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Microsurgical and Conventional Open Flap Debridement Procedure in the Management of Periodontitis: A Comparative Clinical Study

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Abstract:
Background and objectives: *Periodontitis is one of the most common oral inflammatory infectious disease and the leading cause of loss of dentition and destruction of tooth supporting tissues. The mechanical removal of bacterial plaque, calculus and toxic material is an effective means of altering the periodontal disease. Microsurgery is described as a methodology, a modification, and refinement of existing surgical techniques that uses magnification to improve visualization for efficient surgical approach. As visualization of the surgical site is improved, it results in thorough debridement and more definite removal of calculus during flap surgery. It is least traumatic surgical approach being possible because of magnified surgical field and enhanced dexterity of operator leading to less injury and more meticulous tissue handling with cleaner incisions, closer wound apposition and reduced hemorrhage. The aim of the study was to compare and evaluate the clinical outcomes of microsurgery with conventional open flap debridement in management of chronic periodontitis.* ***Material and Methods:*** *12 Chronic periodontitis patients having probing pocket depth ≥ 5 mm were randomly assigned for microsurgical (test) and conventional open flap debridement (control) in a split mouth design. At baseline and 3 months the clinical parameters were recorded. Plaque index, probing depth, clinical attachment level, gingival recession, bleeding index, post-operative healing at 1 week by early healing index and pain scale for 7 days was assessed.* ***Results:*** *A significant reduction in clinical parameters at baseline and at 3 months was found in both test and control groups. A superior result was observed for test group which presented with a better early wound healing index and less post-operative pain.* ***Conclusion:*** *Microsurgical approach results in enhanced clinical outcomes.*

Key Words: *Microsurgery, Open flap debridement, early wound healing index.*

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I. Introduction

Periodontitis is one of the most prevalent oral conditions worldwide. The current model for periodontitis includes microbial components, host inflammatory responses and environmental factors. [1,2] They play a major etiological role and cause both direct as well as host-mediated tissue injury.[3] The ultimate goal of periodontal therapy is to eliminate these factors, restore function and regenerate the supporting tissues lost as a consequence of inflammatory periodontal disease.

The major etiologic factors, plaque and calculus removal from the tooth surface remains to be the gold standard in treating periodontal disease.[4] Complete removal of bacterial deposits and their toxins from the root surface cannot be completely achieved by conventional nonsurgical mechanical therapy because of limited access to areas such as furcations, concavities and developmental grooves and hence necessitating surgical intervention.[5-7] Thus, flap surgery is an indication for deeper pockets, resulting in reduction of pockets and clinical attachment gain.[8]

With the advent of new technology and easy access for modern time-limiting procedures, the focus is getting drifted towards newer technology from traditional mechanical and surgical therapy. The application of microscopes in dentistry has brought on a major evolution in dental practice. Microsurgery, is described by Serafin as a methodology – modification and refinement of existing surgical techniques using magnification to improve visualization, with application to all specialties.[9]

Periodontal microsurgery is an extension of surgical principles and techniques by which exceedingly accurate and delicate preparation and atraumatic handling of soft and hard tissue is achieved that enhances primary wound closure through optical or video magnification.[10] The importance of root debridement is recognized universally as an essential component of periodontal therapy.[11-14] Evidence presents that residual

calculus persists not only on teeth treated by scaling alone but also on teeth treated by flap surgery followed by scaling and root planing.[15] It has also been reported that root instrumentation is effective when done under illumination along with an improved early healing index and less postoperative pain.[16,15] In the literature a handful of clinical studies have been documented using application of magnification in periodontal open flap debridement. So, the aim of the present study is to evaluate the treatment outcomes of microsurgical open flap debridement under operating microscope and compare it with conventional open flap debridement procedures.

II. Materials And Methods:

Ethical clearance was obtained from the institutional review board. The study protocol was explained to the patients, and written informed consent was obtained from those who agreed to voluntarily participate in the study. Only subjects with diagnosis of generalized chronic periodontitis were involved in this randomized controlled split mouth study.

Inclusion Criteria:

i. Chronic periodontitis patients (7 males and 5 females).
ii. Good general health.
iii. 30-60 years.
iv. Probing pocket depth (PPD) ≥ 5 mm after phase-1 therapy in contralateral quadrants.

Exclusion Criteria:

i. Previous periodontal surgery on the involved site within 6 months before the first visit.
ii. Systemic diseases.
iii. Use of antibiotics and steroids.
iv. Smokers.
v. Pregnancy.
vi. Patients with poor oral hygiene.

A minimum of 4 teeth per quadrant with similar pattern of bone loss and probing depth were included for treatment either by microsurgical (test site) or conventional approach (control site) in a split mouth design. The clinical parameters were evaluated at baseline and 3 months. Parameters assessed were probing pocket depth (PPD), clinical attachment level (CAL), gingival recession (GR), gingival bleeding index, early healing index at 1 week and visual analog scale (VAS) for patient comfort assessment for 7 days post-operatively.

III. Surgical Procedure:

Surgical procedure was carried out 4 weeks after phase-I therapy by the same operator for each patient in both groups. The patient was asked to rinse the mouth with 10 ml of 0.2% chlorhexidine gluconate solution for 60 seconds. The operative sites were anaesthetized using 2% lidocaine hydrochloride with adrenaline (1:200,000).

In the control group, after proper isolation of the surgical field, crevicular incisions were made on the facial and lingual/palatal surfaces of each tooth and full thickness mucoperiosteal flaps were elevated. Open flap debridement after reflection was done. Pocket epithelium and granulation tissue was removed using curette, to provide full access and visibility to the root surfaces and the root surfaces were planed thoroughly. The surgical site was flushed with sterile saline. Flaps were approximated to presurgical level and were sutured using interrupted suturing technique with 3-0 silk suture. A non-eugenol periodontal dressing, Coe-pak® was placed. (Figure 3-7)

In the test sites, the procedure was carried out using Seiler LQ operating microscope (Figure 1) under 10x magnification. After local anaesthesia, crevicular incisions were placed using microsurgical blades. A microsurgical periosteal elevator was used to elevate a full thickness buccal and palatal/lingual flap. (Figure 2) Degranulation was carefully done using curettes. The flaps were approximated to the original level and secured with 6-0 vicryl microsutures. (Figure 8-12)

POST-OPERATIVE CARE AND FOLLOW-UP

Post-operative instructions were given to the patients. Patients were prescribed with anitibiotics (Amoxicillin, 500mg thrice daily for 5 days) and analgesics (Diclofenac, 100mg twice daily for 3 days) Chlorhexidine gluconate rinses (0.2%) were prescribed twice daily for 1 week. Periodontal dressings and sutures were removed after 7 days post operatively. Patients were recalled for post-operative evaluation.

STATISTICAL ANALYSIS

Statistical Product and Service Solutions (SPSS) version 21 for Windows, Armonk, NY: IBM corp software was used to analyze the data. Statistical analysis was done by using tools of descriptive statistics such as Mean, and SD for representing quantitative data. Probability $p<0.05$, considered as significant as alpha error set at 5% with confidence interval of 95% set in the study. Power of the study was set at 80% with beta error set at 20%. Normality of data was checked using Shapiro Wilk test. Unpaired 't' test was used for intergroup comparison between conventional OFD and microsurgical OFD for various clinical parameters at different time intervals. Paired 't' test was used for intragroup comparison of change in various gingival and periodontal parameters from baseline to 3 months in each group.

IV. Results

Over the time of 3 months, no significant difference was observed between the groups for probing pocket depth, clinical attachment level, gingival recession, gingival bleeding index, gingival margin level, but clinically significant difference was observed in intragroup comparison. (Figure 13-17) A positive difference was noted for healing by using early healing index assessment which showed better results for the test group as compared to the control group. (Figure 18) Pain assessment using VAS scale (Figure 19) revealed a statistically significant difference between test group and control group. (Table 1)

V. Discussion

Periodontitis is a chronic inflammatory disease characterized by tissue destruction resulting from interaction between microbial plaque and host immune mechanisms.[17] The etiology of periodontitis is multi-factorial, but it is an infection and bacterial species are the primary etiologic agents. Periodontal therapy is the primary treatment for patients having periodontal diseases.

Non-surgical measures for management of periodontitis do not suffice thorough debridement. In vitro studies have shown that after therapy, 3%–80% of instrumented root surfaces harbored some residual calculus.[18-21] This has led to development of various surgical procedures for management of periodontitis to obtain access to the root surfaces for proper debridement and to provide ideal conditions for healing. Open flap debridement helps in pocket elimination or reduction and complete removal of calculus. Periodontal microsurgery is the descendant of conventional periodontal surgery in an attempt to reduce the surgical trauma and opens the horizon for better patient care. Microsurgery, allows subgingival treatment in deep pockets with less chances of over instrumentation of the root surface. Magnification improves the root surface debridement by enhancing clinician's ability to differentiate the calculus from tooth surface to the microscopic level, which accurately procreates working end angles during instrumentation. [22]

The application of microsurgery has been carried out in various fields of periodontology, like root surface debridement, regenerative periodontal procedures, mucogingival surgery, implant therapy, crown lengthening procedures. Sparse literature is available for comparing the use of microsurgery to open flap debridement procedure in the management of periodontitis. This study utilized an operating microscope for open flap debridement in periodontitis patients.

The present study was a split mouth study with a probing depth of $\geq$ 5mm were included. After 3 months of completion of study, an average reduction of 2.34 mm and 2.56 mm was found in control and test group respectively and CAL gain of 2.12 mm and 3.14 mm was recorded in control and test group respectively. This is in accordance with studies conducted by Perumal.et.al [15] and Reddy.S.et.al [23] The early healing index score of 1.33 was recorded in microsurgical group which yielded superior results owing to the benefit of precise wound approximation while suturing and atraumatic handling of the tissues. The pain scale was assessed using VAS scale at 7 days which showed better patient related outcome for test group. This could be because of using finer sutures and instruments. In this study, no significant amount of increase in gingival recession was observed. However, studies have shown minimal gingival recession (0.4 mm) with microsurgery due to atraumatic manipulation during surgery and excellent soft tissue preservation.[24,25]

This study clearly demonstrates improvement in all clinical parameters at 3 months when compared at baseline in both the groups with a better result in microsurgical group. Open flap debridement with operating microscope showed better early wound healing and less patient discomfort compared to conventional approach.
The present study has certain limitations. The sample size was kept minimum. The test sites were treated after the control sites, the less postoperative pain may be due to the less apprehension for the second surgery.

VI. Conclusion

The surgical operating microscope provides a microsurgical triad of illumination, magnification, and an environment in which surgical skills can be refined. Incorporation of smaller instruments, sutures, and needles into this environment allow clinicians to increase the precision of their surgical skills. The present study demonstrated a better patient centric outcome and wound healing when microsurgical approach was used. Both

the groups were equally efficient in improving clinical parameters. Although clinical studies are lacking and research is needed, the increase in visual acuity provided by the surgical operating microscope should enhance the periodontist's delivery of surgical skills.

Acknowledgement

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TABLE 1:

Parameters	Time intervals	Group A (Conventional OFD) Mean (S.D)	Group B (Microsurgical OFD) Mean (S.D)	p value^
Probing Pocket depth	Baseline	5.47 (0.28)	5.13 (0.12)	p = 0.021*
	3 Month	3.13 (0.22)	2.57 (0.19)	p = 0.001*
	p value#	p<0.001**	p <0.001**	
Plaque Index score	Baseline	1.70 (0.3)	1.40 (0.08)	p = 0.039*
	3 Month	1.24 (0.18)	0.98 (0.18)	p = 0.032*
	p value#	p = 0.009*	p = 0.001*	
Sulcus Bleeding Index Score	Baseline	1.63 (0.5)	1.16 (0.19)	p = 0.058
	3 Month	0.71 (0.44)	0.33 (0.09)	p = 0.074
	p value#	p = 0.008*	p<0.001**	
Gingival Recession Score	Baseline	0.19 (0.13)	0.91 (0.25)	p < 0.001**
	3 Month	0.46 (0.19)	0.35 (0.13)	p = 0.262
	p value#	p =0.020*	p =0.001*	
Relative Clinical Attachment score	Baseline	5.63 (0.38)	6.06 (0.22)	p = 0.041*
	3 Month	3.51 (0.24)	2.92 (0.27)	p = 0.003*
	p value#	p <0.001**	p < 0.001**	
Early healing index score	7 DAYS	2.83 (0.4)	1.33 (0.51)	p <0.001**
Pain score	7 DAYS	5.66 (0.51)	3.5 (0.54)	p <0.001**

FIGURE 1: SEILER LQ OPERATING MICROSCOPE

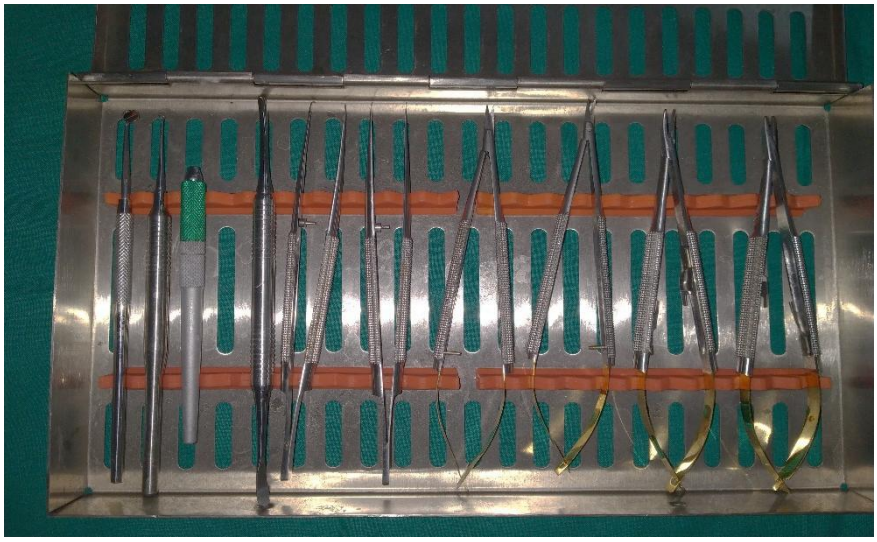

FIGURE 2: MICROSURGICAL INSTRUMENT KIT

CONVENTIONAL GROUP:

FIGURE 3: PROBING DEPTH

FIGURE 4: INCISION

FIGURE 5: FLAP REFLECTED

FIGURE 6: SUTURES

FIGURE 7: POST OPERATIVE

TEST GROUP (OPERATING MICROSCOPE):

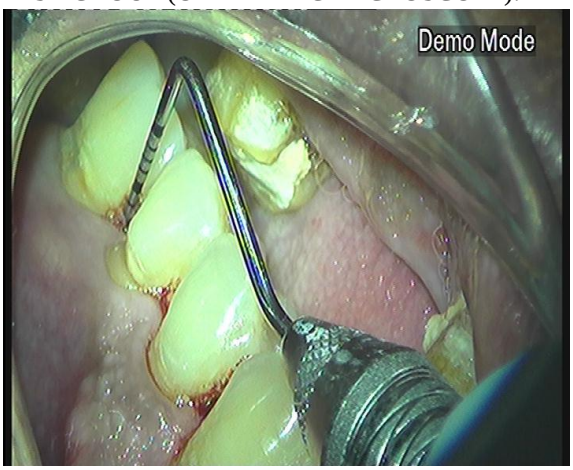

FIGURE 8: PROBING DEPTH

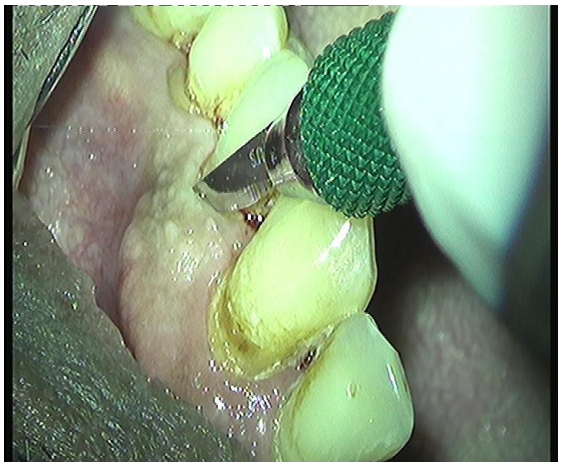

FIGURE 9: INCISION

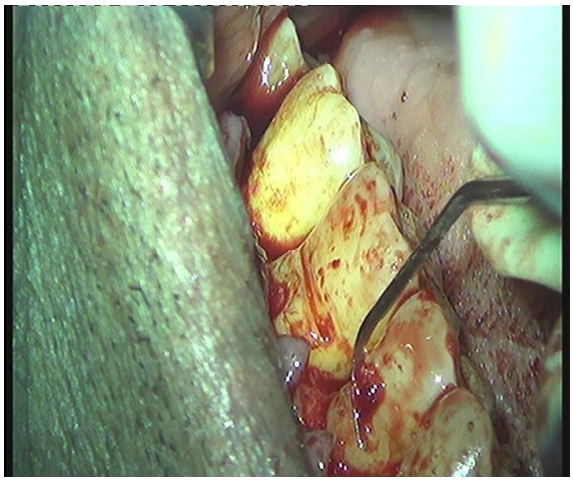

FIGURE 10: DEBRIDEMENT

FIGURE 11: SUTURING

FIGURE 12: POST OPERATIVE

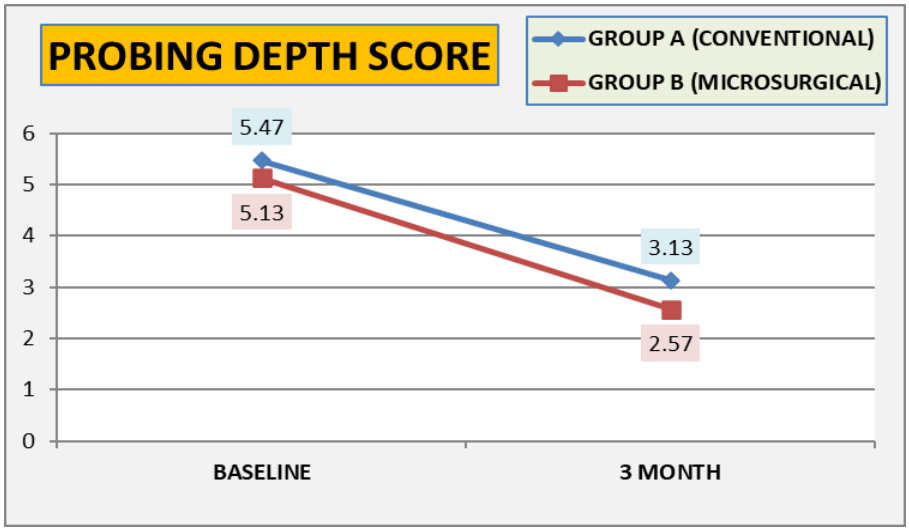

FIGURE 13: PROBING DEPTH SCORE AT BASELINE AND 3 MONTHS

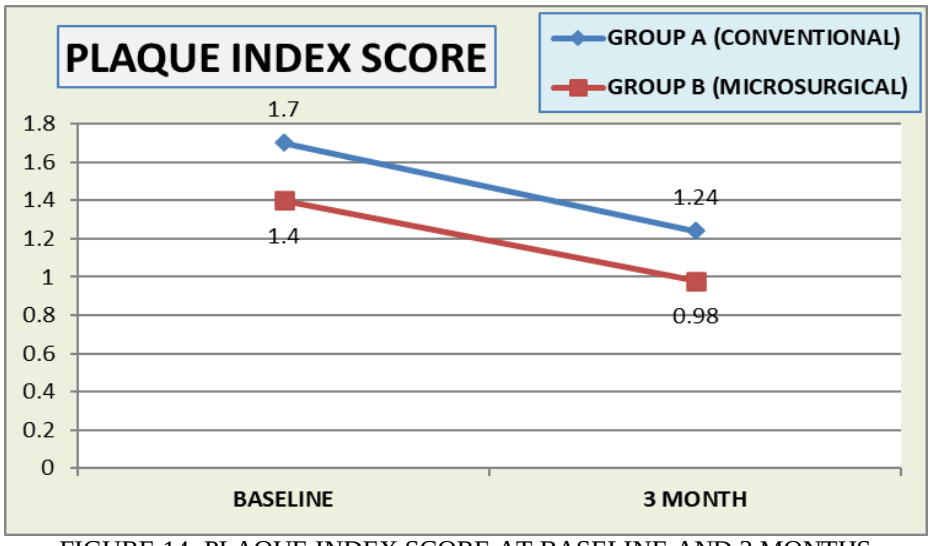

FIGURE 14: PLAQUE INDEX SCORE AT BASELINE AND 3 MONTHS

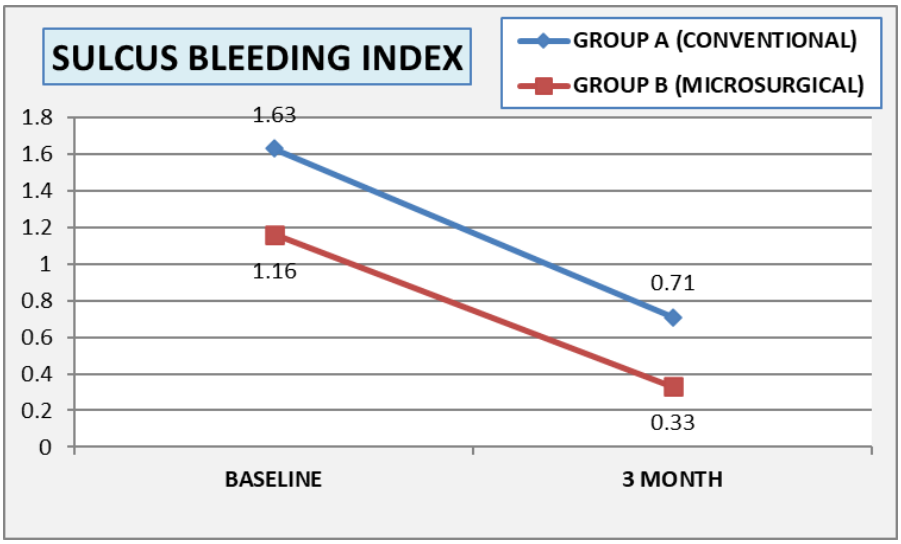

FIGURE 15: SULCUS BLEEDING INDEX AT BASELINE AND 3 MONTHS

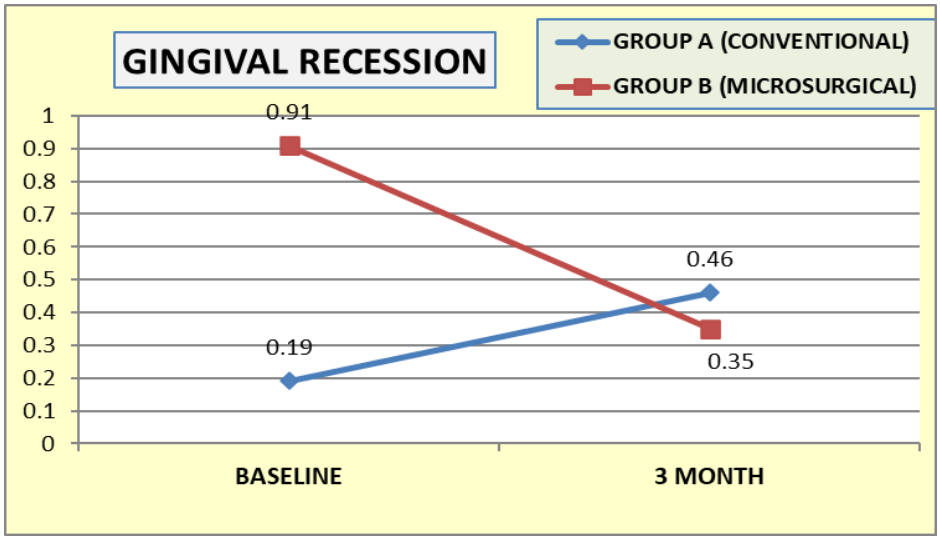

FIGURE 16: GINGIVAL RECESSION

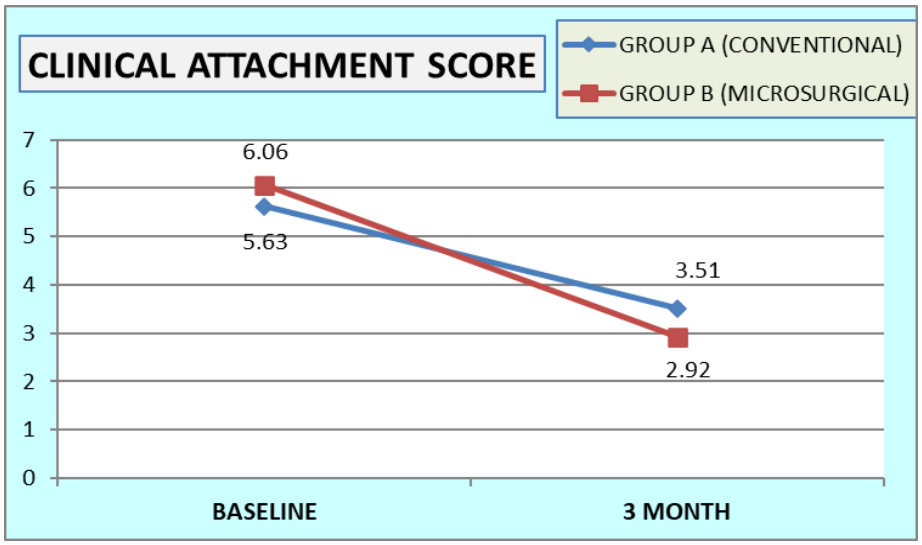

FIGURE 17: CLINICAL ATTACHMENT SCORE AT BASELINE AND 3 MONTHS

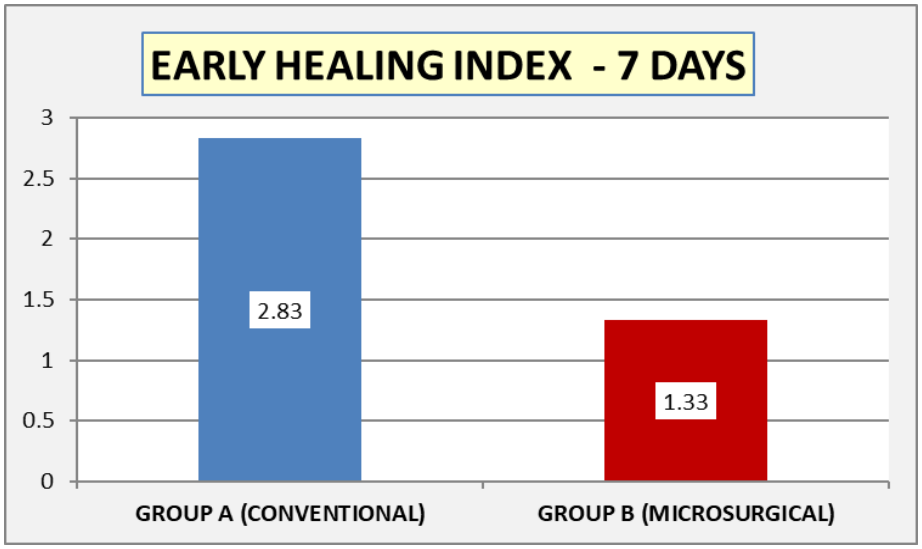

FIGURE 18: EARLY HEALING INDEX AT 7 DAYS ASSESSED BY WACHTEL ET.AL INDEX

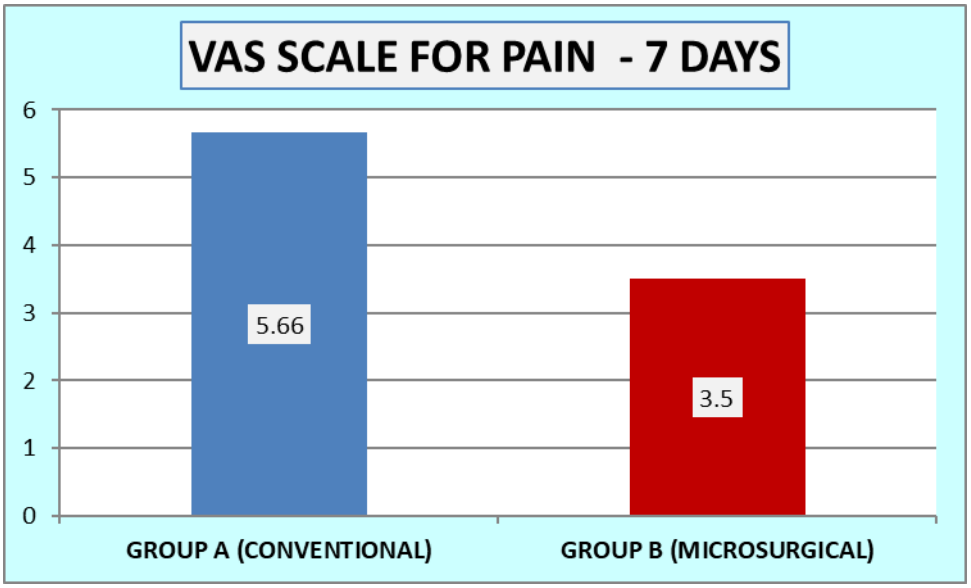

FIGURE19: VISUAL ANALOGUE SCALE (VAS) SCORES FOR PAIN ASSESSMENT

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