A COMPARATIVE STUDY OF ERGONOMICS AND CLINICAL OUTCOME WITH MICROSURGICAL AND MACROSURGICAL PROCEDURES

Dissertation

Submitted to

BABU BANARASI DAS UNIVERSITY, LUCKNOW, UTTAR PRADESH

In the partial Fulfilment of the requirements for the Degree

of

MASTER OF DENTAL SURGERY

in

PERIODONTOLOGY

by

Dr. POONAM YADAV

Under the guidance of

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BABU BANARASI DAS COLLEGE OF DENTAL SCIENCES, LUCKNOW

(Faculty of Babu Banarasi Das University)

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ENDORSEMENT BY THE HEAD OF THE DEPARTMENT

This is to certify that the dissertation entitled **"A COMPARATIVE STUDY OF ERGONOMICS AND CLINICAL OUTCOME WITH MICROSURGICAL AND MACROSURGICAL PROCEDURES",** is a bonafide work done by

Dr. Poonam Yadav, under direct supervision and guidance of **Dr. Vandana A Pant**, Professor and Head, Department of Periodontology, Babu Banarasi Das College Of Dental Sciences**,** Babu Banarasi Das University, Lucknow, Uttar Pradesh.

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ENDORSEMENT BY THE HEAD OF THE INSTITUTION

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Place:

Dr. POONAM YADAV

DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation entitled **"A COMPARATIVE STUDY OF ERGONOMICS AND CLINICAL OUTCOME WITH MICROSURGICAL AND MACROSURGICAL PROCEDURES"**, is a bonafide and genuine research work carried out by me under the guidance of **Dr. VANDANA A PANT**, Professor and Head, Department of Periodontology, Babu Banarasi Das College Of Dental Sciences, Babu Banarasi Das University, Lucknow, Uttar Pradesh.

Date:

Place:

Dr. POONAM YADAV

APPENDIX – I

INSTITUTIONAL RESEARCH COMMITTEE APPROVAL FORM

BABU BANARASI DAS COLLEGE OF DENTAL SCIENCES
(FACULTY OF BBD UNIVERSITY), LUCKNOW

INSTITUTIONAL RESEARCH COMMITTEE APPROVAL

The project titled **"A Comparative Study of Ergonomics and Clinical Outcome with Microsurgical and Macrosurgical Procedures"** submitted by **Dr. Poonam Yadav** Post graduate student from the **Department of Periodontology** as part of MDS Curriculum for the academic year 2017-2020 with the accompanying proforma was reviewed by the Institutional Research Committee present on **05th December 2017** at BBDCODS.

The Committee has granted approval on the scientific content of the project. The proposal may now be reviewed by the Institutional Ethics Committee for granting ethical approval.

8/12/17

Prof. (Dr) Vandana A Pant
Co-Chairperson

Prof. (Dr) B. Rajkumar
Chairperson

APPENDIX – II

ETHICAL COMMITTEE APPROVAL FORM

Babu Banarasi Das University
Babu Banarasi Das College of Dental Sciences,
BBD City, Faizabad Road, Lucknow – 226028 (INDIA)

Dr. Lakshmi Bala
Professor and Head Biochemistry and
Member-Secretary, Institutional Ethics Committee

Communication of the Decision of the VIth Institutional Ethics Sub-Committee

IEC Code: 15 **BBDCODS/01/2018**

Title of the Project: A Comparative Study of Ergonomics and Clinical Outcome with Microsurgical and Macrosurgical Procedures.

Principal Investigator: Dr. Poonam Yadav **Department:** Periodontology

Name and Address of the Institution: BBD College of Dental Sciences Lucknow.

Type of Submission: New, MDS Project Protocol

Dear Dr. Poonam Yadav,

The Institutional Ethics Sub-Committee meeting comprising following four members was held on 30th January 2018.

1.	Dr. Lakshmi Bala Member Secretary	Prof. and Head, Department of Biochemistry, BBDCODS, Lucknow
2.	Dr. Amrit Tandan Member	Prof. & Head, Department of Prosthodontics and Crown & Bridge, BBDCODS, Lucknow
3.	Dr. Rana Pratap Maurya Member	Reader, Department of Orthodontics & Dentofacial Orthopedics, BBDCODS, Lucknow
4.	Dr. Sumalatha M.N. Member	Reader, Department of Oral Medicine & Radiology, BBDCODS, Lucknow

The committee reviewed and discussed your submitted documents of the current MDS Project Protocol in the meeting.
The comments were communicated to PI thereafter it was revised.

Decisions: The committee approved the above protocol from ethics point of view.

Forwarded by:

Lakshmi Bala 05/02/18

(Dr. Lakshmi Bala)
Member-Secretary
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CERTIFICATE

This is to certify that the **DISSERTATION** manuscript titled **"A COMPARATIVE STUDY OF ERGONOMICS AND CLINICAL OUTCOME WITH MICROSURGICAL AND MACROSURGICAL PROCEDURES",** is a bonafide work done by **Dr. POONAM YADAV**, post graduate student, **Department of Periodontology**, under our guidance and supervision in partial fulfillment of the Master of Dental Surgery course during the academic session 2017-2020.

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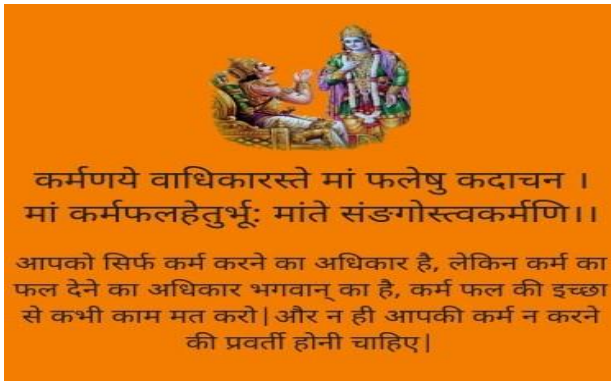

The work presented in this thesis would not have been possible without my close association with many people. I take this opportunity to extend my sincere gratitude and appreciation to all those who made this dissertation possible.

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Last but not the least I thank the almighty and ever loving "GOD".

Dr. POONAM YADAV

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List of Tables

List ofAbbreviations

AAP	American Academy of Periodontology
PI	Plaque Index
GI	Gingival Index
PD	Probing Pocket Depth
CAL	Clinical Attachment Level
VAS	Visual Analogue Scale
EHI	Early Healing Index
UNC	University of North Carolina
LA	Local Anesthesia
CAF	Coronally Advanced Flap
FRPA	Free rotated papilla autograft
PAI	Posture Assessment Instrument
OFD	Open Flap Debridement
RULA	Rapid Upper Limb Assessment
SSC	Salli Saddle chair
CBCT	Cone beam computed tomography

INTRODUCTION

In the field of dentistry, Dentists always try hard to treat the surgical sites atraumaticallyi.e causing "minimal" tissue injury. For the past decennium ,the field of Periodontology has shown increasing surgical refinement of many procedures. Reconcilable successful periodontal treatment procedures want clinical expertise that challenges the technical skills of Periodontists to the limit of and beyond the range of visual acuity. Therefore,over the last decade, introduction of periodontal microsurgery led to enhanced refinement of procedures such as guided tissue regeneration, coverage of recession , augmentation of gingiva, augmentation of hard tissue, osseous resection, cosmetic lengthening of crown and for dental implants, that require clinical expertise and effective technical skills of periodontists.

Periodontal microsurgery is defined as the refinement of basic surgical techniques made possible by the improvement in visual acuity gained with the use of of surgical microscope (Tibbets LS, Shanelac D 1992)[1].In 1979, Daniel defined microsurgery as the surgery performed under magnification by the microscope[2]. Serafin in 1980 defined it as a modification and refinement of existing surgical techniques using magnification to improve visualization with applications to all specialities[3].A microsurgery triad consists of magnification, illumination and instrumentation. Microsurgery has three main principles i.e, improvement of motor skills that led to enhancement of the surgical ability, achieve wound closure passively with exact primary approximation of the edges of wound and less tissue trauma at the surgical site by the application of microsurgical instrumentation, suturing[4] and enhancing operator's posture.

On seeing the history of microsurgery, the first compound lens microscope was constructed by Amsterdam merchant Anton van Leeuwenhook (1694)[5]. During late 19th century magnification for surgical microscope was introduced in medicine field[6]. In 1876 ,ophthalmic surgery was performed by Saemisch using simple binocular loupes [5]. Carl Nylen(the Father of microsurgery) first used a binocular microscope in 1921 for performing ear surgery[7].Barraquer in 1950 used the microscope for performing the surgery of cornea[8].

The first microscope in dentistry was introduced by Apotheker and Jako in 1978 [9].During 1992, an article that outlined the use of the surgical microscope during endodontic procedures was published by Carr[10]. A continuing education course on Periodontal microsurgery was presented at the annual meeting of AAP by Shanelac and Tibbetts in 1993[5].

Various simple and complex magnifying systems available in dentistry , including magnifying loupes i.e, simple loupes, compound loupes, prism loupes and the operating microscopes .A successful mucogingival invasion depends upon the selection of an approach that causes minimum tissue damage[11,12] .The use of loupes and surgical microscopes along with the incorporation of the microsurgical instruments led to periodontal microsurgery to an entirely new level of refinement in a revolutionary way[4].

There are many adavantages of microsurgery like the visual data reaches the cerebral cortex so surgical skills enhanced as well as reduced neuromuscular fatigue lead to improved ergonomics and less chance of occupational skeletal pathologies. A microsurgical instruments has the ability to create clean incisions and close the prepared wounds, which led to healing by primary intention. These are one of their important characteristics.[13].

Improved ergonomics of operator in terms of reduced back, neck and shoulder problems by using magnification is the most influential factors in its adoption at large scale by the dental profession . Magnification also provided improved vision, and reduced eye fatigue, that hadalso been found from the qualitative research done at Vancouver Community College in British Columbia because a healthy dentist is one of the most important component in a successful dental practice.[14,15] The emergence of microsurgery in the field of periodontology is an asset as microsurgery facilitates enhanced vision and ergonomics, thus resulting in better therapeutic outcome.[13]

As per the literature search there is paucity of study which assesses both the quality of surgery and ergonomics of the dental operator using magnifying loupes. So, in the present study we have evaluated the treatment outcomes of microsurgery using magnifying loupes for open flap debridement and compared it with macrosurgicalopen flap debridement procedures and also assessed the effect of magnifying loupes on the ergonomics of dental operators.

AIM

The present study was designed with the aim to evaluate the treatment outcomes of microsurgery using magnifying loupes and compare it with macrosurgical open flap debridement procedures and also assessing the effect of magnifying loupes on the ergonomics of the dental operators.

OBJECTIVES

1.To compare the following clinical parameters at baseline,1 and 3 months postoperatively for both micro and macro surgical procedures i.e. Gingival index, Plaque index, Probing pocket depth and Clinical attachment level.

2. To compare the healing by Early Healing Index at one week postoperatively for both the micro and macro surgical procedures.

3. To compare Patient comfort by Visual Analogue Scale for seven days postoperatively for both the surgical procedures.

4. To assess ergonomics of the dental operator immediately after both the surgical procedures by a self-administered questionnaire and compare the difference.

REVIEW OF LITERATURE

Carrel A (1902)[19], a French surgeon and biologist , received Nobel Prize in 1912 for his pioneering work on the triangulation technique of vascular anastomoses which paved the path for organ transplantation. He first performed the vascular end to end anastomoses by hand with a 3 stay suture technique, i.e, he repaired the blood vessels and developed a method to suture them together end-to-end with a minimum of stitches, which has been a fundamental technique of vascular surgery up to now. He reported his vascular anastomosis technique and its applications in transplantationof several organs in experimental animals in *Lyon Medicale.*

Guthrie CC (1912)[20]published a monograph named 'Blood Vessel Surgery and its applications' which includes pioneering achievements on the replantation of amputated limbs in dogs and also transplantation of the canine head to the neck of another dog. Carrel and Guthrie worked together to transplant several organs such as heart, kidney and ovary. At the beginning of vascular surgery , the application of vascular anastomoses was limited to large vessels because fine suture materials and delicate instruments for small vessel anastomoses had not been developed. Before Carrel and Guthrie there was considerable debate over whether intima of blood vessels should be included in vascular repair. Thereafter, the report of including the intima in suturing made vascular anastomoses uniformly successful.

Nylen CO (1921)[21],a clinical assistant in otorhinolaryngology in Kaolin-ska Medical school, used a monocular microscope for a few cases of chronic otitis and pseudo-fistula formation. In November 1921, he used the Brinell microscope developed by Brinell –Leitz factory for observations and operations in 2 cases of chronic otitis with labyrinthine fistulas and in 1 case with bilateral pseudo-fistula symptoms. Hence ,Carl OlofNylenfirst recognized the need of magnification for ear surgery.

Kurze T (1957)[22]first applied microsurgery for human brain surgery. He developed a posterior fossa transmeatalapproach to the internal auditory canal and used this technique for the total removal of acoustic neurinomas, without facial nerve damage. He removed neurilemmoma of the 7th cranial nerve in a 5 year old patient. Ultimately it resulted in significant changes to the frontotemporal craniotomy in that same era by improved illumination, magnification and better precision.

Jacobson JH and Suarez(1960)[23]reported 100% patency at 4 months in the anastomoses of the carotid arteries of 20 dogs and 6 rabbits .The vessels averaging

3.2 and 1.4 mm in diameter respectively. A successful canine vessel anastomoses was performed by them using an operating microscope and achieved a 1.6-3.2 mm diameter vessel anastomoses and led to the foundation for microsurgery development. But the advantages of magnificationwere confirmed 2 years after Jacobson's initial report by Chase and Schwartz.

Malt RA and McKhann CF (1962)[24] did the first replantation which involved repair of the brachial artery and was done by a team of chief residents led by Ronald Malt and Charles McKhann at Massachusetts General Hospital in Boston, Massachusetts, United States in 1962. The arm of a 12 year old child severed at the level of the proximal humerus was reattachedusing microscope, microinstruments and microsutures. For Dr. Malt, thearm replantation did by him known as the famous Boston-arm that gave him a greater understanding of the importance of proper transportation of amputated extremities, microsurgery, bone stabilization and tension –free anastomoses.

Tamai S and Komatsu S (1965)[25]achieved a microsurgical replantation of a completely amputated left thumb at the metacarphophalangeal joint level in a 4.5 hour procedure in a 28 year old male worker. The amputated thumb was perfused with heparin solution before the operation and repaired two vola arteries and two dorsal veins under Zeiss diploscopeusing 8-0sutures for arterial anastomoses and 7-0 sutures for veinous anastomoses ,which were the smallest suture materials by that time and the thumb was replanted successfully without any postoperative complications. It was reported as the world's first replantation of a completely amputated digit.

TamaiS, Komatsu S, Sakamoto H, Sano S, Sasauchi N, Hori Y et al (1968)[26] performed the first experimental transplantation of a skeletal muscle in the dog with microneurovascular anastomoses . The rectus femorismuscle , with its nutrient vessels and nerve, was completely isolated from the thigh and transplanted to the contralateral thigh, which was never achieved in the past and it was followed for one year. The transplantation was proven successful in terms of functional recovery and histological appearance by electromyography, light and electron microscopy.

Cotellini P and TonettiMS (2001)[27]did a study including 26 patients with 1 deep intrabony defect. Each of them were treated with papilla preservation flaps with an operating microscope and microsurgical instruments alongwith guided tissue regeneration membranes and found clinically important CAL gain amounts,

reduction in probing depths with minimal increase in recession. It was suggested that a very high ability to obtain primary closure of tissues in interdental area can be achieved using microsurgery over the barrier membranes.

BG Branson, KK Bray, C Gadbury –Amyot, LA Holt, NT Keselyak, TV Mitchell et al (2004)[28]a study was conducted by them to evaluate the effect of magnification lenses on the dental hygiene students' posture in a randomized crossover design. The researchers videotaped the students performing an intra-oral procedure with and without using magnification lenses. The evaluation of tapes was then done using Branson's Posture Assessment Instrument(PAI) and found that posture of dental hygiene students was more acceptable when they wore magnification lenses than when they wore traditional safety glasses.

Burkhardt R and Lang NP (2005)[29]did a study in which 10 patients with bilateral Millers class I and II recessions were included (at maxillary canines), the selection of defects was random for recession coverage either by a microsurgical(test) or macrosurgical(control) approach in a split mouth design. At baseline,3 and 7 days of healing, the degree of vascularization of connective tissue graft by performing fluorescent angiograms was evaluated. The clinical parametersalso were assessed before the surgical procedure 1,3,6 and 12 months postoperatively and found that microsurgically treated sites were highly vascularized as compared to macrosurgicalsites.However no significant difference was found in recession coverage.

Francetti L, Fabbro MD,Calace S,Testori T,Weinstein RL (2005)[30]did a clinical study to treat 24 recession cases out of which 12 patients were treated using surgical microscope and 12 patients were treated without microscope and found that all the periodontal parameters were significantly improved from baseline to 12 months in both the groups with no statistically significant difference in terms of root coverage between the two groups. 86% and 78% mean defect coverage for test and control groups was found respectively. The test group showed significantly better scarring and marginal profile and no significant difference in papillae appearance was observed.

Maillet JP ,Miller AM,Burke J M,Maillet W A,Neish NR(2008)[31] conducted a study to investigate the use of magnification loupes on dental hygiene student's posture during provision of treatment.35 detal hygiene students included in the study. Each student was assessed who provided dental hygiene care without and with

loupes. In the first session group1 used the loupes and did not use them for the 2nd session and this sequence was reversed by group 2. At the end of each session, all students were videotaped while performing scaling procedures. Branson et al's posture assessment instrument(adapted version) was used to assess students' postureand an improvement in their posture by using magnifying loupes was found.

Nordland WP , Sandhu HS (2008)[32]did three case reports for the reconstruction of interdental papilla using microscope and microsurgical instruments without vertical releasing incisons thereby the likelihood of donor tissue survival was increased and tissue trauma, pain and scarring were minimized. The surgical dissecting microscope was used to visualize the morphology of the entire interdental papilla area and a micro scalpel with blade of width 0.9 mm was usedfor incisons.On evaluation after 6 weeks improvements in closure of papillary space was found and also a 6 year follow up showed a healthy tissue.

Song JS, Kin E, Jung IY, Lee SJ, Kim S(2008)[33]performed aclinical, prospective study to evaluate the outcomes of endodontic microsurgery for cases with lesions of endodontic origin compared with cases with lesions of combined periodontal-endodontic origin. 263 teeth in 227 patients who requiredperiradicular surgery were included in this study. And concluded that in endo-perio combined lesions, successful outcomes were lower than those obtained for the isolated endodontic lesions i.e, for isolated endodontic lesions , the successful outcome was 95.2% and the successful outcome for endodontic-periodontal combined lesions was 77.5%.

Hegde R,Sumanth S, Padhye A (2009)[11] reviewedthe status of using surgical microscopes and microsurgery and their clinical application in field of periodontics .They found faster healing and atraumatic tissue handling in microsurgical procedures and concluded that periodontal microsurgery had advantages in terms of visual acuity, superior approximation of wounds, faster healing, reduced post-operative morbidity, and increased patient acceptance.The introduction of microsurgery helped the periodontist to treat the patient in aconservative way with increased visibility of the field of surgery and minimizing surgical wounds to facilitate a favorable outcome of the treatment.

Tibbets LS, Shanelac D(2009)[34]reviewed the basics of Periodontal Microsurgery in a brief ,including the role and instruments of magnification, hand positions, knot tying, clinical applications and the effect of microsurgery on esthetics. It was concluded that in the hands of a trained and experienced clinician, enhanced

outcomeswere achieved with microsurgery as compared to traditional macrosurgery, especially in terms of passive wound closure and reduced tissue trauma.

Kapadia JA,Bhedasgoankar SY, Bhandari DS (2013)[35]did a case report on free gingival graft surgery in the treatment of gingival recession using microsurgical approach with the purpose to limelight the advantages of periodontal microsurgery in the surgical disciplines.Recipient site was prepared with microsurgical approach using surgical microscope, the graft was harvested from donor site and was sutured in place at recipient site followed by application of periodontal dressing. On evaluation after 12 weeks, patient was reported with no major problems, uneventful wound healing, gain in attached gingiva andreduced post operative morbidity.

Kahn S, Rodrigues WJDPR, Barceleiro MDO (2013)[36]performed subepithelial connective tissue graft in three cases using a microsurgical technique and microsurgical instruments under an operating microscope in treating deep gingival recession after orthodontic treatment . The microsutures for flap approximation were performed using 6-0 and 8-0 vicryl sutures. A successful root coverage,gain in the keratinized tissue and an improved gingival esthetic pattern was found after 3 months. Hence concluded that a microsurgical approach for subepithelial connective tissue graft resulted in an increase in keratinized tissue, successful root coverage and better gingival esthetics.

Mohan R, Jain R (2013)[37]treated Miller's class I gingival recession in maxillary left canine in a 25 year old patientwith periodontal plastic microsurgery by employing double papilla grafting with connective tissue graft. The connective tissue graft was harvested from the palate to cover denuded roots using microsurgical instruments and it was secured with microsutures. Three months postoperatively, an uneventful wound healing and 100% root coverage was found.

RamisettiA,Ramisetti S, Prasad SSV, Madhuri SV (2014)[38]did a case of multiple recessions with modified connective tissue grafting procedure. The free rotated papilla autograft was performed using periodontal microsurgery including magnifying loupes of 2.5x and microsurgical instruments. Six months postoperatively, complete root coverage was found. Hence concluded that FRPA combined with CAF using microsurgicalaid is a predictable and stable method of rootcoverage for shallow two teeth gingival recessions.

Gupta P, Jan SM ,Behal R ,Mir RA ,Shafi M ,Teli ZA(2014)[5]did a review study on periodontal microsurgery including definition, history, magnification systemsalongwith their advantages and limitations, microsurgical instruments , microsurgical indications in periodontal surgery and concluded that microsurgical periodontics was technique sensitive and of more interest than macrosurgical periodontics. Periodontal microsurgery was less invasive and less traumatic so it led to rapid healing.The advantages of periodontal microsurgery included improvedergonomics and enhanced visibility .

Chandra S, Mathew S (2014)[39]did a case report on endodontic treatment of maxillary radiculous or three rooted premolar in a female patient under magnification. It was suggested that magnification and illumination aided to the visualization of the premolar with three roots and concluded that proper diagnostic tools, magnification and illumination significantly improved the quality of the treatment.

Sharma R, Hegde V, Siddharth M, Hegde R, Manchanda G, Agarwal P(2014)[40]reviewed 26 case reports which demonstrated successful management of endodontic-periodontal lesions with the regenerative procedures and endodontic treatment using an operating microscope and concluded that the endodontic microsurgicaltechniques and concurrent bone grafting andmembrane barriers techniques resulted in the predictable and successful management of these cases..

Dable RA, Wasnik PB, Yeashwante BJ Musani SI, Patil AK, Nagmode SN (2014)[41]assessed ninety dental students by using rapid upper limb assessment (RULA) in using 3 different seats in 3 groups with and without magnification system and found that RULA score for conventional seat was higher without using magnication when compared to Salli Saddle chair (SSC) using magnification system. It was concluded that the use ergonomic saddle chair alongwith magnification system support lumber region, maintain natural curvature of lower back and also gave a clear view to operator as compared to conventional seat without using magnification.

Bhagawathy MP, Ramegowda AD , Lingaraju AJ , Raja JJ (2015)[42] did a study to compare the clinical outcomes of microsurgery using a magnification dental loupe and compared it to conventional open flap debridement in chronic periodontitis

patients .13 patients with chronic periodontitis were assigned randomly for open flap debridement procedure using microsurgery and macrosurgery in a split mouth design. The clinical parameters like probing pocket depth, relative attachment level, gingival recession, gingival bleeding index, healing 1 week postoperatively and pain scale for 7 days were assessed at baseline, 3, 6 and 9 monthsand concluded that microsurgical approach resulted in early healing and less postoperative pain as compared to conventional macroscopic approach.

Singhal D, Shinde A(2016)[13]reviewed the basics of periodontal microsurgery and concluded that the advent of microsurgery in the field of Periodontology is a boon. The three basic philosophies ,i.e, enhanced motor skills, minimal tissue trauma and primary wound closure were included as an important element of microsurgery. The triad in periodontal microsurgery included illumination, magnification, and increased precision. Newer treatment modalities like Periodontal microsurgery enhance the skill of the clinician as well as ensure better results.

Suryavanshi P, Bhongade ML(2017)[4] did a review study as a new approach to Periodontal surgeryincluding definition, history, magnification systems alongwith their advantages and limitations, microsurgical instruments , microsurgical indications in periodontal surgery and concluded that periodontal surgery under magnification impressed the periodontal surgeon with the coarseness of conventional surgical manipulation.Periodontal microsurgery introduced the potential for less invasive surgical approach in Periodontics.Other microsurgeons,noticed that reduced incision size and surgical retraction were directly related to decreased postoperative pain and rapid healing in terms of microsurgery. Periodontal surgeons also noticed the same.

Mohan R, Srivasatava R, Gundappa M (2017)[43]treated a case of Miller's class I gingival recession with coronally advanced flap with alloderm using microsurgical approach i.r.t 13in a 34 year old male patient. Microscalpel was used for incisions and for the reflection of the flap microelevators were used and obtained uneventful healing,100% root coverage 3 months postoperatively with reconstruction of lost gingiva .

Yadav VS, Salaria SK, Bhatia A, Yadav R(2018)[44]reviewed the most recent journals. The databases such as Pubmed or Medline and Google Scholar were also searched for relevant material upto 2017 from the published literature. 'Periodontal microsurgery' and 'minimally invasive periodontal surgery' were the words looked

for in those searches . The available literature ,to periodontal surgeries was analyzed and compiled. It was shown by an analysis that inclusion of magnification in periodontal practice improved the visual acuity,improved ergonomics,decreased patient morbidity,rapid healing and enhancedthe patient acceptance.

YeS, Zhao S, Wang W, Jiang Q, Yang X (2018)[45]treated a periapical lesion of left maxillary lateral incisor and canine in a 37 year old female patient using microsurgical endodontic surgery with the aid of CBCT scan and intraoral scan and virtually designed a template to locate root-ends and lesion areas using a 3D printer. It was found that six months postoperatively the patient was asymptomatic and one year after the surgery the lesion healed well with no periapical radiolucency.

Jain D, Mohan R, Singh VD (2018)[46]did a microsurgical technique for reconstruction of lost interdental papilla using a surgical microscope of 3.5x magnification.After root conditioning,papilla was trimmed,folded and sutured with 6.0 microsuture for creating new papilla to obliterate open embrasure between 11 and 21. This case was resulted in successful reconstruction of interdental papilla six months postoperatively and concluded that microsurgical technique provided a new edge for predictable esthetic outcomes.

Seedat HC, Vyver PJVD, Wet FAD (2018)[47]reviewed the indications and contraindications for endodontic surgery, the use of CBCT for diagnosis and treatment planning and also outlined the modern technique for endodontic microsurgery. He concluded that endodontic microsurgery with appropriate armamentarium significantly improved the outcome of the treatment as compared with traditional technique .

NigriF, Viana JDS, Pinto PHDCF, Simoes EL, Ribeiro CRT (2018)[48]treated a case of 28 year old woman with a successful microsurgical cavernoma resection with prior ventriculoscopy. Initially, a ventricu-loscopy was done to inspect the lesion and the surrounding ventricular structures , a conversion technique from endoscopy to microsurgery was performedand suggested that a prior endoscopic approach followed by microsurgery for intraventricularcavernoma ensured a safe and complete resection and a greater success.

FrancettiL,Taschieri S, Cavalli N, Corbella S (2018)[49]retreated gingival recession in aesthetic area usingcoronally advanced flapalongwithsubepithelial connective tissue graft through a microsurgical approach. One single recession of 4mm in a young patient was treated with CAF+ CTG . The surgical microscope as a magnification device was used for surgeryalongwith microsurgical instruments. It was suggested in retreatment of gingival recessions, periodontal microsurgery could be effective and in long term evaluation, it may reduce the aesthetic problems.

Yadav D, Singh S, Roy S (2019)[50]treated a case of multiple Miller Class I marginal tissue recession using Zucchelli'scoronally advanced flap with pericardium membrane under an operating microscope and by using the micosurgical instrumentsin a 28 year old male patient. Oblique submarginal incisions followed by intrasulcular incision were given, the interdental papilla kept intact.Flap was raised, debridement was done followed by secure placement of pericardium membrane, then the flap was advanced coronally and sutured. The mean root coverage of 91.6% was achieved with complete reduction in cold sensitivity and concluded that significant root coverage with reduction in sensitivity was resulted using periodontal microsurgery and guided tissue regeneration.

WanjgartenD, Garcia PPNS (2019)[51]did a study to determine neck angulation and visual acuity in 40 dental students when they used magnification devices and distances from the operating field. A miniature Snellen eye chart was used to test visual acuity and photographs were taken to evaluate neck angulation in a neutral posture. The result so obtained was that, enhanced visual acuity and lowest neck angulation was found with both Galilean and Keplarian magnification systems at both the distances i.e, at a standardized distance and at a comfortable distance. Also operating microscopes at a standardized distance of 30-40cm gave similar results.

MATERIALS AND METHOD

The current study was carried out to evaluate the treatment outcomes of microsurgery using magnifying loupes and compare it with macrosurgical open flap debridement procedures and also assessing the effect of magnifying loupes on the ergonomics of the dental operators after obtaining an appropriate clearance from the Institutional Ethical Committee.**(Appendix I,II)**.

SAMPLE POPULATION

The subjects for the study were selected from the Out Patient Department of Periodontology, BabuBanarasi Das College of Dental Sciences, Lucknow. Total, 30 quadrants of patients of age 30-55 years with generalized chronic periodontitis were assigned randomly for test (microsurgical) and control (macrosurgical) open flap debridement in a prospective, case-control, randomized split mouth design. The subjects were apprised about the benefits and potential risks, and written informed consent was obtained on the prescribed format. (**Appendix III,IV).**

An inclusion and exclusion criteria was followed for the recruitment of the subjects as mentioned below-

Inclusion criteria

- Age range 30-55 years
- Patients with generalized chronic periodontits with probing depth $\geq$5 mm.
- Systemically healthy patients.
- Adequate patient compliance.
- No contraindication to periodontal surgery.

Exclusion Criteria.

1. Patients with any systemic diseases that might affect the outcome of periodontal treatment.
2. Patients who have taken antibiotics in past 6 months.
3. Smokers
4. Pregnant and post menopausal women.

Material

Armamentarium for Diagnosis and Pre-clinical Assessment : [Plate I]

- Mouth mirror
- UNC 15 Periodontal probe
- Explorer
- Tweezer

Armamentarium for Macrosurgery: [Plate II]

- Local anesthesia (Lignocaine2% with Adrenaline)
- Syringe 3ml
- Normal saline
- Bard Parker Handle no.3
- Swann Morton Blade(No. 15)
- Periosteal elevator(P24G Hu- Friedy)
- Set of Gracey Curettes
- Ultrasonic scaler
- Tissue holding forceps
- Curved scissor
- Needle holder
- Suture needle
- Suture material (3.0 silk)
- Suture cutting scissors
- Periodontal dressing (coe-pack)

Armamentarium for Microsurgery: [Plate III]

- Local anesthesia (Lignocaine2% with Adrenaline)
- Syringe 3ml
- Normal saline
- Bard Parker Handle no.3
- Magnifying loupe (3.5x optical magnification, Surgiwell)
- 15 C blade
- Microsurgical Periosteal elevator
- Set of mini curettes

- Tissue holding forceps
- Microsurgical castroviejo scissor
- Castroviejo Needle holder
- Suture material (5.0silk)
- Suture cutting scissors
- Periodontal dressing (coe-pack)

Methodology

It was a prospective, randomized, case control ,split mouth study in which 30 quadrants in patients of age group 30-55 years with generalized chronic periodontitis were assigned randomly for **test**(microsurgical) and **control**(macrosurgical) open flap debridement.

GROUP A(Test) = 15 quadrants for Microsurgery

GROUPB(Control) = 15 quadrants for Macrosurgery

In **Control (Group B)-**After achieving adequate anesthesia intracrevicularand interdental incisionswere made using blade no.15, full thickness mucoperiosteal flap was reflected ,surgical debridement was carried out using scalers and curettes, surgical sites were irrigated with sterile saline .Surgical flap was sutured to presurgical level with 3.0 silk suture.Periodontal dressing (coe-pack)was placed. Antimicrobials and analgesics were prescribed for the patients for 5 days and post operative instructions were given to the patient.**[PLATE IV – PLATE VII]**

All the clinical parameters like Plaque index, Gingival index, Clinical attachment level and probing pocket depth were recorded at baseline, 1 and 3 months **[PLATE VIII]**. One week postoperatively healing was assessed by Early Healing Index**[PLATE VIII].**For seven continuous days postoperatively patient comfort was assessed by Visual Analogue Scale. Immediately after the surgery ergonomics of dental operators was assessed using a self-administered questionnaire.**(Appendix V,VI)**

In **Test (Group A)**- Microsurgery was carried out with 3.5x optical magnification dental loupe (Surgiwell). The surgical procedure was same as that for Group Bi.e, After achieving adequate anesthesia intracrevicular and interdental incisions were made using blade no.15c, full thickness mucoperiosteal flap was reflected ,surgical debridement was carried out using minicurettes. All microsurgical instruments were

used to perform the microsurgery. Surgical sites were irrigated with sterile saline .Sutures were placed using 5.0 silk suture. Periodontal dressing (coe-pack) was placed. Antimicrobials and analgesics were prescribed for the patients for 5 days and post operative instructions were given to the patient.**[PLATE IV – PLATE VII]**

All the clinical parameters like Plaque index, Gingival index, Clinical attachment level and probing pocket depth were recorded at baseline, 1 and 3 months**[PLATE VIII]**. One week postoperatively healing was assessed by Early Healing Index**[PLATE VIII]**. For seven continuous days postoperatively patient comfort was assessed by Visual Analogue Scale. Immediately after the surgery ergonomics of dental operators was assessed using a self-administered questionnaire.**(Appendix V,VI)**

The assessment for the outcome of clinical parameters was done by single operator. For the assessment of ergonomics 5 different operators were included in the study for whom the questionnaire was given immediately after they performed similar type of surgery.

CLINICAL PARAMETERS

The following clinical parameters were recorded in both test and control groups-

i) **Probing Pocket depth**- Using UNC 15 Probe
ii) **Clinical attachment level**- Using UNC 15 Probe
iii) **Plaque index(Silness J and Loe H 1964)[16]**
iv) **Gingival index (Loe H and SilnessJ 1963)[17]**
v) **Healing- Early Healing index(Wachtel et al 2003)[18]**

Score	**Wachtel et al 2003 (EHI)**
1	Complete flap closure-no fibrin line in the inter-proximal area
2	Complete flap closure-fine fibrin line in the inter-proximal area

3	Complete flap closure-fibrin clot in the inter-proximal area
4	Incomplete flap closure-partial necrosis of the inter-proximal tissue
5	Incomplete flap closure –complete necrosis of the inter-proximal tissue

vi) Patient comfort –By self administered Visual Analogue Scale(VAS)

0 1 2 3 4 5 6 7 8 9 10

A horizontal line include markings from **0 to 10 cm**interpreted as-

0-1cm= no pain

2-4cm = mild pain

5-7cm = moderate pain

8-10cm = severe pain

Patients were instructed to give the score on the sheets consisting of self administered VASfor seven continuous days postoperatively.

vii) Ergonomics of the dental operator - By a self- admininstered questionnaire(Appendix VI)

- The data collected from the study was subjected to statistical analysis using SPSS software 17.0 (IBM corporation, Chicago,USA). Means on the same or related subjects over time were compared using Paired t-test and to compare the means of the two groups, unpaired t-test was applied.**(Appendix VII,VIII)**

Armamentarium

DIAGNOSIS and PRE-CLINICAL ASSESSMENT

Plate I

Armamentarium

MICROSURGERY

Plate III

b

Preoperatively

Macrosurgery

Microsurgery

Incison

Macrosurgery

Microsurgery

Plate IV

Flap reflection

Macrosurgery

Microsurgery

Macrosurgery

Microsurgery

Plate V

Debridement

Macrosurgery

Microsurgery

Macrosurgery

Microsurgery

Plate VI

Suturing

Macrosurgery

Microsurgery

Periodontal dressing(Coe-pack)

Macrosurgery

Microsurgery

Plate VII

Macrosurgery **Microsurgery**

Early healing index 1 week postoperatively

Healing 1 month postoperatively

Healing 3 month postoperatively

Plate VIII

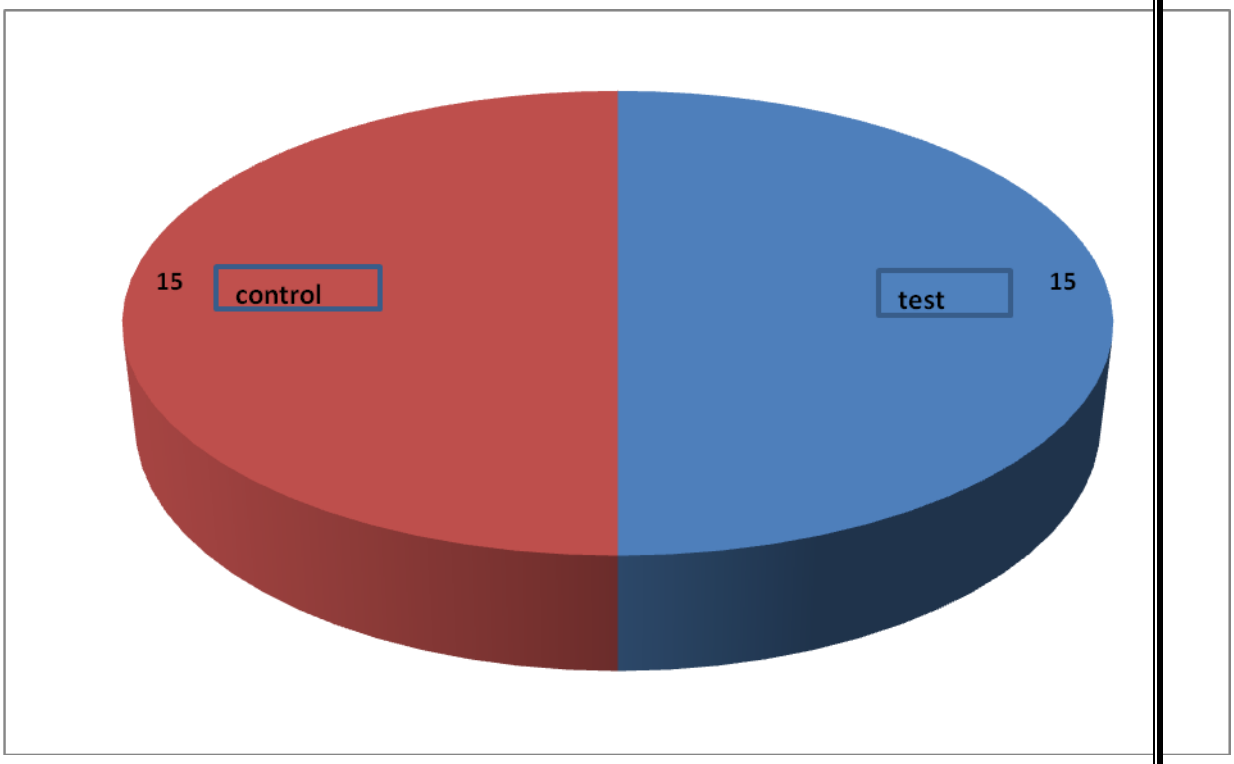
OBSERVATIONS & RESULT

The current study was done to evaluate the treatment outcomes of microsurgery using magnifying loupes and compare it with macrosurgical open flap debridement procedures and also assess the effect of magnifying loupes on the ergonomics of the dental operators.The present study comprised of two groups i.e. Group A (Test) for microsurgery and Group B (Control) for macrosurgery, having 15 subjects each as shown in Table 1,Graph 1.

Table 1: Sample distribution among the study subjects

Group	N	%
Group A (Test)	15	50
Group B (Control)	15	50
Total	30	100

Graph 1: Sample distribution among the study subjects



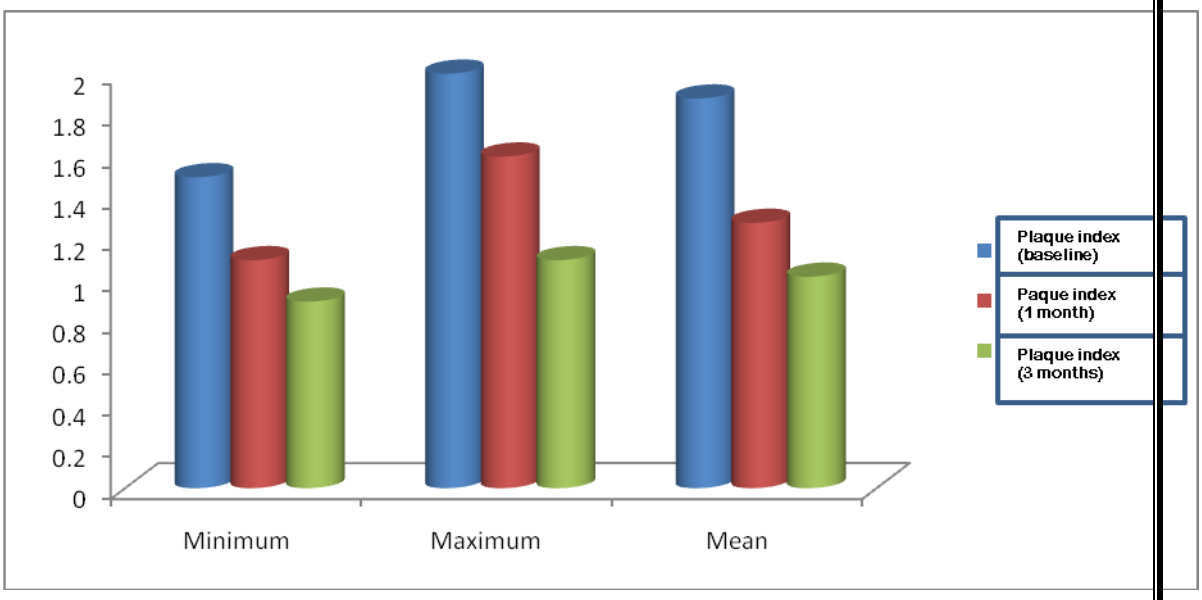
Plaque index in test group at different intervals is shown in Table 2, Graph 2. Mean±SD plaque index at baseline, one month and three months was 1.88±0.15, 1.28±0.17 and 1.02±0.06 respectively. When plaque index was compared statistically among the test group at different intervals using anova test, it was found to be statistically significant as $p<0.05$. Tukey HSD post hoc test was applied to compare plaque index values at all the different intervals with each other. Statistically significant difference was found when plaque values at baseline, one month and three months were compared with each other.

Table 2: Plaque index in test group at different intervals

Intervals	**Minimum**	**Maximum**	**Mean**	**SD**	**Anova test**	**p value**
At baseline(Gp1)	1.5	2.0	1.88	0.15	59.16	<0.01*
At 1 month(Gp2)	1.10	1.60	1.28	0.17		
At 3 months(Gp3)	0.90	1.10	1.02	0.06		
Tukey HSD Post-hoc Test... Group 1 vs Group 2: Diff=-0.6000, 95%CI=-0.7201 to -0.4799, p=<0.01* Group 1 vs Group 3: Diff=-0.8600, 95%CI=-0.9801 to -0.7399, p=<0.01* Group 2 vs Group 3: Diff=-0.2600, 95%CI=-0.3801 to -0.1399, p=<0.01*						

*: statistically significant CI: Confidence Interval

Graph 2: Plaque index in test group at different intervals



Plaque index in control group at different intervals is shown in Table 3, Graph 3. Mean±SD plaque index at baseline, one month and three months was 1.97±0.40, 1.57±0.36 and 1.34±0.31 respectively. When plaque index was compared statistically among the control group at different intervals using anova test, it was found to be statistically significant as $p<0.05$. Tukey HSD post hoc test was applied to compare plaque index values at all the different intervals with each other. Statistically significant difference was found when baseline plaque index was compared with one month and three months as $p<0.05$.

Table 3: Plaque index in control group at different intervals

Intervals	**Minimum**	**Maximum**	**Mean**	**SD**	**Anova test**	**p value**
At baseline(Gp1)	1.7	2.8	1.97	0.40	11.86	0.001*
At 1 month(Gp2)	1.10	2.20	1.57	0.36		
At 3 months(Gp3)	0.90	1.90	1.34	0.31		
Tukey HSD Post-hoc Test... Group 1 vs Group 2: Diff=-0.4000, 95%CI=-0.7181 to -0.0819, p=0.01* Group 1 vs Group 3: Diff=-0.6300, 95%CI=-0.9481 to -0.3119, p=0.0001* Group 2 vs Group 3: Diff=-0.2300, 95%CI=-0.5481 to 0.0881, p=0.19						

*: statistically significantCI: Confidence Interval

Graph 3:Plaque index in control group at different intervals

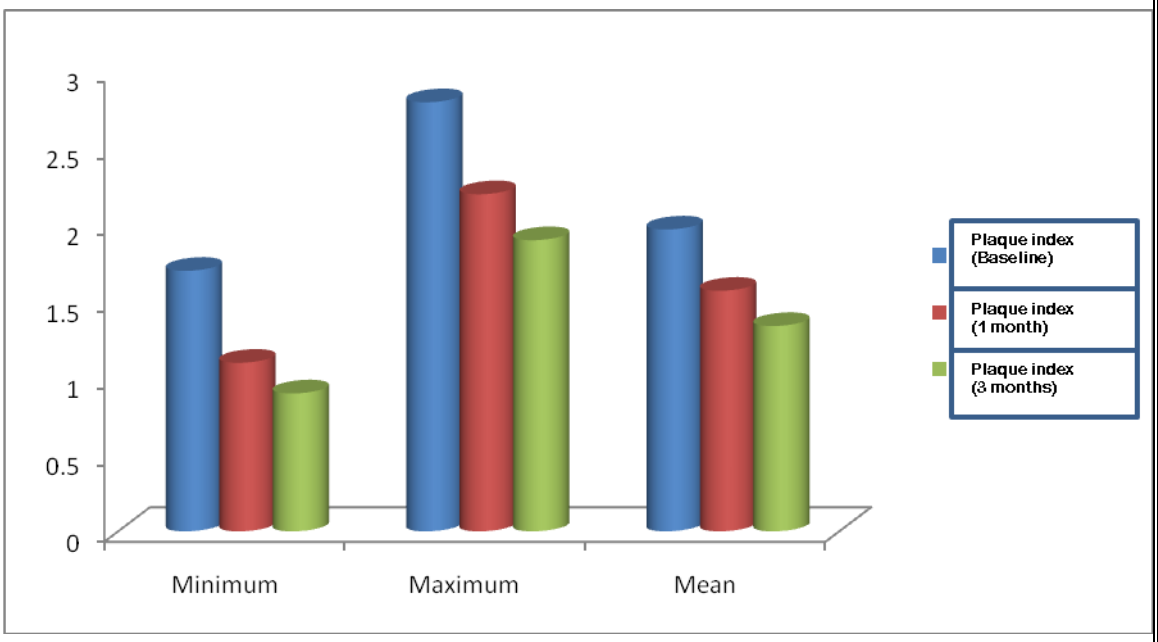


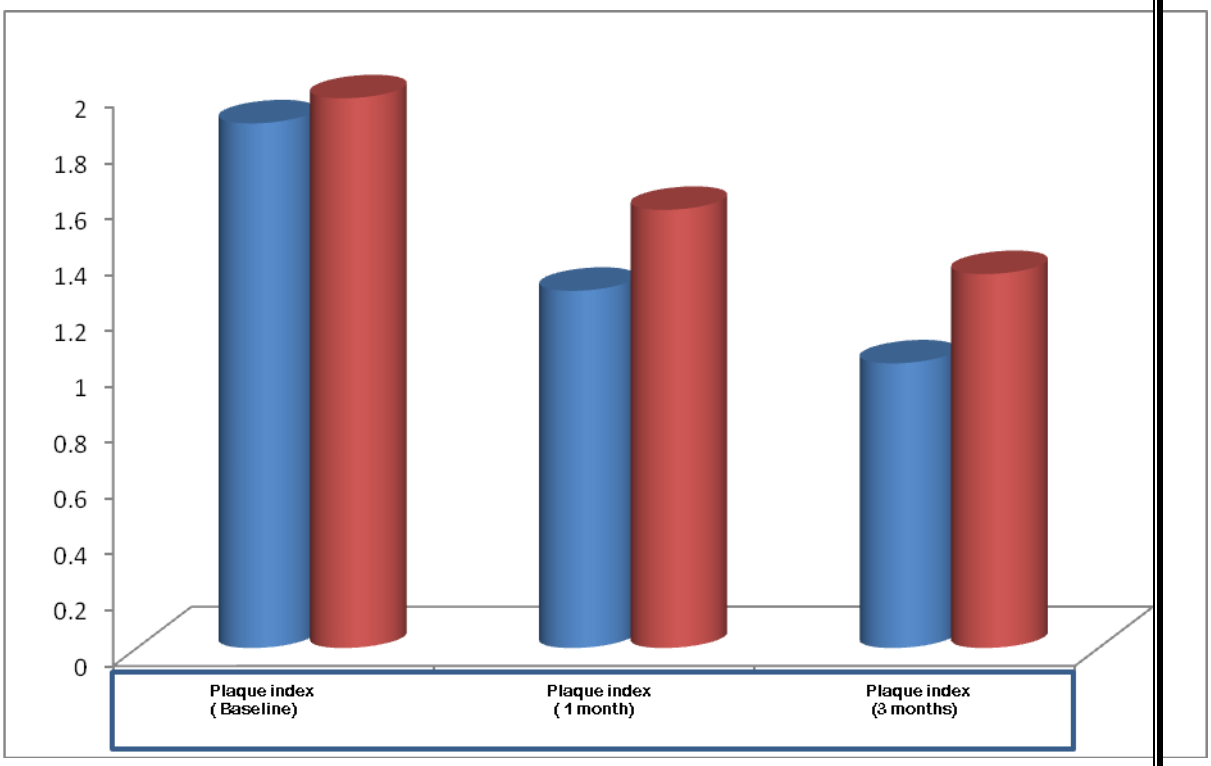
Table 4, Graph 4 shows the comparison of plaque index at different intervals between test and control group. Mean plaque value was reduced by 0.60 and 0.40 at first month in test and control group respectively. Mean plaque value was reduced by 0.26 and 0.23 at 3months in test and control groups respectively. When plaque index value at first month and three months was compared statistically between test and control group, it was found to be statistically significant.

Table 4: Comparison of plaque index at different intervals between test and control group

Intervals	**Test**		**Control**		**t test**	**p value**
	Mean	**SD**	**Mean**	**SD**		
At baseline	1.88	0.15	1.97	0.40	0.82	0.42
At 1 month	1.28	0.17	1.57	0.36	2.82	0.009*
At 3 months	1.02	0.06	1.34	0.31	3.93	0.001*

*: statistically significant

Graph 4: Comparison of plaque index at different intervals between test and control group



control- test-

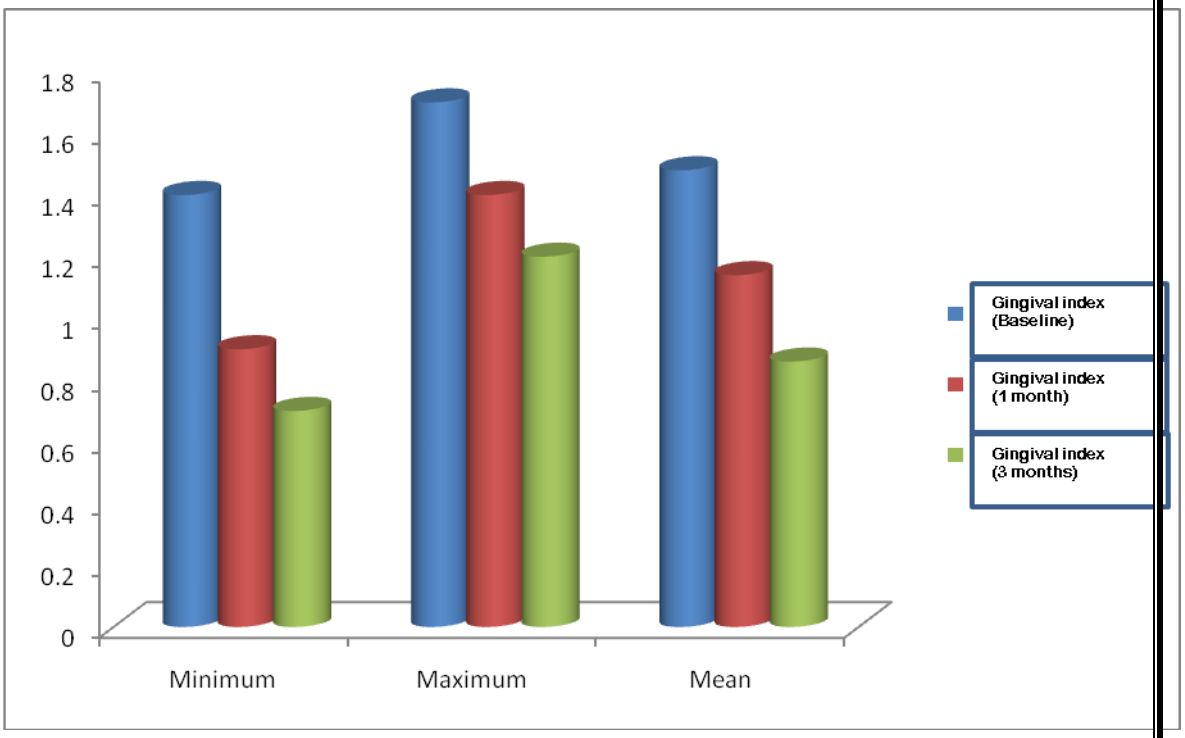
Gingival index in test group at different intervals is shown in Table 5, Graph 5. Mean±SDgingival index at baseline, one month and three months was 1.48±0.11, 1.14±0.15 and 0.86±0.12 respectively. When gingival index was compared statistically among the test group at different intervals using anova test, it was found to be statistically significant as $p<0.05$.Tukey HSD post hoc test was applied to compare gingival index values at all the different intervals with each other. Statistically significant difference was found when gingival index values at baseline, one month and three months were compared with each other.

Table 5: Gingival index in test group at different intervals

Intervals	**Minimum**	**Maximum**	**Mean**	**SD**	**Anova test**	**p value**
At baseline(Gp1)	1.4	1.7	1.48	0.11	88.53	<0.01*
At 1 month(Gp2)	0.90	1.40	1.14	0.15		
At 3 months(Gp3)	0.70	1.20	0.86	0.12		
Tukey HSD Post-hoc Test... Group 1 vs Group 2: Diff=-0.3400, 95%CI=-0.4534 to -0.2266, p=<0.01* Group 1 vs Group 3: Diff=-0.6200, 95%CI=-0.7334 to -0.5066, p=<0.01* Group 2 vs Group 3: Diff=-0.2800, 95%CI=-0.3934 to -0.1666, p=<0.01*						

*: statistically significant CI: Confidence Interval

Graph 5:Gingival index in test group at different intervals



Gingival index in control group at different intervals is shown in Table 6, Graph 6. Mean±SD plaque index at baseline, one month and three months was 1.69±0.27, 1.32±0.16 and 0.95±0.19 respectively. When gingival index was compared statistically among the control group at different intervals using anova test, it was found to be statistically significant as $p<0.05$. Tukey HSD post hoc test was applied to compare gingival index values at all the different intervals with each other. Statistically significant difference was found when gingival index values at baseline, one month and three months were compared with each other.

Table 6: Gingival index in control group at different intervals

Intervals	**Minimum**	**Maximum**	**Mean**	**SD**	**Anova test**	**p value**
At baseline(Gp1)	1.4	2.0	1.69	0.27	45.77	<0.01*
At 1 month(Gp2)	1.10	1.50	1.32	0.16		
At 3 months(Gp3)	0.70	1.30	0.95	0.19		
Tukey HSD Post-hoc Test...						
Group 1 vs Group 2: Diff=-0.3700, 95%CI=-0.5579 to -0.1821, p=0.0001*						
Group 1 vs Group 3: Diff=-0.7400, 95%CI=-0.9279 to -0.5521, p=<0.01*						
Group 2 vs Group 3: Diff=-0.3700, 95%CI=-0.5579 to -0.1821, p=0.0001*						

*: statistically significant CI: Confidence Interval

Graph 6:Gingival index in control group at different intervals

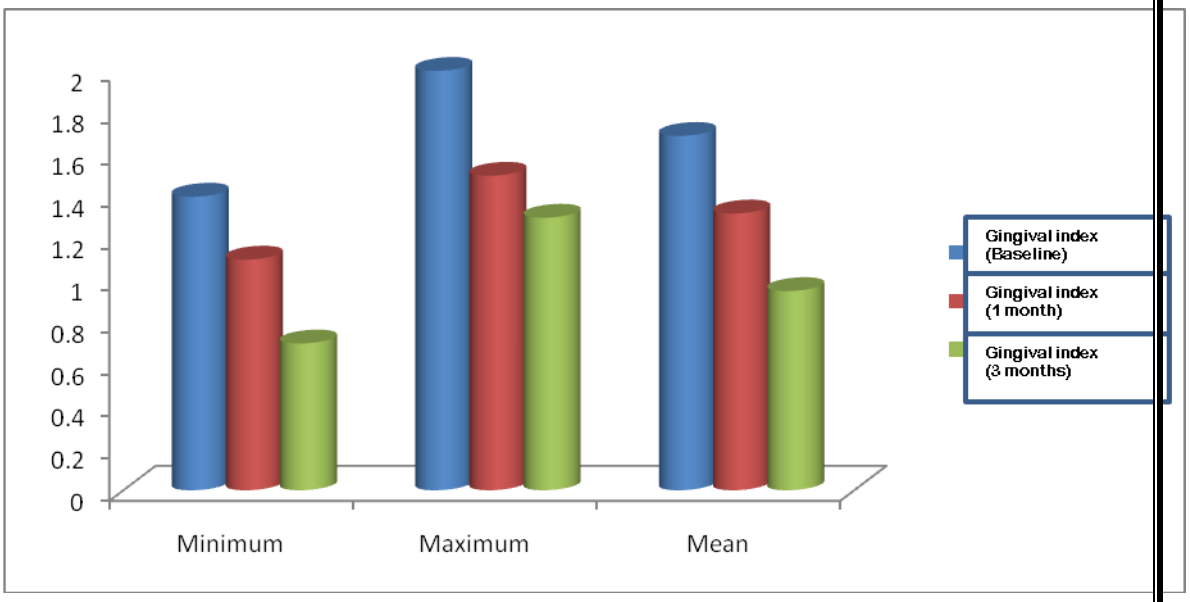


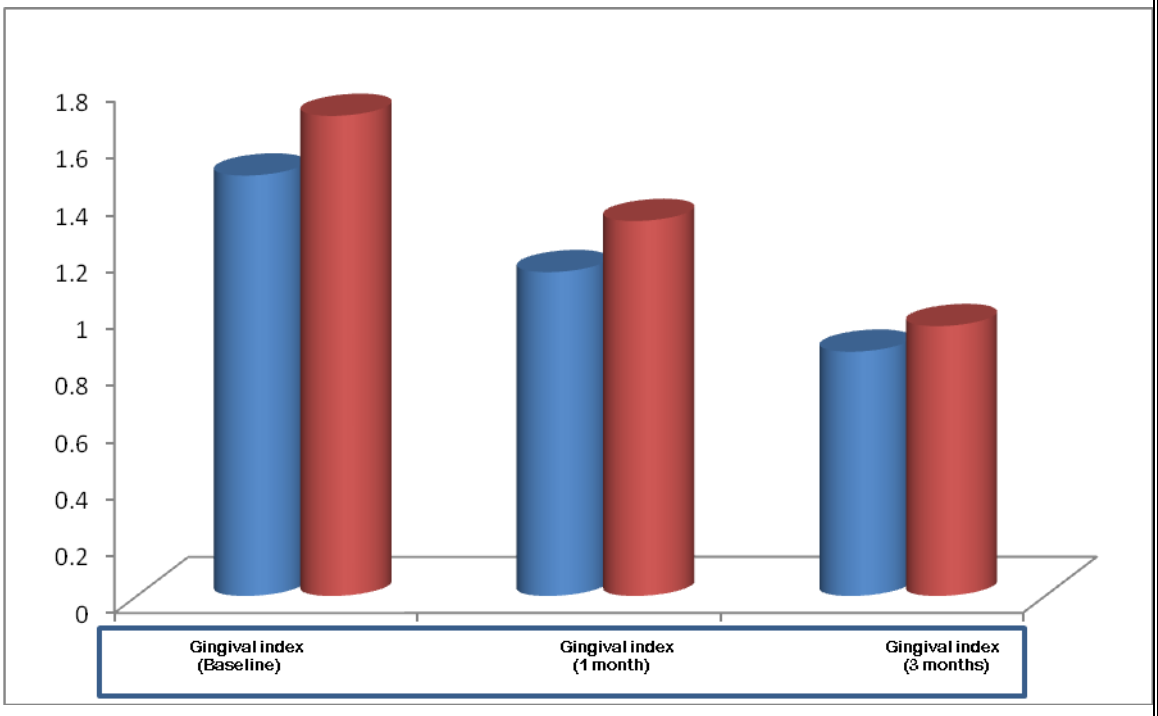
Table 7, Graph 7 shows the comparison of gingival index at different intervals between test and control group. Mean gingival index value was reduced by 0.34 and 0.37 at first month between test and control group respectively. It was further reduced by 0.28 and 1.13 at 3 months for test and control group respectively. The reduction was statistically significant for control group when compared to test group at 1 month. The difference of reduction between the two groups was statistically non significant at 3 months when compared to 1 month.

Table 7: Comparison of Gingival index at different intervals between test and control group

Intervals	Test		Control		t test	p value
	Mean	SD	Mean	SD		
At baseline	1.48	0.11	1.69	0.27	1.79	0.07
At 1 month	1.14	0.15	1.32	0.16	3.18	0.004*
At 3 months	0.86	0.12	0.95	0.19	1.55	0.13

*: statistically significant

Graph 7:Comparison of Gingival index at different intervals between test and control group



control- test-

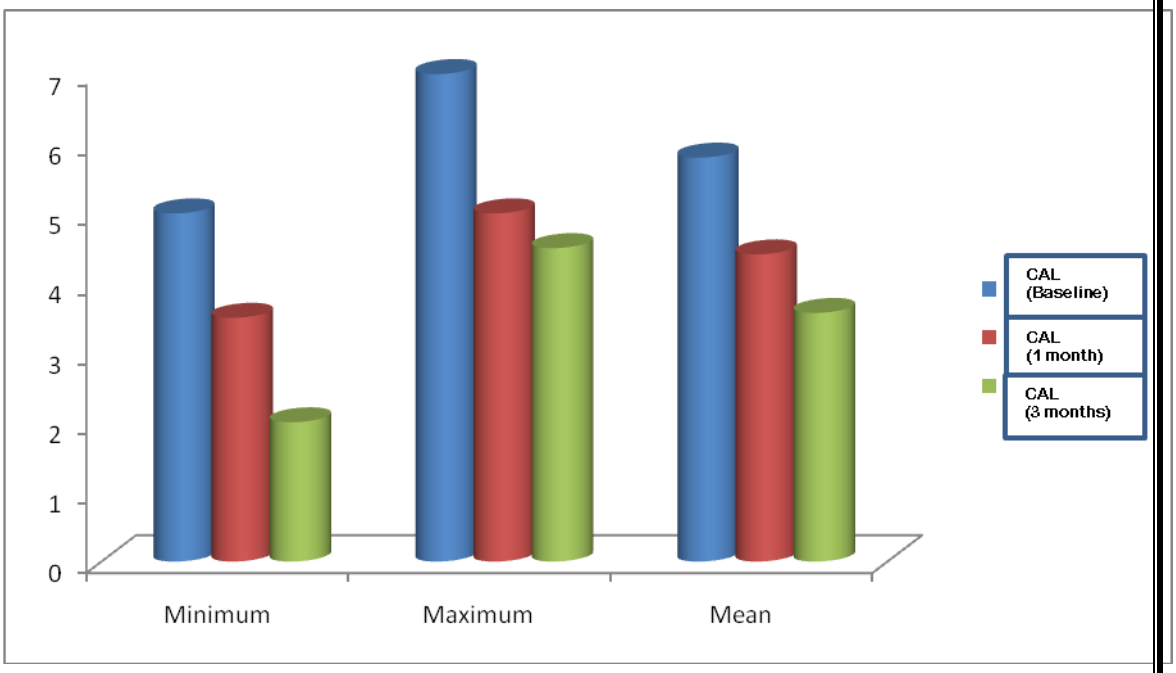
CAL in test group at different intervals is shown in Table 8, Graph 8. Mean±SD CAL at baseline, one month and three months was 5.80±0.63, 4.41±0.53 and 3.57±0.69 respectively. When CAL was compared statistically among the test group at different intervals using anova test, it was found to be statistically significant as $p<0.05$. Tukey HSD post hoc test was applied to compare CAL values at all the different intervals with each other. Statistically significant difference was found when CAL values at baseline, one month and three months were compared with each other.

Table 8: CAL in test group at different intervals

Intervals	**Minimum**	**Maximum**	**Mean**	**SD**	**Anova test**	**p value**
At baseline(Gp1)	5.0	7.0	5.80	0.63	49.47	<0.01*
At 1 month(Gp2)	3.50	5.0	4.41	0.53		
At 3 months(Gp3)	2.0	4.5	3.57	0.69		
Tukey HSD Post-hoc Test...						
Group 1 vs Group 2: Diff=-1.3900, 95%CI=-1.9402 to -0.8398, p=<0.01*						
Group 1 vs Group 3: Diff=-2.2300, 95%CI=-2.7802 to -1.6798, p=<0.01*						
Group 2 vs Group 3: Diff=-0.8400, 95%CI=-1.3902 to -0.2898, p=0.002*						

*: statistically significant CI: Confidence Interval

Graph 8:CAL in test group at different intervals



CAL in control group at different intervals is shown in Table 9, Graph 9. Mean±SD CAL at baseline, one month and three months was 5.65±0.68, 4.21±0.69 and 3.35±0.93 respectively. When CAL was compared statistically among the control group at different intervals using anova test, it was found to be statistically significant as $p<0.05$. Tukey HSD post hoc test was applied to compare CAL values at all the different intervals with each other. Statistically significant difference was found when CAL values at baseline, one month and three months were compared with each other.

Table 9: CAL in control group at different intervals

Intervals	**Minimum**	**Maximum**	**Mean**	**SD**	**Anova test**	**p value**
At baseline(Gp1)	5.0	7.0	5.65	0.68	33.69	<0.01*
At 1 month(Gp2)	3.0	5.0	4.21	0.69		
At 3 months(Gp3)	2.0	5.0	3.35	0.93		
Tukey HSD Post-hoc Test... Group 1 vs Group 2: Diff=-1.4400, 95%CI=-2.1278 to -0.7522, p=<0.01* Group 1 vs Group 3: Diff=-2.3000, 95%CI=-2.9878 to -1.6122, p=<0.01* Group 2 vs Group 3: Diff=-0.8600, 95%CI=-1.5478 to -0.1722, p=0.01*						

*: statistically significant CI: Confidence Interval

Graph 9: CAL in control group at different intervals

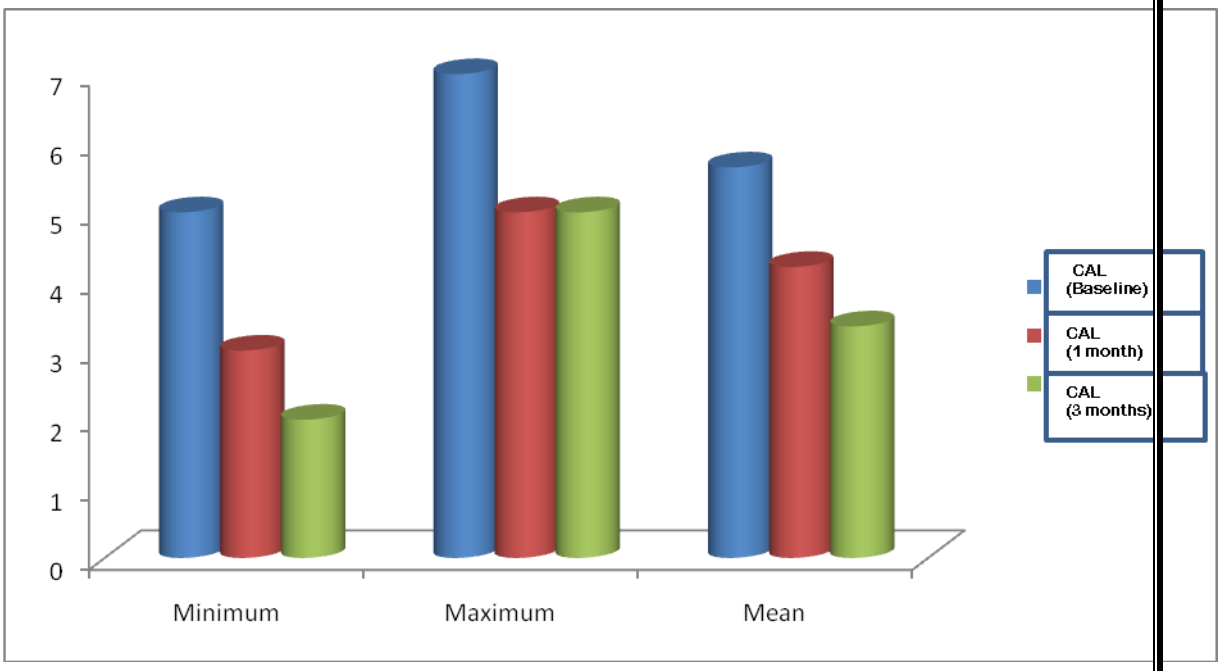
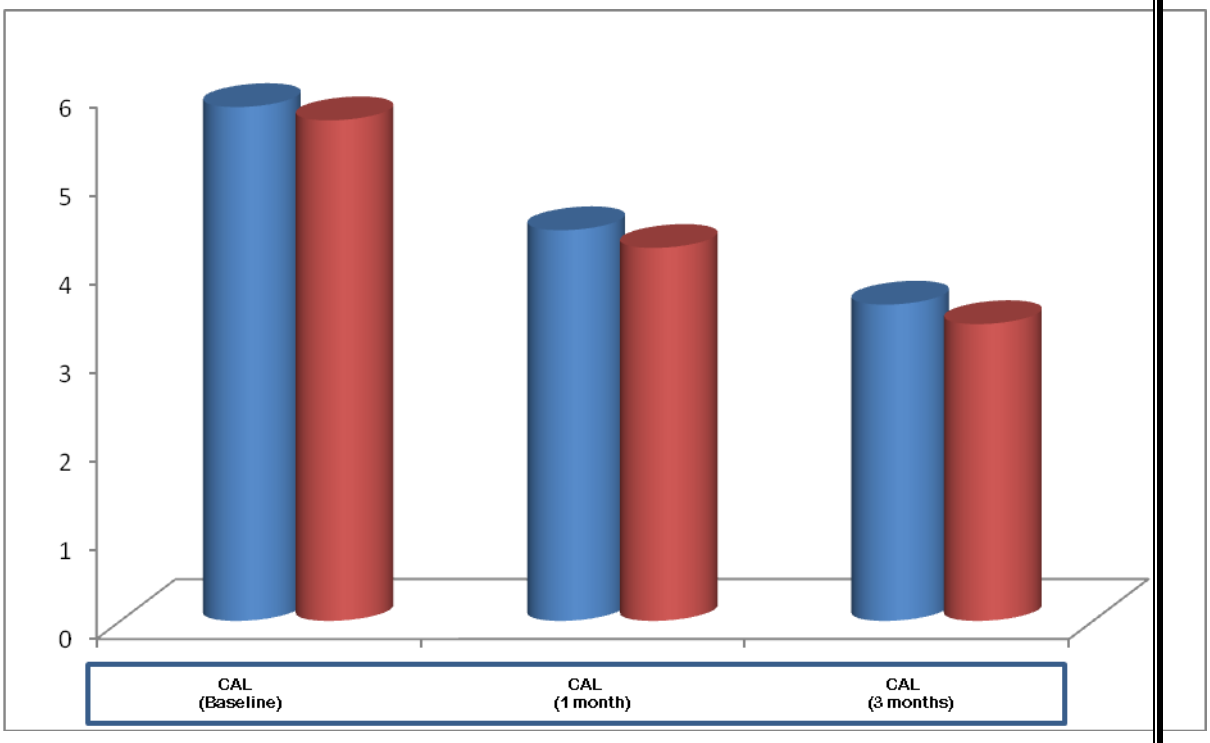


Table 10, Graph 10 shows the comparison of CAL at different intervals between test and control group. Mean CAL value was reduced by 1.39 and 1.44 at first month for test and control group respectively. It was further reduced by 0.84and 0.86 at 3 months for test and control group respectively. When CAL value at baseline, first month and three months was compared statistically between test and control group, it was found to be statistically non significant as $p>0.05$.

Table 10: Comparison of CAL at different intervals between test and control group

Intervals	Test		Control		t test	p value
	Mean	SD	Mean	SD		
At baseline	5.80	0.63	5.65	0.68	0.63	0.54
At 1 month	4.41	0.53	4.21	0.69	0.89	0.38
At 3 months	3.57	0.69	3.35	0.93	0.74	0.47

Graph 10:Comparison of CAL at different intervals between test and control group



control- test-

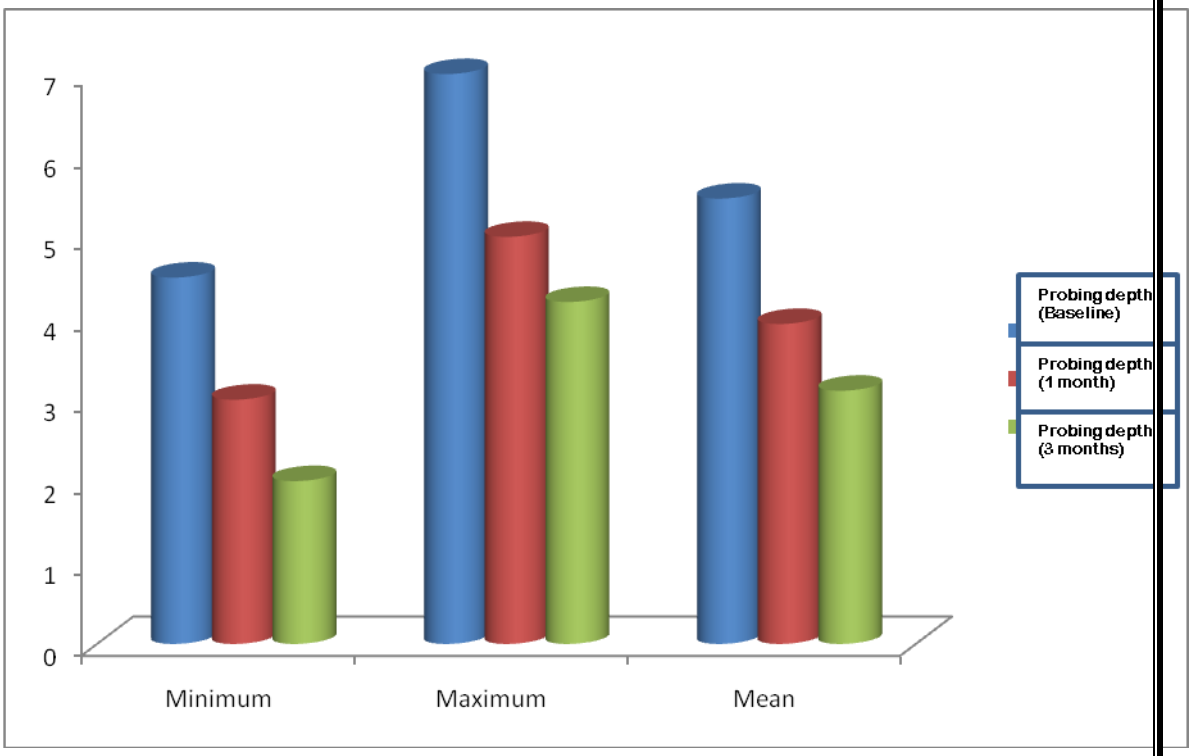
Probing depth in test group at different intervals is shown in Table 11, Graph 11. Mean±SD Probing depth (PD) at baseline, one month and three months was 5.47±0.78, 3.93±0.62 and 3.11±0.71 respectively. When PD was compared statistically among the test group at different intervals using anova test, it was found to be statistically significant as $p<0.05$. Tukey HSD post hoc test was applied to compare PD values at all the different intervals with each other. Statistically significant difference was found when PD values at baseline, one month and three months were compared with each other.

Table 11: Probing depth in test group at different intervals

Intervals	**Minimum**	**Maximum**	**Mean**	**SD**	**Anova test**	**p value**
At baseline(Gp1)	4.5	7.0	5.47	0.78	43.16	<0.01*
At 1 month(Gp2)	3.0	5.0	3.93	0.62		
At 3 months(Gp3)	2.0	4.2	3.11	0.71		
Tukey HSD Post-hoc Test...						
Group 1 vs Group 2: Diff=-1.5400, 95%CI=-2.1666 to -0.9134, p=<0.01*						
Group 1 vs Group 3: Diff=-2.3600, 95%CI=-2.9866 to -1.7334, p=<0.01*						
Group 2 vs Group 3: Diff=-0.8200, 95%CI=-1.4466 to -0.1934, p=0.008*						

*: statistically significant CI: Confidence Interval

Graph 11:Probing depth in test group at different intervals



Probing depthin control group at different intervals is shown in Table 12, Graph 12. Mean±SD Probing depth at baseline, one month and three months was 5.39±0.60, 3.81±0.56 and 2.79±0.68 respectively. When PD was compared statistically among the control group at different intervals using anova test, it was found to be statistically significant as $p<0.05$. Tukey HSD post hoc test was applied to compare PD values at all the different intervals with each other. Statistically significant difference was found when PD values at baseline, one month and three months were compared with each other.

Table 12: PDin control group at different intervals

Intervals	**Minimum**	**Maximum**	**Mean**	**SD**	**Anova test**	**p value**
At baseline(Gp1)	4.5	7.0	5.39	0.60	67.98	<0.01*
At 1 month(Gp2)	3.0	5.0	3.81	0.56		
At 3 months(Gp3)	2.0	4.0	2.79	0.68		
Tukey HSD Post-hoc Test...						
Group 1 vs Group 2: Diff=-1.5800, 95%CI=-2.1259 to -1.0341, p=<0.01*						
Group 1 vs Group 3: Diff=-2.6000, 95%CI=-3.1459 to -2.0541, p=<0.01*						
Group 2 vs Group 3: Diff=-1.0200, 95%CI=-1.5659 to -0.4741, p=0.0001*						

*: statistically significant CI: Confidence Interval

Graph 12: PDin control group at different intervals

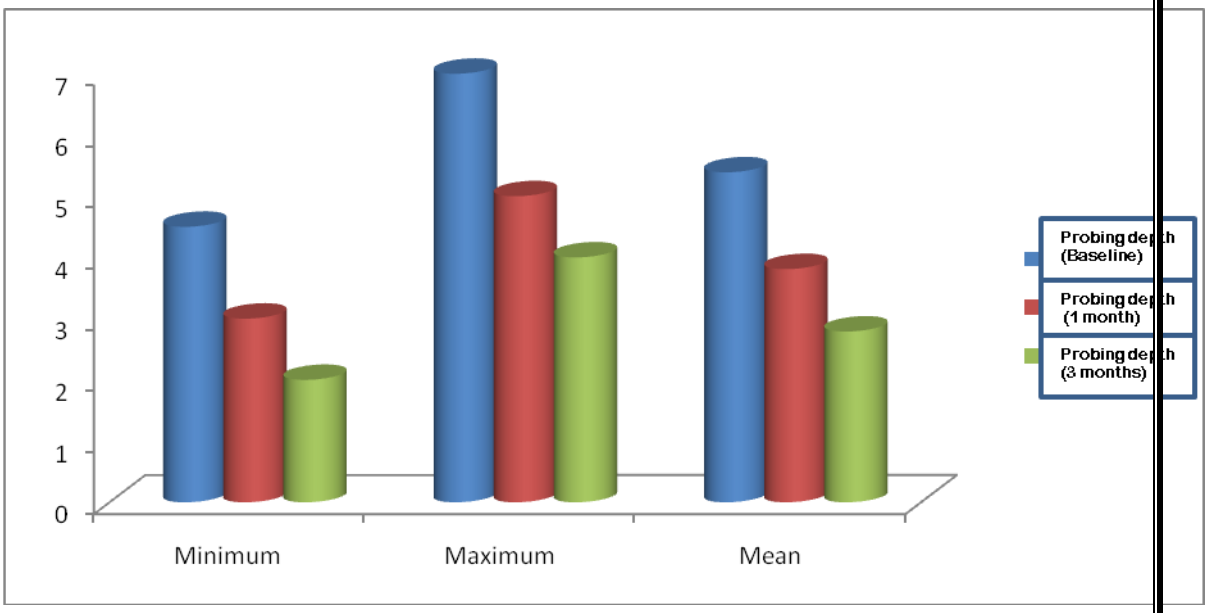
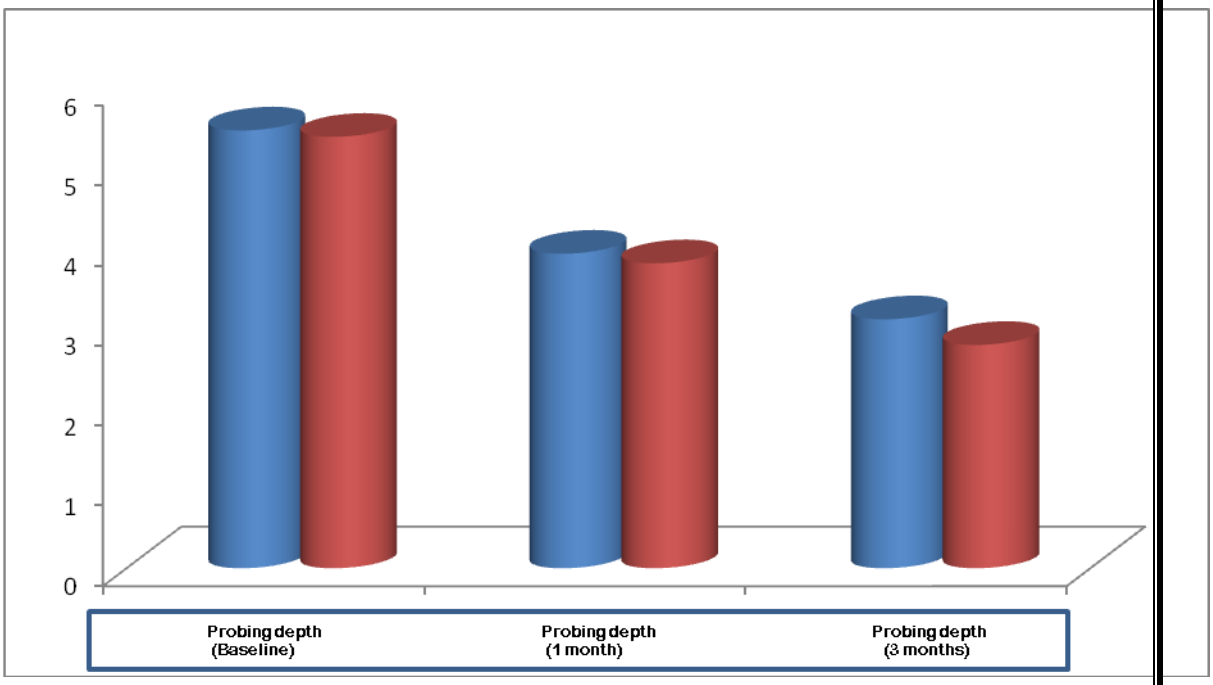


Table 13, Graph 13 shows the comparison of Probing depth (PD)at different intervals between test and control group. Mean PD value was reduced at first month by 1.54 and 1.58 in the test and control group respectively.Mean PD value was further reducedat 3 months , by 0.82 and 1.02 in the test and control group respectively. When PD value at baseline, first month and three months was compared statistically between test and control group, it was found to be statistically non significant as $p>0.05$.

Table 13: Comparison of PDat different intervals between test and control group

Intervals	**Test**		**Control**		**t test**	**p value**
	Mean	**SD**	**Mean**	**SD**		
At baseline	5.47	0.78	5.39	0.60	0.32	0.76
At 1 month	3.93	0.62	3.81	0.56	0.56	0.58
At 3 months	3.11	0.71	2.79	0.68	1.26	0.22

Graph 13:Comparison of PDat different intervals between test and control group



control- test-

Table 14, Graph 14 shows the comparison of EHI between test and control group. Mean EHI was 1.40±0.51 in test group and the same was 1.60±0.63 in control group. When mean EHI was compared statistically among the test and control group, it was found to be statistically insignificant as p>0.05.

Table 14: Comparison of Early Healing Index (EHI)between test and control group

Intervals	Mean	SD	t test	p value
Test	1.40	0.51	0.96	0.75
Control	1.60	0.63		

Graph 14:Comparison of Early Healing Index (EHI)between test and control group

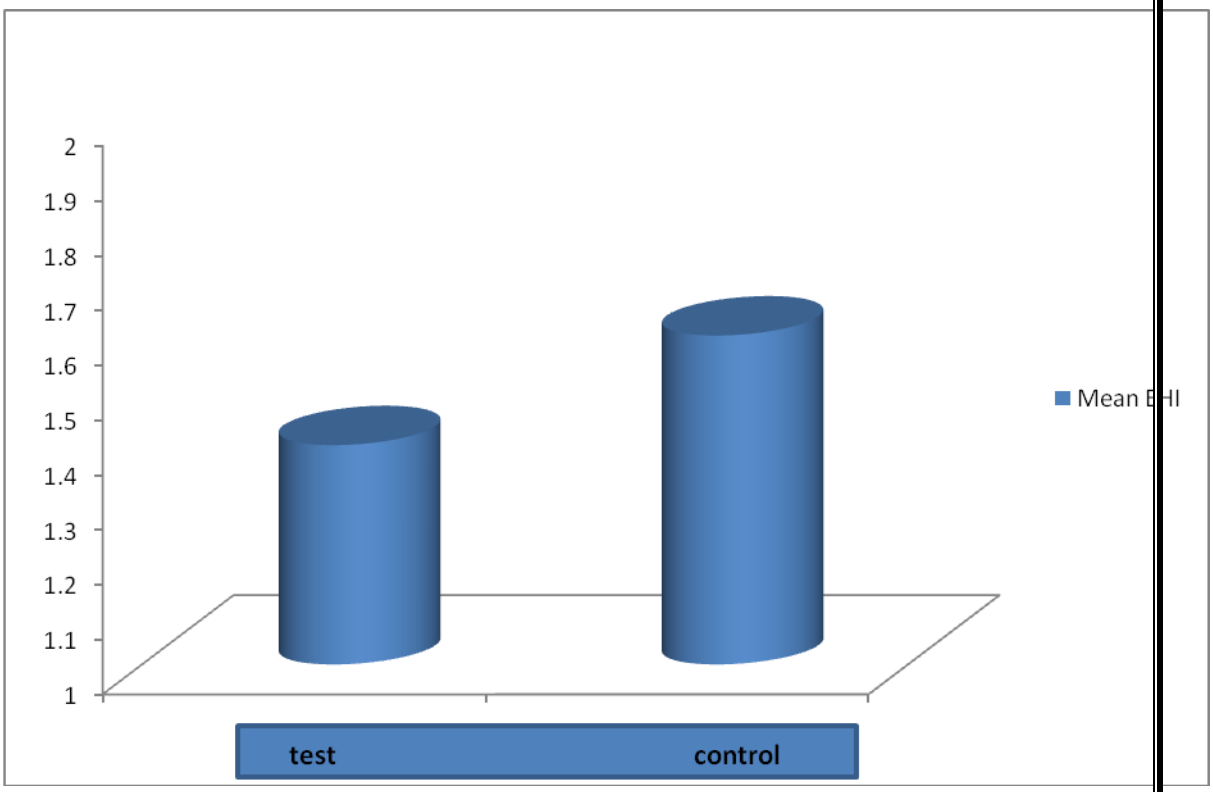


Table 15, Graph 15 shows the comparison of Visual Analogue Scale(VAS)between test and control group. Mean VAS was 0.77±0.18 in test group and the same was 5.43±0.79 in control group. When mean VAS was compared statistically among the test and control group, it was found to be statistically significant as p<0.05.

Table 15: Comparison of Visual Analogue Scale (VAS)between test and control group

Intervals	Mean	SD	t test	p value
Test	0.77	0.18	22.28	<0.01*
Control	5.43	0.79		

*: statistically significant

Graph 15:Comparison of Visual Analogue Scale (VAS)between test and control group

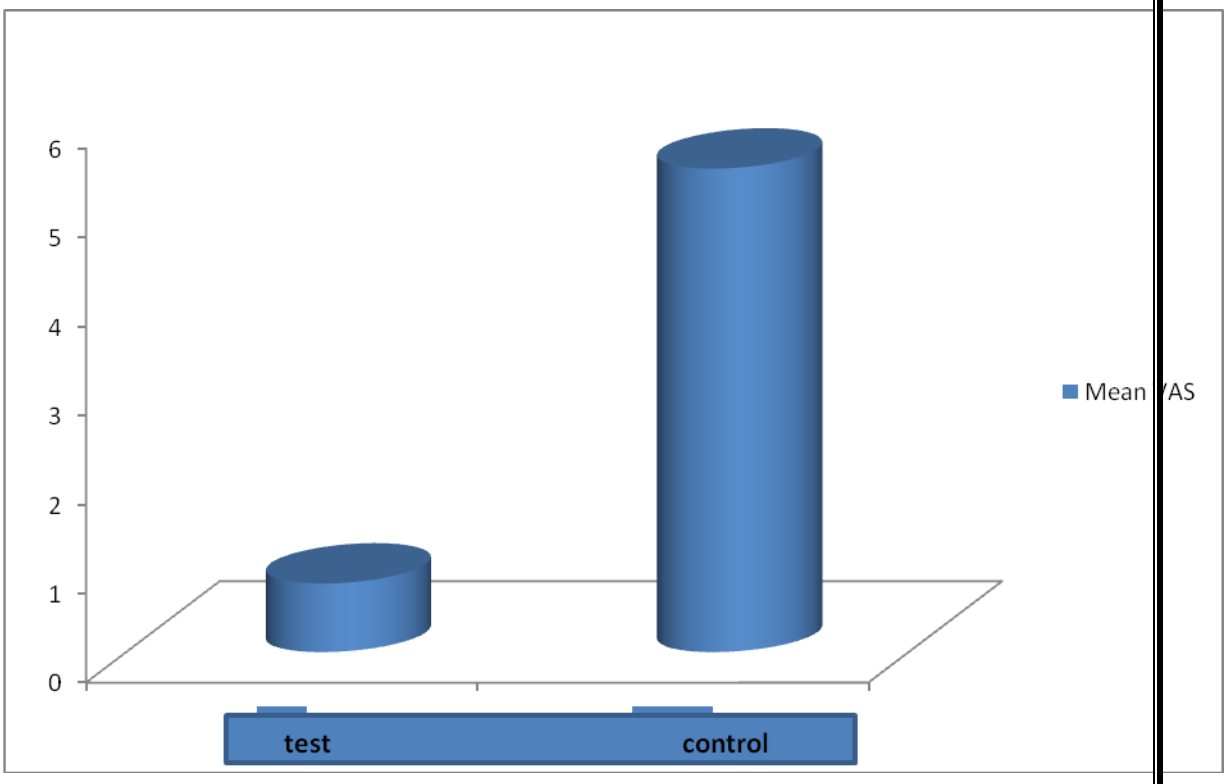


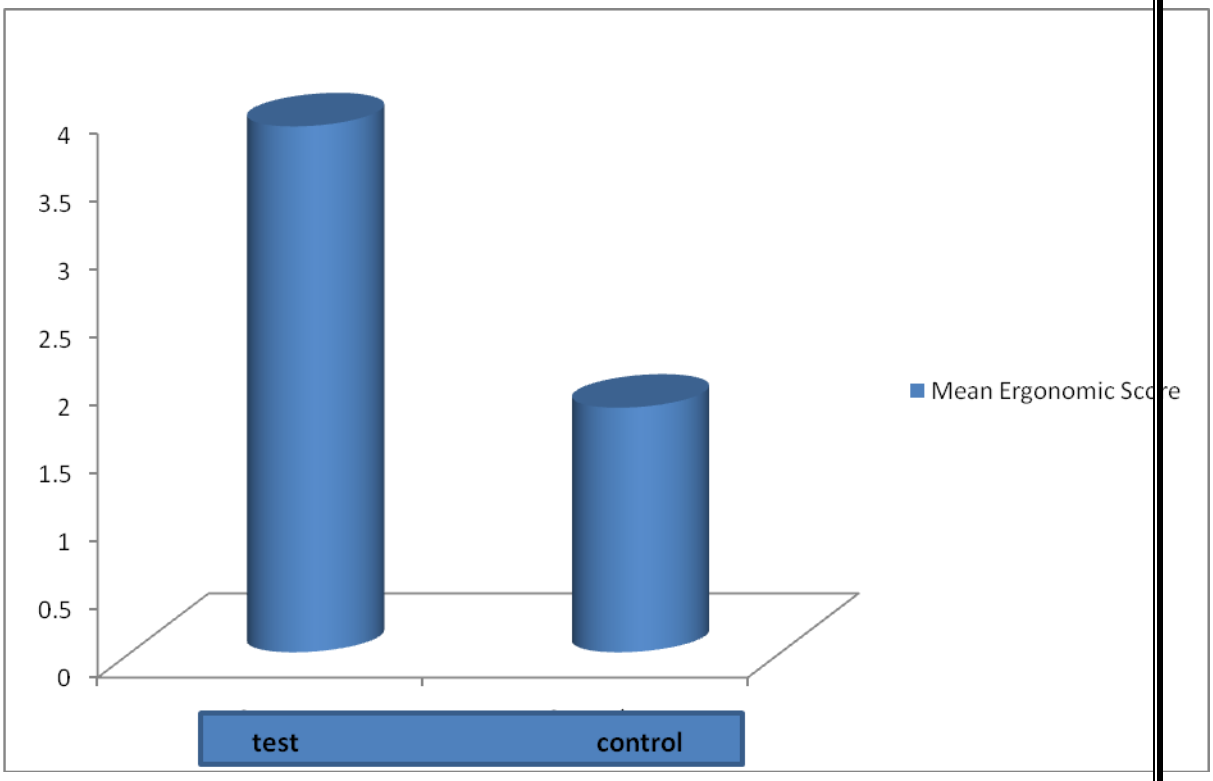
Table 16, Graph 16 shows the comparison of ergonomic score between test and control group. Mean ergonomic score was 3.87±0.18 in test group and the same was 1.80±0.41 in control group. When mean ergonomic score was compared statistically among the test and control group using t test, it was found to be statistically significant as p<0.05.

Table 16:Comparison of ergonomic score between test and control group

Intervals	Mean	SD	t test	p value
Test	3.87	1.52	5.90	<0.01*
Control	1.80	0.41		

*: statistically significant

Graph 16: Comparison of ergonomic score between test and control group



DISCUSSION

Periodontitis is a chronic inflammatory disease characterized by loss of supporting structures of teeth. Periodontal therapy constitutes a key aspect of the treatment of patients having periodontal diseases. It aims at establishing healthy gingiva and arresting the progressive destruction of the supporting apparatus[52]. A variety of surgical techniques have been developed and tested for their potential to restore the periodontal tissues lost due to destructive periodontal disease. The modified widman flap procedure is frequently used in periodontal therapy (Ramjford 1977). It is one of the conservative surgical approaches to eliminate the inflamed gingival tissue and also provide access for root debridement.[53]The use of magnification systems and periodontal microsurgery are one of the greater steps in dentistry toward the use of minimally invasive procedures to replace the need for more extensive surgical procedures. The introduction of microsurgery has helped the periodontist in treating the patient in a conservative manner using enhanced visibility of the surgical field which increase the effectiveness of scaling and root debridement, minimize surgical wounds,rapid wound healing, decreased post-operative morbidity, increased acceptance by patients and increased operator's comfort.[53]

Several studies have reported the use of microsurgery in various recession coverage procedures, interdental papillae preservation techniques and periodontal regeneration procedures in intrabony defects. Very few clinical studies have documented the use and possible advantages of operating microsurgical loupes in periodontal open flap debridement surgery.

The current study was done to evaluate the treatment outcomes of microsurgery using magnifying loupes and compares it with macrosurgical open flap debridement procedures in generalized chronic periodontitis patients and also assessing the effect of magnifying loupes on the ergonomics of the dental operators.In the present split mouth study, teeth with probing pocket depth $\geq$ 5mm were considered as test site and the contralateral teeth with same probing pocket depth were considered as controls. Both control and test sites had almost similar clinical and radiographic parameters.The present study comprised of two groups i.e. Group A (Test) for microsurgery and Group B (Control) for macrosurgery, having 15 subjects each as shown in table 1.

The present study showed that , in test groupPlaque index value were decreased significantly at 1 month and 3 months as compared to baseline as $p<0.01$. In control group, plaque index showed a similar trend to that of test group where there is significant reduction of plaque values from baseline to 1 month and baseline to 3 months.This is in accordance to a study conducted by Perumalet al[42].When plaque index was compared from 1month to 3 months, significant difference was found between the values ($p<0.01$) for test group whereas it was non significant for control group. Plaque index was also compared between the test and control groups at baseline, 1 month and 3 months. In this there was no significant difference between the two groups at baseline but there was a significant difference between these two groups at 1 month ($p=0.009$) and at 3 months ($p=0.001$). This is again in accordance withthe study conducted by Perumal et al[42]upto 9 months.

Gingival index value when compared among test group, it was found to be decreased at 1 month and 3 months as compared to baseline as $p <0.05$. In control group, gingival index showed similar results as of test group where there is significant reduction of gingival index values from baseline to 1month, 1 month to 3 months and baseline to 3 months ($p<0.05$).Gingival index was also compared between the test and control groups at baseline, 1 month and 3 months. In this there was no significant difference between the groups at baseline but there was a significant difference between these groups at 1 month(0.004). Control group showed significant reduction of gingival index values. However, when reduction in gingival index value at 1month and 3 months were compared statistically between test and control group, it was not found to be statistically significant.

Gain in clinical attachment level was found when it was compared among test group at baseline, 1 month and 3 months($p<0.05$).The control group also showed similar results where there is significant CAL gain from baseline to 1 month, baseline to 3 months and 1 month to 3 months($p<0.05$).CAL was also compared between test and control groups at baseline, 1 month and 3 months. In this no significant differene was found when the two groups were compared with each other at baseline, 1 month and 3 months. This is in accordance with the study done by Nizamet al[54] and Perumal et al[42].

In test group, probing depth was decreased at 1 month and 3 months as compared to baseline as $p<0.05$. In control group, similar results were found as that of test group where there is significant reduction of probing depth from baseline to 1 month,

baseline to 3 months and 1 month to 3 months ($p<0.05$). Probing depth was also compared between test and control groups at baseline, 1 month and 3 months. No significant difference was found when the two groups were compared with each other at baseline, 1 month and 3 months. This is in agreement with the results of a study done by Reddy et al[55] .

All the clinical parameters i.e, Plaque index, Gingival index, Clinical attachment level, Probing depth showed a significant improvement at 1 month and 3 months when compared to baseline for both the test and control groups. But when all the parameters were compared between the two groups, it was only significant for Plaque index at 1 month for test group and Gingival index at 1 month for control group and not for Clinical attachment level and Probing depth. By this we infer that there is no much difference when using magnifying loupes compared to conventional methods for open flap debridement. In terms of Periodontal plastic surgeries, the advantages of microsurgical approach in root coverage with free connective tissue grafts have already been demonstrated in a clinical study done by Burkhardt and Hurzeler(2000)[12] ,in which they used fluorescence angiography to verify that sites treated microsurgically achieved vascularization more rapidly than the macrosurgical sites. According to another study conducted by Burkhardt and Lang (2005)[29], microsurgical approach substantially improved the vascularization of the grafts and the percentage of root coverage compared with applying a conventional macroscopic approach.Lindhe and co-workers (1984)[56] suggested that the evaluative factor of the success of periodontal therapy is the meticulousness of debridement of the root surface rather than the choice of grafting modality.

Mean Early Healing Index(EHI) compared statistically among the test and control group, was found to be statistically insignificant as $p>0.05$. This is inconsistent with the study done by Cortellini and Tonnetti, in which they found uneventful earlywound healing with no edema, hematoma, orpain along with statistically significant one-yearCAL gain and PD reduction. This was a casecohort study of 13 deep isolated intrabony defectsin 13 patients, microsurgically accessed using theMIST and the application of EMD (enamel matrixderivative).[57]Since this study was not a minimally invasive therapy, we couldn't found much difference in this index.

In this study, when Visual Analogue Scale(VAS) was compared statistically among the test and

control group, it was found to be statistically significant as $p<0.05$.VAS score washigher in the control (macrosurgery) group showing that pain perceived was more when compared to the test (microsurgical) group.This may be due to delicate handling of the tissues and precise wound closure, which are similar to some of the earlier studies done by Cotellini and Tonetti[57] and Shetty et al[58]. Also, Tibbetts[59]showed that microsurgery offers less postoperative pain, discomfort and better healing because of finer sutures and instruments used in it.

Mean ergonomic score was 3.87±0.18 in test group and the same was 1.80±0.41 in control group. When mean ergonomic score was compared statistically among the test and control group using t test, it was also found to be statistically significant as $p<0.05$ i.e, the ergonomic score was higher for test group as compared to control group. By this , it was suggested that when open flap debridement procedures were performed using magnifying loupes , no muscular pain, better ergonomic posture, ease to reach the instruments without any strenuous movement,improved visibility and accessibility without bending of the neck were reported by the dental operators which were included in this study as compared to performing open flap debridement procedures without loupes .This was in accordance with the results of a qualitative study at VancouverCommunity College (VCC) in British Columbiainvolving dental hygiene students and clinicaleducators, that shown physical health benefitsof surgical magnification. The study participantsreported decreased neck, back, and shoulderproblems; decreased time leaning forward; anddecreased eye fatigue and enhanced vision[60].Our study was also in agreement with the study conducted by Maillet et al[31], in which a statistically significant improvement in mean ergonomic score was found for the times when the students were wearing loupes.

Results of the present study showed a significant reduction in Plaque index,Gingival index, Probing depth and Clinical attachment level at 1 month and 3 months when compared to baseline for both the test and control groups. However, when all the parameters were compared between the two groups , it was only found to be significant for Plaque index at 1 month for test group and Gingival index at 1 month for control group and not for CAL and PD. Alsoit was found that test group offers less postoperative pain and discomfort than the control group. The test group showed better ergonomic score, suggested that the magnifying loupes provide better visibility

and accessibility, improvedposture and enhanced skillsof thedental operator.In the long term, beneficial ergonomic aspects of microsurgery may be the most influentialfactors in its adoption by the dental profession atlarge.

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SUMMARY

A COMPARATIVE STUDY OF ERGONOMICS AND CLINICAL OUTCOME WITH MICROSURGICAL AND MACROSURGICAL PROCEDURES.

Contemporary periodontal therapy extends well beyond merely treating the bacterial component of periodontal disease. Increased patient awareness has generated the demand for an ideal therapy encompassing the elimination of disease and the restoration of esthetics and function that is administered with minimal trauma and discomfort.The treatment for chronic periodontitis needs a surgical intervention for which macrosurgical(conventional) techniques done without using magnification aids such as magnifying loupes or surgical microscope. But nowadays in the minds of many dental professionals, microsurgery is an interesting concept.Microsurgery is the refinement in surgical technique by which normal vision is enhanced through magnification. It is done with using magnifying loupes or surgical microscope. Magnifying Loupes are fundamentally two monocular microscopes, with side by side lenses, angled to focus on an object. Also the chair-side work posture of the dental operators has long been a concern because of health related problems potentially caused or exacerbated by poor posture. As a result dental operators are increasingly concerned about Ergonomics.Ergonomics proposes the provision of working conditions which promote workers welfare and facilitate the performance of labor,it also includes the design of work spaces, equipment, the environment and the process to adequate them to physical and psychological characteristics of the human being.Periodontal microsurgery enable more definite removal of calculus, atraumatic handling of tissues, provides Ergonomic benefits through improved visual acuity and can lead to high quality of care and improved surgical outcome. There is paucity of literature which compares the clinical outcome of patient and Ergonomics of the dental operator using microsurgical and macrosurgical techniques. Hence this study was done for the comparison of ergonomics and clinical outcome with microsurgical and macrosurgical procedures.

The aim of this study was to evaluate the treatment outcomes of microsurgery using magnifying loupes and compare it with macrosurgical open flap debridement procedures and also to assess the effect of magnifying loupes on the ergonomics of the dental operators.This study was designed with the following objectives-To

compare the following clinical parameters for both micro and macro surgical procedures i.e. Gingival index, Plaque index, Probing pocket depth and Clinical attachment level at baseline,1 and 3 months postoperatively, To compare the healing by Early Healing Index at 1 week postoperatively for both the micro and macro surgical procedures, To compare Patient comfort by Visual Analogue Scale for 7 days postoperatively for both the surgical procedures, To assess ergonomics of the dental operator immediately after both the surgical procedures by self-administered questionnaire and compare the difference.

In the following study 30 quadrants in Patients of age group 30-55 years with chronic periodontitis were randomly assigned for microsurgical (test) and macrosurgical (control) open flap debridement procedures in a split mouth design. GROUP A(Test) = 15 quadrants for Microsurgery, GROUP B(Control) = 15 quadrants for macrosurgery.In Control (Group B)-After achieving adequate anesthesia intracrevicular incision was made, full thickness mucoperiosteal flap was reflected ,surgical debridement was carried out, surgical sites were irrigated with sterile saline .Surgical flap was sutured to presurgical level with 3.0 silk suture.Periodontal dressing was placed and post operative instructions were given to the patient.In Test (Group A)- Microsurgery was carried out with x 3.5 optical magnification dental loupe. The surgical procedure was same as that for Group B. All microsurgical instruments were used to perform the microsurgery. Surgical sites was irrigated with sterile saline .Sutures were placed using 5.0 silk suture. Periodontal dressing was placed and post operative instructions were given to the patient.

At baseline,1 and 3 months the following clinical parameters were recorded in both test and control groups-:Plaque index ,Gingival index, Probing pocket depth, Clinical attachment level, post operative healing at 1 week by early healing index and patient comfort by Visual Analogue Scale(VAS) for 7 days postoperatively. Also we assessed the effect of magnifying loupes on the working posture(ergonomics) of the dental operator by the help of a self- admininstered questionnaire. It was done immediately after the surgery.

Clinical study was done by single dental operator and for ergonomics 5 different dental operators were included in the study for whom the questionnaire was given after they had performed similar type of surgery. The data collected from the study was subjected to statistical analysis.

The results of the present study were as follows-a significant reduction in Plaque index, Gingival index, Probing depth and Clinical attachment level at 1 month and 3 months was found when compared to baseline for both the test and control groups. However, when all the parameters were compared between the two groups , it was only found to be significant for Plaque index and Gingival index at 1 month and not for CAL and PD. Also, it was found that the test group offers less postoperative pain and discomfort than the control group. The test group showed better ergonomic score, suggested that the magnifying loupes helps in improved posture of dental operator.From the present study, it can be concluded that microsurgical approach resulted in improved ergonomic posture of operator and less postoperative pain of patients as compared to macrosurgical approach. Both the procedures were effective in improving the clinical parameters equally. The choice of micro or macro surgical approaches should be decided based on the treatment outcomes, cost, and patient centered parameters.