Comparative Evaluation Of Microsurgical And Conventional Open Flap Debridement: A Randomized Controlled Trial

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ABSTRACT

Aim: To compare the clinical outcomes of microsurgical and conventional open flap debridement in patients with generalized periodontitis stage III, grade B.

Materials and methods: A total of 40 patients with the age range of 21- 50 years were taken into the study from the Out-Patient Section of the Department of Periodontics, Government Dental College and Hospital, Kadapa, India. A split-mouth study design was employed. Each patient was given a brief description of the intended surgical procedure and was required to sign an informed consent paper. Control sites consist of 40 sites treated by conventional open flap debridement. Test sites comprised 40 sites treated by microsurgical open flap debridement.

Results: There were no statistically significant differences among the groups with respect to Probing Pocket Depth, Clinical Attachment Level, and Gingival Recession, but there was a reduction within the groups from baseline to 9 months except in Gingival Recession. The intergroup comparison of the Visual Analogue Scale of pain and the Early Wound Healing Index showed significant results in the Test group than in the Control group 1 week after the operation.

Conclusion: An improvement was observed in all the clinical parameters except Gingival Recession in both the groups from baseline to 9 months with no statistical significance in the between the groups. However, the intergroup comparison revealed a reduction in pain and better healing in the test group compared to the control group.

Keywords: microsurgery, periodontitis, open flap debridement wound healing

1. INTRODUCTION

Periodontitis is a common inflammatory disease of the oral cavity and the leading cause of tooth loss. It is characterized by the destruction of the tissues that support the teeth. This disease is complex, involving both bacterial challenges and factors related to the host's response[1]. In its wake, periodontitis leaves significant damage primarily to the structures that support the teeth.

Periodontal therapy includes various treatment approaches aimed at arresting the infection, restoring lost structures, and maintaining a healthy periodontal state[2]. This is typically achieved by eliminating the periodontal infection caused by the colonization of disease-causing bacteria beneath the gums[3].

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The treatment of periodontitis involves the complete removal of calculus to achieve a biologically acceptable tooth surface. Residual calculus can be present not only on teeth treated with scaling alone but also on those treated with flap surgery following scaling and root planing. Optimizing the surgical approach and controlling variables—particularly about flap design and management can enhance outcomes.

Key requirements for successful open flap debridement procedures include effectively accessing the defect, performing meticulous debridement, and sealing the flap to protect it from contamination by the oral environment. Therefore, employing a microsurgical approach may enhance clinicians' ability to achieve these goals.

By combining improved visual acuity with specially designed microsurgical instruments, clinicians may achieve more precise and less traumatic manipulation of both soft and hard tissues. This improvement can enhance their ability to properly debride the defect and root surfaces. In this study, we compared the effectiveness and healing index of microsurgical versus conventional open-flap debridement techniques.

2. MATERIAL AND METHODS

The study was conducted at the Government Dental College and Research Institute, Kadapa. A total of 40 periodontitis patients were included in the study. A split-mouth study design was employed as control and test sites randomly. Each patient was given a brief description of the intended surgical procedure and was required to sign an informed consent form. The ethical clearance was obtained from the Institutional Ethical Review Committee (Pr.009/IEC/GDCH/2019-20/11).

Criteria for selection of subjects:

INCLUSION CRITERIA

1. Patients with generalized periodontitis, stage III, grade B.

2. Patients with Probing pocket depth > 5 mm.

3. Patients with horizontal bone loss in contra lateral quadrants.

EXCLUSION CRITERIA

1. Patients with any systemic diseases.

2. Patients under antibiotic therapy in the past 6 months.

3. Smokers and alcoholics.

4. Pregnancy and lactating women.

5. Patients with poor oral hygiene.

CLINICAL PARAMETERS

1. Probing Pocket Depth.

2. Clinical Attachment Level.

3. Gingival Recession.

4. Plaque Index - Loe and Silness.

5. Gingival Bleeding Index – Ainamo and Bay.

6. Visual Analogue Scale of Pain for 1 Week Post Operatively.

7. Early Wound Healing Index – Wachtel.

PROCEDURE

A Pre-operative examination and radiographic evaluation were conducted for all patients for study. Pre-surgical blood investigations (HB %, RBS, CT, BT, HIV, Hbs- Ag) were performed on each patient. All selected patients were given strict oral hygiene instructions and were subjected to Phase-I periodontal therapy and after 3-4 weeks of Phase-I therapy, patients were reevaluated for clinical status, and those with acceptable oral hygiene were chosen for further evaluation.

SURGICAL PROCEDURE

The patients were prepared by intra-oral and extra-oral antisepsis using 0.2% Chlorhexidine Digluconate rinse and 5% Povidine Iodine solution respectively, draped, and anesthetized under aseptic conditions with 2% lignocaine HCL with adrenaline (1:80,000).

In the control site (FIG:1-3) , intracrevicular incisions were made and full-thickness mucoperiosteal flaps were elevated both buccally and lingually. Surgical debridement was performed to remove subgingival plaque, calculus, diseased granulation

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tissue, and pocket epithelium. Then surgical flaps were closed using 3-0 silk sutures, and non-eugenol periodontal dressing (Coe-pack) was applied.

Microsurgery was performed on the test site (FIG:6-9) using dental loupes with x3 optical magnification. After administering anesthesia, intracrevicular incisions were made with a microsurgical blade. Flaps were then reflected buccally and lingually with a microsurgical periosteal elevator. The area was debrided with curettes to ensure full visibility and access to the root surfaces. Once the procedure was completed, the area was sutured with 5-0 silk sutures, and a non-eugenol periodontal dressing (Coe-Pak) was applied.

CONTROL GROUP

Fig 1) PRE-OPERATIVE VIEW

Fig 2) INCISION

Fig3) REFLECTION

Fig 4) AFTER 3 MONTHS

Fig 5) AFTER 9 MONTHS

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TEST GROUP

Fig 6) MICROSURGICAL INSTRUMENTS

Fig 7) PRE-OPERATIVE VIEW

Fig 8) INCISION

Fig9) DEBRIDEMENT

Fig 10) AFTER 3 MONTHS

Fig 11) AFTER 9 MONT

POST-OPERATIVE CARE AND EVALUATION

The patients were placed on an antibiotic regimen consisting of Amoxicillin 500mg TID for 5 days as well as analgesics like Aceclofenac-100mg twice daily for 3 days. They were instructed to abstain from brushing on the surgical site for at least 1 week. All the patients were given post-operative instructions, which included rinsing with 0.2% Chlorhexidine Digluconate for 7 days. They were recalled 7/10 days postoperatively, during which sutures were removed and the operated area was evaluated for healing, infection, and any signs of ulceration or necrosis. Subsequent recall appointments were made at 3 months, 6 months, and 9 months after the surgery. During these visits, all clinical parameters were assessed, oral hygiene practices were reinforced, and supragingival scaling was performed, if necessary.

3. STATISTICAL ANALYSIS

The data obtained were analyzed using the IBM SPSS 25.0 software. A Paired t-test was employed for intragroup comparisons and intergroup comparisons. Additionally, the Wilcoxon signed-rank test was used to compare the Early Wound Healing Index with the Visual Analogue Scale for pain. The results of this study, obtained from the above-mentioned analyses, are summarized under the following headings:

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PLAQUE INDEX (PI)

Table 1: Comparison of mean and standard deviation values of Plaque Index in control and test groups at different time intervals.

		Mean	N	Std. Deviation	Std. Error Mean	P Value
PI Baseline	Control	1.6700	40	.31395	.04964	1.000
	Test	1.6700	40	.31395	.04964	
PI_3M	Control	.7564	40	.23147	.03706	1.000
	Test	.7564	40	.23147	.03706	
PI_6M	Control	.5350	40	.20946	.03312	0.957
	Test	.5350	40	.20946	.03312	
PI_9M	Control	.3950	40	.17534	.02772	1.000
	Test	.3950	40	.17534	.02772	

GINGIVAL BLEEDING INDEX (GBI)

Table 2: Comparison of mean and standard deviation values of Gingival Bleeding Index in control and test groups at different time intervals.

		Mean	N	Std. Deviation	Std. Error Mean	P Value
GI_ Baseline	Control	1.4300	40	.35605	.05630	1.000
	Test	1.4300	40	.35605	.05630	
GI_3M	Control	.5700	40	.25840	.04086	1.000
	Test	.5700	40	.25840	.04086	
GI_6M	Control	.3625	40	.19701	.03115	1.000
	Test	.3625	40	.19701	.03115	
GI_9M	Control	.2475	40	.14140	.02236	0.938
	Test	.2475	40	.14140	.02236	

PROBING POCKET DEPTH (PPD)

Table 3: Comparison of mean and standard deviation values of Probing Pocket Depths in control and test groups at different time intervals

		Mean	N	Std. Deviation	Std. Error Mean	P Value
PPD_ Baseline	Control	5.8700	40	.50393	.07968	.608
	Test	5.8350	40	.46880	.07412	
PPD_3M	Control	3.1200	40	.57611	.09109	.547
	Test	3.1700	40	.54922	.08684	

PPD_6M	Control	2.7425	40	.53296	.08427	.438
	Test	2.7975	40	.59850	.09463	
PPD_9M	Control	2.5425	40	.48511	.07670	.775
	Test	2.5250	40	.48819	.07719	

CLINICAL ATTACHMENT LEVEL (CAL)

Table 4: Comparison of mean and standard deviation values of Clinical Attachment Level in control and test groups at different time intervals

		Mean	N	Std. Deviation	Std. Error Mean	P Value
CAL_ Baseline	Control	6.1950	40	.78543	.12419	.656
	Test	6.1225	40	.84139	.13304	
CAL_3M	Control	3.4700	40	.82094	.12980	.821
	Test	3.4325	40	.86510	.13678	
CAL_6M	Control	3.0925	40	.81944	.12956	.843
	Test	3.0600	40	.88457	.13986	
CAL_9M	Control	2.8425	40	.72603	.11480	.723
	Test	2.7875	40	.80166	.12675	

Table 5: GINGIVAL RECESSION (GR)

Comparison of mean and standard deviation values of Gingival Recession in control and test groups at different time intervals

		Mean	N	Std. Deviation	Std. Error Mean	P value
GR_ Baseline	Control	.35	40	.622	.098	.665
	Test	.2875	40	.52973	.08376	
GR_3M	Control	.35	40	.622	.098	.551
	Test	.2625	40	.51872	.08202	
GR_6M	Control	.35	40	.622	.098	.435
	Test	.2375	40	.88457	.08004	
GR_9M	Control	.35	40	.622	.098	.551
	Test	.2625	40	.51872	.08202	

VISUAL ANALOGUE SCALE, EARLY WOUND HEALING INDEX

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Table 6: Comparison of mean and standard deviation values of Visual Analogue Scale of pain and Early Wound Healing Index in control and test groups at 1 week post operative interval

		Mean	N	Std. Deviation	Std. Error Mean	Correlation	P Value
VAS	Control	2.80	40	.608	.096	.748	.000
	Test	1.60	40	.496	.078		
EHI	Control	1.90	40	.304	.048	.543	.000
	Test	1.00	40	.000	.000		

4. RESULTS

There were no statistically significant differences among the groups regarding Plaque Index, Gingival Bleeding Index, Probing Pocket Depth, Clinical Attachment Level, and Gingival recession (table 1-table 5). However, there swas a reduction within the groups from baseline to 9 months, except for the Gingival Recession. The intergroup comparison of the Visual Analogue Scale of pain and the Early Wound Healing Index showed significant results in the Test group than in the Control group 1 week after the operation.(table 6).

5. DISCUSSION

Periodontitis is a chronic inflammatory disease categorized as a complex condition in humans. This complexity arises not only from the various clinical symptoms associated with the disease but also from the numerous factors that contribute to and influence periodontal inflammation.[1]

The disease can start in childhood or adolescence, but it usually appears in early adulthood and, in rare cases, later in life. Patients with periodontitis typically reveal one or more disease risk factors, but individuals with vastly different disease severity can reveal identical risk factors. Some patients with severe diseases, such as localized aggressive periodontitis, do not exhibit any of the traditional risk factors. Aggregatibacter actinomycetemcomitans and Porphyromonas gingivalis are important pathogens of aggressive periodontitis, but low levels of the species can also inhabit disease-stable sites. Periodontitis affects select teeth or tooth surfaces, and rarely the entire dentition, and may approach the apex of one tooth while barely involving a neighboring tooth sharing the same interdental space.[4] Rateitschak-Pluss et al. (1992)[5] used scanning electron microscopy to show that non-surgical therapy failed to reach the base of the pocket on 75% of the root surfaces. Furthermore, molar furcation sites with initial pocket depths (PD) of ≥4 mm had a poor response to a non-surgical approach alone. A large number of studies have been conducted over the years to compare the efficacy of SRP alone and SRP in combination with surgery. Their findings are consistent with those of a systematic review and a literature review found that, while SRP alone and SRP with a surgical flap were both effective treatment modalities for periodontitis, open flap debridement resulted in greater PD reductions and Clinical Attachment Level (CAL) gains in deeper pockets.[6] A meta-analysis also confirmed that for all initial pocket depths, surgical treatment resulted in more PD reductions than non-surgical treatment in the short term. Furthermore, when compared to non-surgical treatment, surgical treatment resulted in greater PD reductions with the deepest initial pockets in the long term.[6] Microsurgery has a wide range of applications, including rotational, free gingival, double papilla, and subepithelial connective tissue grafts for coverage because it causes minimal trauma and improves wound healing. The use of small microsurgical instruments in conjunction with delicate surgical techniques allows for extremely fine, crisp, and accurate incisions, gentle tissue handling, and precise repositioning of wound margins with smaller needles and sutures.[7]

Microsurgical approaches have been shown in studies to improve initial healing in the sites due to more accurate and atraumatic soft tissue handling. Furthermore, with the microsurgical technique, the coronal displacement of the flaps over the defects was found to be easier and had less tension, which facilitates healing and the return of the mucogingival line to its original position. Enamel matrix derivatives have been shown in studies with enamel matrix proteins to have better biologic activity in microsurgically treated sites due to reduced tissue trauma and vessel injury, allowing for improved vascularization and primary wound closure, allowing for optimal retention of enamel matrix derivatives.[8]

Periodontal microsurgery is not substitute for traditional periodontal surgery. It is the evolution of surgical techniques to allow for less trauma. This methodology enhances existing surgical practice and opens the door to better patient care in periodontics.

Microsurgery opens up new avenues for improving periodontal care in a variety of ways. Its advantages include improved cosmetics, faster healing, less discomfort, and increased patient acceptance.[9]

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6. CONCLUSION

An improvement was observed in all the clinical parameters in both the groups from baseline to 9 months with no statistical significance in between the groups. However, the intergroup comparison revealed a reduction in pain and better healing in the test group compared to the control group.

Declarations

Conflict of Interest

The Author declares that she has no conflict

Ethical Approval

Signed in consent form prior to procedure.