamed wall of the pocket was scraped with curettes using horizontal strokes. This was followed by root planing and removal of tissue tags, blood clots and debris by irrigation with normal saline.
Group II: Following SRP, local anesthesia was administered and an internal bevel incision was made with no. 15 or 11 scalpel blade from the crest of the gingiva to the base of the sulcus. Scalers and curettes were used to remove excised lining of the pocket wall and granulation tissue. Root planing was carried out to remove tissue tags, blood clots and debris from the area by irrigation with normal saline. Simple interrupted sutures were given.

Statistical Analysis
Clinical parameters such as GI, PI, mSBI were assessed at baseline, 1 month and 3 months while PPD and CAL were assessed at baseline and 3 months.
All the clinical parameters values were then statistically analyzed. Data comparison was done by applying specific statistical tests to find out the statistical significance of the comparisons. Statistics were done using SPSS version 21, Amork, NY software. Descriptive statistics were expressed as mean, standard deviation (SD), and standard error of mean (SEM). Parametric tests were applied to continuous data at a confidence interval of 95% and $p<0.05$. Mean and SD was calculated for continuous variable.

Figure 1: Materials

Figure 2: Armamentarium

Figure 3: Ultrasonic Scaler

Figure 4: PPD At Baseline of Group I (Gingival Curettage)

Figure 5: Gingival Curettage In Group I

Figure 6: Follow-Up (3 Months) PPD Of Group I (Gingival Curettage)

Figure 7: PPD Baseline Of Group II (ENAP)

Figure 8: Incision Given In Group II (ENAP)

Figure 9: Sutures Given In Group II (ENAP)

Figure 10: COE-PAK Placed In Group II (ENAP)

Figure 11: Follow-Up (3 Months) PPD Of GROUP II (ENAP)

RESULTS

Clinical Parameters GI

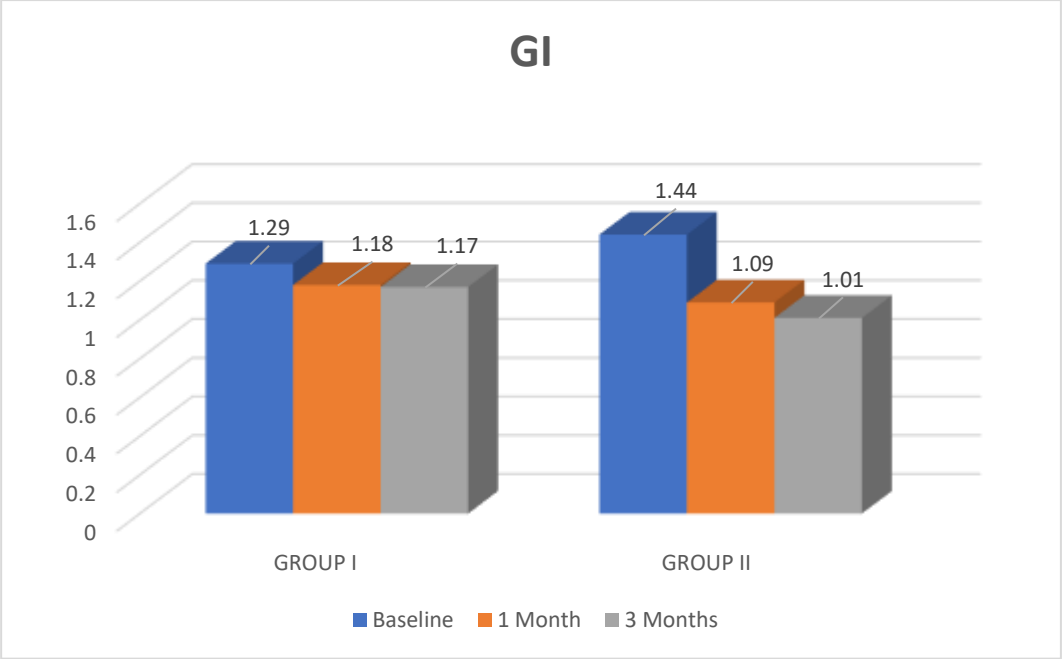
The GI score for Group I was 1.290 ± 0.233 at baseline, which reduced to 1.180 ± 0.161 after 1 month and further decreased to 1.170 ± 0.182 after 3 months. The difference in the values of GI in Group I from baseline to 1 month (p=0.017) and baseline to 3 months (p=0.024) were statistically significant.

The GI score for Group II was 1.440 ± 0.309 at baseline which decreased to 1.090 ± 0.110 after 1 month and to 1.010 ± 0.099 after 3 months. The difference in the values of GI in Group II from baseline to 1 month (p=0.004) and baseline to 3 months (p=0.003) were statistically significant [Table 1, Graph 1].

Table 1: Intragroup Comparison of GI Scores at Baseline, 1 Month, and 3 Months

Groups	Time Interval	Mean ± SD	Difference from Baseline	'p' value
Group I SRP+ Gingival Curettage	Baseline	1.290 ± 0.233	-	-
	1 Month	1.180 ± 0.161	0.110	0.017
	3 Months	1.170 ± 0.182	0.120	0.024
Group II SRP+ENAP	Baseline	1.440 ± 0.309	-	-
	1 Month	1.090 ± 0.110	0.350	0.004
	3 Months	1.010 ± 0.099	0.430	0.003

Paired T-test p-Value ≤ 0.05 –statistically significant



Graph I: Changes in GI Scores Within Group I and Group II from Baseline to 3 Months

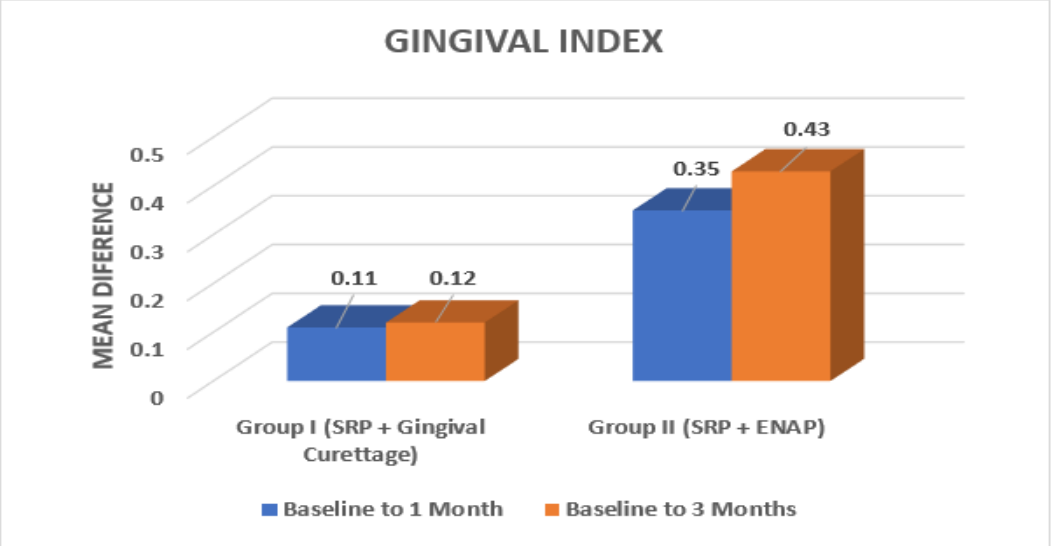
The mean difference of GI from baseline to 1 month in Group I was 0.110 ± 0.120 and in Group II was 0.350 ± 0.288. The mean difference of GI from baseline to 3 months in Group I was 0.120 ± 0.140 and in Group II was 0.430 ± 0.334.

On Intergroup comparison, the decrease in GI was more in Group II as compared to Group I which was statistically non-significant from baseline to 1 month (p=0.237) and statistically significant from baseline to 3 months (p=0.016) [Table 2, Graph 2].

Table 2: Intergroup Comparison of GI Scores at Baseline, 1 Month, and 3 Months

Groups	Time Interval	Mean ± SD	P value
Group I SRP + Gingival Curettage	Baseline to 1 month	0.110 ± 0.120	0.237
Group II SRP + ENAP		0.350 ± 0.288	
Group I SRP + Gingival Curettage	Baseline to 3 months	0.120 ± 0.140	0.016
Group II SRP+ENAP		0.430 ± 0.334	

Independent T-test p-Value≤ 0.05– statistically significant



Graph 2: Comparison of GI Scores Between Group I and Group II at Baseline, 1 Month, and 3 Months

PI

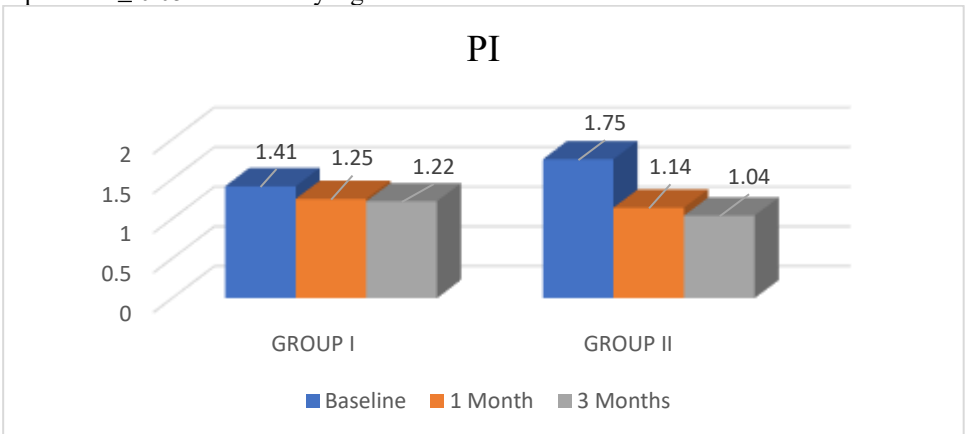
The PI score for Group I at baseline was 1.410 ± 0.179 which reduced to 1.250 ± 0.184 after 1 month and further reduced to 1.220 ± 0.244 after 3 months. The difference in the values of PI in Group I from baseline to 1 month (p=0.001) and baseline to 3 months (p=0.003) were statistically significant.

The PI score for Group II was 1.750 ± 0.503 at baseline which decreased to 1.140 ± 0.189 after 1 month and to 1.040 ± 0.069 after 3 months. The difference in the values of PI in Group II from baseline to 1 month (p=0.005) and baseline to 3 months (p=0.001) were statistically significant [Table 3, Graph 3].

Table 3: Intragroup Comparison of PI Scores at Baseline, 1 Month, and 3 Months

Groups	Time Interval	Mean ± SD	Difference from Baseline	'p' value
Group I SRP+ Gingival curettage	Baseline	1.410 ± 0.179	-	-
	1 Month	1.250 ± 0.184	0.160	0.001
	3 Months	1.220 ± 0.244	0.190	0.003
Group II SRP+ENAP	Baseline	1.750 ± 0.503	-	-
	1 Month	1.140 ± 0.189	0.610	0.005
	3 Months	1.040 ± 0.069	0.710	0.001

Paired T-test p-Value ≤ 0.05 –statistically significant



Graph 3: Changes in PI Scores Within Group I and Group II from Baseline to 3 Months

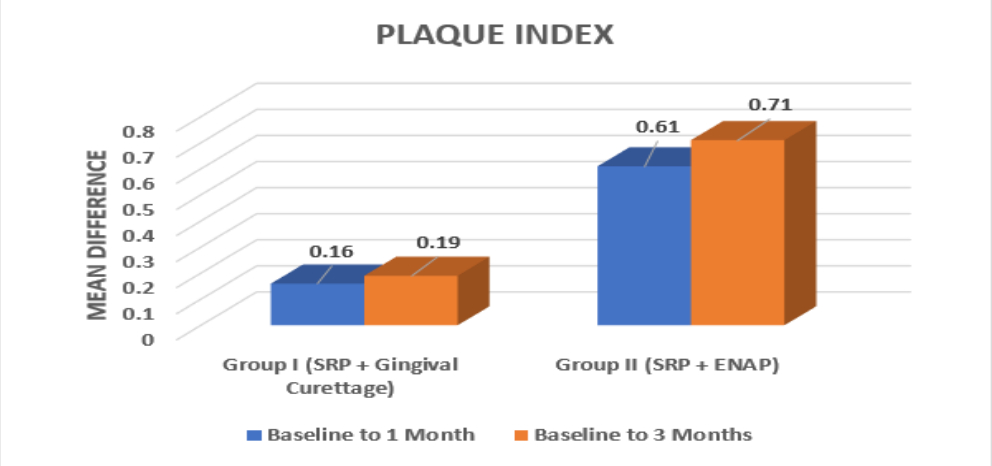
The mean difference of PI from baseline to 1 month in Group I was 0.160 ± 0.108 and in Group II was 0.610 ± 0.522. The mean difference of PI from baseline to 3 months in Group I was 0.190 ± 0.152 and in Group II was 0.710 ± 0.489.

On Intergroup comparison, the decrease in PI was more in Group II as compared to Group I which was statistically non-significant from baseline to 1 month (p=0.060) and statistically significant from baseline to 3 months (p=0.038) [Table 4, Graph 4].

Table 4: Intergroup Comparison of PI Scores Between Group I and Group II at Baseline, 1 Month, and 3 Months

Groups	Time Interval	Mean ± SD	P value
Group I SRP + Gingival Curettage	Baseline to 1 month	0.160 ± 0.108	0.060
Group II SRP + ENAP		0.610 ± 0.522	
Group I SRP + Gingival Curettage	Baseline to 3 months	0.190 ± 0.152	0.038
Group II SRP+ENAP		0.710 ± 0.489	

Independent T-test p-Value≤ 0.05– statistically significant



Graph 4: Comparison of PI Scores Between Group I and Group II at Baseline, 1 Month, and 3 Months

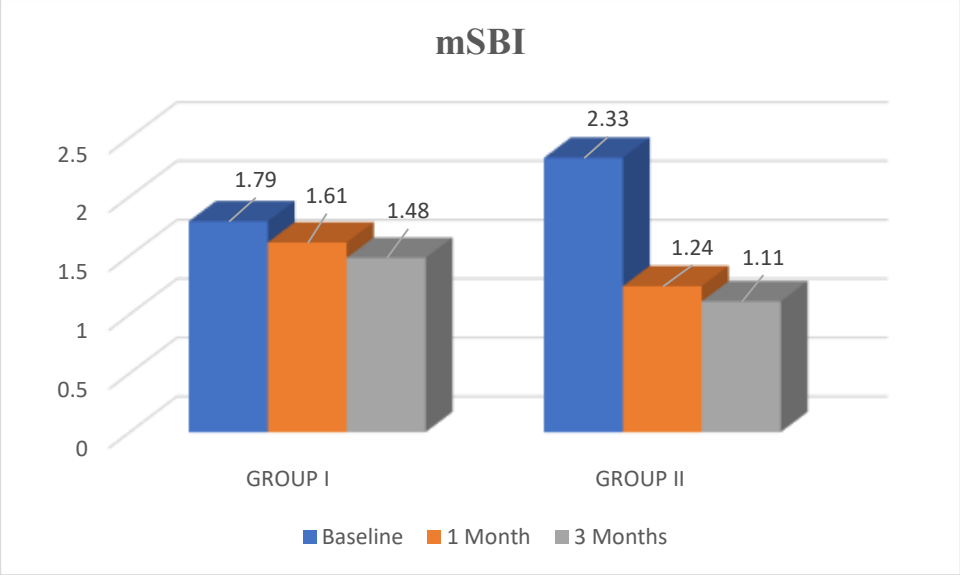
The mSBI score for Group I at baseline was 1.790 ± 0.486 which reduced to 1.610 ± 0.425 after 1 month and further reduced to 1.480 ± 0.436 after 3 months. The difference in the values of mSBI in Group I from baseline to 1 month (p=0.024) and baseline to 3 months (p=0.001) were statistically significant.
The mSBI for Group II was 2.330 ± 0.594 at baseline which decreased to 1.240 ± 0.450 after 1 month and to 1.110 ± 0.398 after 3 months. The difference in the values of mSBI in Group II from baseline to 1 month (p=0.000) and baseline to 3 months (p=0.000) were highly statistically significant [Table 5, Graph 5].

mSBI

Table 5: Intragroup Comparison of mSBI Scores at Baseline, 1 Month, and 3 Months

Groups	Time Interval	Mean ± SD	Difference from Baseline	'p' value
Group I SRP + Gingival Curettage	Baseline	1.790±0.486	-	-
	1 Month	1.610±0.425	0.180	0.024
	3 Months	1.480±0.436	0.310	0.001
Group II SRP+ENAP	Baseline	2.330±0.594	-	-
	1 Month	1.240±0.450	1.090	0.000
	3 Months	1.110±0.398	1.220	0.000

Paired T-test p-Value ≤ 0.05 –statistically significant



Graph 5: Changes in mSBI Scores Within Group I and Group II from Baseline to 3 Months

The mean difference of mSBI from baseline to 1 month in Group I was 0.18 ± 0.20 and in Group II was 1.09 ± 0.36. The mean difference of mSBI from baseline to 3 months in Group I was 0.310 ± 0.208 and in Group II was 1.220 ± 0.413.

On Intergroup comparison, the reduction in the values of mSBI was more in Group II as compared to Group I which was statistically significant from baseline to 1 month (p=0.039) and statistically non-significant from baseline to 3 months (p=0.063) [Table 6, Graph 6].

Table 6: Intergroup Comparison of mSBI Scores Between Group I and Group II at Baseline, 1 Month, and 3 Months

Groups	Time Interval	Mean ± SD	P value
Group I SRP + Gingival Curettage	Baseline to 1 month	0.18± 0.20	0.039
Group II SRP+ENAP		1.09 ± 0.36	
Group I SRP + Gingival Curettage	Baseline to 3 months	0.310 ± 0.208	0.063
Group II SRP+ENAP		1.220 ± 0.413	

IndependentT-test p-Value≤ 0.05– statistically significant

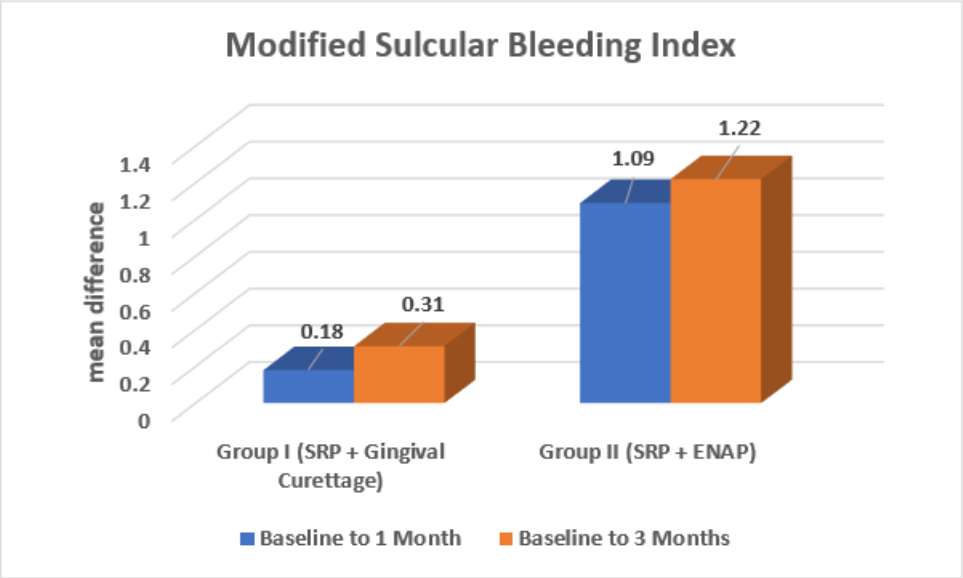


Figure 6: Intergroup Comparison of mSBI Scores Between Group I and Group II at Baseline, 1 Month, and 3 Months

PPD

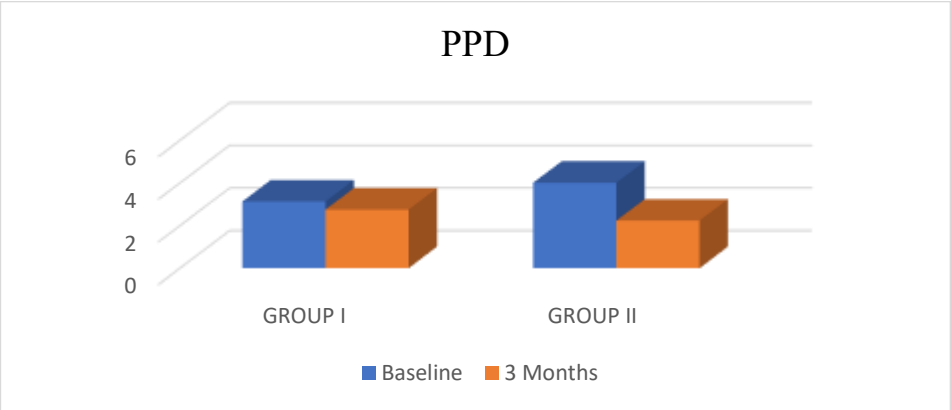
The PPD for Group I at baseline was 3.130 ± 0.510 which reduced to 2.750 ± 0.411 after 3 months. The difference was statistically not significant (p=0.098).

The PPD score for Group II was 4.010 ± 0.477 at baseline which decreased to 2.230 ± 0.777 after 3 months and the differences were statistically significant (p=0.000) [Table 7, Graph 7].

Table 7: Intragroup comparison of PPD in both the group in baseline and 3 months

Groups	Time Interval	Mean ± SD	Difference from Baseline	'p' value
Group I SRP + Gingival Curettage	Baseline	3.130 ± 0.510	-	-
	3 Months	2.750 ± 0.411	0.380	0.098
Group II SRP+ENAP	Baseline	4.010 ± 0.477	-	-
	3 Months	2.230 ± 0.777	1.780	0.000

Paired T-test p-Value ≤ 0.05 –statistically significant



Graph 7: Intragroup comparison of PPD in both the group in baseline and 3 months

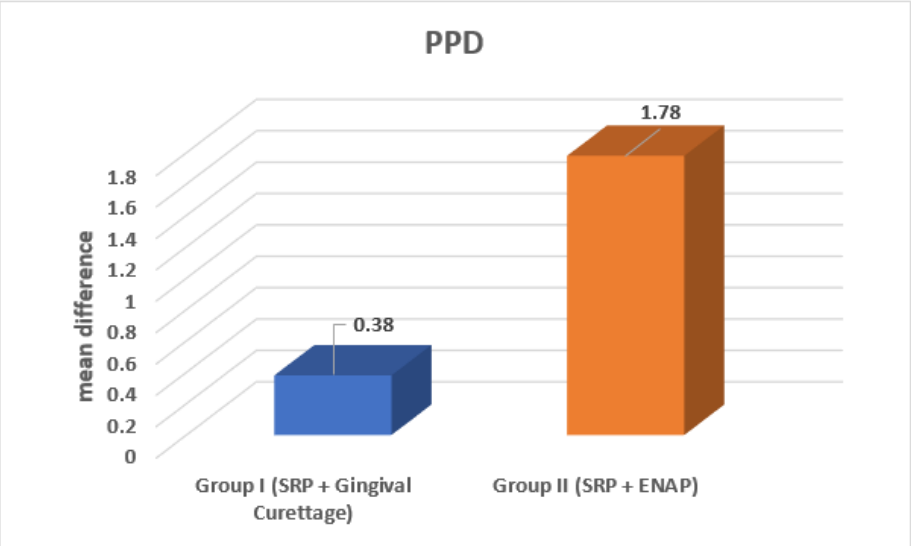
The mean difference of PPD from baseline to 3 months in Group I was 0.380 ± 0.651 and in Group II was 1.780 ± 0.567. On Intergroup comparison, the reduction in PPD from baseline to 3 months was more in Group II than Group I, which was statistically non-significant (p=0.078) [Table 8, Graph 8].

Table 8: Intergroup comparison of PPD in both the group in baseline and 3 months

Groups	Time Interval	Mean ± SD	P value

Group I SRP + Gingival Curettage	Baseline to 3 months	0.380 ± 0.651	0.078
Group II SRP + ENAP		1.780 ± 0.567	

Independent T-test p-Value≤ 0.05– statistically significant



Graph 8: Intergroup comparison of PPD in both the group in baseline and 3 months

CAL

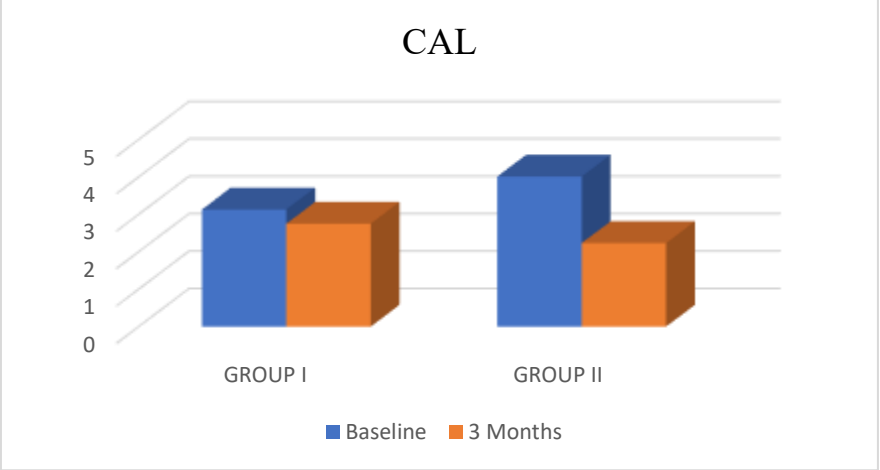
The CAL for Group I at baseline was 3.130 ± 0.510 and 2.750 ± 0.411 after 3 months. The difference was statistically not significant (p=0.098).

The CAL for Group II was 4.010 ± 0.477 at baseline and 2.230 ± 0.777 after 3 months and the differences were statistically significant (p=0.000) [Table 9, Graph 9].

Table 9: Intra group comparison of CAL in both the group in baseline and 3 months

Groups	Time Interval	Mean ± SD	Difference from Baseline	'p' value
Group I SRP + Gingival Curettage	Baseline	3.130 ± 0.510	-	-
	3 Months	2.750±0.411	0.380	0.098
Group II SRP+ENAP	Baseline	4.010±0.477	-	-
	3 Months	2.230±0.777	1.780	0.000

Paired T-test. p-Value ≤ 0.05 –statistically significant



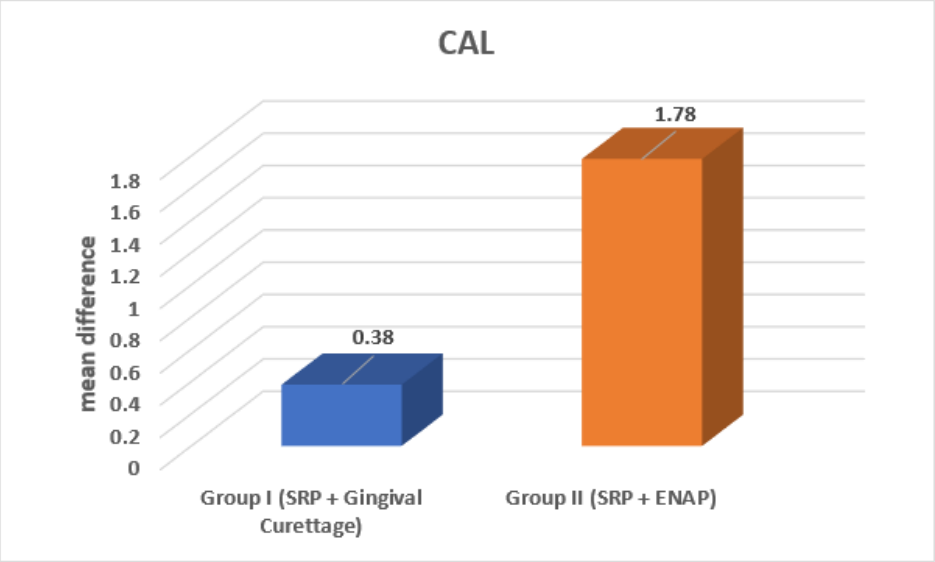
Graph 9: Intragroup comparison of CAL in both the group in baseline and 3 months

The mean difference of CAL from baseline to 3 months in Group I was 0.380 ± 0.651 and in Group II was 1.780 ± 0.567.
On Intergroup comparison, the CAL gain from baseline to 3 months was more in Group II than Group I, which was statistically non-significant (p=0.078) [Table 10, Graph 10].

Table 10: Intergroup comparison of CAL in both the group in baseline and 3 months

Groups	Time Interval	Mean ± SD	P value
Group I SRP + Gingival Curettage	Baseline to 3 months	0.380 ± 0.651	0.078
Group II SRP+ENAP		1.780 ± 0.567	

Independent T-test p-Value≤ 0.05– statistically significant.



Graph 10: Intergroup comparison of CAL in both the group in baseline and 3 months

DISCUSSION

The periodontium is a highly specialized supporting apparatus that maintains tooth stability and dissipates masticatory forces. Chronic periodontitis is characterized by plaque-induced inflammation leading to destruction of the periodontal ligament, alveolar bone loss, apical migration of the junctional epithelium, and periodontal pocket formation. Successful periodontal therapy aims to eliminate inflammation, reduce periodontal pockets, and preserve periodontal support through effective control of microbial biofilm [7].
SRP remains the cornerstone of initial periodontal therapy; however, its effectiveness is limited in deep periodontal pockets because of restricted access, complex root morphology, and persistence of inflamed granulation tissue [8]. Consequently, conservative surgical procedures such as gingival curettage and the ENAP have been advocated to improve access for root debridement while preserving periodontal tissues
Gingival curettage involves removal of the diseased pocket lining and inflamed granulation tissue with the objective of reducing inflammation and facilitating healing [9]. Nevertheless, healing is predominantly reparative, resulting mainly in the formation of a long junctional epithelium, and several studies have demonstrated little additional clinical benefit over SRP alone [10]. In contrast, ENAP utilizes an internal bevel incision to excise the pocket epithelium without raising a full-thickness flap, thereby improving visibility and root surface access while preserving the external gingival architecture [11]. The biological rationale of ENAP lies in the elimination of inflamed tissues and bacterial reservoirs, creating favorable conditions for periodontal healing and clinical attachment improvement, although true periodontal regeneration is not its primary objective [12].
Previous investigations have consistently demonstrated superior clinical outcomes with ENAP compared with conventional gingival curettage. Improved pocket reduction, enhanced root debridement, better soft tissue adaptation, reduced postoperative inflammation, minimal gingival recession, and favorable esthetic outcomes have established ENAP as a conservative alternative between nonsurgical therapy and conventional flap surgery, particularly in esthetically demanding cases [13–15]. Consequently, contemporary periodontal guidelines no longer recommend gingival curettage as a definitive treatment modality because of its limited long-term benefits,

whereas ENAP continues to be regarded as a predictable option for managing moderate to deep periodontal pockets [16, 17].

The findings of the present study support these concepts. Both treatment groups demonstrated significant improvements in gingival health; however, the improvements were consistently greater in the ENAP group. GI decreased significantly in both groups from baseline to 3 months, with Group II exhibiting significantly lower scores at the end of the study. Similar observations were reported by Kumari P et al. (2021) [3] and Bhattacharya S et al. (2023) [18], who demonstrated superior gingival health following ENAP compared with gingival curettage.

A similar trend was observed for PI. Although plaque scores decreased significantly in both groups, Group II showed a greater and sustained reduction throughout the study period, whereas improvement in Group I plateaued after one month. These findings are consistent with those of Kumari P et al. (2021) [3] and Bhattacharya S et al. (2023) [18], who also reported significantly better plaque control following ENAP.

mSBI scores also decreased significantly in both groups, reflecting reduced gingival inflammation after treatment. However, the reduction was significantly greater in the ENAP group at both follow-up visits, indicating more effective resolution of inflammation. Comparable findings have been reported by Bhattacharya S et al. (2023) [18], who observed superior bleeding reduction following SRP combined with ENAP.

Regarding PPD, Group I demonstrated only minimal and statistically non-significant improvement, whereas Group II exhibited a significant reduction from baseline to 3 months. Although the intergroup difference was not statistically significant at the end of the study, the magnitude of improvement was greater in the ENAP group. CAL followed a similar pattern, with significant attachment gain occurring only in the ENAP group, despite the absence of a statistically significant intergroup difference. These observations are in agreement with Gudakuwala et al. (2018) [1] and Kumari P et al. (2021) [3], both of whom reported greater PPD reduction and CAL gain following ENAP.

The superior clinical performance of ENAP can be attributed to its ability to provide direct access for meticulous root debridement and complete removal of diseased pocket epithelium while preserving the external gingival contour. In contrast, gingival curettage is performed blindly and may leave residual inflamed tissue and calculus, thereby limiting healing and long-term pocket reduction [13–17].

The present findings are further supported by several contemporary studies evaluating adjunctive periodontal therapies. Abdullah (2013) [19] reported significant improvements in PPD, CAL, and periodontal inflammation when ENAP was combined with subgingival irrigation using metronidazole and chlorhexidine, demonstrating that surgical pocket elimination combined with antimicrobial therapy enhances periodontal healing.

Similarly, Thangavelu et al. (2015) [20] demonstrated that laser curettage used as an adjunct to SRP produced greater reductions in PPD, improved attachment gain, and reduced gingival inflammation than SRP alone in patients with chronic periodontitis and controlled diabetes mellitus.

Sameera et al. (2018) [21] compared ENAP with laser-assisted new attachment procedure (LANAP) and reported superior wound healing and revascularization with LANAP, together with significant reductions in PPD and attachment gain. Their findings highlight the advantages of minimally invasive periodontal surgery in promoting favorable tissue healing.

In diabetic patients with moderate-to-severe chronic periodontitis, Bian et al. (2021) [22] demonstrated that periodontal curettage combined with root planing resulted in significantly greater improvements in PPD, CAL, gingival health, and systemic inflammatory status compared with conventional treatment, emphasizing the value of comprehensive periodontal therapy.

Likewise, Mai et al. (2021) [23] reported that ultrasonic subgingival curettage combined with Xipayi gingival rinse significantly reduced plaque accumulation, gingival inflammation, BOP, and PPD, indicating that adjunctive antimicrobial therapy can further enhance clinical outcomes.

Chung et al. (2022) [24] showed that minimally invasive non-surgical periodontal therapy achieved comparable or superior clinical outcomes with reduced patient discomfort and faster healing compared with conventional therapy, reflecting the growing preference for conservative treatment approaches.

Further evidence was provided by Bali et al. (2023) [25], who demonstrated that diode laser-assisted gingival curettage produced significantly greater reductions in PPD improved clinical attachment, and reduced gingival inflammation than conventional curettage, highlighting the benefits of laser-assisted periodontal therapy.

Although Yuliani et al. (2024) [26] reported that gingival curettage remains an effective adjunctive procedure when combined with meticulous plaque control and supportive periodontal therapy, its clinical benefits are generally less pronounced than those achieved with procedures providing improved access for debridement.

More recently, Singhania et al. (2025) [27] demonstrated that laser curettage combined with local drug delivery achieved greater reductions in periodontal pathogens, deeper pocket reduction, superior CAL gain, and improved gingival health than laser curettage alone, emphasizing the advantages of combining minimally invasive surgical procedures with adjunctive antimicrobial strategies.

Overall, the present study demonstrates that both gingival curettage and ENAP improve periodontal clinical parameters when used as adjuncts to conventional periodontal therapy. However, ENAP consistently produced

greater improvements in gingival inflammation, plaque control, bleeding, PPD, and CAL, corroborating previous clinical evidence. These findings reinforce the role of ENAP as a predictable, minimally invasive surgical approach for the management of chronic periodontitis, particularly in patients with persistent moderate-to-deep periodontal pockets where nonsurgical therapy alone is insufficient.

Limitations

The present study has several limitations that should be considered while interpreting the findings. The relatively small sample size may have limited the statistical power to detect significant intergroup differences. The follow-up period was restricted to 3 months, precluding assessment of the long-term stability of periodontal outcomes. As a single-center study, the findings may not be generalizable to broader populations. The evaluation was limited to clinical parameters namely PPD, CAL, PI, GI, and mSBI, while radiographic bone changes, microbiological findings, inflammatory biomarkers, and histological evidence of periodontal regeneration were not assessed. In addition, patient-centered outcomes, including postoperative pain, discomfort, esthetic satisfaction, healing experience, and quality of life, were not evaluated. The procedures were performed by a single operator, which may have introduced operator-related bias and limited the reproducibility of the findings. Furthermore, baseline differences in PPD and CAL between the groups may have influenced the magnitude of clinical improvement. Future multicenter randomized controlled trials with larger sample sizes, longer follow-up periods, and comprehensive clinical, radiographic, microbiological, histological, and patient-reported outcome assessments are warranted to further validate the comparative effectiveness of ENAP and gingival curettage in the management of chronic periodontitis.

CONCLUSION

Within the limitations of this study, both ENAP and gingival curettage demonstrated effectiveness in reducing PPD in patients with chronic periodontitis. However, ENAP showed superior clinical outcomes when compared to gingival curettage because ENAP ensures complete elimination of the inner lining epithelium through an internal bevel incision, in contrast to curettage, where scraping movements can leave residual keratinized epithelial tissue. Patients treated with ENAP exhibited greater reduction in PPD, improved CAL and better gingival tissue adaptation. These results may be attributed to the precise removal of keratinized pocket epithelium and enhanced wound stability associated with ENAP, which favors relatively strong long junctional epithelial attachment and improved healing as compared to healing by conventional curettage. Gingival curettage, while beneficial as an adjunctive procedure, showed comparatively limited effectiveness in achieving long-term pocket reduction and attachment gain. Therefore, ENAP can be considered a more predictable and effective surgical approach for managing moderate periodontal pockets in chronic periodontitis patients. Nevertheless, patient selection, operator skill, and strict plaque control remain critical determinants of successful periodontal therapy. Further long-term studies with larger sample sizes are recommended to validate these findings.

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