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Eeficiency of conventional technique and surgical operating microscope in crown lengthening: An original research

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***Abstract*---**Background: The success of any periodontal therapy always depends on better visual access and, magnification is an important component which provides good hand eye coordination with a better treatment outcome. The aim of our study is to assess the effectiveness of magnification over conventional method while performing surgical crown lengthening and to evaluate the patient

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comfort level and pain perception over a period of 3 months. Methods -The study was conducted amongst 20 patients, 10 in each group requiring crown lengthening for restorative purpose and was evaluated ever a period of 3 months. Results - During 3months follow up, significant differences were found between the groups for probing depth with mean difference of 1.22±0.6, position of gingival margin as with mean 2.7±1.15 and biologic width with mean difference 2.8±0.42.Regarding patient comfort and patients pain perception it was found low for microscope group with mean difference of 2±0.67 Conclusion – A good visual access is a primary requisite behind the success of any periodontal therapy and it was concluded from our study that there was significant reduction in probing depth and improvement in biologic width, gingival margin, and wound healing of patients under microscope and by evaluating the VAS score it was concluded that pain perception is low for patients under magnification.

***Keywords*---**Periodontal, conventional technique, effectiveness of magnification.

Introduction

Periodontal tissues form the foundation for esthetics , function and health of the dentition. The relationship between periodontal health and restoration of teeth is intimate and is inseparable wherein the factors impacting restorative / prosthodontic treatment also form the basis of periodontal health. Periodontal health should be the foremost criteria as the infringement for restoring based on the physiologic dimensions of the periodontium will potentially affect function and esthetics and crown lengthening procedures are performed ,to overcome these effects. All prosthetic and restorative therapies generally require a healthy periodontium as a pre requisite for a successful outcome[(2)] . This interplay between periodontics and restorative dentistry is present at many fronts ,including location of restorative margin ,crown contours and response of the gingival tissue to restorative preparation.[(1)] The clinical crown is the portion of the tooth that extends occlusally or incisally from the investing soft tissue, usually the gingiva as defined by American Academy of Periodonology[(3)]. Crown lengthening surgery and such procedure which is designed to increase clinical crown length for functional or esthetic purposes. It is performed for function to expose tooth structure for restorative therapies and for esthetics to treat excessive gingival display and gingival margin discrepancies. In addition to increasing the length of the clinical crown should also result in adequate biologic width and stable gingival margin position, Which can be performed by various procedures like conventional, electrosurgery , lasers, microsurgery etc.[(4)] In general any periodontal procedures are routinely carried out by conventional means that includes performance of the procedures under a naked eye. Although regularly performed it is not without limitations. However the main limitation lies in the patient's position in the dental chair as the procedures are time taking and requires lot of patience from the operator's side. Also tooth factors like improper root anatomy and lack of proper vision to inaccessible areas might also lead to

tissue trauma resulting in discomfort to the patient even.[5] Periodontal procedures are the one that are performed on small tissue requiring more precision and accuracy. It is clearly stated in the literature that diagnostic skills along with good visual access form the key criteria in the success of a periodontal treatment procedure by allowing a magnified view.[6]The success of treatment not only depends on a successful treatment plan but also the key to it lies in crucial diagnosis. Taking these factors into consideration, dentistry has evolved from conventional to that of advancements in the field wherein procedures are being performed under magnification. As the literature search has also evidenced positive outcomes like less tissue trauma as a result of precise and controlled instrumentation, resulting in a better and faster wound healing, procedures under magnification are the need of the hour .[5,6,7,8]Not only they account for the above said benefits but also have tremendous advantages related to the work position of the clinician as the increased time involved in dental procedures subject the clinician to musculoskeletal disorders.[9] Above all documentation in an accurate and proper way is the most important aspect of today's dentistry due to various other issues which can be achieved with procedures being done under magnification especially the surgical operating microscope. Taking these factors into consideration, as there is spare literature on the periodontal procedures done under magnification especially advocating under surgical operating microscope, in this study an attempt was made evaluate the effectiveness of surgical crown lengthening done under surgical operating microscope, there by evaluating its efficacy over the conventional means of crown lengthening.

Materials and Methods:-

Source of the Data

This is a randomized, controlled clinical trial where in patients from the Department of Periodontics and Implantology were recruited in this study. A total of 17 patients with age groups ranging from 20 to 60 years, who requires crown lengthening involving one or more teeth either to gain retention of sites with insufficient supracrestal tooth structure or to gain accessibility to deep , subgingivally located lesions were enrolled in this study.Ethical clearance was taken from Institutional Ethics and Review Board with an informed consent from the patient.

Selection Criteria

Inclusion criteria comprised of Periodontally healthy patients requiring crown lengthening for restoration of either anterior or posterior teeth**.** Patients with systemic diseases that contraindicate periodontal surgery, patients having active gingival and periodontal diseases and patients who are smokers were excluded from the study.

Study design

The selected patients are divided into two groups

1. Group A include 9 patients with 10 teeth requiring crown lengthening which was performed under surgical operating microscope

2. Group B include 8 patients with 10 teeth requiring crown lengthening which was performed under conventional surgical procedure

All the subjects received initial treatment of oral prophylaxis and oral hygiene instructions. Upper and lower impressions were taken and models were prepared. Prior to the surgery customized acrylic stent was prepared involving at least two teeth adjacent to the tooth to be treated. Vertical grooves parallel to the long axis of the tooth at the mesiobuccal, mid buccal , distobuccal , mesiopalatal , mid palatal and distopalatal area were made .These grooves were of sufficient length and aid guiding a calibrated periodontal probe for repeated reproducible measurements.

Statistical analysis

The data were subjected to normality tests before checking for differences in the study parameters between the groups. The choice of statistical tests was made based on the results obtained from the Kolmogorov Smirnov test.

Results

It was observed that no significant differences in the study parameters of plaque index, probing depth, biologic width, and bone level existed between the two groups at baseline. Significant baseline differences were observed between the study groups with regard to gingival index scores, clinical attachment levels, and position of the gingival margin. During this 3 months follow up, significant differences between the groups were found only for gingival index scores, probing depth, position of gingival margin and biologic width. At baseline the gingival index was 1.39±0.78 under magnification and results showed that there is reduction of 0.75±0.33mm with subsequent mean difference of 7.6 and the reduction in the plaque scores, clinical attachment level and bone level are shown in Table 1. Regarding probing depth the mean reduction in conventional group varies from 3.3±1.25 at baseline to 2.9±1.28 at 3 months interval where as in surgical operating microscope it is reduced from 2.7±0.82 to 1.7±0.48 by 3 months interval which vary significantly in surgical operating microscope. Same mean difference reduction significantly vary from baseline to 3months interval regarding position of gingival margin and it varied with a mean difference of 4.6±1.34 at baseline to 3.8±0.78 at 3 months interval. In regards to the biologic width mean difference varies from 3.3±0.48 at baseline to 2.2±0.63 at 3 months interval as shown in Table 2,3. Intra group comparison with change in time revealed that there were significant changes with relation to all the study parameters in the surgical microscope group. In the conventional group, the parameters of position, biologic width, and bone level did not vary significantly with time as shown in Significant differences between the study groups were observed with regard to patient comfort and wound healing, with less VAS scores and EHWI scores in the surgical microscope group compared to the conventional group as shown in Table 4,5 and Table 6.

Table 1: Comparison of study parameters between the groups at baseline

Parameter	Surgical Microscope Group (n=10)		Conventional Group (n=10)		P value
	Mean±SD	Mean Rank	Mean±SD	Mean Rank	
Plaque index	1.93±0.55	9	2.19±0.56	12	0.25
Gingival index	1.39±0.78	7.3	2.36±0.69	13.7	0.016*
Probing depth	2.7±0.82	9.25	3.3±1.25	11.75	0.316
Clinical Attachment Level (CAL)	7.2±1.03	13.25	6.1±0.99	7.75	0.031*
Position	4.6±1.34	13.75	2.8±1.39	7.25	0.012*
Biologic width	3.3±0.48	11.5	3.1±0.31	9.5	0.276
Bone level	7.1±1.1	11.1	6.8±1.4	9.9	0.641

Mann Whitney U test; p≤0.05 considered statistically significant

Figure 1: Comparison of study parameters between the groups at baseline

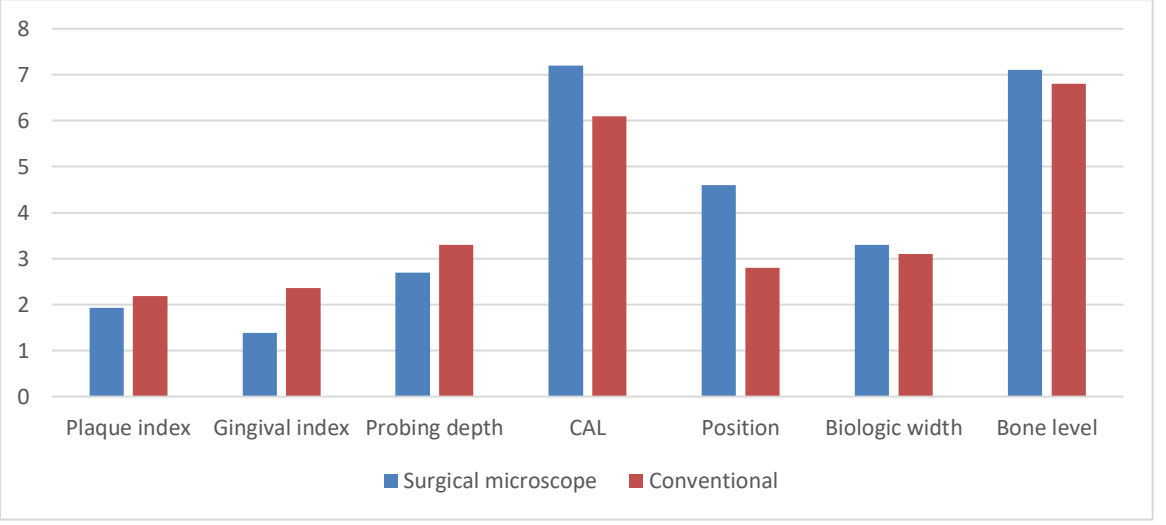


Table 2: Comparison of study parameters between the groups at 3months

Parameter	Surgical Microscope Group (n=10)		Conventional Group (n=10)		P value
	Mean±SD	Mean Rank	Mean±SD	Mean Rank	
Plaque index	1.26±0.34	10.1	1.33±0.44	10.9	0.76
Gingival	0.75±0.33	7.6	1.22±0.6	13.4	0.028*

index					
Probing depth	1.7±0.48	7.05	2.9±1.28	13.95	0.005*
Clinical Attachment Level (CAL)	5.4±0.84	9.8	3.6±0.69	11.2	0.562
Position	3.8±0.78	13.4	2.7±1.15	7.6	0.023*
Biologic width	2.2±0.63	7.9	2.8±0.42	13.1	0.025*
Bone level	6.1±0.56	9.85	6.3±1.63	11.15	0.603

Mann Whitney U test; p≤0.05 considered statistically significant

Figure 2: Comparison of study parameters between the groups at baselin

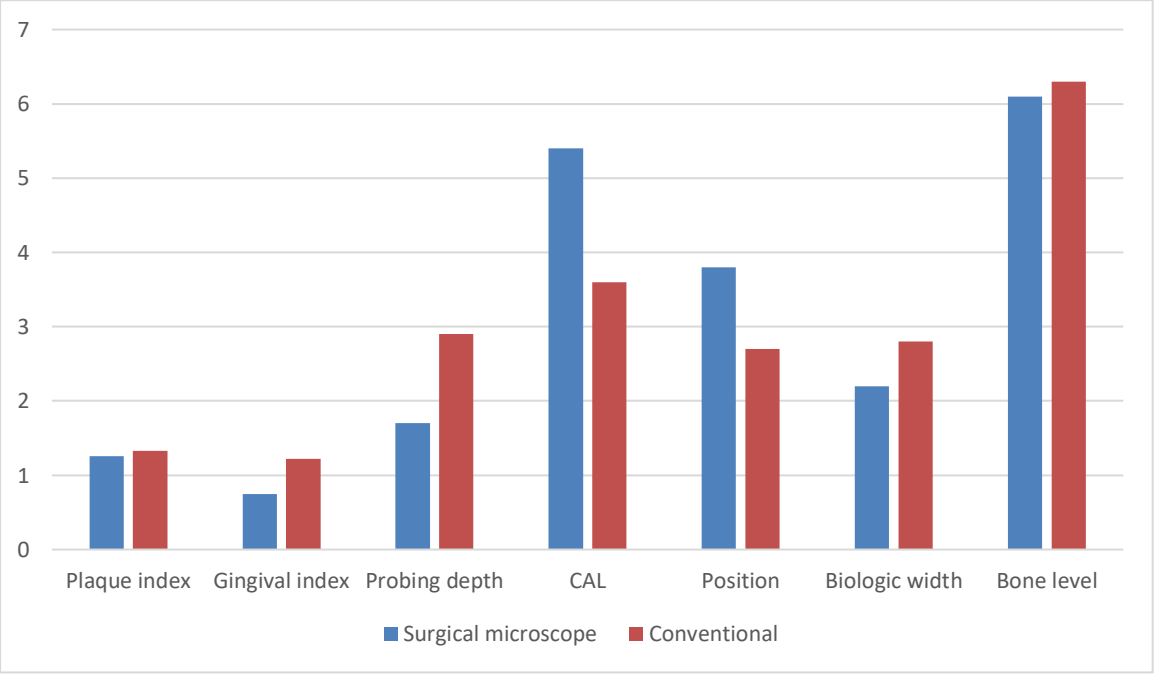


Table 3: Comparison of mean change in study parameters between the groups

Parameter (Baseline – 3 months)	Surgical Microscope Group (n=10)		Conventional Group (n=10)		P value
	Mean±SD	Mean Rank	Mean±SD	Mean Rank	
Plaque index	0.67±0.59	9.1	0.86±0.31	11.9	0.29
Gingival index	0.69±0.82	8.5	1.13±0.59	12.5	0.13
Probing	1±0.47	13.2	0.4±0.51	7.8	0.018*

depth					
Clinical Attachment Level (CAL)	1.8±0.63	14.75	0.5±0.52	6.25	0.001*
Position	0.8±0.78	12.4	0.1±0.99	8.6	0.101
Biologic width	1.1±0.31	14.15	0.3±0.48	6.85	0.001*
Bone level	1±0.81	12.25	0.5±0.7	8.75	0.154

Mann Whitney U test; p≤0.05 considered statistically significant

Table 4: Comparison of changes in study parameters with time in the Surgical Microscope Group

Parameter	Baseline (n=10) Mean±SD	3 Months (n=10) Mean±SD	P value
Plaque index	1.93±0.55	1.26±0.34	0.008*
Gingival index	1.39±0.78	0.75±0.33	0.028*
Probing depth	2.7±0.82	1.7±0.48	0.004*
Clinical Attachment Level (CAL)	7.2±1.03	5.4±0.84	0.004*
Position	4.6±1.34	3.8±0.78	0.021*
Biologic width	3.3±0.48	2.2±0.63	0.002*
Bone level	7.1±1.1	6.1±0.56	0.015*

Wilcoxon Signed rank test; p≤0.05 considered statistically significant

Intra group comparison with change in time revealed that there were significant changes with relation to all the study parameters in the surgical microscope group. In the conventional group, the parameters of position, biologic width, and bone level did not vary significantly with time.

Figure 3: Comparison of changes in study parameters with time in the Surgical Microscope Group

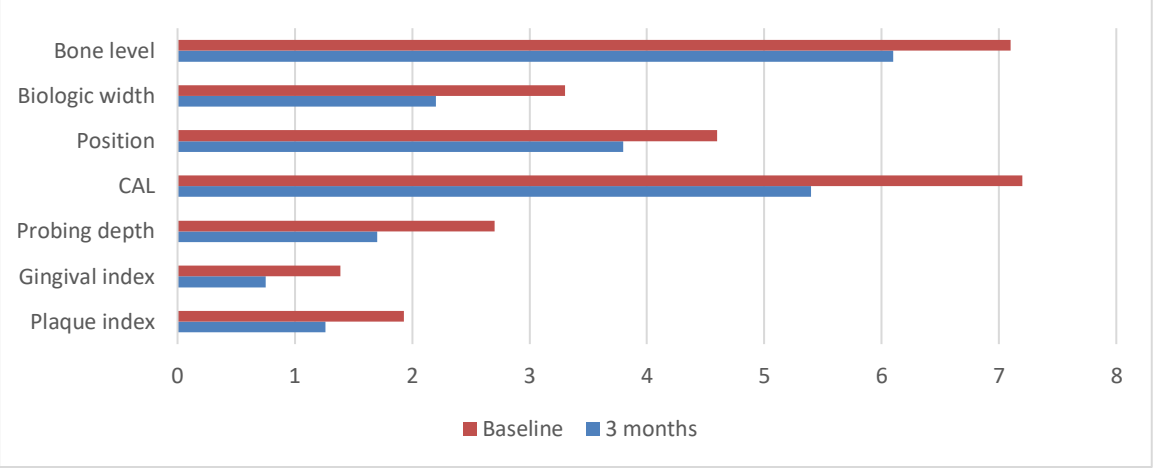


Table 5: Comparison of changes in study parameters with time in the Conventional Group

Parameter	Baseline (n=10) Mean±SD	3 Months (n=10) Mean±SD	P value
Plaque index	2.19±0.56	1.33±0.44	0.005*
Gingival index	2.36±0.69	1.22±0.6	0.005*
Probing depth	3.3±1.25	2.9±1.28	0.046*
Clinical Attachment Level (CAL)	6.1±0.99	3.6±0.69	0.025*
Position	2.8±1.39	2.7±1.15	0.739
Biologic width	3.1±0.31	2.8±0.42	0.083
Bone level	6.8±1.4	6.3±1.63	0.059

Wilcoxon Signed rank test; p≤0.05 considered statistically significant

Figure 4: Comparison of changes in study parameters with time in the Conventional Group

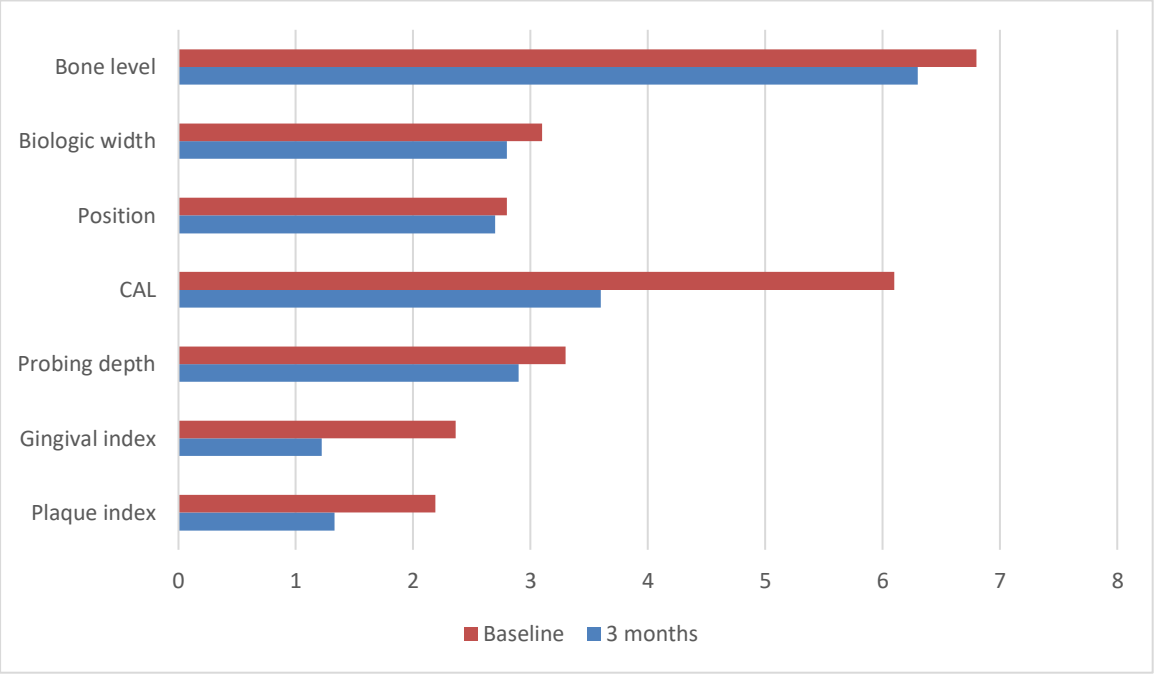


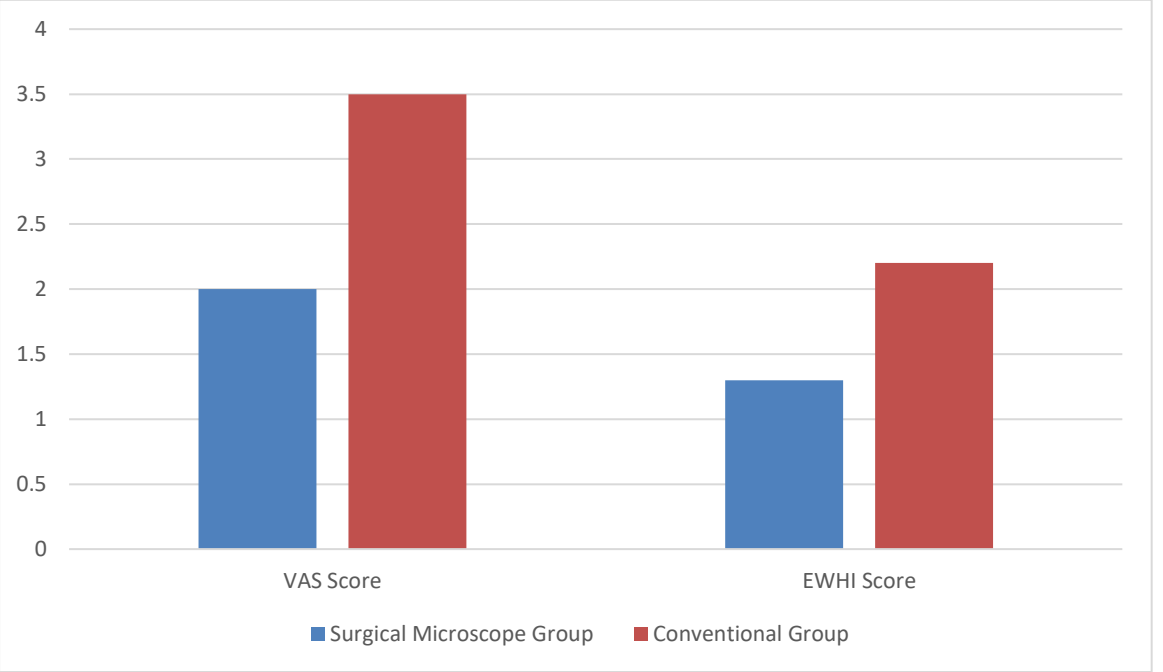
Table 6: Comparison of patient comfort and post-operative healing between the study groups

Parameter	Surgical Microscope Group (n=10)			Conventional Group (n=10)			P value
	Mean±SD	Mean Rank	Median	Mean±SD	Mean Rank	Median	
VAS score	2±0.67	6.3	2	3.5±0.7	14.7	4	0.001*
EWHI score	1.3±0.48	7.05	1	2.2±0.63	13.95	2	0.005*

Mann Whitney U test; p≤0.05 considered statistically significant

Significant differences between the study groups were observed with regard to patient comfort and wound healing, with less VAS scores and EHWI scores in the surgical microscope group compared to the conventional group.

Figure 5: Comparison of patient comfort and post-operative healing between the study groups



Discussion

The goal of surgical crown lengthening is to provide the restorative dentist with sufficient clnical crown to permit optimum restoration of a tooth. A short clinical crown may lead to poor retention form thereby leading to improper tooth preparation and the stability of gingival margin and biologic width are considered to be of prime concern after surgical crown lengthening procedures .Surgical crown lengthening procedure is done to increase clinical crown length without violating biologic width .Following crown lengthening surgery, some degree of marginal rebound can be anticipated and many factors that contribute to this include, position of flap margin after surgery , periodontal biotype, ,reformation of the biologic width ,individual patient healing characteristics , timing of restorative procedures and post operative plaque control. Recently microsurgery has been emphasized for periodontal surgical procedures and periodontal microsurgery is the descendant of conventional periodontal surgery, which opens the horizons for better patient care .Microsurgery enhances the surgeons motor skills to improve surgical ability, and this is accomplished by increasing the precision of movements and decreasing the involuntary tremor , and reducing the tissue trauma at the surgical site through the use of small instruments and a smaller surgical field and application of this microsurgical principles to enhances passive and primary wound closure. The advantage is that they eliminate the gaps and dead space at the wound edge to circumvent new tissue formation needed to fill the surgical voids as well as to avoid the painful and inflammatory phase of wound healing .[11] Though many conventional methods have been discussed in the

literature , there are no studies comparing the microsurgical crown lengthening procedures with the conventional technique. In this present study, the marginal periodontal tissues showed a distinct tendency to grow in a coronal direction from the level defined at surgery in both the groups .The post surgical soft tissue remodelling occurred in conjugation with positive clinical parameters as shown by low plaque and gingival index , and this was in accordance with the study conducted by Ritika erora et al[11], Sharon K Lanning et al [12] wherein evaluation of the rebound of periodontal tissue after surgical crown lengthening was examined wherein a significant rebound of periodontal tissue through conventional means of surgery was elucidated. In the present study the mean probing depth decreased from baseline to 3 months in both groups was elucidated and group A showed higher reduction of probing depth compared to group B. This significant difference in probing depth in group B is in accordance with the studies conducted by David e deans et al and R Pontoriero et al [10,13] on surgical crown lengthening. It was also observed in this study that mean biologic width was decreased to 0.08mm in Group B and this difference was statistically significant between the groups over time which is in accordance with the study conducted by Ritika erora et al[11] where the amount of biologic width reduction with the conventional means of surgical crown lengthening was evaluated. There is decrease in the biologic width ,which was considered to be due to the coronal movement of supracrestal gingiva from baseline to 3 months and this was not in accordance with the study conducted by Bragger et al where in they have found a significant difference in the biologic width from baseline to 6 months when done through conventional means of crown lengthening. Study conducted by Rashmi Hegde et al were performed on a series of four cases under surgical operating microscope wherein they have concluded that and there was less tissue trauma at the surgical site , finer incisions without any ragged edges and better tissue approximation which is in accordance with the present study which showed better wound healing in surgical operating microscope when compared to the conventional method. A notable trend in this study was that the patient outcome was more satisfactory and there is significant VAS score and Early Wound Healing Index score for surgical operating microscope which is in accordance with the study done by Gautami penmetsa et al [16]wherein the efficacy of scaling and root planning was compared and evaluated in different magnification variables and healing index was also assessed under surgical operating microscope. The results under surgical operating microscope have shown decrease in probing depths, biologic width , less tissue rebound capacity which can be attributed to the better visibility and accessibility which can further be attributed to the restricted movements leading to less tissue damage resulting in improved and better healing outcomes.

Conclusion

As ergonomics is one of the most important principles that needs to be implicated in dental practice, the use of surgical operating microscope can definitely overcome the limitations encountered in performing the procedures in a conventional way.[12] The reason for these differences in the probing depth , biologic width and alteration in the position of gingival margin may be due to the execution of surgical technique under surgical operating microscope which will be

more precise in means of incising the tissue and handling of the tissues due to restricted field of view, owing to a more defined execution of procedure.

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